AR11

WRAPAROUND TEST 2

MD-11-DZARC-B

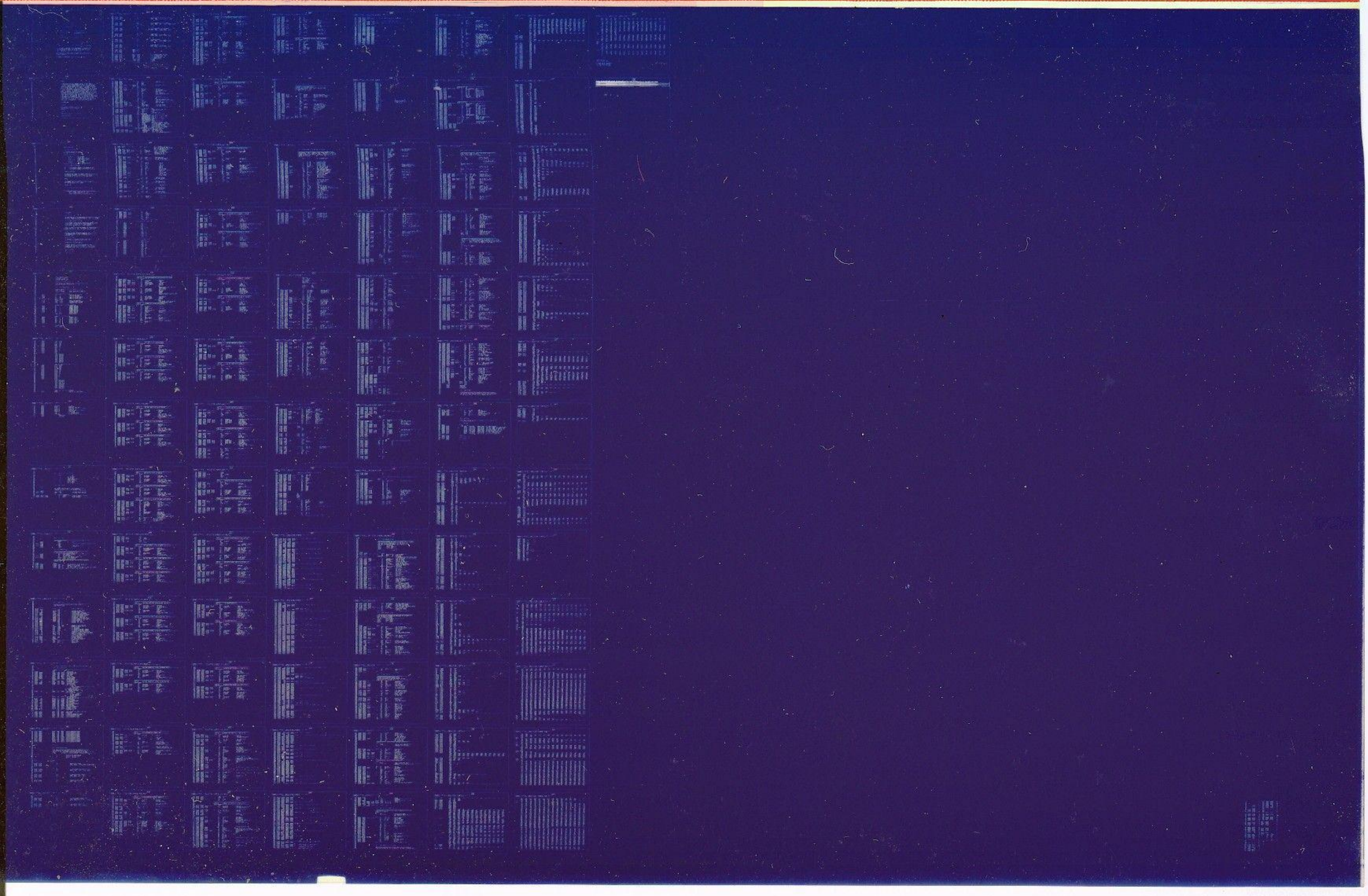
EP-DZARC-B-DL-A

FICHE 1 OF 1

NOV 1976

digital

MADE IN USA



.REM '.

IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZARC-B
PRODUCT NAME:	AR11 DIAGNOSTIC TEST III (WRAPAROUND TEST)
DATE:	MAY 21, 1976
MAINTAINER:	DIAGNOSTIC GROUP

1. ABSTRACT

THE WRAPAROUND DIAGNOSTIC ENABLES THE AR11 TO TEST ITSELF, IN CONJUCTION WITH A G5036 WRAPAROUND MODULE, WHICH IS CONNECTED TO THE AR11 THROUGH A BC08-R CABLE. THE TWO D/A CONVERTERS ARE COMBINED IN VARIOUS MANNERS USING RESISTIVE DIVIDERS ON THE G5036 MODULE AND SENT BACK INTO THE A/D INPUTS. CONSEQUENTLY, BOTH X AND Y D/A'S ARE TESTED BY THE A/D CONVERTER, AND THE A/D IS TESTED BY THE D/A CONVERTERS. BECAUSE THE D/A'S ARE DIVIDED DOWN BEFORE GOING INTO THE A/D, TEST RESOLUTION FAR BETTER THAN 1 LSB IS ATTAINED. IN ADDITION, THE ANALOG POWER SUPPLY LEVELS (+/- 14 VOLTS) ARE DIVIDED DOWN AND USED AS INPUTS, ALLOWING TEST OF THE DC-TO-DC CONVERTER; THE FOUR SCOPE CONTROL LOGIC OUTPUTS (ERASE L, NON-STORE L, CH02 L, AND WRITE-THRU L) ARE USED AS INPUTS, ALLOWING PARAMETRIC TESTS OF THEIR HIGH AND LOW OUTPUT LEVELS; THE CH02 L OUTPUT IS FED BACK INTO THE ERASE RET INPUT, ALLOWING TEST OF THE STORAGE SCOPE ERASE RETURN HANDSHAKING LOGIC; AND THE SCOPE INTENSIFY OUTPUT IS FED BACK INTO THE A/D EXTERNAL START INPUT, ALLOWING TESTS OF BOTH FUNCTIONS. SINCE ALL A/D INPUT CHANNELS ARE USED (AT DIFFERENT INPUT VOLTAGE LEVELS), THE WRAPAROUND MODULE ALSO PROVIDES A COMPLETE FUNCTIONAL CHECK ON THE A/D INPUT MULTIPLEXER.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 FAMILY COMPUTER WITH 9K WORDS OF MEMORY
AR11 HEX OPTION MODULE INSTALLED
G5036 WRAPAROUND MODULE AND BC08-R CABLE
TELETYPE

2.2 STORAGE

THIS PROGRAM USES LESS THAN 9K OF MEMORY.

3. LOADING PROCEDURE

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

THIS PROGRAM HAS BEEN MODIFIED TO RUN WITH OR
WITHOUT A HARDWARE SWITCH REGISTER.

STANDARD PDP-11 FORMAT

```
        SW 15 = 1       HALT ON ERROR
        SW 14 = 1       LOOP ON TEST
        SW 13 = 1       INHIBIT ERROR TYPEOUTS
        SW 12 = 1       FORCED PRINTOUT ENABLE
        SW 11 = 1       INHIBIT ITERATIONS
        SW 10 = 1       BELL ON ERROR
        SW 09 = 1       LOOP ON ERROR
        SW 08 = 1       LOOP ON TEST IN SWR <7:0>
```

REFER TO 9. FOR SOFTWARE SWITCH REGISTER CONTROL

4.2 STARTING ADDRESS OR ADDRESSES

```
200     IS THE STARTING ADDRESS OF THE WRAPAROUND TEST.
204     IS THE RESTART ADDRESS OF THE WRAPAROUND TEST.
210     IS THE STARTING ADDRESS FOR THE OPTION TEST AREA.
```

5. OPERATING PROCEDURE

THE OPERATOR MUST INSERT THE CORRECT INFORMATION IN THE SWITCH
REGISTER WHEN REQUESTED BY THE PROGRAM OR AN ERROR WILL OCCUR.
ONCE STARTED THE TEST WILL RUN IN ITS NORMAL MANNER
WITHOUT OPERATOR INTERVENTION OR SWITCH SELECTION.

6. ERRORS

THIS PROGRAM USES THE DIAGNOSTIC 'SYSMAC' PACKAGE FOR
ERROR REPORTING AND TYPEOUT. REFER TO THE "ERROR POINTER TABLE"
FOR TYPE AND DESCRIPTION OF ERRORS.

7. RESTRICTIONS

SWITCH ON G5036 MUST BE IN THE 'U' POSITION.

```
**************************************************************
THE WRAPAROUND (G5036) MODULE MUST BE CONNECTED AS FOLLOWS:
        AR11 TO BC08R CONNECTION A-A, VV-VV
        BC08R TO G5036 CONNECTION "UPSIDE-DOWN" A-VV, VV-A
**************************************************************
```

8. MISCELLANEOUS

8.1 EXECUTION TIME

THE FIRST PASS WILL TAKE APPROXIMATELY 45 SECONDS FOR COMPLETION.
ADDITIONAL PASSES WILL TAKE APPROXIMATELY 4 MIN. FOR COMPLETION.
THE END OF A PASS IS INDICATED BY THE 'END PASS #X' MESSAGE.

8.2 DEVICE ADDRESS PROGRAM LOCATIONS

LOCATION $BASE CONTAINS THE AR11 BASE DEVICE ADDRESS (170400)
LOCATION $VECT1 CONTAINS THE AR11 BASE INTERRUPT VECTOR (340)
LOCATION $FILLS CONTAINS THE TTY FILLER CHARACTER COUNT
LOCATION $NULL CONTAINS THE TTY FILLER CHARACTER

*NOTE: IF THESE LOCATIONS ARE CHANGED, THE OPERATOR MUST START
THE TEST AGAIN AT LOC. 200. THE PROGRAM WILL USE THE BASE
ADDRESS AND VECTOR AND UPDATE THE ACTUAL PROGRAM VALUES.

8.3 MULTIPLE AR-11 TESTING

A PROVISION IS MADE FOR TESTING SEQUENTIAL AR-11. STARTING
AT BUS ADDRESS/VECTOR DEFINED BY $BASE AND $VECT1.
THE HEADER TYPEOUT WILL INFORM THE OPERATOR OF THE NUMBER
OF AR-11'S FOUND.

8.4 XXDP/ACT/APT NOTES

THIS PROGRAM IS A CHAINABLE PROGRAM UNDER XXDP ACT.
THE APT HOOKS HAVE BEEN INSTALLED BUT NOT TESTED.

9. SOFTWARE SWITCH REGISTER OPERATION

THE PROGRAM SUPPORTS NON-SWITCH REGISTER CPU TYPES.
A CHANGE IN SWR VALUE IS ACCOMPLISHED BY TYPING A "CTRL G".
THE RESPONSE WILL BE "SWR = " AND WAIT FOR A NEW VALUE.
THE OPERATOR NOW INPUTS THE NEW VALUE AND TERMINATES WITH A "CR".

10. TABLE OF CONTENTS

ATTACHED

```
                                        %
                                .TITLE  MAINDEC-11-DZARC-B
                                ;*COPYRIGHT (C) 1976
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*PROGRAM BY RAYMOND SHOOP
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-B2).NOV 21, 1975.
                                ;*

                                .SBTTL  BASIC DEFINITIONS

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

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

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

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

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

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

                                ;*DATA BIT DEFINITIONS (BIT00 T) BIT15)
                100000          BIT15=  100000
                040000          BIT14=  40000
                020000          BIT13=  20000
                010000          BIT12=  10000
                004000          BIT11=  4000
                002000          BIT10=  2000
                001000          BIT09=  1000
                000400          BIT08=  400
                000200          BIT07=  200
                000100          BIT06=  100
                000040          BIT05=  40
                000020          BIT04=  20
                000010          BIT03=  10
                000004          BIT02=  4
                000002          BIT01=  2
                000001          BIT00=  1
                                .EQUIV  BIT09,BIT9
                                .EQUIV  BIT08,BIT8
                                .EQUIV  BIT07,BIT7
                                .EQUIV  BIT06,BIT6
                                .EQUIV  BIT05,BIT5
                                .EQUIV  BIT04,BIT4
                                .EQUIV  BIT03,BIT3
                                .EQUIV  BIT02,BIT2
                                .EQUIV  BIT01,BIT1
                                .EQUIV  BIT00,BIT0

                                ;*BASIC "CPU" TRAP VECTOR ADDRESSES
                000004          ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
                000010          RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
```

```
                        TBITVEC=14              ;;"T" BIT
                        TRTVEC= 14              ;;TRACE TRAP
                        BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
                        IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
                        PWRVEC= 24              ;;POWER FAIL
                        EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
                        TRAPVEC=34              ;;"TRAP" TRAP
                        TKVEC=  60              ;;TTY KEYBOARD VECTOR
                        TPVEC=  64              ;;TTY PRINTER VECTOR
                        PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
                                ABASE=170400
                                AVECT1=340
                                APRIOR=200
```

```
                                .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        12            FORCED PRINTOUT
                                ;*        11            INHIBIT ITERATIONS
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
                                ;*         8            LOOP ON TEST IN SWR<7:0>

                                .SBTTL  TRAP CATCHER

000000                                  .=0
                                ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
000174                                  .=174
000174  000000                 DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000                 SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER

                                .SBTTL  STARTING ADDRESS(ES)
000200  000137  001516                  JMP     @#BEGIN ;;JUMP TO STARTING ADDRESS OF PROGRAM
000204  000137  001536                  JMP     BEGIN1          ;RESTART ADDRESS
000210  000137  001530                  JMP     BEGIN2          ;STARTING ADDRESS OF OPTION TEST PREA
```

```
                                        .SBTTL  ACT11 HOOKS

                                        ;;**************************************************************
                                        ;HOOKS REQUIRED BY ACT11
000214                                          $SVPC=.                 ;SAVE PC
000046                                          .=46
000046  010436                                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .SEOP
000052                                          .=52
000052  000000                                  .WORD   0               ;;2)SET LOC.52 TO ZERO
000214                                          .=$SVPC                 ;; RESTORE PC
001000                                          .=1000

                                        .SBTTL  APT PARAMETER BLOCK

                                        ;;**************************************************************
                                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                        ;;**************************************************************
001000                                          .$X=.   ;;SAVE CURRENT LOCATION
000024                                          .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                                  200     ;;FOR APT START UP
000044                                          .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  001000                                  $APTHDR ;;POINT TO APT HEADER BLOCK
001030                                          .=.$X   ;;RESET LOCATION COUNTER
                                        ;;**************************************************************
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.

001000                                  $APTHD:
001000  000000                          $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001002  001200                          $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001004  000020                          $TSTM:  .WORD   20      ;;RUN TIM OF LONGEST TEST
001006  000030                          $PASTM: .WORD   30      ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001010  000120                          $UNITM: .WORD   120     ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001012  000052                                  .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                                .SBTTL  COMMON TAGS

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

                    001100                  .=1100
001100                          $CMTAG:                 ;;START OF COMMON TAGS
001100  000000                          .WORD   0
001102     000          $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103     000          $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114     000          $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115     001          $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134  000000                  .WORD   0
001136  177570          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001140  177570          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001142  177560          $TKS:   177560                  ;;TTY KBD STATUS
001144  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001146  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001150  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001152     000          $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001153     002          $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001154     012          $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001155     000          $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001156  000000          $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                        ;;WHICH  ($REGO) WAS OBTAINED
001160  000000          $REGO:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001162  000000          $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
001164  000000          $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001166  000000          $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001170  177607  000377  $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001174     077          $QUES:  .ASCII  /?/             ;;QUESTION MARK
001175     015          $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001176  000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
```

```
                        ;;**************************************************************
                        .SBTTL  APT MAILBOX-ETABLE
                        ;;**************************************************************
                        .EVEN
001200                  $MAIL:                          ;;APT MAILBOX
001200  000000          $MSGTY: .WORD   AMSGTY          ;;MESSAGE TYPE CODE
001202  000000          $FATAL: .WORD   AFATAL          ;;FATAL ERROR NUMBER
001204  000000          $TESTN: .WORD   ATESTN          ;;TEST NUMBER
001206  000000          $PASS:  .WORD   APASS           ;;PASS COUNT
001210  000000          $DEVCT: .WORD   ADEVCT          ;;DEVICE COUNT
001212  000000          $UNIT:  .WORD   AUNIT           ;;I/O UNIT NUMBER
001214  000000          $MSGAD: .WORD   AMSGAD          ;;MESSAGE ADDRESS
001216  000000          $MSGLG: .WORD   AMSGLG          ;;MESSAGE LENGTH
001220                  $ETABLE:                        ;;APT ENVIRONMENT TABLE
001220     000          $ENV:   .BYTE   AENV            ;;ENVIRONMENT BYTE
001221     000          $ENVM:  .BYTE   AENVM           ;;ENVIRONMENT MODE BITS
001222  000000          $SWREG: .WORD   ASWREG          ;;APT SWITCH REGISTER
001224  000000          $USWR:  .WORD   AUSWR           ;;USER SWITCHES
001226  000000          $CPUOP: .WORD   ACPUOP          ;;CPU TYPE,OPTIONS
                        ;*                              BITS 15-11=CPU TYPE
                        ;*                                      11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                        ;*                                      11/70=06,PDQ=07,Q=10
                        ;*                              BIT 10=REAL TIME CLOCK
                        ;*                              BIT  9=FLOATING POINT PROCESSOR
                        ;*                              BIT  8=MEMORY MANAGEMENT
001230     000          $MAMS1: .BYTE   AMAMS1          ;;HIGH ADDRESS,M.S. BYTE
001231     000          $MTYP1: .BYTE   AMTYP1          ;;MEM. TYPE,BLK#1
                        ;*                              MEM.TYPE BYTE   --  (HIGH BYTE)
                        ;*                                      900 NSEC CORE=001
                        ;*                                      300 NSEC BIPOLAR=002
                        ;*                                      500 NSEC MOS=003
001232  000000          $MADR1: .WORD   AMADR1          ;;HIGH ADDRESS,BLK#1
                        ;*                                MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
001234     000          $MAMS2: .BYTE   AMAMS2          ;;HIGH ADDRESS,M.S. BYTE
001235     000          $MTYP2: .BYTE   AMTYP2          ;;MEM.TYPE,BLK#2
001236  000000          $MADR2: .WORD   AMADR2          ;;MEM.LAST ADDRESS,BLK#2
001240     000          $MAMS3: .BYTE   AMAMS3          ;;HIGH ADDRESS,M.S.BYTE
001241     000          $MTYP3: .BYTE   AMTYP3          ;;MEM.TYPE,BLK#3
001242  000000          $MADR3: .WORD   AMADR3          ;;MEM.LAST ADDRESS,BLK#3
001244     000          $MAMS4: .BYTE   AMAMS4          ;;HIGH ADDRESS,M.S.BYTE
001245     000          $MTYP4: .BYTE   AMTYP4          ;;MEM.TYPE,BLK#4
001246  000000          $MADR4: .WORD   AMADR4          ;;MEM.LAST ADDRESS,BLK#4
001250     340          $VECT1: .BYTE   AVECT1          ;;INTERRUPT VECTOR#1
001251     000          $VECT2: .BYTE   AVECT2          ;;INTERRUPT VECTOR#2
001252     200          $PRIOR: .BYTE   APRIOR          ;;BUS PRIORITY #1,#2
001253     000                  .BYTE   0              ;;SPARE,NOT USED
                                .EVEN
001254  170400          $BASE:  .WORD   ABASE           ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001256  000000          $DEVM:  .WORD   ADE             ;;DEVICE MAP
001260  000000          $CDW1:  .WORD   AC_             ;;      ER DESCRIPTION WORD#1
001262  000000          $CDW2:  .WORD   ACDW2           ;;      LER DESCRIPTION WORD#2
001264  000000          $DDW0:  .WORD   ADDW0           ;;DEVICE DESCRIPTOR WORD#0
001266  000000          $DDW1:  .WORD   ADDW1           ;;DEVICE DESCRIPTOR WORD#1
001270  000000          $DDW2:  .WORD   ADDW2           ;;DEVICE DESCRIPTOR WORD#2
```

```
001272  000000                  $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
001274  000000                  $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
001276  000000                  $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
001300  000000                  $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
001302  000000                  $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
001304  000000                  $DDW8:  .WORD   ADDW8   ;;DEVICE DESCRIPTOR WORD#8
001306  000000                  $DDW9:  .WORD   ADDW9   ;;DEVICE DESCRIPTOR WORD#9
001310  000000                  $DDW10: .WORD   ADDW10  ;;DEVICE DESCRIPTOR WORD#10
001312  000000                  $DDW11: .WORD   ADDW11  ;;DEVICE DESCRIPTOR WORD#11
001314  000000                  $DDW12: .WORD   ADDW12  ;;DEVICE DESCRIPTOR WORD#12
001316  000000                  $DDW13: .WORD   ADDW13  ;;DEVICE DESCRIPTOR WORD#13
001320  000000                  $DDW14: .WORD   ADDW14  ;;DEVICE DESCRIPTOR WORD#14
001322  000000                  $DDW15: .WORD   ADDW15  ;;DEVICE DESCRIPTOR WORD#15


001324                          $ETEND:


                                .SBTTL  ERROR POINTER TABLE

                                ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                                ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
                                ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:

                                ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                ;*      DH              ;;POINTS TO THE DATA HEADER
                                ;*      DT              ;;POINTS TO THE DATA
                                ;*      DF              ;;POINTS TO THE DATA FORMAT


001324                          $ERRTB:

                                ;ITEM   1
001324  011736                          EM1                     ;ERROR ON A/D CHANNEL
001326  012451                          DH1                     ;ERRPC  ARADD   CHANNEL NOMINAL TOLERANCE ACTUAL
001330  014572                          DT1                     ;$ERRPC ARBADD  CHANL   $GDDAT  SPREAD  $BDDAT
001332  000000                          0

                                ;ITEM   2
001334  011763                          EM2                     ;VC LOGIC SIGNAL HIGH OUTPUT TOO LOW
001336  012530                          DH2                     ;ERRPC  ARADD   CHANNEL 3V LEV. OUTPUT
001340  014610                          DT2                     ;$ERRPC ARBADD  CHANL   $GDDAT  $BDDAT
001342  000000                          0

                                ;ITEM   3
001344  012027                          EM3                     ;VC STATUS REGISTER IN ERROR
001346  012577                          DH3                     ;ERRPC  ARADD   GOOD    BAD
001350  014624                          DT3                     ;$ERRPC ARBADD  $GDDAT  $BDDAT
001352  000000                          0

                                ;ITEM   4
001354  012063                          EM4                     ;EXTERNAL AD START FAILED
001356  012577                          DH3                     ;ERRPC  ARADD   GOOD    BAD
001360  014624                          DT3                     ;$ERRPC ARBADD  $GDDAT  $BDDAT
```

```
MAINDEC-11-DZARC-B     MACY11 27(732)  21-SEP-76  16:44  PAGE 13
DZARCB.P11      ERROR POINTER TABLE

   537  001362  000000                          0
   538
   539                                  :ITEM   5
   540  001364  012120                          EM5                 :A/D DIFFERENTIAL LINEARITY ERROR
   541  001366  012534                          DH5                 :ERRPC  ARADD   # OF STATES     ALLOWED
   542  001370  014636                          DT5                 :$ERRPC ARBADD    $BDDAT         $GDDAT
   543  001372  000000                          0
   544
   545                                  :ITEM   6
   546  001374  012161                          EM6                 :NOISE LEVEL EXCEEDED LIMIT
   547  001376  012674                          DH6                 :ERRPC  ARADD   LIMIT   MEASURED
   548  001400  014624                          DT3                 :$ERRPC ARBADD  $GDDAT  $BDDAT
   549  001402  000000                          0
   550
```

```
                                :ITEM   7
001424  012214                          EM7             ;VC LOGIC SIGNAL LOW OUTPUT TOO HIGH
001406  012735                          DH7             ;ERRPC  ARADD   A-D CHAN +.4V LEV. OUTPUT
001410  014610                          DT2             ;$ERRPC ARBADD  CHANL   $GDDAT   $BDDAT
001412  000000                          0

                                :ITEM   10
001414  012260                          EM10            ;D-A DIFFERENTIAL LINEARITY ERROR
001416  013004                          DH10            ;ERRPC  ARADD   STEP    NOMINAL SPREAD  ACTUAL
001420  014650                          DT10            ;$ERRPC ARBADD  EDGE    $GDDAT  SPREAD  $BDDAT
001422  000000                          0

                                :ITEM   11
001424  012321                          EM11            ;A-D INTER-CHANNEL SETTLING ERROR
001426  013063                          DH11            ;ERRPC  ARADD   NOMINAL SPREAD  ACTUAL
001430  014666                          DT11            ;$ERRPC ARBADD  $GDDAT  SPREAD  $BDDAT
001432  000000                          0

                                :ITEM   12
001434  012362                          EM12            ;OFFSET ERROR
001436  013063                          DH11            ;ERRPC  ARADD   NOMINAL SPREAD  ACTUAL
001440  014656                          DT11            ;$ERRPC ARBADD  $GDDAT  SPREAD  $BDDAT
001442  000000                          0

                                :ITEM   13
001444  012377                          EM13            ;CALIBRATION ERROR
001446  013063                          DH11            ;ERRPC  ARADD   NOMINAL SPREAD  ACTUAL
001450  014666                          DT11            ;$ERRPC ARBADD  $GDDAT  SPREAD  $BDDAT
001452  000000                          0

                                :ITEM   14
001454  012421                          EM14            ;LINEARITY ERROR AT XXDC
001456  013063                          DH11            ;ERRPC  ARADD   NOMINAL SPREAD  ACTUAL
001460  014666                          DT11            ;$ERRPC ARBADD  $GDDAT  SPREAD  $BDDAT
001462  000000                          0

001464  170400          ARBADD: 170400
001466  000340          ARBVCT: 340
001470  000000          NMBEXT: 0
001472  000000          NBEXT:  0

001474  170400          ADCS:   170400          ;A TO D STATUS/CONTROL REGISTER
001476  170401          ADCS1:  170401          ;A TO D STATUS REGISTER (HIGH BYTE
001500  170402          ADDBP:  170402          ;A TO D CONVERTED VALUE (READ
001502  170404          CSR:    170404          ;CLOCK STATUS REGISTER
001504  170406          CSB:    170406          ;CLOCK PRESET BUFFER
001506  170410          VCSTAT: 170410          ;DAC STATUS REGISTER
001510  170412          VCXREG: 170412          ;X BUFFER
001512  170414          VCYREG: 170414          ;Y BUFFER
001514  170416          CSC:    170416          ;CLOCK COUNTER
                        .SBTTL  PROGRAM START-UP
```

```
                                BEGIN:  CLR     R0                      ;CLEAR R0
001520  005037  016762                  CLR     WFTEST                  ;CLEAR TOLERANCE FLAG
001524  000406                          BR      RBEG
001526  000405                          BR      RBEG
001530  012737  000001  016762  BEGIN2: MOV     #1,WFTEST               ;SET TOLERANCE FLAG
001536  012700  177777          BEGIN1: MOV     #-1,R0                  ;LOAD R0
001542  000005                  RBEG:   RESET
001544  005037  177776                  CLR     PS
001550  012706  001100                  MOV     #STACK,SP               ;LOAD STACK
001554  012737  001632  000004          MOV     #1$,@#4                 ;LOAD BUS ERROR
001562  013702  001254                  MOV     $BASE,R2                ;LOAD STARTING ADDRESS
001566  005003                          CLR     R3                      ;CLEAR COUNT
001570  005712                  2$:     TST     (R2)                    ;TEST IF EXISTENT
001572  062702  000020                  ADD     #20,R2                  ;EXIST, UPDATE TEST ADDRESS
001576  005203                          INC     R3                      ;UPDATE # OF AR11'S
001600  000773                          BR      2$
001602  022626                  1$:     CMP     (SP)+,(SP)+             ;POP STACK
001604  005703                          TST     R3                      ;TEST IF FIRST DOES EXIST
001606  001002                          BNE     3$                      ;BR
001610  000000                          HALT                            ;FIRST AR11 DOES NOT EXIST
001612  000741                          BR      BEGIN                   ;CHECK THE PROGRAM DEVICE ADDRESS
001614  005303                  3$:     DEC     R3                      ;ADJUST R3
001616  010337  001470                  MOV     R3,NMBEXT               ;SAVE THE NUMBER OF ADDITIONAL AR11'S
001622  012737  000006  000004          MOV     #6,@#4                  ;RESET BUS ERROR
001630  005037  000006                  CLR     @#6
001634  013737  001254  001464          MOV     $BASE,ARBADD            ;LOAD FIRST ADDRESS
001642  013737  001250  001466          MOV     $VECT1,ARBVCT           ;LOAD FIRST VECTOR
001650  013737  001470  001472          MOV     NMBEXT,NBEXT            ;LOAD NUMBER OF ADDITIONAL AR11'S
001656  000005                          RESET
                        ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
001660  012706  001100                  MOV     #$CMTAG,R6              ;;FIRST LOCATION TO BE CLEARED
001664  005026                          CLR     (R6)+                   ;;CLEAR MEMORY LOCATION
001666  022706  001126                  CMP     #$BDDAT,R6              ;;DONE?
001672  001374                          BNE     .-6                     ;;LOOP BACK IF NO
001674  012706  001100                  MOV     #STACK,SP               ;;SETUP THE STACK POINTER
                        ;;INITIALIZE A FEW VECTORS
001700  012737  017172  000020          MOV     #$SCOPE,@#IOTVEC        ;;IOT VECTOR FOR SCOPE ROUTINE
001706  012737  000340  000022          MOV     #340,@#IOTVEC+2         ;;LEVEL 7
001714  012737  017452  000030          MOV     #$ERROR,@#EMTVEC        ;;EMT VECTOR FOR ERROR ROUTINE
001722  012737  000340  000032          MOV     #340,@#EMTVEC+2         ;;LEVEL 7
001730  012737  021774  000034          MOV     #$TRAP,@#TRAPVEC        ;;TRAP VECTOR FOR TRAP CALLS
001736  012737  000340  000036          MOV     #340,@#TRAPVEC+2        ;LEVEL 7
001744  012737  020576  000024          MOV     #$PWRDN,@#PWRVEC        ;;POWER FAILURE VECTOR
001752  012737  000340  000026          MOV     #340,@#PWRVEC+2         ;;LEVEL 7
001760  013737  010404  010376          MOV     $ENDCT,$EOPCT           ;;SETUP END-OF-PROGRAM COUNTER
001756  005037  001164                  CLR     $TIMES                  ;;INITIALIZE NUMBER OF ITERATIONS
001772  005037  001166                  CLR     $ESCAPE                 ;;CLEAR THE ESCAPE ON ERROR ADDRESS
001776  112737  000001  001115          MOVB    #1,$ERMAX               ;;ALLOW ONE ERROR PER TEST
002004  012737  002004  001106          MOV     #..,$LPADR              ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
002012  012737  002012  001110          MOV     #.,$LPERR               ;;SETUP THE ERROR LOOP ADDRESS
                        ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                        ;;EQUAL TO A "-1"  SETUP FOR A SOFTWARE SWITCH REGISTER.
002020  013746  000004                  MOV     @#ERRVEC,-(SP)          ;;SAVE ERROR VECTOR
002024  012737  002062  000004          MOV     #64$,@#ERRVEC           ;;SET UP ERROR VECTOR
002032  012737  177570  001136          MOV     #DSWR,SWR               ;;SETUP FOR A HARDWARE SWICH REGISTER
002040  012737  177570  001140          MOV     #DDISP,DISPLAY          ;;AND A HARDWARE DISPLAY REGISTER
```

```
                                CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
                                BNE     65$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                        ;;AND  THE HARDWARE SWR IS NOT = -1
                                TST     @#1             ;;FORCE A TRAP THROUGH ERRVEC
                        64$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
                                MOV     #DISPREG,DISPLAY ;;POINT TO SOFTWARE DISPLAY REG
                                MOV     #65$,(SP)       ;;REPLACE OLD PC WITH NEW
                                RTI                     ;;RESTORE PC AND PSW
                        65$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

                        $ARG1:                  ;
                                CLR     $PASS           ;;CLEAR PASS COUNT
                                BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
                                BEQ     64$             ;;YES,USE NON-APT SWITCH
                                MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
                        64$:
                        RBEG2:  RESET
                                MOV     #232,R2                 ;LOAD R2
                                MOV     #230,R1                 ;LOAD R1
                        5$:     MOV     R2,(R1)+                ;LOAD .+2
                                CLR     (R1)+                   ;LOAD HALT
                                MOV     R1,R2                   ;LOAD R2
                                TST     (R2)+                   ;BUMP R2
                                CMP     R2,#1002                ;TEST FOR LAST
                                BNE     5$                      ;BR UNTIL DONE
                                JSR     PC,WFADJ                ;ADJUST SOME TOLERANCES
                                TST     R0                      ;TEST R0
                                BEQ     2$                      ;BR IF CLEARED
                                JMP     4$                      ;INHIBIT TYPOUT
                        2$:     TST     @#42                    ;TEST ACT-11 OR DCP
                                BEQ     3$                      ;BR IF CLEARED
                                JMP     4$                      ;INHIBIT TYPOUT
                        3$:
                                TYPE    ,65$                ;;TYPE ASCIZ STRING
                                BR      64$                 ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  <15><12>/AR-11 DIAGNOSTIC WRAPAROUND TEST.
                        64$:
                                TYPE    ,67$                ;;TYPE ASCIZ STRING
                                BR      66$                 ;;GET OVER THE ASCIZ
                        ;;67$:  .ASCIZ  <15><12>/MAINDEC-11-DZARC-B.<15><12>
                        66$:
                                MOV     NMBEXT,-(SP)            ;PUSH ON STACK
                                TYPOS                           ;TYPE OCTAL
                                .WORD   2
                                TYPE    ,69$                ;;TYPE ASCIZ STRING
                                BR      68$                 ;;GET OVER THE ASCIZ
                        ;;69$:  .ASCIZ  /(8) ADDITIONAL AR11'S CONNECTED/
                        68$:
                                TYPE    ,71$                ;;TYPE ASCIZ STRING
                                BR      70$                 ;;GET OVER THE ASCIZ
                        ;;71$:  .ASCIZ  <15><12>/ALL AR-11'S MUST HAVE G5036 WRAPAROUND MODULE INSTALLED
                        70$:

                        4$:     MOV     #ADCS,R0                ;LOAD POINTER
                        10$:    MOV     ARBADD,(R0)+
                                CMP     #BEGIN,R0               ;TEST FOR END
```

```
 002512  001373                         BNE     10$
 002514  005237  001476                 INC     ADCS1
 002520  012700  001500                 MOV     #ADDBR,R0
 002524  012701  000002                 MOV     #2,R1
 002530  060120                 12$:    ADD     R1,(R0)+
 002532  005721                         TST     (R1)+
 002534  022701  000020                 CMP     #20,R1
 002540  001373                         BNE     12$
                                        .SBTTL  A TO D CHANNEL NUMBERS

                                ;BIPOLAR CHANNEL NUMBERS

                 000000                 CH0=    0
                 000001                 CH1=    1
                 000002                 CH2=    2
                 000003                 CH3=    3
                 000004                 CH4=    4
                 000005                 CH5=    5
                 000006                 CH6=    6
                 000007                 CH7=    7
                 000010                 CH10=   10
                 000011                 CH11=   11
                 000012                 CH12=   12
                 000013                 CH13=   13
                 000014                 CH14=   14
                 000015                 CH15=   15
                 000016                 CH16=   16
                 000017                 CH17=   17

                                ;UNIPOLAR CHANNEL NUMBERS

                 000040                 CH40=   40
                 000041                 CH41=   41
                 000042                 CH42=   42
                 000043                 CH43=   43
                 000044                 CH44=   44
                 000045                 CH45=   45
                 000046                 CH46=   46
                 000047                 CH47=   47
                 000050                 CH50=   50
                 000051                 CH51=   51
                 000052                 CH52=   52
                 000053                 CH53=   53
                 000054                 CH54=   54
                 000055                 CH55=   55
                 000056                 CH56=   56
                 000057                 CH57=   57
                                        .SBTTL
                                        .SBTTL  TEST NUMBER                     ABSTRACT
                                        .SBTTL
```

```
                                        ;;*****************************************************************
                                        ;*TEST 1        TEST THAT "ERASE" AND DONE CAN BE SET AND CLEARED
                                        ;;*****************************************************************
002542  000004                  TST1:   SCOPE
002544  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
002552  005077  176730                  CLR     @VCSTAT                 ;CLEAR
002556  012737  010000  001124          MOV     #BIT12,$GDDAT           ;LOAD EXPECTED
002564  013777  001124  176714          MOV     $GDDAT,@VCSTAT          ;LOAD REG
002572  017737  176710  001126          MOV     @VCSTAT,$BDDAT          ;READ REG
002600  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE
002606  001401                          BEQ     1$              ;;BR IF SET
002610  104003                          ERROR   3                       ;ERASE FAILED TO SET, CHECK G5036-
                                                                        ;BCOBR CONNECTION: A-VV, VV-A
002612  012737  001000  001124  1$:     MOV     #BIT9,$GDDAT            ;LOAD EXPECTED
002620  052777  001000  176660          BIS     #BIT9,@VCSTAT           ;SET CH 2 BIT
002626  017737  176654  001126          MOV     @VCSTAT,$BDDAT          ;READ REG
002634  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE
002642  001401                          BEQ     2$              ;;BR IF CLEARED
002644  104003                          ERROR   3                       ;ERASE BIT FAILED TO CLEAR BY ERASE
                                                                        ;RETURN (SETTING OF THE CH 2 BIT)
002646  012737  000200  001124  2$:     MOV     #BIT7,$GDDAT            ;LOAD EXPECTED
002654  042777  001000  176624          BIC     #BIT9,@VCSTAT           ;CLEAR CH 02
002662  017737  176620  001126          MOV     @VCSTAT,$BDDAT          ;READ REG
002670  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE
002676  001401                          BEQ     TST2            ;;BR IF EQUAL
002700  104003                          ERROR   3                       ;READY FAILED TO SET ON THE END
                                                                        ; OF ERASE RETURN (CLEARING CH 2)
                                        ;;*****************************************************************
                                        ;*TEST 2        EXTERNAL A TO D START FROM INTENSIFY
                                        ;;*****************************************************************
002702  000004                  TST2:   SCOPE
002704  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
002712  005077  176570                  CLR     @VCSTAT
002716  017777  176556  176554          MOV     @ADDBR,@ADDBR           ;CLEAR DONE
002724  005077  176544                  CLR     @ADCS
002730  012737  000220  001124          MOV     #BIT7!BIT4,$GDDAT       ;LOAD EXPECTED
002736  013777  001124  176530          MOV     $GDDAT,@ADCS            ;LOAD EXTERNAL A/D START ENABLE
002744  005277  176536                  INC     @VCSTAT                 ;INTENSIFY
002750  105777  176532          1$:     TSTB    @VCSTAT                 ;WAIT FOR READY
002754  100375                          BPL     1$
002756  012737  000400  015216          MOV     #BIT8,TEMP              ;SET UP A COUNTER
002764  005337  015216          2$:     DEC     TEMP                    ;DELAY
002770  100375                          BPL     2$
002772  017737  176476  001126          MOV     @ADCS,$BDDAT            ;READ REG.
003000  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
003006  001401                          BEQ     3$              ;;BR IF EQUAL
003010  104004                          ERROR   4                       ;INTENSIFY PULSE FAILED TO START
003012  017777  176462  176460  3$:     MOV     @ADDBR,@ADDBR           ; AN A TO D CONVERSION
003020  005077  176462                  CLR     @VCSTAT
003024  005077  176444                  CLR     @ADCS
```

```
                                        ;;*****************************************************************
                                        ;*TEST 3         TEST THAT CH 0 IS A BIPOLAR GROUND
                                        ;;*****************************************************************
003030  000004                          TST3:   SCOPE
003032  012737  000010  001164                  MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003040  012737  001000  001124                  MOV     #1000,$GDDAT            ;LOAD EXPECTED VALUE
003046  004537  011534                          JSR     R5,CONVRT               ;CONVERT
003052  000000                                  CH0                             ;CH 0
003054  013737  011656  001126                  MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003062  012737  000001  011664                  MOV     #1,SPREAD               ;LOAD + OR - COUNT SPREAD
003070  004737  011666                          JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003074  000401                                  BR      TST4            ;;BR IF WITHIN TOLERANCE
003076  104001                                  ERROR   1                       ;CH 0 FAILED TO EQUAL EXPECTED
                                                                                ; VALUE
                                        ;;*****************************************************************
                                        ;*TEST 4         TEST THAT CH 40 IS A UNIPOLAR GROUND
                                        ;;*****************************************************************
003100  000004                          TST4:   SCOPE
003102  012737  000010  001164                  MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003110  012737  000000  001124                  MOV     #0,$GDDAT               ;LOAD EXPECTED VALUE
003116  004537  011534                          JSR     R5,CONVRT               ;CONVERT
003122  000040                                  CH40                            ;CH 40
003124  013737  011656  001126                  MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003132  012737  000001  011664                  MOV     #1,SPREAD               ;LOAD + OR - COUNT SPREAD
003140  004737  011666                          JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003144  000401                                  BR      TST5            ;;BR IF WITHIN TOLERANCE
003146  104001                                  ERROR   1                       ;CH 40 FAILED TO EQUAL EXPECTED
                                                                                ; VALUE
                                        ;;*****************************************************************
                                        ;*TEST 5         TEST THAT CH 2 IS AT +1 VOLT BIPOLAR
                                        ;;*****************************************************************
003150  000004                          TST5:   SCOPE
003152  012737  000010  001164                  MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003160  012737  001315  001124                  MOV     #1315,$GDDAT            ;LOAD EXPECTED VALUE
003166  004537  011534                          JSR     R5,CONVRT               ;CONVERT
003172  000002                                  CH2                             ;CH 2
003174  013737  011656  001126                  MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003202  012737  000024  011664                  MOV     #24,SPREAD              ;LOAD + OR - COUNT SPREAD
003210  004737  011666                          JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003214  000401                                  BR      TST6            ;;BR IF WITHIN TOLERANCE
003216  104001                                  ERROR   1                       ;CH 2 FAILED TO EQUAL EXPECTED
                                                                                ; VALUE
```

```
                                        ;;*****************************************************************
                                        ;*TEST 6         TEST THAT CH 42 IS AT +1 VOLT UNIPOLAR
                                        ;;*****************************************************************
003220  000004                  TST6:   SCOPE
003222  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003230  012737  000315  001124          MOV     #315,$GDDAT             ;LOAD EXPECTED VALUE
003236  004537  011534                  JSR     R5,CONVRT               ;CONVERT
003242  000042                          CH42                    ;CH 42
003244  013737  011656  001126          MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003252  012737  000024  011664          MOV     #24,SPREAD              ;LOAD + OR - COUNT SPREAD
003260  004737  011666                  JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003264  000401                          BR      TST7            ;;BR IF WITHIN TOLERANCE
003266  104001                          ERROR   1                       ;CH 42 FAILED TO EQUAL EXPECTED
                                                                        ; VALUE

                                        ;;*****************************************************************
                                        ;*TEST 7         TEST THAT CH 3 IS AT +2.5 BIPOLAR
                                        ;;*****************************************************************
003270  000004                  TST7:   SCOPE
003272  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003300  013737  016764  001124          MOV     V1754,$GDDAT            ;LOAD EXPECTED VALUE
003306  004537  011534                  JSR     R5,CONVRT               ;CONVERT
003312  000003                          CH3                     ;CH 3
003314  013737  011656  001126          MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003322  013737  016766  011664          MOV     V24,SPREAD              ;LOAD + OR - COUNT SPREAD
003330  004737  011666                  JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003334  000401                          BR      TST10           ;;BR IF WITHIN TOLERANCE
003336  104001                          ERROR   1                       ;CH 3 FAILED TO EQUAL EXPECTED
                                                                        ; VALUE

                                        ;;*****************************************************************
                                        ;*TEST 10        TEST THAT CH 43 IS AT +2.5 UNIPOLAR
                                        ;;*****************************************************************
003340  000004                  TST10:  SCOPE
003342  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003350  012737  001000  001124          MOV     #1000,$GDDAT            ;LOAD EXPECTED VALUE
003356  004537  011534                  JSR     R5,CONVRT               ;CONVERT
003362  000043                          CH43                    ;CH 43
003364  013737  011656  001126          MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003372  013737  016770  011664          MOV     V50,SPREAD              ;LOAD + OR - COUNT SPREAD
003400  004737  011666                  JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003404  000401                          BR      TST11           ;;BR IF WITHIN TOLERANCE
003406  104001                          ERROR   1                       ;CH 435FAILED TO EQUAL EXPECTED
                                                                        ; VALUE
```

```
                                        ;;*****************************************************************
                                        ;*TEST 11       TEST THAT CH 4 IS AT -2.5 BIPOLAR
                                        ;;*****************************************************************
003410  000004                  TST11:  SCOPE
003412  012737  000010  001164          MOV     #10.$TIMES      ;;DO 10 ITERATIONS
003420  013737  016766  001124          MOV     V24,$GDDAT              ;LOAD EXPECTED VALUE
003426  004537  011534                  JSR     R5,CONVRT               ;CONVERT
003432  000004                          CH4                             ;CH 4
003434  013737  011656  001126          MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003442  013737  016766  011664          MOV     V24,SPREAD              ;LOAD + OR - COUNT SPREAD
003450  004737  011666                  JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003454  000401                          BR      TST12           ;;BR IF WITHIN TOLERANCE
003456  104001                          ERROR   1                       ;CH 4 FAILED TO EQUAL EXPECTED VALUE

                                        ;;*****************************************************************
                                        ;*TEST 12       TEST THAT CH 57 IS AT +4 VOLTS UNIPOLAR
                                        ;;*****************************************************************
003460  000004                  TST12:  SCOPE
003462  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003470  012737  001463  001124          MOV     #1463,$GDDAT            ;LOAD EXPECTED VALUE
003476  004537  011534                  JSR     R5,CONVRT               ;CONVERT
003502  000057                          CH57                            ;CH 57
003504  013737  011656  001126          MOV     ADEND,$BDDAT            ;LOAD VALUE READ
003512  012737  000120  011664          MOV     #120,SPREAD             ;LOAD + OR - COUNT SPREAD
003520  004737  011666                  JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003524  000401                          BR      TST13           ;;BR IF WITHIN TOLERANCE
003526  104001                          ERROR   1                       ;CH 57 FAILED TO EQUAL EXPECTED VALUE

                                        ;;*****************************************************************
                                        ;*TEST 13       TEST THAT CH 41 IS LESS THAN +200 MVOLTS UNIPOLAR
                                        ;;*****************************************************************
003530  000004                  TST13:  SCOPE
003532  012737  000004  001164          MOV     #4,$TIMES       ;;DO 4 ITERATIONS
003540  012737  000041  011662          MOV     #CH41,CHANL             ;LOAD CHANNEL # FOR ERROR TYPOUT
003546  112777  000041  175722          MOVB    #CH41,@ADCS1            ;LOAD MUX
003554  013737  016772  001124          MOV     VA24,$GDDAT             ;LOAD EXPECTED VALUE
003562  013737  016772  011664          MOV     VA24,SPREAD             ;LOAD + OR - COUNT SPREAD
003570  012737  000200  015216          MOV     #BIT7,TEMP              ;LOAD DELAY
003576  005337  015216          2$:     DEC     TEMP                    ;DELAY
003602  001375                          BNE     2$
003604  005277  175664                  INC     @ADCS                   ;CONVERT CH 41
003610  105777  175660          3$:     TSTB    @ADCS                   ;DONE ?
003614  100375                          BPL     3$
003616  017737  175656  001126          MOV     @ADDBR,$BDDAT           ;READ RESULTS
003624  013737  001126  015164          MOV     $BDDAT,BIASC1           ;SAVE RESULTS
003632  004737  011666                  JSR     PC,COMPAR               ;COMPARE $GDDAT AND $BDDAT
003636  000401                          BR      1$              ;;BR IF WITHIN TOLERANCE
003640  104001                          ERROR   1                       ;CH 41 FAILED TO EQUAL EXPECTED
                                                                        ; VALUE, BIAS CURRENT TOO HIGH
003642  032777  010000  175266  1$:     BIT     #BIT12,@SWR             ;TEST FORCED SW
003650  001432                          BEQ     TST14           ;;BR IF NOT FORCED PRINTOUT
003652  104400  003660                  TYPE    ,65$            ;;TYPE ASCIZ STRING
003656  000412                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12><12>/AR-11 ADDRESS = /
003704                          64$:
003704  013746  001464                  MOV     ARBADD,-(SP)            ;SAVE ADDRESS
```

```
                                        TYPOC
                                        TYPE    .ACRLF
                                        TYPE    .BIASST
                                        MOV     BIASC1,-(SP)
                                        TYPOS
                                        .BYTE   3,0
                                        TYPE    ,BIASDN

                                ;;**********************************************************************
                                ;*TEST 14        TEST THAT ERASE L (CH 53) IS GREATER THAN +3 VOLTS WHEN HIGH
                                ;;**********************************************************************
                                TST14:  SCOPE
                                        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
                                        MOV     #BIT11!BIT9,@VCSTAT     ;LOAD VC STATUS
                                        MOV     #1146,$GDDAT            ;LOAD EXPECTED VALUE
                                        JSR     R5,CONVRT               ;CONVERT
                                        CH53                            ;CH 53
                                        MOV     ADEND,$BDDAT            ;LOAD VALUE READ
                                        CMP     $GDDAT,$BDDAT           ;COMPARE
                                        BLE     TST15           ;;BR IF LESS THAN OR EQUAL
                                        ERROR   2                       ;CH 53 FAILED TO EQUAL EXPECTED VALUE

                                ;;**********************************************************************
                                ;*TEST 15        TEST THAT ERASE L (CH 53) IS LESS THAN +400 MVOLTS WHEN LOW
                                ;;**********************************************************************
                                TST15:  SCOPE
                                        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
                                        CLR     @VCSTAT                 ;CLEAR VC STATUS
                                        MOV     #BIT12!BIT10,@VCSTAT    ;SET ERASE
                                        MOV     #120,$GDDAT             ;LOAD EXPECTED VALUE
                                        JSR     R5,CONVRT               ;CONVERT
                                        CH53                            ;CH 53
                                        MOV     ADEND,$BDDAT            ;LOAD VALUE READ
                                        CMP     $GDDAT,$BDDAT           ;COMPARE
                                        BGE     TST16           ;;BR IF GREATER THAN OR EQUAL
                                        ERROR   7                       ;CH 53 FAILED TO EQUAL EXPECTED VALUE

                                ;;**********************************************************************
                                ;*TEST 16        TEST THAT WRITE-THRU (CH 54) IS GREATER THAN +3 VOLTS WHEN HIGH
                                ;;**********************************************************************
                                TST16:  SCOPE
                                        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
                                        MOV     #BIT12!BIT9,@VCSTAT     ;LOAD VC STATUS
                                        MOV     #1146,$GDDAT            ;LOAD EXPECTED VALUE
                                        JSR     R5,CONVRT               ;CONVERT
                                        CH54                            ;CH 54
                                        MOV     ADEND,$BDDAT            ;LOAD VALUE READ
                                        CMP     $GDDAT,$BDDAT           ;COMPARE
                                        BLE     TST17           ;;BR IF LESS THAN OR EQUAL
                                        ERROR   2                       ;CH 54 FAILED TO EQUAL EXPECTED VALUE
```

```
1013                                    ;;*****************************************************************
1014                                    ;*TEST 17       TEST THAT WRITE-THRU (CH 54) IS LESS THAN +400 MVOLTS WHEN LOW
1015                                    ;;*****************************************************************
1016  004140  000004                    TST17:  SCOPE
1017  004142  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1018  004150  012777  006000  175330            MOV     #BIT11!BIT10,@VCSTAT    ;SET WRITE-THRU
1019  004156  012737  000120  001124            MOV     #120,$GDDAT             ;LOAD EXPECTED VALUE
1020  004164  004537  011534                    JSR     R5,CONVRT               ;CONVERT
1021  004170  000054                            CH54                            ;CH 54
1022  004172  013737  011656  001126            MOV     ADEND,$BDDAT            ;LOAD VALUE READ
1023  004200  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE
1024  004206  002001                            BGE     TST20           ;;BR IF GREATER THAN OR EQUAL
1025  004210  104007                            ERROR   7                       ;CH 54 FAILED TO EQUAL EXPECTED
1026                                                                            ; VALUE
1027
1028                                    ;;*****************************************************************
1029                                    ;*TEST 20       TEST THAT NON-STORE (CH 55) IS LESS THAN +400 MVOLTS WHEN LOW
1030                                    ;;*****************************************************************
1031  004212  000004                    TST20:  SCOPE
1032  004214  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1033  004222  005077  175260                    CLR     @VCSTAT                 ;CLEAR STORE MODE
1034  004226  012737  000120  001124            MOV     #120,$GDDAT             ;LOAD EXPECTED VALUE
1035  004234  004537  011534                    JSR     R5,CONVRT               ;CONVERT
1036  004240  000055                            CH55                            ;CH 55
1037  004242  013737  011656  001126            MOV     ADEND,$BDDAT            ;LOAD VALUE READ
1038  004250  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE
1039  004256  002001                            BGE     TST21           ;;BR IF GREATER THAN OR EQUAL
1040  004260  104007                            ERROR   7                       ;CH 54 FAILED TO EQUAL EXPECTED
1041                                                                            ; VALUE
1042
1043                                    ;;*****************************************************************
1044                                    ;*TEST 21       TEST THAT NON-STORE L (CH 55) IS GREATER THAN +3 VOLTS WHEN HIGH
1045                                    ;;*****************************************************************
1046  004262  000004                    TST21:  SCOPE
1047  004264  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1048  004272  012777  017000  175206            MOV     #BIT12!BIT11!BIT10!BIT9,@VCSTAT         ;SET STORE MODE
1049  004300  012737  001146  001124            MOV     #1146,$GDDAT            ;LOAD EXPECTED VALUE
1050  004306  004537  011534                    JSR     R5,CONVRT               ;CONVERT
1051  004312  000055                            CH55                            ;CH 55
1052  004314  013737  011656  001126            MOV     ADEND,$BDDAT            ;LOAD VALUE READ
1053  004322  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE
1054  004330  003401                            BLE     TST22           ;;BR IF LESS THAN OR EQUAL
1055  004332  104002                            ERROR   2                       ;CH 55 FAILED TO EQUAL EXPECTED
1056                                                                            ; VALUE
1057
```

```
1058                                    ;;*****************************************************************
1059                                    ;*TEST 22       TEST THAT CHANNEL 02 L (CH 56) IS GREATER THAN +3 VOLTS WHEN HIGH
1060                                    ;;*****************************************************************
1061  004334  000004                    TST22:  SCOPE
1062  004336  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1063  004344  012777  014000  175134            MOV     #BIT12!BIT11,@VCSTAT    ;LOAD VC STATUS
1064  004352  012737  001146  001124            MOV     #1146,$GDDAT            ;LOAD EXPECTED VALUE
1065  004360  004537  011534                    JSR     R5,CONVRT               ;CONVERT
1066  004364  000056                            CH56                            ;CH 56
1067  004366  013737  011656  001126            MOV     ADEND,$BDDAT            ;LOAD VALUE READ
1068  004374  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE
1069  004402  003401                            BLE     TST23           ;;BR IF LESS THAN OR EQUAL
1070  004404  104002                            ERROR   2                       ;CH 56 FAILED TO EQUAL EXPECTED
1071                                                                            ; VALUE
1072
1073                                    ;;*****************************************************************
1074                                    ;*TEST 23       TEST THAT CHANNEL 02 L (CH 56) IS LESS THAN +400 MVOLTS WHEN LOW
1075                                    ;;*****************************************************************
1076  004406  000004                    TST23:  SCOPE
1077  004410  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1078  004416  012777  003000  175062            MOV     #BIT9!BIT10,@VCSTAT     ;SET CHANNEL 2
1079  004424  012737  000120  001124            MOV     #120,$GDDAT             ;LOAD EXPECTED VALUE
1080  004432  004537  011534                    JSR     R5,CONVRT               ;CONVERT
1081  004436  000056                            CH56                            ;CH 56
1082  004440  013737  011656  001126            MOV     ADEND,$BDDAT            ;LOAD VALUE READ
1083  004446  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE
1084  004454  002001                            BGE     1$              ;;BR IF GREATER THAN
1085  004456  104007                            ERROR   7                       ;CH 56 FAILED TO EQUAL EXPECTED
1086                                                                            ; VALUE
1087  004460  005077  175022            1$:     CLR     @VCSTAT                 ;CLEAR BIT 9
1088
```

```
1089                                    ;;*****************************************************************
1090                                    ;*TEST 24        A TO D DIFFERENTIAL LINEARITY TEST
1091                                    ;;*****************************************************************
1092  004464  000004                    TST24:  SCOPE
1093  004466  012737  000001  001164            MOV     #1,$TIMES       ;;DO 1 ITERATION
1094
1095  004474  004537  015220                    JSR     R5,DIFLIN               ;START TEST
1096  004500  001510                            VCXREG                          ;X COARSE
1097  004502  001512                            VCYREG                          ;Y FINE
1098  004504     001     005                    .BYTE   1,5                     ;GO AND CHANNEL 5
1099
1100  004506  005037  001124                    CLR     $GDDAT                  ;CLEAR EXPECTED
1101  004512  013737  015740  001126            MOV     SKIPST,$BDDAT           ;LOAD # OF SKIPPED STATES
1102  004520  001401                            BEQ     1$              ;;BR IF NO SKIPPED STATES
1103  004522  104005                            ERROR   5                       ;SKIPPED STATE(S) DETECTED
1104
1105  004524  013737  015744  001126  1$:      MOV     EXCESS,$BDDAT           ;LOAD # OF >2LSB STATES
1106  004532  001401                            BEQ     2$              ;;BR IF NO GREATER THAN 2LSB WIDE STATES
1107  004534  104005                            ERROR   5                       ;> 2LSB WIDE STATE(S) DETECTED
1108
1109  004536  013737  015742  001126  2$:      MOV     DIFERR,$BDDAT           ;LOAD # OUTSIDE +- 5/2 LSB
1110  004544  012737  000064  001124            MOV     #52.,$GDDAT             ;LOAD MAX # OF ALLOWABLE STATES OUTSIDE +- 1/2 L
1111  004552  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;ANY ERRORS
1112  004560  002001                            BGE     TST25           ;;BR IF NO ERROR
1113  004562  104005                            ERROR   5                       ;DIFFERENTIAL LINEARITY ERROR, >5% OF STATE
1114                                                                            ;WIDTHS OUTSIDE +- 1/2 LSB
1115
```

```
                                        ;;*****************************************************************
                                        ;*TEST 25       X D/A DIFFERENTIAL LINEARITY USING CH 5
                                        ;;*****************************************************************
004564  000004                  TST25:  SCOPE
004566  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004574  012701  000001                  MOV     #1,R1                   ;LOAD EDGE VALUE
004600  012702  015022                  MOV     #RSLT2,R2               ;LOAD RESULT POINTER

004604  010177  174700          1$:     MOV     R1,@VCXREG              ;LOAD X DAC WITH PRESET
004610  010137  004624                  MOV     R1,10$                  ;LOAD EDGE VALUE

004614  004437  010716                  JSR     R4,SAR                  ;SOFTWARE SUCCESSIVE APPROX. ROUTINE
004620  001512                          VCYREG
004622     000     005                  .BYTE   0,CH5
004624  000000                  10$:    0                               ;EDGE VALUE
004626  000200                          BIT7                            ;50-50

004630  013737  015122  004746          MOV     DACSAV,12$              ;SAVE VALUE
004636  005377  174646                  DEC     @VCXREG                 ;LOAD X DAC
004642  010137  004656                  MOV     R1,11$                  ;LOAD SAME EDGE

004646  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
004652  001512                          VCYREG
004654     000     005                  .BYTE   0,CH5
004656  000000                  11$:    0
004660  000200                          BIT7

004662  013737  015122  004750          MOV     DACSAV,13$              ;SAVE VALUE
004670  013737  015122  001126          MOV     DACSAV,$BDDAT           ;LOAD VALUE INTO $BDDAT
004676  163737  004746  001126          SUB     12$,$BDDAT              ;STEP HEIGHT IN $BDDAT
004704  013722  001126                  MOV     $BDDAT,(R2)+            ;SAVE RESULT
004710  012737  000062  001124          MOV     #62,$GDDAT              ;LOAD EXPECTED VALUE FOR 1 LSB STEP
004716  013737  016774  011664          MOV     V62,SPREAD              ;LOAD TOLERANCE
004724  004737  011666                  JSR     PC,COMPAR               ;TEST LIMITS
004730  000401                          BR      2$              ;;BR IF WITHIN LIMITS
004732  104010                          ERROR   10                      ;D/A DIFFERENTIAL LINEARITY ERROR
004734  006301                  2$:     ASL     R1                      ;MOVE LEFT
004736  020127  002000                  CMP     R1,#2000                ;DONE
004742  001320                          BNE     1$              ;;BR IF NOT DONE
004744  000402                          BR      TST26           ;;

004746  000000                  12$:    0
004750  000000                  13$:    0
```

```
                                        ;;**********************************************************************
                                        ;*TEST 26       Y D-A DIFFERENTIAL LINEARITY USING CH 6
                                        ;;**********************************************************************
005752  000004                  TST26:  SCOPE
005754  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
005762  012701  000001                  MOV     #1,R1                   ;LOAD EDGE VALUE
005766  012702  015060                  MOV     #RSLT3,R2               ;LOAD RESULT POINTER

005772  010177  174514          1$:     MOV     R1,@VCYREG              ;LOAD Y DAC WITH PRESET
005776  010137  005012                  MOV     R1,10$                  ;LOAD EDGE VALUE

006002  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
006006  001510                          VCXREG
006010      000      006                 .BYTE   0,CH6
006012  000000                  10$:    0                               ;EDGE VALUE
006014  000200                          BIT7

006016  013737  015122  005200          MOV     DACSAV,12$              ;SAVE VALUE
006024  005377  174462                  DEC     @VCYREG                 ;LOAD Y DAC
006030  010137  005044                  MOV     R1,11$                  ;LOAD EDGE

006034  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
006040  001510                          VCXREG
006042      000      006                 .BYTE   0,CH6
006044  000000                  11$:    0
006046  000200                          BIT7

006050  013737  015122  005202          MOV     DACSAV,13$              ;SAVE RESULTS
006056  013737  015122  001126          MOV     DACSAV,$BODAT           ;LOAD $BODAT
006064  163737  005200  001126          SUB     12$,$BODAT              ;STEP HEIGHT IN $BODAT
006072  013722  001126                  MOV     $BODAT,(R2)+            ;SAVE RESULT
006076  012737  000062  001124          MOV     #62.,$GODAT             ;LOAD EXPECTED
006104  013737  016774  011664          MOV     V62,$PREAD              ;LOAD TOLERANCE
006112  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN LIMITS
006116  000401                          BR      2$              ;;BR IF WITHIN LIMITS
006120  104010                          ERROR   10                      ;D A DIFFERENTIAL LINEARITY ERROR
006122  006301                  2$:     ASL     R1
006124  020127  002000                  CMP     R1,#2000                ;DONE ?
006130  001320                          BNE     1$              ;;BR IF NOT DONE
006132  032777  010000  173776          BIT     #BIT12,@SWR             ;TEST FORCED PRINTOUT
006142  001402                          BEQ     TST27           ;;BR IF NOT FORCED PRINTOUT
006144  104403  013203                  TYPE    ,DIFMSG
006150  004537  011510                  JSR     R5,TYPSTG               ;TYPE A STRING OF OCTAL #
006154  015022                          RSLT2                           ;STARTING
006156  000012                          10.                             ; # OF LOCATIONS
006160  104403  013367                  TYPE    ,DIYMSG
006164  004537  011510                  JSR     R5,TYPSTG               ;TYPE A STRING OF OCTAL #
006170  015060                          RSLT3
006172  000012                          10.                             ; # OF LOCATIONS
006174  104403  013377                  TYPE    ,DIEMSG
006200  000402                          BR      TST27           ;;
006202  000000                  12$:    0
006204  000000                  13$:    0
```

```
                                        ;;**********************************************************
                                        ;*TEST 27       A TO D POSITIVE MULTIPLEXER SETTLING TEST
                                        ;;**********************************************************
005204  000004                  *ST27:  SCOPE
005206  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
005214  012777  001770  174270          MOV     #1770,@VCYREG           ;LOAD Y DAC
005222  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
005226  001510                          VCXREG
005230     000     006                  .BYTE   0,6
005232  001771                          1771
005234  000200                          BIT7

005236  013737  015122  005330          MOV     DACSAV,10$              ;SAVE RESULTS
005244  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
005250  001510                          VCXREG
005252     004     006                  .BYTE   CH4,CH5                 ;-2.5V  CH AND CH 5
005254  001771                          1771                            ;EDGE
005256  000200                          BIT7

005260  013737  015122  001126          MOV     DACSAV,$BDDAT           ;SAVE RESULT IN $BDDAT
005266  163737  005330  001126          SUB     10$,$BDDAT              ;SUB FIRST VALUE
005274  013737  001126  015160          MOV     $BDDAT,ADPMUX           ;SAVE RESULT
005302  012737  000000  001124          MOV     #0,$GDDAT               ;LOAD EXPECTED SETTLING ERROR
005310  012737  000077  011664          MOV     #77,SPREAD              ;LOAD TOLERANCE
005316  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN LIMITS
005322  000403                          BR      TST30           ;;BR IF WITHIN
005324  104011                          ERROR   11                      ;A-D POSITIVE SETTLING ERROR
005326  000401                          BR      TST30           ;;
005330  000000                  10$:    0
```

```
                                ;;*****************************************************************
                                ;*TEST 30       A TO D NEGATIVE MULTIPLEXER SETTLING TEST
                                ;;*****************************************************************
005332  000004                  TST30:  SCOPE
005334  012737  000010  001164          MOV     #10.$TIMES      ;;DO 10 ITERATIONS
005342  012777  000010  174142          MOV     #10,@VCYREG             ;LOAD Y DAC
005350  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
005354  001510                          VCXREG
005356     000     006                  .BYTE   0,6
005360  000010                          10
005362  000200                          BIT7

005364  013737  015122  005522          MOV     DACSAV,10$              ;SAVE RESULTS
005372  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
005376  001510                          VCXREG
005400     003     006                  .BYTE   CH3,CH6                 ;+2.5V  CH AND CH 6
005402  000010                          10                              ;EDGE
005404  000200                          BIT7

005406  013737  015122  001126          MOV     DACSAV,$BDDAT           ;SAVE RESULT IN $BDDAT
005414  163737  005522  001126          SUB     10$,$BDDAT              ;SUB FIRST VALUE
005422  013737  001126  015162          MOV     $BDDAT,ADNMUX           ;SAVE RESULTS
005430  012737  000000  001124          MOV     #0,$GDDAT               ;LOAD EXPECTED ZERO SETTLING ERROR
005436  012737  000077  011664          MOV     #77,SPREAD              ;LOAD TOLERANCE
005444  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN LIMITS
005450  000401                          BR      1$              ;;BR IF WITHIN
005452  104011                          ERROR   :1                      ;A/D NEGATIVE SETTLING ERROR
005454  032777  010000  173454  1$:     BIT     #BIT12,@SWR             ;TEST FOR FORCED TYPEOUT
005462  001420                          BEQ     TST31           ;;BR IF NOT FORCED
005464  104400  013436                  TYPE    ,ADSMSG
005470  013746  015160                  MOV     ADPMUX,-(SP)            ;SAVE MUX SETTLING
005474  104402                          TYPOS
005476     003     000                  .BYTE   3,0
005500  104400  013525                  TYPE    ,ADEMSG
005504  013746  015162                  MOV     ADNMUX,-(SP)            ;SAVE MUX SETTLING
005510  104402                          TYPOS
005512     003     000                  .BYTE   3,0
005514  104400  016536                  TYPE    ,ACRLF
005520  000401                          BR      TST31           ;;

005522  000000          10$:    0
```

```
                                        ;;*****************************************************************
                                        ;*TEST 31       A D RMS NOISE TEST ON CHANNEL 7 - BIPOLAR
                                        ;;*****************************************************************
005524  000004                  TST31:  SCOPE
005526  012737  000010  001164          MOV     #10.,$TIMES     ;;DO 10 ITERATIONS

005534  004437  010716                  JSR     R4,SAR                  ;S A R  ROUTINE
005540  001512                          VCYREG                  ;Y AXIS
005542      000     007                 .BYTE   0,7             ;CHANNEL 7, FINE Y
005544  001000                          1000                    ;EDGE VALUE
005546  000000                          0                       ;RMS RESULTS

005550  010537  001126                  MOV     R5,$BDDAT               ;SAVE RESULTS (2X RMS NOISE, 1=1/50 LSB)
005554  010537  015130                  MOV     R5,CH7RMS               ;SAVE RESULTS (RMS NOISE, 1 = 1/100 LSB)
005560  013737  015124  001124          MOV     RMSMAX,$GDDAT           ;LOAD EXPECTED
005566  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
005574  002001                          BGE     TST32           ;;BR IF NOISE WITHIN SPEC
005576  104006                          ERROR   6                       ;A/D RMS NOISE (BIPOLAR) IS GREATER
                                                                        ; THAN SPEC

                                        ;;*****************************************************************
                                        ;*TEST 32       A/D PEAK NOISE TEST ON CHANNEL 7 - BIPOLAR
                                        ;;*****************************************************************
005600  000004                  TST32:  SCOPE
005602  012737  000010  001164          MOV     #10.,$TIMES     ;;DO 10 ITERATIONS

005610  004437  010716                  JSR     R4,SAR                  ;S A R  ROUTINE
005614  001512                          VCYREG                  ;Y AXIS
005616      000     007                 .BYTE   0,7             ;CHANNEL 7, FINE Y
005620  001000                          1000                    ;EDGE VALUE
005622  100000                          BIT15                   ;PEAK RESULTS

005624  010537  001126                  MOV     R5,$BDDAT               ;SAVE RESULTS (PEAK NOISE, 1 = .01 LSB)
005630  010537  015132                  MOV     R5,CH7PEK               ;SAVE RESULTS
005634  013737  015126  001124          MOV     PEKMAX,$GDDAT           ;LOAD EXPECTED
005642  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
005650  002001                          BGE     TST33           ;;BR IF NOISE WITHIN SPEC
005652  104006                          ERROR   6                       ;A D PEAK NOISE (BIPOLAR) IS GREATER
                                                                        ; THAN SPEC
```

F03


```
1324                                    ;;*****************************************************************
1325                                    ;*TEST 33       A/D RMS NOISE TEST ON CHANNEL 47 - UNIPOLAR
1326                                    ;;*****************************************************************
1327  005654  000004                    TST33:  SCOPE
1328  005656  012737  000010  001164            MOV     #10.,$TIMES     ;;DO 10 ITERATIONS
1329
1330  005664  004437  010716                    JSR     R4,SAR                  ;S A R  ROUTINE
1331  005670  001512                            VCYREG                  ;Y AXIS
1332  005672     000     047                    .BYTE   0,CH47                  ;CHANNEL 47, FINE Y
1333  005674  000003                            3                       ;EDGE VALUE
1334  005676  000000                            0                       ;RMS RESULTS
1335
1336  005700  010537  001126                    MOV     R5,$BDDAT               ;SAVE RESULTS (RMS NOISE, 1=.01 LSB)
1337  005704  010537  015134                    MOV     R5,CH47RM               ;SAVE RESULT
1338  005710  013737  015124  001124            MOV     RMSMAX,$GDDAT           ;LOAD EXPECTED
1339  005716  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
1340  005724  002001                            BGE     TST34           ;;BR IF NOISE WITHIN SPEC
1341  005726  104006                            ERROR   6                       ;A/D RMS NOISE (UNIPOLAR) IS GREATER
1342                                                                    ; THAN SPEC
1343
1344                                    ;;*****************************************************************
1345                                    ;*TEST 34       A/D PEAK NOISE TEST ON CHANNEL 47 - UNIPOLAR
1346                                    ;;*****************************************************************
1347  005730  000004                    TST34:  SCOPE
1348  005732  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1349
1350  005740  004437  010716                    JSR     R4,SAR                  ;S A R  ROUTINE
1351  005744  001512                            VCYREG                  ;Y AXIS
1352  005746     000     047                    .BYTE   0,CH47                  ;CHANNEL 47, FINE Y
1353  005750  000003                            3                       ;EDGE VALUE
1354  005752  100000                            BIT15                   ;PEAK RESULTS
1355
1356  005754  010537  001126                    MOV     R5,$BDDAT               ;SAVE RESULTS (PEAK NOISE, 1 = .01 LSB)
1357  005760  010537  015136                    MOV     R5,CH47PK               ;SAVE RESULT
1358  005764  013737  015126  001124            MOV     PEKMAX,$GDDAT           ;LOAD EXPECTED
1359  005772  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
1360  006000  002001                            BGE     TST35           ;;BR IF NOISE WITHIN SPEC
1361  006002  104006                            ERROR   6                       ;A/D PEAK NOISE (UNIPOLAR) IS GREATER
1362                                                                    ; THAN SPEC
1363
```

```
1364                                    ;;*****************************************************************
1365                                    ;*TEST 35       X DAC RMS NOISE TEST ON CHANNEL 5
1366                                    ;;*****************************************************************
1367  006004  000004                   TST35:  SCOPE
1368  006006  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1369  006014  012777  001000  173466            MOV     #1000,@VCXREG           ;LOAD X POS
1370
1371  006022  004437  010716                    JSR     R4,SAR                  ;S A R  ROUTINE
1372  006026  001512                            VCYREG                  ;Y AXIS
1373  006030     000     005                    .BYTE   0,5             ;CHANNEL 5, COARSE X AND FINE Y
1374  006032  001000                            1000                    ;EDGE VALUE
1375  006034  000000                            0                       ;RMS RESULTS
1376
1377  006036  010537  001126                    MOV     R5,$BDDAT               ;SAVE RESULTS (X DAC + A/D RMS NOISE, 1=.01 LSB)
1378  006042  163737  015130  001126            SUB     CH7RMS,$BDDAT           ;XDAC RMS NOISE ONLY
1379  006050  013737  001126  015140            MOV     $BDDAT,XDACRM           ;SAVE RESULT
1380  006056  013737  015124  001124            MOV     RMSMAX,$GDDAT           ;LOAD EXPECTED
1381  006064  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
1382  006072  002001                            BGE     TST36           ;;BR IF NOISE WITHIN SPEC
1383  006074  104006                            ERROR   6                       ;X D/A RMS NOISE  IS GREATER
1384                                                                            ; THAN SPEC
1385
1386                                    ;;*****************************************************************
1387                                    ;*TEST 36       X DAC PEAK NOISE TEST ON CHANNEL 5
1388                                    ;;*****************************************************************
1389  006076  000004                   TST36:  SCOPE
1390  006100  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1391
1392  006106  012777  001000  173374            MOV     #1000,@VCXREG           ;LOAD X DAC
1393  006114  004437  010716                    JSR     R4,SAR                  ;S A R  ROUTINE
1394  006120  001512                            VCYREG                  ;Y AXIS
1395  006122     000     005                    .BYTE   0,5             ;CHANNEL 5, COARSE X AND FINE Y
1396  006124  001000                            1000                    ;EDGE VALUE
1397  006126  100000                            BIT15                   ;PEAK RESULTS
1398
1399  006130  010537  001126                    MOV     R5,$BDDAT               ;SAVE RESULTS (X DAC + A/D PEAK NOISE, 1=.01 LSB
1400  006134  163737  015132  001126            SUB     CH7PEK,$BDDAT           ;X DAC PEAK NOISE ONLY
1401  006142  013737  001126  015142            MOV     $BDDAT,XDACPK           ;SAVE RESULT
1402  006150  013737  015126  001124            MOV     PEKMAX,$GDDAT           ;LOAD EXPECTED
1403  006156  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
1404  006164  002001                            BGE     TST37           ;;BR IF NOISE WITHIN SPEC
1405  006166  104006                            ERROR   6                       ;X D/A PEAK NOISE  IS GREATER
1406                                                                            ; THAN SPEC
1407
```

```
1409                                    ;;*****************************************************************
1409                                    ;*TEST 37       Y DAC RMS NOISE TEST ON CHANNEL 6
1410                                    ;;*****************************************************************
1411  006170  000004                    TST37:  SCOPE
1412  006172  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1413
1414  006200  012777  001000  173304            MOV     #1000,@VCYREG           ;LOAD Y REG
1415  006206  004437  010716                    JSR     R4,SAR                  ;S A R  ROUTINE
1416  006212  001510                            VCXREG                          ;X AXIS
1417  006214     000     006                    .BYTE   0,6                     ;CHANNEL 6 ,COARSE Y AND FINE X
1418  006216  001000                            1000                            ;EDGE VALUE
1419  006220  000000                            0                               ;RMS RESULTS
1420
1421  006222  010537  001126                    MOV     R5,$BDDAT               ;SAVE RESULTS (Y DAC + A/D RMS NOISE, 1=.01 LSB)
1422  006226  163737  015130  001126            SUB     CH7RMS,$BDDAT           ;Y DAC RMS NOISE ONLY
1423  006234  013737  001126  015144            MOV     $BDDAT,YDACRM           ;SAVE RESULT
1424  006242  013737  015124  001124            MOV     RMSMAX,$GDDAT           ;LOAD EXPECTED
1425  006250  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
1426  006256  002001                            BGE     TST40           ;;BR IF NOISE WITHIN SPEC
1427  006260  104006                            ERROR   6                       ;Y D/A RMS NOISE  IS GREATER
1428                                                                            ; THAN SPEC
1429
1430                                    ;;*****************************************************************
1431                                    ;*TEST 40       Y DAC PEAK NOISE TEST ON CHANNEL 6
1432                                    ;;*****************************************************************
1433  006262  000004                    TST40:  SCOPE
1434  006264  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1435
1436  006272  012777  001000  173212            MOV     #1000,@VCYREG           ;LOAD Y AXIS
1437  006300  004437  010716                    JSR     R4,SAR                  ;S A R  ROUTINE
1438  006304  001510                            VCXREG                          ;X AXIS
1439  006306     000     006                    .BYTE   0,6                     ;CHANNEL 6, COARSE Y AND FINE X
1440  006310  001000                            1000                            ;EDGE VALUE
1441  006312  100000                            BIT15                           ;PEAK RESULTS
1442
1443  006314  010537  001126                    MOV     R5,$BDDAT               ;SAVE RESULTS (Y DAC + A/D PEAK NOISE, 1=.01 LSB
1444  006320  163737  015132  001126            SUB     CH7PEK,$BDDAT           ;Y DAC PEAK NOISE ONLY
1445  006326  013737  001126  015146            MOV     $BDDAT,YDACPK           ;SAVE RESULT
1446  006334  013737  015126  001124            MOV     PEKMAX,$GDDAT           ;LOAD EXPECTED
1447  006342  023737  001124  001126            CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
1448  006350  002001                            BGE     1$              ;;BR IF NOISE WITHIN SPEC
1449  006352  104006                            ERROR   6                       ;Y DAC PEAK NOISE  IS GREATER
1450                                                                            ; THAN SPEC
1451
1452  006354  032777  010000  172554  1$:       BIT     #BIT12,@SWR             ;TEST FORCED PRINTOUT
1453  006362  001432                            BEQ     TST41           ;;BR IF NOT FORCED
1454  006364  104400  013543                    TYPE    ,NOIMSG
1455  006370  004537  011466                    JSR     R5,BYTWO                ;TYPE 2 OCTAL COL.
1456  006374  015130                            CH7RMS
1457  006376  015132                            CH7PEK
1458  006400  104400  013664                    TYPE    ,NOIMG1
1459  006404  004537  011466                    JSR     R5,BYTWO                ;TYPE 2 OCTAL COL.
1460  006410  015134                            CH47RM
1461  006412  015136                            CH47PK
1462  006414  104400  013707                    TYPE    ,NOIMG2
1463  006420  004537  011466                    JSR     R5,BYTWO                ;TYPE 2 OCTAL COL.
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1464  006424  015140                          XDACRM
1465  006426  015142                          XDACPK
1466  006430  104400  013732                  TYPE    ,NOIMG3
1467  006434  004537  011466                  JSR     R5,BYTWO
1468  006440  015144                          YDACRM
1469  006442  015146                          YDACPK
1470  006444  104400  016536                  TYPE    ,ACRLF
1471
1472                                  ;;*****************************************************************
1473                                  ;*TEST 41       BIPOLAR A/D OFFSET USING CH 7 WITH WAIT INTERRUPT
1474                                  ;;*****************************************************************
1475  006450  000004                  TST41:  SCOPE
1476  006452  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1477  006460  004437  010716                  JSR     R4,$AR                  ;SOFTWARE S.A.R.
1478  006464  001512                          VCYREG
1479  006466     000     007                  .BYTE   0,CH7                   ;CHANNEL 7, FINE Y
1480  006470  001001                          1001                            ;EDGE, 1000/1001 TRANSITION
1481  006472  000200                          BIT7                            ;50-50
1482
1483  006474  013737  015122  015150          MOV     DACSAV,OFSTBX           ;SAVE A/D OFFSET BIPOLAR
1484  006502  013737  015122  001126          MOV     DACSAV,$BDDAT           ;LOAD VALUE READ
1485  006510  012737  001014  001124          MOV     #1014,$GDDAT            ;LOAD EXPECTED
1486  006516  013737  016774  011664          MOV     V62,SPREAD              ;LOAD +- VARIABLE, 1LSB
1487  006524  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN +- VALUE
1488  006530  000401                          BR      TST42           ;;BR IF WITHIN LIMITS
1489  006532  104012                          ERROR   12                      ;A/D BIPOLAR OFFSET ERROR
1490
1491                                  ;;*****************************************************************
1492                                  ;*TEST 42       UNIPOLAR A/D OFFSET USING CH 7 WITH WAIT INTERRUPT
1493                                  ;;*****************************************************************
1494  006534  000004                  TST42:  SCOPE
1495  006536  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1496  006544  004437  010716                  JSR     R4,$AR                  ;SOFTWARE S.A.R.
1497  006550  001512                          VCYREG
1498  006552     000     047                  .BYTE   0,CH47                  ;CHANNEL 7, UNIPOLAR FINE Y
1499  006554  000001                          1                               ;EDGE, 0/1 TRANSITION
1500  006556  000200                          BIT7                            ;50-50
1501
1502  006560  013737  015122  015152          MOV     DACSAV,OFSTUX           ;SAVE A/D OFFSET UNIPOLAR
1503  006566  013737  015122  001126          MOV     DACSAV,$BDDAT           ;LOAD VALUE READ
1504  006574  012737  001014  001124          MOV     #1014,$GDDAT            ;LOAD EXPECTED
1505  006602  013737  016774  011664          MOV     V62,SPREAD              ;LOAD +- VARIABLE, 1 LSB
1506  006610  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN +- VALUE
1507  006614  000401                          BR      TST43           ;;BR IF WITHIN LIMITS
1508  006616  104012                          ERROR   12                      ;A/D UNIPOLAR OFFSET ERROR
```

```
                                        ;;*****************************************************************
                                        ;*TEST 43       BIPOLAR A/D OFFSET USING CH 7 WITH WAIT LOOP
                                        ;;*****************************************************************
006620  000004                  TST43:  SCOPE
006622  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
006630  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
006634  001512                          VCYREG
006636     000     007                  .BYTE   0,CH7                           ;CHANNEL 7, FINE Y
006640  001001                          1001                    ;EDGE, 1000/1001 TRANSITION
006642  000201                          BIT7!BIT0                       ;50-50, WAIT LOOP

006644  013737  015122  015154          MOV     DACSAV,OFSLBX           ;SAVE A/D OFFSET BIPOLAR
006652  013737  015122  001126          MOV     DACSAV,$BDDAT           ;LOAD VALUE READ
006660  012737  001014  001124          MOV     #1014,$GDDAT            ;LOAD EXPECTED
006666  013737  016774  011664          MOV     V62,SPREAD              ;LOAD +- VARIABLE, 1 LSB
006674  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN +- VALUE
006700  000401                          BR      1$              ;;BR IF WITHIN LIMITS
006702  104012                          ERROR   12                      ;A/D BIPOLAR OFFSET ERROR

006704  163737  015150  001126  1$:     SUB     OFSTBX,$BDDAT           ;OFFSET DUE TO WAIT LOOP
006712  005037  001124                  CLR     $GDDAT                  ;
006716  012737  000031  011664          MOV     #31,SPREAD              ;1/2 LSB ALLOWED
006724  004737  011666                  JSR     PC,COMPAR               ;WITHIN LIMITS
006730  000401                          BR      TST44           ;;BR IF WITHIN LIMITS
006732  104012                          ERROR   12                      ;A/D BIPOLAR OFFSET ERROR DUE TO WAIT LOOP

                                        ;;*****************************************************************
                                        ;*TEST 44       UNIPOLAR A/D OFFSET USING CH 7 WITH WAIT LOOP
                                        ;;*****************************************************************
006734  000004                  TST44:  SCOPE
006736  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
006744  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
006750  001512                          VCYREG
006752     000     047                  .BYTE   0,CH47                  ;CHANNEL 7, UNIPOLAR, FINE Y
006754  000001                          1                       ;EDGE, 0/1 TRANSITION
006756  000201                          BIT7!BIT0                       ;50-50, WAIT LOOP

006760  013737  015122  015156          MOV     DACSAV,OFSLUX           ;SAVE A/D OFFSET UNIPOLAR
006766  013737  015122  001126          MOV     DACSAV,$BDDAT           ;LOAD VALUE READ
006774  012737  001014  001124          MOV     #1014,$GDDAT            ;LOAD EXPECTED
007002  013737  016774  011664          MOV     V62,SPREAD              ;LOAD +- VARIABLE, 1 LSB
007010  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN +- VALUE
007014  000401                          BR      1$              ;;BR IF WITHIN LIMITS
007016  104012                          ERROR   12                      ;A/D UNIPOLAR OFFSET ERROR

007020  163737  015152  001126  1$:     SUB     OFSTUX,$BDDAT           ;OFFSET DUE TO WAIT LOOP
007026  005037  001124                  CLR     $GDDAT                  ;
007032  012737  000031  011664          MOV     #31,SPREAD              ;1/2 LSB ALLOWED
007040  004737  011666                  JSR     PC,COMPAR               ;WITHIN LIMITS
007044  000401                          BR      TST45           ;;BR IF WITHIN LIMITS
007046  104012                          ERROR   12                      ;A/D UNIPOLAR OFFSET ERROR DUE TO WAIT LOOP
```

```
                                        ;;*****************************************************************
                                        ;*TEST 45        X D/A OFFSET USING CH 5
                                        ;;*****************************************************************
007050  000004                  TST45:  SCOPE
007052  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
007060  012777  001000  172422          MOV     #1000,@VCXREG           ;LOAD X REG
007066  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
007072  001512                          VCYREG                          ;Y AXIS
007074     000     005                  .BYTE   0,CH5                   ;CHANNEL 5, COARSE X AND FINE Y
007076  001001                          1001                            ;EDGE VALUE, 1000/1001 TRANSITION
007100  000200                          BIT7                            ;50-50
007102  013737  015122  001126          MOV     DACSAV,$BDDAT           ;SAVE RESULT (X DAC + A/D OFFSET)
007110  163737  015150  001126          SUB     OFSTBX,$BDDAT           ;OFFSET DUE TO X DAC
007116  005037  001124                  CLR     $GDDAT                  ;CLEAR EXPECTED
007122  013737  016776  011664          MOV     V77,SPREAD              ;TOLERANCE DUE TO X DAC
007130  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN +- LIMITS
007134  000401                          BR      TST46           ::BR IF WITHIN LIMITS
007136  104012                          ERROR   12                      ;X DAC OFFSET ERROR

                                        ;;*****************************************************************
                                        ;*TEST 46        Y D/A OFFSET USING CH 6
                                        ;;*****************************************************************
007140  000004                  TST46:  SCOPE
007142  012737  000010  001164          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
007150  012777  001000  172334          MOV     #1000,@VCYREG           ;LOAD Y REG
007156  004437  010716                  JSR     R4,SAR                  ;SOFTWARE S.A.R.
007162  001510                          VCXREG                          ;X AXIS
007164     000     006                  .BYTE   0,CH6                   ;CHANNEL 6, COARSE Y AND FINE X
007166  001001                          1001                            ;EDGE VALUE, 1000/1001 TRANSITION
007170  000200                          BIT7                            ;50-50
007172  013737  015122  001126          MOV     DACSAV,$BDDAT           ;SAVE RESULT (Y DAC + A/D OFFSET)
007200  163737  015150  001126          SUB     OFSTBX,$BDDAT           ;OFFSET DUE TO Y DAC
007206  005037  001124                  CLR     $GDDAT                  ;CLEAR EXPECTED
007212  013737  016776  011664          MOV     V77,SPREAD              ;TOLERANCE DUE TO Y DAC
007220  004737  011666                  JSR     PC,COMPAR               ;TEST IF WITHIN +- LIMITS
007224  000401                          BR      TST47           ::BR IF WITHIN LIMITS
007226  104013                          ERROR   13                      ;Y DAC OFFSET ERROR
```

```
1597                                    ;;*****************************************************************
1598                                    ;*TEST 47       CALIBRATION USING CHANNEL 11 - X DAC VS. A/D
1599                                    ;;*****************************************************************
1600  007230  000004                    $ST47:  SCOPE
1601  007232  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1602  007240  012777  001300  172242            MOV     #1300,@VCXREG           ;LOAD X DAC
1603  007246  012737  001600  001124            MOV     #1600,$GDDAT            ;LOAD EXPECTED
1604  007254  004537  011534          2$:       JSR     R5,CONVRT               ;CONVERT 32X AND AVERAGE
1605  007260  000011                            CH11
1606  007262  013737  011656  001126            MOV     ADEND,$BDDAT            ;READ VALUE OBTAINED
1607  007270  012737  000003  011664            MOV     #3,SPREAD               ;LOAD DEVIATION
1608  007276  004737  011666                    JSR     PC,COMPAR               ;TEST IF WITHIN
1609  007302  000401                            BR      1$                      ;BR IF WITHIN
1610  007304  104013                            ERROR   13                      ;CALIBRATION ERROR - X DAC VS. A/D
1611  007306  162777  000100  172174  1$:       SUB     #100,@VCXREG            ;DECREMENT DAC
1612  007314  162737  000200  001124            SUB     #200,$GDDAT             ;DEC. EXPECTED
1613  007322  100354                            BPL     2$                      ;BR UNTIL DONE
1614
1615                                    ;;*****************************************************************
1616                                    ;*TEST 50       CALIBRATION USING CHANNEL 12 - Y DAC VS. A/D
1617                                    ;;*****************************************************************
1618  007324  000004                    $ST50:  SCOPE
1619  007326  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1620  007334  012777  001300  172150            MOV     #1300,@VCYREG           ;LOAD Y DAC
1621  007342  012737  001600  001124            MOV     #1600,$GDDAT            ;LOAD EXPECTED
1622  007350  004537  011534          2$:       JSR     R5,CONVRT               ;CONVERT 32X AND AVERAGE
1623  007354  000012                            CH12
1624  007356  013737  011656  001126            MOV     ADEND,$BDDAT            ;READ VALUE OBTAINED
1625  007364  012737  000003  011664            MOV     #3,SPREAD               ;LOAD DEVIATION
1626  007372  004737  011666                    JSR     PC,COMPAR               ;TEST IF WITHIN
1627  007376  000401                            BR      1$                      ;BR IF WITHIN
1628  007400  104013                            ERROR   13                      ;CALIBRATION ERROR - Y DAC VS. A/D
1629  007402  162777  000100  172102  1$:       SUB     #100,@VCYREG            ;DECREMENT DAC
1630  007410  162737  000200  001124            SUB     #200,$GDDAT             ;DEC. EXPECTED
1631  007416  100354                            BPL     2$                      ;BR UNTIL DONE
```

```
1632                                    ;;*****************************************************************
1633                                    ;*TEST 51       LINEARITY TEST USING CH 6 - Y DAC VS. A/D
1634                                    ;;*****************************************************************
1635  007420  000004                    TST51:  SCOPE
1636  007422  012737  000010  001164            MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1637  007430  012700  014702                    MOV     #NUMBF2,R0              ;LOAD EDGE VALUE POINTER
1638  007434  012702  014726                    MOV     #RSLT0,R2               ;LOAD RESULT POINTER
1639
1640  007440  011037  007460            1$:     MOV     (R0),10$                ;LOAD EDGE EXPECTED
1641  007444  012077  172042                    MOV     (R0)+,@VCYREG           ;LOAD DAC
1642  007450  004437  010716                    JSR     R4,SAR                  ;SOFTWARE S.A.R.
1643  007454  001510                            VCXREG
1644  007456     000     006                    .BYTE   0,CH6                   ;CHANNEL 6, COARSE Y AND FINE X
1645  007460  000000                    10$:    0                               ;EDGE VALUE
1646  007462  000200                            BIT7                            ;50-50
1647
1648  007464  013722  015122                    MOV     DACSAV,(R2)+            ;SAVE RESULTS
1649  007470  005710                            TST     (R0)                    ;LAST RESULT ?
1650  007472  100362                            BPL     1$                      ;BR UNTIL DONE
1651  007474  005037  001124                    CLR     $GDDAT                  ;ZERO NOMINAL LINEARITY ERROR
1652  007500  013737  016776  011664            MOV     V77,SPREAD              ;TOLERANCE FOR A/D + DAC
1653  007506  013700  014746                    MOV     RSLT0+20,R0             ;GET LAST VALUE
1654  007512  163700  014726                    SUB     RSLT0,R0                ;SUBTRACT FIRST VALUE
1655  007516  006200                            ASR     R0
1656  007520  006200                            ASR     R0
1657  007522  006200                            ASR     R0
1658  007524  005500                            ADC     R0                      ;AVERAGE DIFFERENCE IN R0
1659  007526  012701  000002                    MOV     #2,R1
1660  007532  005037  014746                    CLR     RSLT0+20                ;START RUNNING SUM OF ERRORS
1661  007536  060037  014726            2$:     ADD     R0,RSLT0                ;COMPUTE NOM. VALUE ON LINE BETW. END PTS.
1662  007542  163761  014726  014726            SUB     RSLT0,RSLT0(R1)         ;COMPUTE ERROR WITH RESP. TO END PT. LINE
1663  007550  066137  014726  014746            ADD     RSLT0(R1),RSLT0+20      ;KEEP RUNNING SUM
1664  007556  005721                            TST     (R1)+                   ;BUMP R1
1665  007560  020127  000020                    CMP     R1,#20                  ;DONE ?
1666  007564  001364                            BNE     2$              ;BR IF NOT
1667  007566  006237  014746                    ASR     RSLT0+20
1668  007572  006237  014746                    ASR     RSLT0+20
1669  007576  006237  014746                    ASR     RSLT0+20
1670  007602  005537  014746                    ADC     RSLT0+20                ;AVERAGE ERROR WITH RESP. TO END PT. LINE
1671  007606  005037  014726                    CLR     RSLT0
1672  007612  005001                            CLR     R1
1673  007614  163761  014746  014726    3$:     SUB     RSLT0+20,RSLT0(R1)      ;ERROR WITH RESP. TO "BEST STRAIGHT LINE"
1674
1675  007622  016137  014726  001126            MOV     RSLT0(R1),$BDDAT
1676  007630  004737  011666                    JSR     PC,COMPAR               ;COMPARE LINEARITY ERROR WITH + OR - TOLERANCE
1677  007634  000422                            BR      4$
1678  007636  010102                            MOV     R1,R2
1679  007640  042702  177770                    BIC     #177770,R2              ;MASK BITS 0-2
1680  007644  062702  000060                    ADD     #60,R2                  ;CONVERT TO ASCII
1681  007650  110237  012445                    MOVB    R2,EM14A
1682  007654  010102                            MOV     R1,R2                   ;LOAD R2
1683  007656  006202                            ASR     R2
1684  007660  006202                            ASR     R2
1685  007662  006202                            ASR     R2
1686  007664  042702  177770                    BIC     #177770,R2              ;MASK
1687  007670  062702  000060                    ADD     #60,R2                  ;MAKE ASCII
```

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1688  007674  110237  012444              MOVB    R2,EM14B                ;SAVE #
1689  007700  104014                      ERROR   14                      ;LINEARITY ERROR USING CH 6 - YDAC VS. A/D
1690  007702  005721              4$:     TST     (R1)+                   ;BUMP R1
1691  007704  020127  000020              CMP     R1,#20                  ;DONE ?
1692  007710  001341                      BNE     3$              ;;BR IF NOT DONE
1693
1694                                      ;;*****************************************************************
1695                                      ;*TEST 52       LINEARITY TEST USING CH 5 - X DAC VS. A/D
1696                                      ;;*****************************************************************
1697  007712  000004              TST52:  SCOPE
1698  007714  012737  000010  001164      MOV     #10.,$TIMES     ;;DO 10 ITERATIONS
1699  007722  012700  014702              MOV     #NUMBF2,R0              ;LOAD EDGE VALUE POINTER
1700  007726  012702  014764              MOV     #RSLT1,R2               ;LOAD RESULT POINTER
1701
1702  007732  011037  007752      1$:     MOV     (R0),10$                ;LOAD EDGE EXPECTED
1703  007736  012077  171546              MOV     (R0)+,@VCXREG           ;LOAD DAC
1704  007742  004437  010716              JSR     R4,SAR                  ;SOFTWARE S.A.R.
1705  007746  001512                      VCYREG
1706  007750     000     005              .BYTE   0,CH5                   ;CHANNEL 5, COARSE & AND FINE Y
1707  007752  000000              10$:    0                               ;EDGE VALUE
1709  007754  000200                      BIT7                                    ;50-5C
1709
1710  007756  013722  015122              MOV     DACSAV,(R2)+            ;SAVE RESULTS
1711  007762  005710                      TST     (R0)                    ;LAST RESULT ?
1712  007764  100362                      BPL     1$                      ;BR UNTIL DONE
1713  007766  005037  001124              CLR     $GDCAT                  ;ZERO NOMINAL LINEARITY ERROR
1714  007772  013737  016776  011664      MOV     V77,SPREAD              ;TOLERANCE FOR A D + DAC
1715  010000  013700  015004              MOV     RSLT1+20,R0             ;GET LAST VALUE
1716  010004  163700  014764              SUB     RSLT1,R0                ;SUBTRACT FIRST VALUE
1717  010010  006200                      ASR     R0
1718  010012  006200                      ASR     R0
1719  010014  006200                      ASR     R0
1720  010016  005500                      ADC     R0                      ;AVERAGE DIFFERENCE IN PC
1721  010020  012701  000002              MOV     #2,R1
1722  010024  005037  015004              CLR     RSLT1+20                ;START RUNNING SUM OF ERRORS
1723  010030  062037  014764      2$:     ADD     PC,RSLT1                ;COMPUTE NOM. VALUE ON LINE BETW. END PTS.
1724  010034  163761  014764  014764      SUB     RSLT1,RSLT1(R1)         ;COMPUTE ERROR WITH RESP. TO END PT. LINE
1725  010042  066137  014764  015004      ADC     RSLT1(R1),RSLT1+20      ;KEEP RUNNING SUM
1726  010050  005721                      TST     (R1)+                   ;BUMP R1
1727  010052  020127  000020              CMP     R1,#20                  ;DONE ?
1728  010056  001364                      BNE     2$              ;;BR IF NO
1729  010060  006237  015004              ASR     RSLT1+20
1730  010064  006237  015004              ASR     RSLT1+20
1731  010070  006237  015004              ASR     RSLT1+20
1732  010074  005537  015004              ADC     RSLT1+20                ;AVERAGE ERROR WITH RESP. TO END PT. LINE
1733  010100  005037  014764              CLR     RSLT1
1734  010104  005001                      CLR     R1
1735  010106  163761  015004  014764  3$:     SUB     RSLT1+20,RSLT1(R1       ;ERROR WITH RESP. TO "BEST STRAIGHT LINE"
1736  010114  016137  014764  001126      MOV     RSLT1(R1),$BCDAT
1737  010122  004737  011666              JSR     PC,COMPAR               ;COMPARE LINEARITY ERROR WITH + OR - TOLERANCE
1738  010126  000422                      BR      4$
1739  010130  010102                      MOV     R1,R2
1740  010132  042702  177770              BIC     #177770,R2              ;MASK BITS 0-2
1741  010136  062702  000060              ADD     #60,R2                  ;CONVERT TO ASCII
1742  010142  110237  012445              MOVB    R2,EM14A
1743  010146  010102                      MOV     R1,R2                   ;LOAD R2
```

```
                                        ASR     R2
                                        ASR     R2
                                        ASR     R2
                                        BIC     #177770,R2              ;MASK
                                        ADD     #60,R2                  ;MAKE ASCII
                                        MOVB    R2,EM14B                ;SAVE #
                                        ERROR   14                      ;LINEARITY ERROR USING CH 5 - /DAC VS. A D
                                4$:     TST     (R1)+                   ;BUMP R1
                                        CMP     R1,#20                  ;DONE ?
                                        BNE     3$                      ::BR IF NOT DONE
                                        BIT     #BIT12,@SWR             ;TEST IF FORCED TYPEOUT
                                        BEQ     TST53                   ::BR IF NOT FORCED
                                        TYPE    ,LINMSG
                                        JSR     R5,TYPSTG               ;TYPE OCTAL STRING
                                        RSLT0                           ;STARTING AT
                                        8.                              ; # OF LOCATIONS
                                        TYPE    ,LINMG1
                                        JSR     R5,TYPSTG               ;TYPE OCTAL STRING
                                        RSLT1                           ;STARTING AT
                                        8.                              ; # OF LOCATIONS
                                        TYPE    ,ACRLF

                        ;;**************************************************************
                        ;*TEST 53       DETERMINE IF MORE AR11'S ARE TO BE TESTED
                        ;;**************************************************************
                        TST53:  SCOPE
                                        MOV     #1,$TIMES               ::DO 1 ITERATION
                                        TST     NBEXT                   ;TEST IF ANY
                                        BEQ     1$                      ;BR IF NONE
                                        ADD     #20,ARBADD              ;UPDATE DEVICE ADDRESS
                                        ADD     #20,ARBVCT              ;UPDATE DEVICE VECTOR
                                        DEC     NBEXT                   ;ANOTHER ONE
                                        BR      BYPAS1                  ;BR IF ANOTHER
                                1$:     MOV     $BASE,ARBADD            ;RELOAD ADDRESS
                                        MOV     $VECT1,ARBVCT           ;RELOAD VECTOR
                                        MOV     NMBEXT,NBEXT            ;RELOAD NUMBER
                                        RESET
                                        JMP     $EOP                    ;DONE
                                BYPAS1: MOV     #-1,R0
                                        JMP     RBE32                   ;TEST ANOTHER UNIT
                                        .SBTTL
```

```
                                .SBTTL  END OF PASS ROUTINE

                                ;;*****************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO BYPAS1

                                $EOP:
                                        SCOPE
                                        CLR     $TSTNM          ;;ZERO THE TEST NUMBER
                                        CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
                                        INC     $PASS           ;;INCREMENT THE PASS NUMBER
                                        BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
                                        DEC     (PC)+           ;;LOOP?
                                $EOPCT: .WORD   1
                                        BGT     $DOAGN          ;;YES
                                        MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
                                $ENDCT: .WORD   1
                                        $EOPCT
                                        TYPE    $ENDMG          ;;TYPE "END PASS #"
                                        MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                        TYPOS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                        TYPE    $ENULL          ;;TYPE A NULL CHARACTER
                                $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
                                        BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
                                        RESET                   ;;CLEAR THE WORLD
                                $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
                                        NOP                     ;;SAVE ROOM
                                        NOP                     ;;FOR
                                        NOP                     ;;ACT11
                                $DOAGN:
                                        JMP     @(PC)+          ;;RETURN
                                $RTNAD: .WORD   BYPAS1
                                $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
                                $ENDMG: .ASCIZ  <15><12>"END PASS #"
```

```
                                .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

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

010472                          $TYPDS:
010472  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
010474  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
010476  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
010500  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
010502  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
010504  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
010510  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
010514  100004                         BPL     1$              ;;BR IF INPUT IS POS.
010516  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
010520  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
010526  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
010530  012703  010706                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
010534  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
010540  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
010542  016001  010676                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
010546  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
010550  103402                         BLT     4$              ;;BR IF DONE
010552  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
010554  000774                         BR      3$
010556  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
010560  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
010562  001002                         BNE     5$              ;;FALL THROUGH IF =
010564  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
010566  100407                         BMI     7$              ;;BR IF YES
010570  105316                 5$:     ASLB    (SP)            ;;MSD?
010572  103003                         BCC     6$              ;;BR IF NO
010574  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
010602  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
010606  052702  000040         7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
010612  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
010614  005720                         TST     (R0)+           ;;JUST INCREMENTING
010616  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
010622  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
010624  003002                         BGT     9$              ;;GO TO EXIT
010626  010502                         MOV     R5,R2           ;;GET THE LSD
010630  000764                         BR      6$              ;;GO CHANGE TO ASCII
010632  105726                 8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
010634  100003                         BPL     9$              ;;BR IF NO
010636  116663  177777  177776         MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
010644  105013                 9$:     CLRB    (R3)            ;;SET THE TERMINATOR
010646  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
```

```
MAINDEC-11-DZARC-B     MACY11 27(732)  21-SEP-76  16:44  PAGE 43
DZARCB.P11             CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

   1883  010650  012603                      MOV     (SP)+,R3        ;;POP STACK INTO R3
   1884  010652  012602                      MOV     (SP)+,R2        ;;POP STACK INTO R2
   1885  010654  012601                      MOV     (SP)+,R1        ;;POP STACK INTO R1
   1886  010656  012600                      MOV     (SP)+,R0        ;;POP STACK INTO R0
   1887  010660  104400  010706              TYPE    $DBLK           ;;NOW TYPE THE NUMBER
   1888  010664  016666  000002  000004      MOV     2(SP),4(SP)     ;;ADJUST THE STACK
   1889  010672  012616                      MOV     (SP)+,(SP)
   1890  010674  000002                      RTI                     ;;RETURN TO USER
   1891  010676  023420              $DTBL:  10000.
   1892  010700  001750                      1000.
   1893  010702  000144                      100.
   1894  010704  000012                      10.
   1895  010706  000004              $DBLK:  .BLKW   4
   1896                                      .SBTTL  SUCCESSIVE APPROX. SUBROUTINE
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```
                                        ;S A R SUBROUTINE
                                        ;       JSR     R4,SAR
                                        ;       AXIS POINTER
                                        ;       CH. IN HIGH BYTE / DUMMY CH. IN LOW BYTE
                                        ;       EDGE VALUE
                                        ;       RESULT/MODE
                                        ;       RETURN WITH R5 = DIFFERENCE
                                        ;
                                        ;       BIT15 = 0       RMS
                                        ;       BIT15 = 1       PEAK
                                        ;       BIT7 = 1        50-50
                                        ;       BIT0 = 1        ;WAIT LOOP
010716  012437  015120          SAR:    MOV     (R4)+,@DAC              ;SAVE DAC ADDRESS POINTER
010722  012437  015166                  MOV     (R4)+,SARCHN            ;SAVE CHANNEL
010726  012437  015170                  MOV     (R4)+,EDGE              ;SAVE VALUE EDGE
010732  012437  015172                  MOV     (R4)+,CONS              ;SAVE RMS/PEAK SW
010736  010046                          MOV     R0,-(SP)                ;SAVE GPR
010740  010146                          MOV     R1,-(SP)
010742  010246                          MOV     R2,-(SP)
010744  010346                          MOV     R3,-(SP)
010746  113737  015167  011662          MOVB    SARCHN+1,CHANL
010754  005037  011660                  CLR     FCHANL
010760  113737  015167  011661          MOVB    SARCHN+1,FCHANL+1
010766  005237  011660                  INC     FCHANL                  ;SET START BIT
010772  017737  004122  015120          MOV     @ADAC,ADAC              ;GET BUS ADDRESS OF ACTIVE DAC
011000  012777  011132  170460          MOV     #11$,@ARBVCT            ;LOAD VECTOR
011006  005037  015174                  CLR     FINS                    ;CLEAR 2 PASS COUNTER FLAG
011012  005737  015172                  TST     CONS                    ;TEST IF RMS
011016  100003                          BPL     10$                     ;BR IF RMS
011020  012703  000002                  MOV     #2,R3                   ;LOAD A = .4% OF 512
011024  000407                          BR      15$
011026  012703  000121          10$:    MOV     #121,R3                 ;LOAD A = 16% OF 512
011032  105737  015172                  TSTB    CONS                    ;TEST FOR 50-50
011036  100002                          BPL     15$
011040  012703  000400                  MOV     #400,R3                 ;LOAD 50-50, A = 50% COUNT
011044  012702  001000          15$:    MOV     #1000,R2                ;SET UP MSB
011050  005077  004044                  CLR     @ADAC                   ;CLEAR DAC
011054  005001                  14$:    CLR     R1                      ;SET HIGH = 0
011056  012700  001000                  MOV     #1000,R0                ;SET UP 512 CONVERSIONS
011062  060277  004032                  ADD     R2,@ADAC                ;NEXT BIT OF ACTIVE DAC
011066  032737  000001  015172  6$:     BIT     #BIT0,CONS              ;TEST BIT 0
011074  001407                          BEQ     20$
011076  013777  011660  170370          MOV     FCHANL,@ADCS            ;START CONVERSION
011104  105777  170364          27$:    TSTB    @ADCS
011110  100375                          BPL     27$
011112  000410                          BR      12$
011114  052737  000100  011660  20$:    BIS     #BIT6,FCHANL            ;SET INTR. ENABLE
011122  013777  011660  170344          MOV     FCHANL,@ADCS            ;START CONVERSION
011130  000001                          WAIT
011132  022626                  11$:    CMP     (SP)+,(SP)+
011134  027737  170340  015170  12$:    CMP     @ADDBR,EDGE             ;IS RESULT < EDGE VALUE ?
011142  002401                          BLT     1$                      ;YES, BR
011144  005201                          INC     R1                      ;NO, INC HIGH FOR RESULT > OR = EDGE VALUE
011146  105737  015166          1$:     TSTB    SARCHN                  ;TEST IF DUMMY CH. IS SET
011152  001420                          BEQ     3$                      ;BR IF NOT
```

```
 1953  011154  012777  011176  170304          MOV     #4$,@ARBVCT             ;LOAD VECTOR
 1954  011162  113777  015166  170306          MOVB    SARCHN,@ADCS1           ;LOAD MUX
 1955  011170  005277  170300                  INC     @ADCS                   ;CONVERT
 1956  011174  000001                          WAIT
 1957  011176  022626                  4$:     CMP     (SP)+,(SP)+             ;POP STACK
 1958  011200  027777  170274  170272  13$:     CMP     @ADDBR,@ADDBR           ;FAKE READ
 1959  011206  012777  011132  170252          MOV     #11$,@ARBVCT            ;RESET VECTOR
 1960  011214  005300                  3$:     DEC     R0                      ;DONE 512 TIMES ?
 1961  011216  001323                          BNE     6$                      ;NO
 1962  011220  020103                          CMP     R1,R3                   ;IS HIGH > OR = A ?
 1963  011222  002402                          BLT     2$                      ;NO, LEAVE BIT ON
 1964  011224  160277  003670                  SUB     R2,@ADAC                ;YES, TAKE IT OUT
 1965  011230  022702  000001          2$:     CMP     #1,R2                   ;TEST FOR Z = 1, S.A.R. DONE ?
 1966  011234  001402                          BEQ     21$                     ;BR IF DONE
 1967  011236  006202                          ASR     R2                      ;NO SET Z /2
 1968  011240  000705                          BR      14$                     ;TRY AGAIN
 1969  011242  017737  003652  015122  21$:     MOV     @ADAC,DACSAV
 1970  011250  005737  015174                  TST     FINS                    ;FIRST OR SECOND TIME ?
 1971  011254  001020                          BNE     45$                     ;SECOND, BR
 1972  011256  017705  003636                  MOV     @ADAC,R5                ;READ VALUE
 1973  011262  005237  015174                  INC     FINS                    ;SET FLAG
 1974  011266  005737  015172                  TST     CONS                    ;TEST IF PEAK/RMS
 1975  011272  100003                          BPL     41$                     ;BR IF RMS
 1976  011274  012703  000776                  MOV     #776,R3                 ;LOAD 99.6% OF 512
 1977  011300  000405                          BR      42$
 1978  011302  012703  000657          41$:    MOV     #657,R3                 ;SET A = 84% OF 512
 1979  011306  105737  015172          43$:    TSTB    CONS
 1980  011312  100404                          BMI     5$
 1981  011314  000653                  42$:    BR      15$                     ;DO MORE TESTING
 1982  011316  167705  003576          45$:    SUB     @ADAC,R5                ;SUBTRACT DIFF
 1983  011322  005405                          NEG     R5
 1984  011324  005077  170144          5$:     CLR     @ADCS                   ;RETURN WITH 2 X NOISE IN R5
 1985  011330  012603                          MOV     (SP)+,R3
 1986  011332  012602                          MOV     (SP)+,R2
 1987  011334  012601                          MOV     (SP)+,R1
 1988  011336  012600                          MOV     (SP)+,R0
 1989  011340  000204                          RTS     R4                      ;EXIT
 1990
 1991                                  .SBTTL  MISC. SUBROUTINES
```

```
                                        ;CONVERT R2 INTO DECIMAL DIGITS

011342  012737  177774  011446  DECPRT: MOV     #-4,DIGCNT      ;LOAD COUNT
011350  010146                          MOV     R1,-(SP)        ;SAVE R1
011352  012701  011462                  MOV     #DIGT1-1,R1     ;LOAD POINTER
011356  012737  011452  011450          MOV     #DECPNT+2,DECPNT        ;LOAD POINTER
011364  012737  177777  011444  1$:     MOV     #-1,DIGIT       ;LOAD #
011372  005237  011444          2$:     INC     DIGIT           ;UPDATE IT
011376  167702  000046                  SUB     @DECPNT,R2      ;SUB MAGNITUDE
011402  100373                          BPL     2$              ;BR IF +
011404  067702  000040                  ADD     @DECPNT,R2      ;RESTORE
011410  052737  000060  011444          BIS     #60,DIGIT       ;MAKE A #
011416  113721  011444                  MOVB    DIGIT,(R1)+     ;LOAD INTO STRING
011422  005237  011446                  INC     DIGCNT          ;UPDATE COUNT
011425  001002                          BNE     3$              ;BR IF NOT DONE
011430  012601                          MOV     (SP)+,R1        ;RESTORE R1
011432  000207                          RTS     PC              ;EXIT
011434  062737  000002  011450  3$:     ADD     #2,DECPNT       ;UPDATE POINTER
011442  000750                          BR      1$              ;BR BACK

011444  000000          DIGIT:  0
011446  000000          DIGCNT: 0
011450  011452          DECPNT: .+2
011452  001750                  1000.
011454  000144                  100.
011456  000012                  10.
011460  000001                  1.

011462      000         DIGT0:  .BYTE   0
011463      000         DIGT1:  .BYTE   0
011464      000         DIGT2:  .BYTE   0
011465      000         DIGT3:  .BYTE   0

011466  013546          BYTWO:  MOV     @(R5)+,-(SP)            ;SAVE ON STACK
011470  104402                  TYPOS
011472      004     001         .BYTE   4,1
011474  104400  014541          TYPE    ,MULTSP
011500  013546                  MOV     @(R5)+,-(SP)            ;SAVE ON STACK
011502  104402                  TYPOS
011504      004     001         .BYTE   4,1
011506  000205                  RTS     R5                      ;EXIT

011510  012500          TYPSTG: MOV     (R5)+,R0                ;GET ADDRESS POINTER
011512  012501                  MOV     (R5)+,R1                ;LOAD # OF LOC.
011514  012046          1$:     MOV     (R0)+,-(SP)             ;SAVE ON STACK
011516  104402                  TYPOS
011520      004     001         .BYTE   4,1
011522  104400  016543          TYPE    ,SP3MSG
011526  005301                  DEC     R1                      ;DONE ?
011530  001371                  BNE     1$
011532  000205          2$:     RTS     R5                      ;EXIT
```

```
                                        ;SUBROUTINE TO GET AVERAGE OF 32 CONVERSIONS
                                        
011534  012537  011652          CONVRT: MOV     (R5)+,10$
011540  013737  011652  011662          MOV     10$,CHANL
011546  000337  011652                  SWAB    10$
011552  012737  000040  011654          MOV     #32.,11$
011560  005037  011656                  CLR     ADEND
011564  013777  011652  167702          MOV     10$,@ADCS
011572  005277  167676          2$:     INC     @ADCS
011576  105777  167672          1$:     TSTB    @ADCS
011602  100375                          BPL     1$
011604  067737  167670  011656          ADD     @ADDBR,ADEND
011612  005337  011654                  DEC     11$
011616  001365                          BNE     2$
011620  006237  011656                  ASR     ADEND
011624  006237  011656                  ASR     ADEND
011630  006237  011656                  ASR     ADEND
011634  006237  011656                  ASR     ADEND
011640  006237  011656                  ASR     ADEND
011644  005537  011656                  ADC     ADEND                   ;ROUND UP
011650  000205                          RTS     R5
                                        
011652  000000          10$:    0
011654  000000          11$:    0
011656  000000          ADEND:  0
011660  000000          FCHANL: 0
011662  000000          CHANL:  0
011664  000000          SPREAD: 0
                                        
011666  010046          COMPAR: MOV     R0,-(SP)
011670  010146                  MOV     R1,-(SP)
011672  013700  001124          MOV     $GODAT,R0               ;LOAD R0
011676  013701  001126          MOV     $BDDAT,R1               ;LOAD R1
011702  160100                  SUB     R1,R0                   ;SUBTRACT
011704  100001                  BPL     8$                      ;
011706  005400                  NEG     R0
011710  020037  011664  8$:     CMP     R0,SPREAD               ;MAGNITUDE OF DIFF. IN R0
011714  003405                  BLE     10$
011716  012601          9$:     MOV     (SP)+,R1
011720  012600                  MOV     (SP)+,R0
011722  062716  000002          ADD     #2,(SP)
011726  000207                  RTS     PC
                                        
011730  012601          10$:    MOV     (SP)+,R1
011732  012600                  MOV     (SP)+,R0
011734  000207                  RTS     PC
                                .SBTTL  ASCII MESSAGES AND ERROR POINTERS
```

```
2090
2091  011736  051105  047522  020122  EM1:    .ASCIZ  \ERROR ON A/D CHANNEL\
2092  011744  047117  040440  042057
2093  011752  041440  040510  047116
2094  011760  046105     000
2095  011763     126  020103  047514  EM2:    .ASCIZ  /VC LOGIC SIGNAL HIGH OUTPUT TOO LOW/
2096  011770  044507  020103  044523
2097  011776  047107  046101  044040
2098  012004  043511  020110  052517
2099  012012  050124  052125  052040
2100  012020  047517  046040  053517
2101  012026     000
2102  012027     126  020103  052123  EM3:    .ASCIZ  /VC STATUS REGISTER IN ERROR/
2103  012034  052101  051525  051040
2104  012042  043505  051511  042524
2105  012050  020122  047111  042440
2106  012056  051122  051117     000
2107  012063     105  052130  051105  EM4:    .ASCIZ  /EXTERNAL A TO D START FAILED/
2108  012070  040516  020114  020101
2109  012076  047524  042040  051440
2110  012104  040524  052122  043040
2111  012112  044501  042514  000104
2112  012120  027501  020104  044504  EM5:    .ASCIZ  \A/D DIFFERENTIAL LINEARITY ERROR\
2113  012126  043106  051105  047105
2114  012134  044524  046101  046040
2115  012142  047111  040505  044522
2116  012150  054524  042440  051122
2117  012156  051117     000
2118  012161     116  044517  042523  EM6:    .ASCIZ  /NOISE LEVEL EXCEEDED LIMIT/
2119  012166  046040  053105  046105
2120  012174  042440  041530  042505
2121  012202  042504  020104  044514
2122  012210  044515  000124
2123  012214  041526  046040  043517  EM7:    .ASCIZ  /VC LOGIC SIGNAL LOW OUTPUT TOO HIGH/
2124  012222  041511  051440  043511
2125  012230  040516  020114  047514
2126  012236  020127  052517  050124
2127  012244  052125  052040  047517
2128  012252  044040  043511  000110
2129  012260  027504  020101  044504  EM10:   .ASCIZ  \D/A DIFFERENTIAL LINEARITY ERROR\
2130  012266  043106  051105  047105
2131  012274  044524  046101  046040
2132  012302  047111  040505  044522
2133  012310  054524  042440  051122
2134  012316  051117     000
2135  012321     101  042057  044440  EM11:   .ASCIZ  \A/D INTER-CHANNEL SETTLING ERROR\
2136  012326  052116  051105  041455
2137  012334  040510  047116  046105
2138  012342  051440  052105  046124
2139  012350  047111  020107  051105
2140  012356  047522  000122
2141  012362  043117  051506  052105  EM12:   .ASCIZ  /OFFSET ERROR/
2142  012370  042440  051122  051117
2143  012376     000
2144  012377     103  046101  041111  EM13:   .ASCIZ  /CALIBRATION ERROR/
2145  012404  040522  044524  047117
```

```
2146  012412  042440  051122  051117
2147  012420     000
2148  012421     114  047111  040505  EM14:   .ASCII  /LINEARITY ERROR AT /
2149  012426  044522  054524  042440
2150  012434  051122  051117  040440
2151  012442  020124
2152  012444     060                  EM14B:  .BYTE   60
2153  012445     060     060     060  EM14A:  .BYTE   60,60,60,0
2154  012450     000
2155  012451     105  051122  041520  DH1:    .ASCIZ  /ERRPC   ARADD   CHANL   NOMINAL SPREAD  ACTUA_/
2156  012456  020040  040440  040522
2157  012464  042104  020040  041440
2158  012472  040510  046116  020040
2159  012500  047040  046517  047111
2160  012506  046101  051440  051120
2161  012514  040505  020104  040440
2162  012522  052103  040525  000114
2163  012530  051105  050122  020103  DH2:    .ASCIZ  /ERRPC   ARADD    CHANL  3V LEV. OUTPUT/
2164  012536  020040  051101  042101
2165  012544  020104  020040  041440
2166  012552  040510  046116  020040
2167  012560  053063  046040  053105
2168  012566  020056  052517  050124
2169  012574  052125     000
2170  012577     105  051122  041520  DH3:    .ASCIZ   ERRPC   ARADD    GOOD    BAD/
2171  012604  020040  040440  040522
2172  012612  042104  020040  020040
2173  012620  047507  042117  020040
2174  012626  020040  040502  000104
2175  012634  051105  050122  020103  DH5:    .ASCIZ  /ERRPC   ARADD  # OF ST. ALLOWED/
2176  012642  020040  051101  042101
2177  012650  020104  021440  047440
2178  012656  020106  052123  020056
2179  012664  046101  047514  042527
2180  012672  000104
2181  012674  051105  050122  020103  DH6:    .ASCIZ  /ERRPC   ARADD   LIMIT   MEASURED/
2182  012702  020040  051101  042101
2183  012710  020104  020040  044514
2184  012716  044515  020124  020040
2185  012724  042515  051501  051125
2186  012732  042105     000
2187  012735     105  051122  041520  DH7:    .ASCIZ  \ERRPC   ARADD   A/D CH. .4 LEV  OUTPUT\
2188  012742  020040  040440  040522
2189  012750  042104  020040  040440
2190  012756  042057  041440  027110
2191  012764  027040  020064  042514
2192  012772  020126  047440  052125
2193  013000  052520  000124
2194  013004  051105  050122  020103  DH10:   .ASCIZ  \ERRPC   ARADD    STEP   NOMINAL SPREAD  ACTUAL\
2195  013012  020040  051101  042101
2196  013020  020104  020040  051440
2197  013026  042524  020120  020040
2198  013034  047516  044515  040516
2199  013042  020114  050123  042522
2200  013050  042101  020040  041521
2201  013056  052524  046101     000
```

```
 2202  013063     105  051122  041520  DH11:   .ASCIZ  /ERRPC   ARADD   NOMINAL SPREAD  ACTUAL/
 2203  013070  020040  040440  040522
 2204  013076  042104  020040  047040
 2205  013104  046517  047111  046101
 2206  013112  051440  051120  040505
 2207  013120  020104  040440  052103
 2208  013126  040525  000114
 2209  013132  005015  020111  044502  BIASST: .ASCIZ  <15><12>/I BIAS = /
 2210  013140  051501  036440  000040
 2211  013146  024040                  BIASDN: .ASCII  / (/
 2212  013150  027062                  BASBT1: .ASCII  /2./
 2213  013152  020060  044515  051103  BASBT2: .ASCII  /0 MICROAMP LIMIT = /
 2214  013160  040517  050115  046040
 2215  013166  046511  052111  036440
 2216  013174     040
 2217  013175     065  024460  005015  BASBT3: .ASCIZ  /50)/<15><12>
 2218  013202     000
 2219  013203     015  005012  027504  DIFMSG: .ASCII  <15><12><12>\D/A DIFFERENTIAL LINEARITY\
 2220  013210  020101  044504  043106
 2221  013216  051105  047105  044524
 2222  013224  046101  046040  047111
 2223  013232  040505  044522  054524
 2224  013240  005015  052123  050105          .ASCII  <15><12>\STEP 0/1    1/2    3/4    7/10   17/20  37/40\
 2225  013246  030040  030457  020040
 2226  013254  020040  027461  020062
 2227  013262  020040  031440  032057
 2228  013270  020040  020040  027467
 2229  013276  030061  020040  030440
 2230  013304  027467  030062  020040
 2231  013312  033463  032057     060
 2232  013317     040  033467  030457          .ASCII  \ 77/100 177/200 377/400 777/1000\
 2233  013324  030060  030440  033467
 2234  013332  031057  030060  031440
 2235  013340  033467  032057  030060
 2236  013346  033440  033467  030457
 2237  013354  030060     060
 2238  013357     015  020012  020130          .ASCIZ  <15><12>\ X   \
 2239  013364  020040     000
 2240  013367     015  020012  020131  DIYMSG: .ASCIZ  <15><12>/ Y   /
 2241  013374  020040     000
 2242  013377     015  024012  047516  DIEMSG: .ASCIZ  <15><12>/(NOMINAL STEP HEIGHT = 62)/<15><12>
 2243  013404  044515  040516  020114
 2244  013412  052123  050105  044040
 2245  013420  044505  044107  020124
 2246  013426  020075  031066  006451
 2247  013434  000012
 2248  013436  005015  027501  020104  ADSMSG: .ASCII  <15><12>\A/D INTER-CHANNEL SETTLING (1 LSB = 62)\
 2249  013444  047111  042524  026522
 2250  013452  044103  047101  042516
 2251  013460  020114  042523  052124
 2252  013466  044514  043516  024040
 2253  013474  020061  051514  020102
 2254  013502  020075  031066     061
 2255  013507     015  050012  051517          .ASCIZ  <15><12>/POSITIVE = /
 2256  013514  052111  053111  020105
 2257  013522  020075     000
```

```
  2258  013525     040  047040  043505  ADEMSG: .ASCIZ  /  NEGATIVE = /
  2259  013532  052101  053111  020105
  2260  013540  020075     000
  2261  013543     015  047012  044517  NOIMSG: .ASCII  <15><12>\NOISE:    RMS (1/4 LSB LIMIT = 31)  PEAK (2 LSB LIMIT = 144)\
  2262  013550  042523  020072  020040
  2263  013556  051040  051515  024040
  2264  013564  027461  020064  051514
  2265  013572  020102  044514  044515
  2266  013600  020124  020075  030463
  2267  013606  020051  050040  040505
  2268  013614  020113  031050  046040
  2269  013622  041123  046040  046511
  2270  013630  052111  036440  030440
  2271  013636  032064     051
  2272  013641     015  040412  042057          .ASCIZ  <15><12>\A/D BIPOLAR     \
  2273  013646  041040  050111  046117
  2274  013654  051101  020040  020040
  2275  013662  000040
  2276  013664  005015  027501  020104  NOIMG1: .ASCIZ  <15><12>\A/D UNIPOLAR    \
  2277  013672  047125  050111  046117
  2278  013700  051101  020040  020040
  2279  013706     000
  2280  013707     015  054012  042040  NOIMG2: .ASCIZ  <15><12>\X D/A           \
  2281  013714  040457  020040  020040
  2282  013722  020040  020040  020040
  2283  013730  000040
  2284  013732  005015  020131  027504  NOIMG3: .ASCIZ  <15><12>\Y D/A           \
  2285  013740  020101  020040  020040
  2286  013746  020040  020040  020040
  2287  013754     000
  2288  013755     015  005012  044514  LINMSG: .ASCII  <15><12><12>/LINEARITY (1 LSB = 62)/<15><12>
  2289  013762  042516  051101  052111
  2290  013770  020131  030450  046040
  2291  013776  041123  036440  033040
  2292  014004  024462  005015
  2293  014010  020040  020040  020040          .ASCII  /                0      200     400     600     1000    1200    1400    1600/
  2294  014016  020040  020040  020040
  2295  014024  020040  020040  020060
  2296  014032  020040  020040  031040
  2297  014040  030060  020040  020040
  2298  014046  030064  020060  020040
  2299  014054  033040  030060  020040
  2300  014062  020040  030061  030060
  2301  014070  020040  030440  030062
  2302  014076  020060  020040  032061
  2303  014104  030060  020040  030440
  2304  014112  030066     060
  2305  014115     015  054412  042040          .ASCIZ  <15><12>\Y D/A VS. A/D   \
  2306  014122  040457  053040  027123
  2307  014130  040440  042057  020040
  2308  014136  000040
  2309  014140  005015  020130  027504  LINMG1: .ASCIZ  <15><12>\X D/A VS. A/D   \
  2310  014146  020101  051526  020056
  2311  014154  027501  020104  020040
  2312  014162     000
  2313  014163     015  005012  027501  ADDIFM: .ASCIZ  <15><12><12>\A/D DIFFERENTIAL LINEARITY:\<15><12>
```

```
  2314  014170  020104  044504  043106
  2315  014176  051105  047105  044524
  2316  014204  046101  046040  047111
  2317  014212  040505  044522  054524
  2318  014220  006472  000012
  2319  014224  052123  052101  026505  ADDIF:  .ASCIZ  /STATE-WIDTH/<15><12>
  2320  014232  044527  052104  006510
  2321  014240  000012
  2322  014242  034050  020051  045523  SKPMSG: .ASCIZ  /(8) SKIPPED STATE(S)/<15><12>
  2323  014250  050111  042520  020104
  2324  014256  052123  052101  024105
  2325  014264  024523  005015      000
  2326  014271      050  024470  037040  GRT2MG: .ASCIZ  /(8) > 2 LSB STATE(S)/<15><12>
  2327  014276  031040  046040  041123
  2328  014304  051440  040524  042524
  2329  014312  051450  006451  000012
  2330  014320  034050  020051  020074  NARMSG: .ASCIZ  \(8) < 1/2 LSB NARROW STATE(S)\<15><12>
  2331  014326  027461  020062  051514
  2332  014334  020102  040516  051122
  2333  014342  053517  051440  040524
  2334  014350  042524  051450  006451
  2335  014356  000012
  2336  014360  034050  02[illegible]  020076  WIDMSG: .ASCIZ  \(8) > 1 1/2 LSB WIDE STATE(S)\<15><12>
  2337  014366  020061  027[illegible]  020062
  2338  014374  051514  020122  044527
  2339  014402  042504  051440  040524
  2340  014410  042524  051450  006451
  2341  014416  000012
  2342  014420  054130  054056  020045  PERM_F: .ASCIZ  \XX.X% OF STATES WITHIN 1/2 LSB  (SPEC = 95%)\<15><12>
  2343  014426  043117  051440  040524
  2344  014434  042524  020123  044527
  2345  014442  044124  047111  030440
  2346  014450  031057  046040  041123
  2347  014456  020040  051450  042520
  2348  014464  020103  020075  032471
  2349  014472  024445  005015      000
  2350  014477      130  027130  022530  PERQRT: .ASCIZ  \XX.X% OF STATES WITHIN 1/4 LSB \<15><12>
  2351  014504  047440  020106  052123
  2352  014512  052101  051505  053440
  2353  014520  052111  044510  020116
  2354  014536  027461  020064  051514
  2355  014534  020102  005015      000
  2356  014541      040  020040  020040  MULTSP: .ASCIZ  /
  2357  014546  020040  020040  020040
  2358  014554  020040  020040  020040
  2359  014562  020040  020040  020040
  2360  014570  000040
  2361                                          .EVEN
  2362  014572  001116  001464  011662  DT1:    $ERRPC,ARBADD,CHANL,$GDDAT,SPREAD,$BDDAT,0
  2363  014600  001124  011664  001126
  2364  014606  000000
  2365  014610  001116  001464  011662  DT2:    $ERRPC,ARBADD,CHANL,$GDDAT,$BDDAT,0
  2366  014616  001124  001126  000000
  2367  014624  001116  001464  001124  DT3:    $ERRPC,ARBADD,$GDDAT,$BDDAT,0
  2368  014632  001126  000000
  2369  014636  001116  001464  001126  DT5:    $ERRPC,ARBADD,$BDDAT,$GDDAT,0
```

```
                    014644  001124  000000
                    014650  001116  001464  015170  DT10:   $ERRPC,ARBADD,EDGE,$GDDAT,SPREAD,$BDDAT,0
                    014656  001124  011664  001126
                    014664  000000
                    014666  001116  001464  001124  DT11:     R PC,ARBADD,$GDDAT,SPREAD,$BDDAT,0
                    014674  011664  001126  000000
                    014702  000004  000203  000402  NUMBF2: 4,203,402,601,1000,1177,1376,1575,1774,BIT15
                    014710  000601  001000  001177
                    014716  001376  001575  001774
                    014724  100000
                    014726  000000  000000  000000  RSLT0:  0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                    014734  000000  000000  000000
                    014742  000000  000000  000000
                    014750  000000  000000  000000
                    014756  000000  000000  000000
                    014764  000000  000000  000000  RSLT1:  0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                    014772  000000  000000  000000
                    015000  000000  000000  000000
                    015006  000000  000000  000000
                    015014  000000  000000  000000
                    015022  000000  000000  000000  RSLT2:  0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                    015030  000000  000000  000000
                    015036  000000  000000  000000
                    015044  000000  000000  000000
                    015052  000000  000000  000000
                    015060  000000  000000  000000  RSLT3:  0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
                    015066  000000  000000  000000
                    015074  000000  000000  000000
                    015102  000000  000000  000000
                    015110  000000  000000  000000
```

.SBTTL DIFFERENTIAL LINEARITY SUBROUTINE

```
                                ADAC:   170412                  :BUS ADDRESS OF DAC
                                DACSAV: 0
                                RMSMAX: 25.                     :1/4 LSB
                                PEKMAX: 200.                    :2 LSB
                                CH7RMS: 0
                                CH7PEK: 0
                                CH47RM: 0
                                CH47PK: 0
                                XDACRM: 0
                                XDACPK: 0
                                YDACRM: 0
                                YDACPK: 0
                                OFSTBX: 0
                                OFSTUX: 0
                                OFSLBX: 0
                                OFSLUX: 0
                                ADPMUX: 0
                                ADNMUX: 0
                                BIASCI: 0
                        006     SARCHN: .BYTE   6.6             :CHANNEL # IN HIGH BYTE
                                EDGE:   1000                    :CONVERTED VALUE EDGE
                                CONS:   0                       :0 = RMS BIT 15 = 1 PEAK
                                FINS:   0                       :2 PASS COUNTER
                                LOLIM1: 31
                                LOLIM2: 46
                                HILIM1: 113
                                HILIM2: 76
                                CRTOK:  0
                                NARROW: 0
                                WIDE:   0
                                MEAN:   62
                                TEMP:   0
```

```
                                                DIFLIN: MOV     (R5)+,VCREG1             ;LOAD COARSE REGISTER ADDRESS
                                                        MOV     (R5)+,VCREG2             ;LOAD FINE ADDRESS
                                                        MOV     (R5)+,DIFCHN             ;LOAD CHANNEL
                                                        MOV     R5,-(SP)
                                                        CLR     @VCSTAT
                                                        MOV     @VCREG1,VCREG1           ;GET BUS ADDRESS
                                                        MOV     @VCREG2,VCREG2
                                                        MOV     #0,@VCREG1               ;CLEAR COARSE
                                                        MOV     #0,@VCREG2               ;CLEAR FINE
                                                        MOV     #ADBUFF,%1
                                                        CLR     %0
                                                1$:     CLR     (1)+                     ;CLEAR MEMORY
                                                        CMP     #LAST,%1
                                                        BNE     1$

                                                CONVR:  JSR     PC,CONVT
                                                        BEQ     2$                       ;BRANCH IF RESULT = 0
                                                        CMP     R5,R0                    ;COMPARE RESULT AND POINT
                                                        BMI     2$                       ;BRANCH FOR RESULT < POINT
                                                        INCB    ADBUFF(%5)               ;INCREMENT CONTENTS OF Z
                                                        BCC     2$
                                                        MOVB    #377,ADBUFF(R5)
                                                2$:     ADD     #1,@VCREG2               ;UPDATE FINE REG.
                                                        TST     @VCREG2
                                                        BNE     CONVR                    ;BRANCH UNTIL FINISH
                                                        CMP     #1774,@VCREG1            ;TEST COARSE REG.
                                                        BEQ     READ
                                                        ADD     #14,@VCREG1              ;UPDATE COARSE REG.
                                                        CLR     @VCREG2                  ;CLEAR FINE REG.
                                                        JSR     PC,CONVT
                                                        ADD     #4,R5                    ;(4+RESULT) IN R5
                                                        MOV     %5,%0                    ;LOAD POINT
                                                        ADD     #ADBUFF,%5               ;
                                                        MOV     #10,%4
                                                1$:     CLRB    (R5)+                    ;CLEAR 8. MEM BYTE LOCATIONS
                                                        DEC     %4
                                                        BNE     1$
                                                        BR      CONVR
                                                READ:   BIT     #BIT12,@SWR
                                                        BEQ     13$
                                                        TYPE    ,ADDIFM
                                                13$:    CLR     R0
                                                        MOV     #1776,%2
                                                        MOV     #ADBUFF+1,%3
                                                        MOV     #1,TEMP
                                                        CLR     GRTOK
                                                        CLR     DIFERR
                                                        CLR     NARROW
                                                        CLR     WIDE
                                                        CLR     20$
                                                        CLR     SKIPST
                                                        CLR     EXCESS
                                                2$:     MOVB    (R3),R0
                                                        CMP     R0,#144                  ;TEST IF STATE WIDTH > 2LSB
                                                        BGT     1$                       ;YES, BR
```

```
 2490  015526  105260  024102                    INCB    ABUFF4(R0)          ;UPDATE STATE-WIDTH BUFFER
 2491  015532  020037  015202                    CMP     R0,HILIM1           ;TEST IF STATE WIDTH > 1 1/2 LSB
 2492  015536  003021                            BGT     3$                  ;YES, BR
 2493  015540  020037  015204                    CMP     R0,HILIM2           ;TEST IF STATE WIDTH > 1 1/4 LSB
 2494  015544  003061                            BGT     4$                  ;YES, BR
 2495  015546  020037  017000                    CMP     R0,V1               ;IS IT A SKIPPED STATE?
 2496  015552  103416                            BLO     10$                 ;YES, BR
 2497  015554  020037  015176                    CMP     R0,LOLIM1           ;TEST IF STATE WIDTH < 1/2 LSB
 2498  015560  002415                            BLT     11$                 ;YES BR
 2499  015562  020037  015200                    CMP     R0,LOLIM2           ;TEST IF STATE WIDTH < 3/4 LSB
 2500  015566  002450                            BLT     4$                  ;YES, BR
 2501  015570  005237  015206                    INC     QRTCK               ;STATE WIDTH BETWEEN 3/4 AND 1 1/4 LSB
 2502  015574  000445                            BR      4$
 2503  015576  005237  015744          1$:       INC     EXCESS              ;UPDATE > 2 LSB WIDE STATE COUNT
 2504  015602  005237  015212          3$:       INC     WIDE                ;UPDATE > 1 1/2 LSB WIDE STATE COUNT
 2505  015606  000406                            BR      12$
 2506  015610  005237  015740          10$:      INC     SKIPST              ;UPDATE SKIPPED STATE COUNT
 2507  015614  105700          11$:      TSTB    R0
 2508  015616  100767                            BMI     1$
 2509  015620  005237  0152.0                    INC     NARROW              ;UPDATE < 1/2 LSB NARROW STATE COUNT
 2510  015624  005237  015742          12$:      INC     DIFERR              ;UPDATE OUTSIDE + OR - 1/2 LSB COUNT
 2511  015630  032777  010000  163300  5$:       BIT     #BIT12,@SWR         ;TEST FOR FORCED TYPEOUT
 2512  015636  001424                            BEQ     4$                  ;:BR IF NOT
 2513  015640  005737  015736                    TST     20$                 ;TEST IF FIRST TIME ?
 2514  015644  001004                            BNE     6$                  ;BR IF YES
 2515  015646  005237  015736                    INC     20$
 2516  015652  104400  014224                    TYPE    ,ADDIF
 2517  015656  013746  015216          6$:       MOV     TEMP,-(SP)          ;SAVE CURRENT STATE
 2518  015662  104402                            TYPOS
 2519  015664     004     001                    .BYTE   4,1
 2520  015666  104400  016552                    TYPE    ,TYANXX
 2521  015672  042700  177400                    BIC     #177400,R0
 2522  015676  010046                            MOV     R0,-(SP)
 2523  015700  104402                            TYPOS
 2524  015702     003     001                    .BYTE   3,1
 2525  015704  104400  016536                    TYPE    ,ACRLF
 2526  015710  005237  015216          4$:       INC     TEMP
 2527  015714  105723                            TSTB    (R3)+
 2528  015716  005302                            DEC     R2
 2529  015720  001276                            BNE     2$
 2530  015722  032777  010000  163206            BIT     #BIT12,@SWR         ;TEST BIT 12
 2531  015730  001006                            BNE     SWDIST              ;BR IF FORCED PRINTOUT
 2532  015732  012605                            MOV     (SP)+,R5
 2533  015734  000205                            RTS     R5
 2534  015736  000000          20$:      0
 2535  015740  000000          SKIPST:   0                                   ;SKIPPED STATE COUNT
 2536  015742  000000          DIFERR:   0                                   ;OUTSIDE + OR - 1 2 LSB STATE COUNT
 2537  015744  000000          EXCESS:   0                                   ;> 2 LSB STATE COUNT
 2538
 2539  015746  012703  024102          SWDIST:   MOV     #ABUFF4,R3
 2540  015752  005037  015216                    CLR     TEMP
 2541  015756  104400  016536                    TYPE    ,ACRLF
 2542  015762  013746  015740                    MOV     SKIPST,-(SP)        ;SAVE SKIPPED STATES
 2543  015766  104402                            TYPOS
 2544  015770     003     000                    .BYTE   3,0
 2545  015772  104400  014242                    TYPE    ,SKPMSG
```

```
2546  015776  013746  015744                    MOV     EXCESS,-(SP)            ;SAVE EXCESSIVE WIDE STATES
2547  016002  104402                            TYPOS
2548  016004     003     000                    .BYTE   3,0
2549  016006  104400  014271                    TYPE    ,GRT2MG
2550  016012  013746  015210                    MOV     NARROW,-(SP)
2551  016016  104402                            TYPOS
2552  016020     003     000                    .BYTE   3,0
2553  016022  104400  014320                    TYPE    ,NARMSG
2554  016026  013746  015212                    MOV     WIDE,-(SP)              ;SAVE WIDE STATES
2555  016032  104402                            TYPOS
2556  016034     003     000                    .BYTE   3,0
2557  016036  104400  014360                    TYPE    ,WIDMSG
2558  016042  012700  001776                    MOV     #1022.,R0
2559  016046  163700  015212                    SUB     WIDE,R0
2560  016052  163700  015210                    SUB     NARROW,R0
2561  016056  004537  017044                    JSR     R5,PRCNT                ;CONVERT TO PERCENT
2562  016062  014420                            PERHLF
2563  016064  104400  014420                    TYPE    ,PERHLF
2564  016070  013700  015206                    MOV     QRTOK,R0
2565  016074  004537  017044                    JSR     R5,PRCNT
2566  016100  014477                            PERQRT
2567  016102  104400  014477                    TYPE    ,PERQRT
2568  016106  104400                            TYPE
2569  016110  016554                            STDMSG
2570  016112  013702  015216          6$:       MOV     TEMP,R2
2571  016116  006302                            ASL     R2
2572  016120  004737  011342                    JSR     PC,DECPRT               ;CONVERT R2 TO DEC.
2573  016124  113737  011463  016400            MOVB    DIGT1,RSV1
2574  016132  113737  011464  016402            MOVB    DIGT2,RSV2
2575  016140  113737  011465  016403            MOVB    DIGT3,RSV3
2576
2577  016146  111302                            MOVB    (R3),R2
2578  016150  004737  011342                    JSR     PC,DECPRT               ;CONVERT R2 TO DEC.
2579  016154  113737  011462  016405            MOVB    DIGT0,RSX1
2580  016162  113737  011463  016406            MOVB    DIGT1,RSX2
2581  016170  113737  011464  016407            MOVB    DIGT2,RSX3
2582  016176  113737  011465  016410            MOVB    DIGT3,RSX4
2583  016204  104400                            TYPE
2584  016206  016376                            RSVMSG
2585  016210  111305                            MOVB    (%3),R5
2586  015212  005305                  2$:       DEC     R5
2587  016214  100403                            BMI     1$
2588  016216  104400                            TYPE
2589  016220  016541                            TYANX
2590  016222  000773                            BR      2$
2591  016224  023737  015176  015216  1$:       CMP     LOLIM1,TEMP
2592  016232  001413                            BEQ     4$
2593  016234  023737  015202  015216            CMP     HILIM1,TEMP
2594  016242  001412                            BEQ     5$
2595  016244  023737  015214  015216            CMP     AMEAN,TEMP
2596  016252  001010                            BNE     3$
2597  016254  104400  016472                    TYPE    ,TYMEAN
2598  016260  000405                            BR      3$
2599  016262  104400  016414            4$:     TYPE    ,TYLOW
2600  016266  000402                            BR      3$
2601  016270  104400  016442            5$:     TYPE    ,TYHIGH
```

```
 2602  016274  005237  015216          3$:     INC     TEMP
 2603  016300  105723                          TSTB    (3)+
 2604  016302  022737  000145  015216          CMP     #145.,TEMP
 2605  016310  001300                          BNE     6$
 2606  016312  104400                          TYPE
 2607  016314  016536                          ACRLF
 2608  016316  104400  016515                  TYPE    ,OVERNG
 2609  016322  013746  015744                  MOV     EXCESS,-(SP)
 2610  016326  104402                          TYPOS
 2611  016330     004     001                  .BYTE   4,1
 2612  016332  012605                          MOV     (SP)+,R5
 2613  016334  000205                          RTS     R5
 2614
 2615  016336  000000          12$:    0
 2616
 2617  016340  005277  163142          CONVT:  INC     @#VCSTAT
 2618  016344  105777  163136          2$:     TSTB    @#VCSTAT
 2619  016350  100375                          BPL     2$
 2620  016352  005005                          CLR     %5
 2621  016354  013777  016644  163112          MOV     DIFCHN,@#ADCS   ;CONVERT
 2622  016362  105777  163106          1$:     TSTB    @#ADCS          ;WAIT FOR DONE
 2623  016366  100375                          BPL     1$
 2624  016370  017705  163104                  MOV     @#ADCBP,R5      ;READ VALUE
 2625  016374  000207                          RTS     PC
 2626
 2627  016376     015     012          RSVMSG: .BYTE   15,12
 2628  016400     060     056          RSV1:   .BYTE   60,56
 2629  016402     060                  RSV2:   .BYTE   60
 2630  016403     060     055          RSV3:   .BYTE   60,55
 2631  016405     060                  RSX1:   .BYTE   60
 2632  016406     060                  RSX2:   .BYTE   60
 2633  016407     060                  RSX3:   .BYTE   60
 2634  016410     060     040     111  RSX4:   .BYTE   60,40,111,0
 2635  016413     000
 2636  016414  026455  026455  026455  TYLOW:  .ASCIZ  "----------  (1/2 LSB)"
 2637  016422  026455  026455  020040
 2638  016430  030450  031057  046040
 2639  016436  041123  000051
 2640  016442  026455  026455  026455  TYHIGH: .ASCIZ  "----------  (1 1/2 LSB)"
 2641  016450  026455  026455  020040
 2642  016456  030450  030440  031057
 2643  016464  046040  041123  000051
 2644  016472  026455  026455  026455  TYMEAN: .ASCIZ  "----------  (1 LSB)"
 2645  016500  026455  026455  020040
 2646  016506  030450  046040  041123
 2647  016514  000051
 2648  016516  052517  020124  043117  OVERNG: .ASCIZ  /OUT OF RANGE - /
 2649  016524  051040  047101  042507
 2650  016532  026440  000040
 2651  016536     015     012     000  ACRLF:  .BYTE   15,12,0
 2652  016541     052     000          TYANX:  .BYTE   52,0
 2653  016543     040  020040     000  SP3MSG: .ASCIZ  /   /
 2654  016547     000     000     000          .BYTE   0,0,0
 2655  016552     055     000          TYANXX: .BYTE   55,0
 2656  016554     015     012          STDMSG: .BYTE   15,12
 2657  016556  052123  052101  026505          .ASCII  /STATE-WIDTH DISTRIBUTION
```

```
 2658  016564  044527  052104  020110
 2659  016572  044504  052123  044522
 2660  016600  052502  044524  047111
 2661  016606     015     012                  .BYTE   15,12
 2662  016610  044527  052104  026510          .ASCIZ   WIDTH-NUMBER OF STATES/
 2663  016616  052516  041115  051105
 2664  016624  047440  020106  052123
 2665  016632  052101  051505     000
 2666          016640                          .EVEN
 2667  016640  000000                  VCREG1: 0
 2668  016642  000000                  VCREG2: 0
 2669  016644  000000                  DIFCHN: 0
 2670
 2671                                          .SBTTL  PARAMETER ADJUSTMENT ROUTINE
 2672  016646  012701  016764          WFADJ:  MOV     #V1754,R1               ;LOAD PARM. POINTER
 2673  016652  005737  016762                  TST     WFTEST                  ;TEST IF OPTION TEST AREA
 2674  016656  001017                          BNE     1$                      ;BR IF IT WAS
 2675  016660  012702  017004                  MOV     #VARLT1,R2              ;LOAD "STANDARD" PARM. VALUES
 2676  016664  112737  000062  013150          MOVB    #'2,BASBT1              ;LOAD BIAS MESSAGE
 2677  016672  112737  000060  013152          MOVB    #'0,BASBT2              ;
 2678  016700  112737  000065  013175          MOVB    #'5,BASBT3              ;LOAD BIAS LIMIT
 2679  016706  112737  000060  013176          MOVB    #'0,BASBT3+1
 2680  016714  000416                          BR      2$
 2681  016716  012702  017022          1$:     MOV     #VARLT2,R2              ;LOAD "OPTION TEST AREA" PARM. VALUES
 2682  016722  112737  000061  013150          MOVB    #'1,BASBT1              ;LOAD BIAS MESSAGE
 2683  016730  112737  000070  013152          MOVB    #'8,BASBT2
 2684  016736  112737  000064  013175          MOVB    #'4,BASBT3              ;LOAD BIAS LIMIT
 2685  016744  112737  000064  013176          MOVB    #'4,BASBT3+1
 2686  016752  012221                  2$:     MOV     (R2)+,(R1)+             ;LOAD INTO PARM. LIST
 2687  016754  005711                          TST     (R1)                    ;TEST FOR LAST
 2688  016756  100375                          BPL     2$                      ;BR IF NOT
 2689  016760  000207                          RTS     PC                      ;EXIT
 2690
 2691  016762  000000                  WFTEST: 0
 2692
 2693  016764  001754                  V1754:  1754            ;1760 IF OPTION TEST AREA SELECTED
 2694  016766  000024                  V24:    24              ;20     "       "    "      "
 2695  016770  000050                  V50:    50              ;40     "       "    "      "
 2696  016772  000024                  VA24:   24              ;22     "       "    "      "
 2697  016774  000062                  V62:    62              ;45     "       "    "      "
 2698  016776  000077                  V77:    77              ;45     "       "    "      "
 2699  017000  000001                  V1:     1               ;15     "       "    "      "
 2700  017002  100000                          BIT15               RM.
 2701
 2702  017004  001754                  VARLT1: 1754
 2703  017006  000024                          24
 2704  017010  000050                          50
 2705  017012  000024                          24
 2706  017014  000062                          62
 2707  017016  000077                          77
 2708  017020  000001                          1
 2709
 2710  017022  001760                  VARLT2: 1760
 2711  017024  000020                          20
 2712  017026  000040                          40
 2713  017030  000022                          22
```

```
                                        45
                                        45
                                        15

                                        .SBTTL  SUBROUTINE TO CONVERT R0 TO DECIMAL PERCENTAGE OF 1022.

017040  000000            MSGPNT: 0
017042  000000            PCT:    0
017044  012537  017040    PRCNT:  MOV     (R5)+,MSGPNT            ;GET MESSAGE POINTER
017050  010037  017042            MOV     R0,PCT                  ;
017054  006200                    ASR     R0
017056  006200                    ASR     R0
017060  006200                    ASR     R0
017062  006200                    ASR     R0
017064  006200                    ASR     R0
017066  006200                    ASR     R0
017070  160037  017042            SUB     R0,PCT
017074  006200                    ASR     R0
017076  160037  017042            SUB     R0,PCT                  ;PCT CONTAINS OCTAL %
017102  013702  017042            MOV     PCT,R2                  ;LOAD R2 WITH PERCENTAGE
017106  004737  011342            JSR     PC,DECPRT               ;CONVERT TO DEC.
017112  013700  017040            MOV     MSGPNT,R0               ;LOAD MSG. POINTER
017116  022737  001750  017042    CMP     #1000.,PCT              ;TEST FOR 100 %
017124  001411                    BEQ     1$                      ;BR IF 100 %
017126  113720  011463            MOVB    DIGT1,(R0)+             ;LOAD A DIGIT
017132  113720  011464            MOVB    DIGT2,(R0)+
017136  112720  000056            MOVB    #56,(R0)+               ;LOAD "."
017142  113720  011465            MOVB    DIGT3,(R0)+             ;LOAD 1/10 % DIGIT
017146  000205                    RTS     R5                      ;EXIT

017150  112720  000040    1$:     MOVB    #40,(R0)+               ;LOAD "SPACE"
017154  112720  000061            MOVB    #'1,(R0)+               ;LOAD '1' 100%
017160  112720  000060            MOVB    #'0,(R0)+
017164  112720  000060            MOVB    #'0,(R0)+
017170  000205                    RTS     R5                      ;EXIT
```

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

017172                                  $SCOPE:
017172  104405                                  CKSWR
017174  032777  040000  161734          1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
017202  001114                                  BNE     $OVER           ;;YES IF SW14=1
                                        ;*****START OF CODE FOR THE XOR TESTER*****
017204  000416                          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                        ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
017206  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
017212  012737  017232  000004                  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
017220  005737  177060                          TST     @#177060        ;;TIME OUT ON XOR?
017224  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
017230  000463                                  BR      $SVLAD          ;;GO TO THE NEXT TEST
017232  022626                          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
017234  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
017240  000423                                  BR      7$              ;;LOOP ON THE PRESENT TEST
017242                                  6$:;*****END OF CODE FOR THE XOR TESTER*****
017242  032777  000400  161666                  BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
017250  001404                                  BEQ     2$              ;;BR IF NO
017252  127737  161660  001102                  CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
017260  001465                                  BEQ     $OVER           ;;BR IF YES
017262  105737  001103                  2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
017266  001421                                  BEQ     3$              ;;BR IF NO
017270  123737  001115  001103                  CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
017276  101015                                  BHI     3$              ;;BR IF NO
017300  032777  001000  161630                  BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
017306  001404                                  BEQ     4$              ;;BR IF NO
017310  013737  001110  001106          7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
017316  000446                                  BR      $OVER
017320  105037  001102                  4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
017324  005037  001154                          CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
017330  000415                                  BR      1$              ;;ESCAPE TO THE NEXT TEST
017332  032777  004000  161576          3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
017340  001011                                  BNE     1$              ;;BR IF YES
017342  005737  001206                          TST     $PASS           ;;IF FIRST PASS OF PROGRAM
017346  001406                                  BEQ     1$              ;;      INHIBIT ITERATIONS
017350  005237  001104                          INC     $ICNT           ;;INCREMENT ITERATION COUNT
017354  023737  001164  001104                  CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
017362  002024                                  BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
017364  012737  000001  001104          1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
017372  013737  017450  001164                  MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
017400  105237  001102                  $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
```

```
 2805  017404  113737  001102  001204          MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
 2806  017412  011637  001106                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 2807  017416  011637  001110                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 2808  017422  005037  001166                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 2809  017426  112737  000001  001125          MOVB    #1,$ESMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
 2810  017434  013777  001102  161476  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
 2811  017442  013716  001106                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 2812  017446  000002                          RTI                     ;;FIXES PS
 2813  017450  003720                  $MXCNT: 2000.                   ;;MAX. NUMBER OF ITERATIONS
 2814
 2815                                  .SBTTL  ERROR HANDLER ROUTINE

 2816
 2817                                  ;;**********************************************************************
 2818                                  ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
 2819                                  ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
 2820                                  ;*AND GO TO $ERRTYP ON ERROR
 2821                                  ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
 2822                                  ;*SW15=1         HALT ON ERROR
 2823                                  ;*SW13=1         INHIBIT ERROR TYPEOUTS
 2824                                  ;*SW10=1         BELL ON ERROR
 2825                                  ;*SW09=1         LOOP ON ERROR
 2826                                  ;*CALL
 2827                                  ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
 2828
 2829  017452                  $ERROR:
 2830  017452  105237  001103  7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
 2831  017456  001775                  BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
 2832  017460  013777  001102  161452  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
 2833  017466  032777  002000  161442  BIT     #BIT10,@SWR     ;;BELL ON ERROR?
 2834  017474  001402                  BEQ     1$              ;;NO - SKIP
 2835  017476  104400  001170          TYPE    ,$BELL          ;;RING BELL
 2836  017502  005237  001112  1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
 2837  017506  011637  001116          MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
 2838  017512  162737  000002  001116  SUB     #2,$ERRPC
 2839  017520  117737  161372  001114  MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
 2840  017526  032777  020000  161402  BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
 2841  017534  001004                  BNE     20$             ;;SKIP TYPEOUTS
 2842  017536  004737  020442          JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
 2843  017542  104400  001175          TYPE    ,$CRLF
 2844  017546                  20$:
 2845  017546  122737  000001  001220  CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
 2846  017554  001007                  BNE     2$              ;;NO,SKIP APT ERROR REPORT
 2847  017556  113737  001114  017570  MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
 2848  017564  004737  021544          JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
 2849  017570     000          21$:    .BYTE   0
 2850  017571     000                  .BYTE   0
 2851  017572  000777          22$:    BR      22$             ;;APT ERROR LOOP
 2852  017574  005777  161336  2$:     TST     @SWR            ;;HALT ON ERROR
 2853  017600  100001                  BPL     3$              ;;SKIP IF CONTINUE
 2854  017602  000000                  HALT                    ;;HALT ON ERROR!
 2855  017604  032777  001000  161324  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
 2856  017612  001402                  BEQ     4$              ;;BR IF NO
 2857  017614  013716  001110          MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
 2858  017620  005737  001166  4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
 2859  017624  001402                  BEQ     5$              ;;BR IF NONE
 2860  017626  013716  001166          MOV     $ESCAPE,(SP     ;;FUDGE RETURN ADDRESS FOR ESCAPE
```

```
 2861  017632                          5$:
 2862  017632  022737  010436  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
 2863  017640  001001                          BNE     6$              ;;BRANCH IF NO
 2864  017642  000000                          HALT                    ;;YES
 2865  017644                          6$:
 2866  017644  000002                          RTI                     ;;RETURN
 2867
 2868                                  .SBTTL  TTY INPUT ROUTINE
 2869
 2870                                  ;;**********************************************************************
 2871                                  ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
 2872                                  ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
 2873                                  ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
 2874                                  ;*WHEN OPERATING IN TTY FLAG MODE.
 2875  017646  022737  000176  001136  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
 2876  017654  001073                          BNE     14$             ;;BRANCH IF NO
 2877  017656  105777  161260                  TSTB    @$TKS           ;;CHAR THERE?
 2878  017662  100070                          BPL     14$             ;;IF NO, DON'T WAIT AROUND
 2879  017664  117746  161254          2$:     MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
 2880  017670  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
 2881  017674  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
 2882  017700  001061                          BNE     14$             ;;NO, RETURN TO USER
 2883  017702  104400  020311                  TYPE    .$CNTLG         ;;YES, ECHO CONTROL G
 2884
 2885  017706  104400  020315          6$:     TYPE    .$MSWR          ;;TYPE CURRENT CONTENTS
 2886  017712  013746  000176                  MOV     $SWREG,-(SP)    ;;SAVE SWREG FOR TYPEOUT
 2887  017716  104401                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
 2888  017720  104400  020327                  TYPE    .$MNEW          ;;PROMPT FOR NEW SWR
 2889  017724  005046                          CLR     -(SP)           ;;CLEAR COUNTER
 2890  017726  005046                          CLR     -(SP)           ;;THE NEW SWR
 2891  017730  104406          7$:     RDCHR                           ;;GET NEXT CHAR
 2892
 2893  017732  022716  000025          8$:     CMP     #25,(SP)        ;;IS IT A CONTROL U?
 2894  017736  001005                          BNE     9$              ;;BRANCH IF NO
 2895  017740  104400  020304                  TYPE    .$CNTLU         ;;YES, ECHO IT
 2896  017744  062706  000006                  ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
 2897  017750  000756                          BR      6$              ;;LET'S TRY IT AGAIN
 2898
 2899  017752  022716  000015          9$:     CMP     #15,(SP)        ;;IS IT A <CR>?
 2900  017756  001011                          BNE     11$             ;;BRANCH IF NO
 2901  017760  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
 2902  017764  001403                          BEQ     10$             ;;BRANCH IF YES
 2903  017766  016677  000002  161142          MOV     2(SP),@SWR      ;;SAVE NEW SWR
 2904  017774  062706  000006          10$:    ADD     #6,SP           ;;CLEAR UP STACK
 2905  020000  000417                          BR      13$             ;;RETURN TO USER
 2906  020002  022716  000012          11$:    CMP     #12,(SP)        ;;IS IT A <LF>
 2907  020006  001017                          BNE     15$             ;;BRANCH IF NO
 2908  020010  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
 2909  020014  001403                          BEQ     12$             ;;YES
 2910  020016  016677  000002  161112          MOV     2(SP),@SWR      ;;SAVE NEW SWR
 2911  020024  062706  000006          12$:    ADD     #6,SP           ;;CLEAR UP STACK
 2912  020030  013716  000046                  MOV     @#46,(SP)       ;;GET RESTART
 2913  020034  062716  000010                  ADD     #10,(SP)        ;;ADDRESS
 2914  020040  104400  001175          13$:    TYPE    .$CRLF          ;;ECHO <CR> AND <LF>
 2915  020044  000002          14$:    RTI                             ;;RETURN
 2916  020046  004737  021456          15$:    JSR     PC,$TYPEC       ;;ECHO CHAR
```

```
 2917  020052  042726  177770                BIC     #177770,(SP)+   ;;RESTRICT TO 0-7
 2918  020056  005766  000002                TST     2(SP)           ;;IS THIS THE FIRST CHAR
 2919  020062  001403                        BEQ     16$             ;;BRANCH IF YES
 2920  020064  006316                        ASL     (SP)            ;;NO, SHIFT PRESENT
 2921  020066  006316                        ASL     (SP)            ;;   CHAR OVER TO MAKE
 2922  020070  006316                        ASL     (SP)            ;;   ROOM FOR NEW ONE.
 2923  020072  005266  000002          16$:  INC     2(SP)           ;;KEEP COUNT OF CHAR
 2924  020076  056616  177776                BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
 2925  020102  000712                        BR      7$              ;;GET THE NEXT ONE
 2926                                  ;;**************************************************************
 2927                                  ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 2928                                  ;*CALL:
 2929                                  ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
 2930                                  ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
 2931                                  ;*                              ;;WITH PARITY BIT STRIPPED OFF
 2932                                  ;
 2933
 2934  020104  011646                $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
 2935  020106  016666  000004  000002        MOV     4(SP),2(SP)     ;;SAVE THE PS
 2936  020114  105777  161022          1$:   TSTB    @$TKS           ;;WAIT FOR
 2937  020120  100375                        BPL     1$              ;;A CHARACTER
 2938  020122  117766  161016  000004        MOVB    @$TKB,4(SP)     ;;READ THE TTY
 2939  020130  042766  177600  000004        BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
 2940  020136  026627  000004  000140        CMP     4(SP),#140      ;;IS IT UPPER CASE?
 2941  020144  002407                        BLT     2$              ;;BRANCH IF YES
 2942  020146  026627  000004  000175        CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
 2943  020154  003003                        BGT     2$              ;;BRANCH IF YES
 2944  020156  042766  000040  000004        BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
 2945  020164  000002                  2$:   RTI                     ;;GO BACK TO USER
 2946                                  ;;**************************************************************
 2947                                  ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
 2948                                  ;*CALL:
 2949                                  ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
 2950                                  ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
 2951                                  ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
 2952
 2953  020166  010346                $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
 2954  020170  012703  020274          1$:   MOV     #$TTYIN,R3      ;;GET ADDRESS
 2955  020174  022703  020304          2$:   CMP     #$TTYIN+80.,R3  ;;BUFFER FULL?
 2956  020200  101405                        BLOS    4$              ;;BR IF YES
 2957  020202  104406                        RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
 2958  020204  112613                        MOVB    (SP)+,(R3)      ;;GET CHARACTER
 2959  020206  122713  000177          10$:  CMPB    #177,(R3)       ;;IS IT A RUBOUT
 2960  020212  001003                        BNE     3$              ;;SKIP IF NOT
 2961  020214  104400  001174          4$:   TYPE    ,$QUES          ;;TYPE A '?'
 2962  020220  000763                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
 2963  020222  111337  020272          3$:   MOVB    (R3),9$         ;;ECHO THE CHARACTER
 2964  020226  104400  020272                TYPE    ,9$
 2965  020232  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
 2966  020236  001356                        BNE     2$              ;;LOOP IF NOT RETURN
 2967  020240  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15.
 2968  020244  104400  001176                TYPE    ,$LF            ;;TYPE A LINE FEED
 2969  020250  012603                        MOV     (SP)+,R3        ;;RESTORE R3
 2970  020252  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
 2971  020254  016666  000004  000002        MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
 2972  020262  012766  020274  000004        MOV     #$TTYIN,4.SP)
```

```
                                        RTI                             ;;RETURN
                                9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
                                        .BYTE   0                       ;;TERMINATOR
                                $TTYIN: .BLKB   8.                      ;;RESERVE 8 BYTES FOR TTY INPUT
                                $CNTLU: .ASCIZ  /^U/<15><12>            ;;CONTROL "U"
                                $CNTLG: .ASCIZ  /^G/<15><12>            ;;CONTROL "G"
                                $MSWR:  .ASCIZ  <15><12>/SWR = /
                                $MNEW:  .ASCIZ  /  NEW = /

                                .SBTTL  READ AN OCTAL NUMBER FROM THE TTY

                                ;;**************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*CALL:
                                ;*      RDOCT                           ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE                     ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                                      ;;HIGH ORDER BITS ARE IN $HIOCT

020340  011646                 $RDOCT: MOV     (SP),-(SP)              ;;PROVIDE SPACE FOR THE
020342  016666  000004  000002          MOV     4(SP),2(SP)             ;;INPUT NUMBER
020350  010046                         MOV     R0,-(SP)                ;;PUSH R0 ON STACK
020352  010146                         MOV     R1,-(SP)                ;;PUSH R1 ON STACK
020354  010246                         MOV     R2,-(SP)                ;;PUSH R2 ON STACK
020356  104407                 1$:     RDLIN                           ;;READ AN ASCIZ LINE
020360  012600                         MOV     (SP)+,R0                ;;GET ADDRESS OF 1ST CHARACTER
020362  005001                         CLR     R1                      ;;CLEAR DATA WORD
020364  005002                         CLR     R2
020366  112046                 2$:     MOVB    (R0)+,-(SP)             ;;PICKUP THIS CHARACTER
020370  001412                         BEQ     3$                      ;;IF ZERO GET OUT
020372  006301                         ASL     R1                      ;;*2
020374  006102                         ROL     R2
020376  006301                         ASL     R1                      ;;*4
020400  006102                         ROL     R2
020402  006301                         ASL     R1                      ;;*8
020404  006102                         ROL     R2
020406  042716  177770                 BIC     #^C7,(SP)               ;;STRIP THE ASCII JUNK
020412  062601                         ADD     (SP)+,R1                ;;ADD IN THIS DIGIT
020414  000764                         BR      2$                      ;;LOOP
020416  005726                 3$:     TST     (SP)+                   ;;CLEAN TERMINATOR FROM STACK
020420  010166  000012                 MOV     R1,12.(SP)              ;;SAVE THE RESULT
020424  010237  020440                 MOV     R2,$HIOCT
020430  012602                         MOV     (SP)+,R2                ;;POP STACK INTO R2
020432  012601                         MOV     (SP)+,R1                ;;POP STACK INTO R1
020434  012600                         MOV     (SP)+,R0                ;;POP STACK INTO R0
020436  000002                         RTI                             ;;RETURN
020440  000000                 $HIOCT: .WORD   0                       ;;HIGH ORDER BITS GO HERE


                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

```
                                ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
                                ;
020442                          $ERRTYP:
020442  104400  001175                TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
020446  010046                        MOV     R0,-(SP)        ;;SAVE R0
020450  005000                        CLR     R0              ;;PICKUP THE ITEM INDEX
020452  153700  001114                BISB    @#$ITEMB,R0
020456  001034                        BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                ;;TYPE THE PC OF THE ERROR
020460  013746  001116                MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                                ;;ERROR ADDRESS
020464  104401                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
020466  000426                        BR      6$              ;;GET OUT
020470  005300                1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
020472  006300                        ASL     R0              ;;      WORK FOR THE ERROR TABLE
020474  006300                        ASL     R0
020476  006300                        ASL     R0
020500  062700  001324                ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
020504  012037  020514                MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
020510  001404                        BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
020512  104400                        TYPE                    ;;TYPE THE "ERROR MESSAGE"
020514  000000                2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
020516  104400  001175                TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
020522  012037  020532        3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
020526  001404                        BEQ     5$              ;;SKIP TYPEOUT IF 0
020530  104400                        TYPE                    ;;TYPE THE "DATA HEADER"
020532  000000                4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
020534  104400  001175                TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
020540  011000                5$:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
020542  001004                        BNE     7$              ;;GO TYPE THE DATA
020544  012600                6$:     MOV     (SP)+,R0        ;;RESTORE R0
020546  104400  001175                TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
020552  000207                        RTS     PC              ;;RETURN
020554                          7$:
020554  013046                        MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
020556  104401                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
020560  005710                        TST     (R0)            ;;IS THERE ANOTHER NUMBER
020562  001770                        BEQ     6$              ;;BR IF NO
020564  104400  020572                TYPE    ,8$             ;;TYPE TWO(2) SPACES
020570  000771                        BR      7$              ;;LOOP
020572  020040  000             8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
020576                                  .EVEN
```

```
                                        .SBTTL  POWER DOWN AND UP ROUTINES

                                        ;;**************************************************************
                                        ;POWER DOWN ROUTINE
020576  012737  020742  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST LP
020604  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
020612  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
020614  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
020616  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
020620  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
020622  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
020624  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
020626  017746  160304                  MOV     @$WR,-(SP)      ;;PUSH @$WR ON STACK
020632  010637  020746                  MOV     SP,$SAVR6       ;;SAVE SP
020636  012737  020650  000024          MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
020644  000000                          HALT
020646  000776                          BR      .-2             ;;HANG UP

                                        ;;**************************************************************
                                        ;POWER UP ROUTINE
020650  012737  020742  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
020656  013706  020746                  MOV     $SAVR6,SP       ;;GET SP
020662  005037  020746                  CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
020666  005237  020746          1$:     INC     $SAVR6          ;;WAIT FOR THE INC
020672  001375                          BNE     1$              ;;OF  WORD
020674  012677  160236                  MOV     (SP)+,@$WR      ;;POP STACK INTO @$WR
020700  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
020702  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
020704  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
020706  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
020710  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
020712  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
020714  012737  020576  000024          MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
020722  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
020730  104400                          TYPE                    ;;REPORT THE POWER FAILURE
020732  020750                  $PWRMG: .WORD   PWRMSG          ;;POWER FAIL MESSAGE POINTER
020734  012716                          MOV     (PC)+,(SP)      ;;RESTART AT BEGIN
020736  001516                  $PWRAD: .WORD   BEGIN           ;;RESTART ADDRESS
020740  000002                          RTI
020742  000000                  $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
020744  000776                          BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
020746  000000                  $SAVR6: 0                       ;;PUT THE SP HERE
020750  005015  042522  052123  PWRMSG: .ASCII  <15><12>RESTARTING AFTER A POWER FAILURE <15><12><12>
020756  051101  044524  043516
020764  040440  052106  051105
020772  040440  050040  053517
021000  051105  043040  044501
021006  052514  042522  005015
021014  000012
                                .E.E'
```

```
                                .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

021016  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
021022  116637  000001  021241          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
021030  112637  021243                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
021034  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
021040  000406                          BR      $TYPON
021042  112737  000001  021241  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
021050  112737  000006  021243          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
021056  112737  000005  021240  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
021064  010346                          MOV     R3,-(SP)        ;;SAVE R3
021066  010446                          MOV     R4,-(SP)        ;;SAVE R4
021070  010546                          MOV     R5,-(SP)        ;;SAVE R5
021072  113704  021243                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
021076  005404                          NEG     R4
021100  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
021104  110437  021242                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
021110  113704  021241                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
021114  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
021120  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
021122  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
021124  000404                          BR      3$              ;;GO DO MSB
021126  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
021130  006105                          ROL     R5
021132  006105                          ROL     R5
021134  010503                          MOV     R5,R3
021136  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
021140  105337  021242                  DECB    $OMODE          ;;TYPE THIS DIGIT?
021144  100016                          BPL     7$              ;;BR IF NO
021146  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
021152  001002                          BNE     4$              ;;TEST FOR 0
```

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021154  005704                          TST     R4              ;;SUPPRESS THIS 0?
021156  001403                          BEQ     5$              ;;BR IF YES
021160  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
021162  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
021166  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
021172  110337  021236                  MOVB    R3,8$           ;;SAVE FOR TYPING
021176  104400  021236                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
021202  105337  021240          7$:     DECB    $OCNT           ;;COUNT BY 1
021206  003347                          BGT     2$              ;;BR IF MORE TO DO
021210  002402                          BLT     6$              ;;BR IF DONE
021212  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
021214  000744                          BR      2$              ;;GO DO THE LAST DIGIT
021216  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
021220  012604                          MOV     (SP)+,R4        ;;RESTORE R4
021222  012603                          MOV     (SP)+,R3        ;;RESTORE R3
021224  016666  000002  000004         MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
021232  012616                          MOV     (SP)+,(SP)
021234  000002                          RTI                     ;;RETURN
021236  000                     8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
021237  000                             .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
021240  000                     $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
021241  000                     $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
021242  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE

                                .SBTTL  TYPE ROUTINE

                                ;;**************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*      TYPE
                                ;*      MESADR
                                ;*

021244  105737  001155          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
021250  100002                          BPL     1$              ;;BR IF YES
021252  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
021254  000430                          BR      3$              ;;LEAVE
021256  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
021260  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
021264  122737  000001  001220          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
021272  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
021274  132737  000100  001221          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
021302  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
021304  010037  021314                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
021310  004737  021534                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
021314  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
021316  132737  000040  001221  62$:    BITB    #APTCSP,$ENVM   ;;APT CONSOLE SUPPRESSED
021324  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
```

```
3235  021326  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
3236  021330  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
3237  021332  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
3238  021334  012600                  6O$:    MOV     (SP)+,R0        ;;RESTORE R0
3239  021336  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
3240  021342  000002                          RTI                     ;;RETURN
3241  021344  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
3242  021350  001430                          BEQ     8$
3243  021352  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
3244  021356  001006                          BNE     5$
3245  021360  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
3246  021362  104400                          TYPE                    ;;TYPE A CR AND LF
3247  021364  001175                          $CRLF
3248  021366  105037  021522                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
3249  021372  000755                          BR      2$              ;;GET NEXT CHARACTER
3250  021374  004737  021456          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
3251  021400  123726  001154          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
3252  021404  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
3253  021406  013746  001152                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
3254                                                                  ;;AND THE NULL CHAR.
3255  021412  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
3256  021416  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
3257  021420  004737  021456                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
3258  021424  105337  021522                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
3259  021430  000770                          BR      7$              ;;LOOP
3260
3261                                  ;HORIZONTAL TAB PROCESSOR
3262
3263  021432  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
3264  021436  004737  021456          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
3265  021442  132737  000007  021522          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
3266  021450  001372                          BNE     9$              ;;TAB STOP
3267  021452  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
3268  021454  000724                          BR      2$              ;;GET NEXT CHARACTER
3269  021456  105777  157464          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
3270  021462  100375                          BPL     $TYPEC
3271  021464  116677  000002  157456          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
3272  021472  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
3273  021500  001003                          BNE     1$              ;;BRANCH IF NO
3274  021502  105037  021522                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
3275  021506  000406                          BR      $TYPEX          ;;EXIT
3276  021510  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
3277  021516  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
3278  021520  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
3279  021522  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
3280  021524  000207          $TYPEX: RTS     PC
3281
3282
3283                                  .SBTTL  APT COMMUNICATIONS ROUTINE
3284
3285                                  ;;**************************************************************
3286  021526  112737  000001  021772  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
3287  021534  112737  000001  021770  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
3288  021542  000403                          BR      $ATYC
3289  021544  112737  000001  021772  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
3290  021552                          $ATYC:
```

```
  3291  021552  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
  3292  021554  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
  3293  021556  105737  021770                  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
  3294  021562  001450                          BEQ     5$              ;;IF NOT:  BR
  3295  021564  122737  000001  001220          CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
  3296  021572  001031                          BNE     3$              ;;IF NOT:  BR
  3297  021574  132737  000100  001221          BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
  3298  021602  001425                          BEQ     3$              ;;IF NOT:  BR
  3299  021604  017600  000004                  MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
  3300  021610  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
  3301  021616  005737  001200          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION
  3302  021622  001375                          BNE     1$              ;;IF NOT:  WAIT
  3303  021624  010037  001214                  MOV     R0,$MSGAD       ;;PUT ADDR IN MAIL20X
  3304  021630  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
  3305  021632  001376                          BNE     2$
  3306  021634  163700  001214                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
  3307  021640  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
  3308  021642  010037  001216                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
  3309  021646  012737  000004  001200          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
  3310  021654  000413                          BR      5$
  3311  021656  017637  000004  021702  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
  3312  021664  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
  3313  021672  013746  177776                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
  3314  021676  004737  021244                  JSR     PC,$TYPE        ;;CALL TYPE MACRO
  3315  021702  000000                  4$:     .WORD   0
  3316  021704                           5$:
  3317  021704  105737  021772          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
  3318  021710  001416                          BEQ     12$             ;;IF NOT:  BR
  3319  021712  005737  001220                  TST     $ENV            ;;RUNNING UNDER APT?
  3320  021716  001413                          BEQ     12$             ;;IF NOT:  BR
  3321  021720  005737  001200          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
  3322  021724  001375                          BNE     11$             ;;IF NOT:  WAIT
  3323  021726  017637  000004  001202          MOV     @4(SP),$FATAL   ;;GET ERROR #
  3324  021734  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
  3325  021742  005237  001200                  INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
  3326  021746  105037  021772          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
  3327  021752  105037  021771                  CLRB    $LFLG           ;;CLEAR LOG FLAG
  3328  021756  105037  021770                  CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
  3329  021762  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
  3330  021764  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
  3331  021766  000207                          RTS     PC              ;;RETURN
  3332  021770     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
  3333  021771     000          $LFLG:  .BYTE   0               ;;LOG FLAG
  3334  021772     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
  3335        021774                          .EVEN
  3336        000200          APTSIZE=200
  3337        000001          APTENV=001
  3338        000100          APTSPOOL=100
  3339        000040          APTCSUP=040
  3340
  3341                          .SBTTL  TRAP DECODER
  3342
  3343                          ;;**************************************************************
  3344                          ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
  3345                          ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
  3346                          ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
```

```
                                        ;*GO TO THAT ROUTINE.

021774  010046                $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
021776  016600  000002                MOV     2(SP),R0        ;;GET TRAP ADDRESS
022002  005740                        TST     -(R0)           ;;BACKUP BY 2
022004  111000                        MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
022006  006300                        ASL     R0              ;;POSITION FOR INDEXING
022010  016000  022016                MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
022014  000200                        RTS     R0              ;;GO TO ROUTINE


                                        .SBTTL  TRAP TABLE

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

                                        ;       ROUTINE
                                        ;       -------
022016                          $TRPAD:
022016  021244                        $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
022020  021042                        $TYPOC  ;;CALL=TYPOC    TRAP+1(104401)  TYPE OCTAL NUMBER (WITH LEADING ZEROS.
022022  021016                        $TYPOS  ;;CALL=TYPOS    TRAP+2(104402)  TYPE OCTAL NUMBER (NO LEADING ZEROS.
022024  021056                        $TYPON  ;;CALL=TYPON    TRAP+3(104403)  TYPE OCTAL NUMBER (AS PER LAST CALL)
022026  010472                        $TYPDS  ;;CALL=TYPDS    TRAP+4(104404)  TYPE DECIMAL NUMBER (WITH SIGN)
022030  017646                        $CKSWR  ;;CALL=CKSWR    TRAP+5(104405)  TEST FOR CHANGE IN SOFT-SWR
022032  020104                        $RDCHR  ;;CALL=RDCHR    TRAP+6(104406)  TTY TYPEIN CHARACTER ROUTINE
022034  020166                        $RDLIN  ;;CALL=RDLIN    TRAP+7(104407)  TTY TYPEIN STRING ROUTINE
022036  020340                        $RDOCT  ;;CALL=RDOCT    TRAP+10(104410) READ AN OCTAL NUMBER FROM TTY

022040  000000                ADBUFF: 0
022042  001020                        .BLKW   1020
024102  000000                ABUFF4: 0
024104  000200                        .BLKW   200
024504  000000                LAST:   0
        000001                        .END
```

```
ABASE = 170400            311*   430    474
ABUFF4  024102           2490*  2539   3379*
ACDW1 = 000000            430    476
ACDW2 = 000000            430    477
ACPUOP= 000000            430    445
ACRLF   016536            963   1279   1470   1764   2525   2541   2607   2651*
ADAC    015120           1910*  1922*  1934*  1937*  1964*  1969   1972   1982   2402*
ADBUFF  022040           2444   2454*  2456*  2467   2478   3376*
ADCS    001474            592*   712    800*   802*   809    815*   946*   947   1940*  1941   1945*  1955*  1984*
                         2050*  2051*  2052   2621*  2622
ADCSI   001476            593*   716*   940*  1954*
ADCBR   001500            594*   717    799*   813*   949   1948   1958   2054   2624
ADDIF   014224           2319*  2516
ADDIFM  014163           2313*  2475
ADDW0 = 000000            430    478
ADDW1 = 000000            430    479
ADDW10= 000000            430    488
ADDW11= 000000            430    489
ADDW12= 000000            430    490
ADDW13= 000000            430    491
ADDW14= 000000            430    492
ADDW15= 000000            430    493
ADDW2 = 000000            430    480
ADDW3 = 000000            430    481
ADDW4 = 000000            430    482
ADDW5 = 000000            430    483
ADDW6 = 000000            430    484
ADDW7 = 000000            430    485
ADDW8 = 000000            430    486
ADDW9 = 000000            430    487
ADEMSG  013525           1275   2258*
ADEND   011656            824    839    954    869    884    899    914    928    979    994   1008   1022   1037
                         1052   1067   1082   1606   1624   2049*  2054*  2057*  2058*  2059*  2060*  2061*  2062*
                         2067*
ADEVCT= 000000            430    436
ADEVM = 000000            430    475
ADNMUX  015162           1263*  1276   2419*
ADPMUX  015160           1233*  1272   2418*
ADSMSG  013436           1271   2248*
AENV  = 000000            430    441
AENVM = 000000            430    442
AFATAL= 000000            430    433
AMADR1= 000000            430    458
AMADR2= 000000            430    462
AMADR3= 000000            430    465
AMADR4= 000000            430    468
AMAMS1= 000000            430    452
AMAMS2= 000000            430    460
AMAMS3= 000000            430    463
AMAMS4= 000000            430    466
AMEAN   015214           2432*  2595
AMSGAD= 000000            430    438
AMSGLG= 000000            430    439
AMSGTY= 000000            430    432
AMTYP1= 000000            430    453
AMTYP2= 000000            430    461
```

```
AMTYP3= 000000            430     464
AMTYP4= 000000            430     467
APASS = 000000            430     435
APRIOR= 000200            313*    430     471
APTCSU= 000040           3233    3339*
APTENV= 000001           2845    3226    3295    3337*
APTSIZ= 000200            671    3336*
APTSPO= 000100           3228    3297    3338*
ARBADD  001464            587*    628*    713     961    1773*   1777*   2362    2365    2367    2369    2371    2374
ARBVCT  001466            588*    629*   1774*   1778*   1923*   1953*   1959*
ASWREG= 000000            430     443
ATESTN= 000000            430     434
AUNIT = 000000            430     437
AJSWR = 000000            430     444
AVECT1= 000340            312*    430     469
AVECT2= 000000            430     470
BASBT1  013150           2212*   2676*   2682*
BASBT2  013152           2213*   2677*   2683*
BASBT3  013175           2217*   2678*   2679*   2684*   2685*
BEGIN   001516            340     603*    623     714    3110
BEGIN1  001536            341     608*
BEGIN2  001530            342     607*
BIASC1  015164            950*    965    2420*
BIASDN  013146            968    2211*
BIASST  013132            964    2209*
BIT0  = 000001            296*   1518    1544    1938
BIT0C = 000001            286*    296
BIT01 = 000002            285*    295
BIT02 = 000004            284*    294
BIT03 = 000010            283*    293
BIT04 = 000020            282*    292
BIT05 = 000040            281*    291
BIT06 = 000100            280*    290
BIT07 = 000200            279*    289
BIT08 = 000400            278*    288    2780
BIT09 = 001000            277*    287    2788    2855
BIT1  = 000002            295*
BIT10 = 002000            276*    990    1018    1048    1078    2833
BIT11 = 004000            275*    975    1018    1048    1063    2795
BIT12 = 010000            274*    771     955     990    1004    1048    1063    1198    1269    1452    1754    2473    2511
                         2530
BIT13 = 020000            273*   2840
BIT14 = 040000            272*   2766
BIT15 = 100000            271*   1314    1354    1397    1441    2376    2700
BIT2  = 000004            294*
BIT3  = 000010            293*
BIT4  = 000020            292*    801
BIT5  = 000040            291*
BIT6  = 000100            290*   1944
BIT7  = 000200            289*    786     801     943    1131    1141    1174    1184    1222    1229    1252    1259    1481
                         1500    1518    1544    1570    1589    1646    1708
BIT8  = 000400            288*    806
BIT9  = 001000            287*    778     779     787     975    1004    1048    1078
BPTVEC= 000014            303*
BYPAS1  010340           1776    1782*   1821
E TWO   011466           1455    1459    1463    1467    2025*
```

```
CHANL   011662            939*   1918*   2046*   2069*   2362    2365
CH0   = 000000            727*    823
CH1   = 000001            728*
CH10  = 000010            735*
CH11  = 000011            736*   1605
CH12  = 000012            737*   1623
CH13  = 000013            738*
CH14  = 000014            739*
CH15  = 000015            740*
CH16  = 000016            741*
CH17  = 000017            742*
CH2   = 000002            729*    853
CH3   = 000003            730*    883    1257
CH4   = 000004            731*    913    1227
CH40  = 000040            746*    838
CH41  = 000041            747*    939     940
CH42  = 000042            748*    868
CH43  = 000043            749*    898
CH44  = 000044            750*
CH45  = 000045            751*
CH46  = 000046            752*
CH47  = 000047            753*   1332    1352    1498    1542
CH47PK  015136           1357*   1461    2409*
CH47RM  015134           1337*   1460    2408*
CH5   = 000005            732*   1129    1139    1568    17..
CH50  = 000050            754*
CH51  = 000051            755*
CH52  = 000052            756*
CH53  = 000053            757*    978     993
CH54  = 000054            758*   1007    1021
CH55  = 000055            759*   1036    1051
CH56  = 000056            760*   1066    1081
CH57  = 000057            761*    927
CH6   = 000006            733*   1172    1182    1227    1257    1557    1644
CH7   = 000007            734*   1479    1516
CH7PEK  015132           1317*   1400    1444    1457    2407*
CH7RMS  015130           1297*   1378    1422    1456    2406*
CKSWR = 104405           2765    3371*
COMPAR  011666            826     841     856     871     886     901     916     930     951    1149    1192    1236    1266
                         1487    1506    1524    1531    1550    1557    1575    1594    1608    1626    1676    1737    2072*
CONS    015172           1913*   1925    1930    1938    1974    1979    2423*
CONVR   015310           2450*   2459    2472
CONVRT  011534            822     837     852     867     882     897     912     926     977     992    1006    1020    1035
                         1050    1065    1080    1604    1622    2045*
CONVT   016340           2450    2464    2617*
CR    = 000015            211*   3272    3282
CRLF  = 000200            212*   3243    3282
CSB     001504            596*
CSC     001514            600*
CSR     001502            595*
DACSAV  015122           1133    1143    1144    1176    1186    1187    1224    1231    1254    1261    1483    1484    1502
                         1503    1520    1521    1546    1547    1571    1590    1648    1710    1969*   2403*
DCISP = 177570            218*    406     658
DECPNT  011450           1997*   2000    2002    2009*   2014*
DECPRT  011342           1994*   2572    2578    2734
DH1     012451            517    2155*
```

DZARCB.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
DH10    013004             559    2194#
DH11    013063             565     571     577     583    2202#
DH2     012530             523    2163#
DH3     012577             529     535    2170#
DH5     012634             541    2175#
DH6     012674             547    2181#
DH7     012735             553    2187#
DIEMSG  013377            1208    2242#
DIFCHN  016644            2437*   2621    2669#
DIFERR  015742            1109    2481*   2510*   2536#
DIFLIN  015220            1095    2435#
DIFMSG  013203            1200    2219#
DIGCNT  011446            1994*   2005*   2013#
DIGIT   011444            1998*   1999*   2003*   2004    2012#
DIGT0   011462            2020#   2579
DIGT1   011463            1996    2021#   2573    2580    2738
DIGT2   011464            2022#   2574    2581    2739
DIGT3   011465            2023#   2575    2582    2741
DISPLA  001140             406#    658*    664*   2810*   2832*
DISPRE  000174             336#    664
DIYMSG  013367            1204    2240#
DSWR   = 177570            217#    405     657
DT1     014572             518    2362#
DT10    014650             560    2371#
DT11    014666             566     572     578     584    2374#
DT2     014610             524     554    2365#
DT3     014624             530     536     548    2367#
DT5     014636             542    2369#
EDGE    015170            1912*   1948    2371    2422#
EMTVEC= 000030             306#    641*    642*
EM1     011736             516    2091#
EM10    012260             558    2129#
EM11    012321             564    3135#
EM12    012362             570    2141#
EM13    012377             576    2144#
EM14    012421             582    2148#
EM14A   012445            1681*   1742*   2153#
EM14B   012444            1688*   1749*   2152#
EM2     011763             522    2095#
EM3     012027             528    2102#
EM4     012063             534    2107#
EM5     012120             540    2112#
EM6     012161             546    2118#
EM7     012214             552    2123#
ERRVEC= 000004             299#    655     656*    667*   2771    2772*   2774*   2777*
EXCESS  015744            1105    2486*   2503*   2537#   2546    2609
FCHANL  011660            1919*   1920*   1921*   1940    1944*   1945    2068#
FINS    015174            1924*   1970    1973*   2424#
GNS    = ******  U         335     694     698     705     709     959    3366    3367    3368    3369    3370    3371    3372
                          3373    3374
GRT2MG  014271            2326#   2549
HILIM1  015202            2427#   2491    2593
HILIM2  015204            2428#   2493
HT     = 000011             209#   3241    3282
ICTVEC= 000020             304#    639*    640*
LAST    024504            2447    3380#
```

```
LF     = 000012            210*   3276    3282
LINMG1  014140            1760    2309*
LINMSG  013755            1756    2288*
LOLIM1  015176            2425*   2497    2591
LOLIM2  015200            2426*   2499
MSGPNT  017040            2720*   2722*   2735
MULTSP  014541            2028    2356*
NARMSG  014320            2330*   2553
NARROW  015210            2430*   2482*   2509*   2550    2560
NBEXT   001472             590*    630*   1771    1775*   1779*
NMBEXT  001470             589*    625*    630     700    1779
NOIMG1  013664            1458    2276*
NOIMG2  013707            1462    2280*
NOIMG3  013732            1466    2284*
NOIMSG  013543            1454    2261*
NUMBF2  014702            1637    1699    2376*
OFSLBX  015154            1520*   2416*
OFSLUX  015156            1546*   2417*
OFSTBX  015150            1483*   1528    1572    1591    2414*
OFSTUX  015152            1502*   1554    2415*
OVERNG  016516            2608    2648*
PC     =.000007            230*    684*    826*    841*    856*    871*    886*    901*    916*    930*    951*   1149*   1192*
                          1236*   1266*   1487*   1506*   1524*   1531*   1550*   1557*   1575*   1594*   1608*   1626*   1676*
                          1737*   1802*   1805*   1815*   1820    2008*   2084*   2088*   2450*   2464*   2572*   2578*   2625*
                          2689*   2734*   2842*   2848*   2916*   3061*   3109    3231*   3250*   3257*   3264*   3279*   3330*
                          3314*   3331*
PCT     017042            2721*   2723*   2730*   2732*   2733    2736
PEKMAX  015126            1318    1358    1402    1446    2405*
PERHLF  014420            2342*   2562    2563
PERQRT  014477            2350*   2566    2567
PIRQ   = 177772             216*
PIRQVE= 000240              310*
PRCNT   017044            2561    2565    2722*
PR0    = 000000             233*
PR1    = 000040             234*
PR2    = 000100             235*
PR3    = 000140             236*
PR4    = 000200             237*
PR5    = 000240             238*
PR6    = 000300             239*
PR7    = 000340             240*
PS     = 177776             213*    214     610*
PSW    = 177776             214*
PWRMSG  020750            3108    3115*
PWRVEC= 000024             305*    645*    646*   3077*   3078*   3087*   3093*   3105*   3106*
QRTOK   015206            2429*   2480*   2501*   2564
RBEG    001542             605     606     609*
RBEG2   002132             675*   1783
RDCHR  = 104406            2891    2957    3372*
RDLIN  = 104407            2999    3373*
RDOCT  = 104410            3374*
READ    015426            2461    2473*
RESVEC= 000010              200*
RMSMAX  015124            1298    1338    1380    1424    2404*
RSLTD   014726            1638    1653    1654    1660*   1661*   1662*   1663*   1667*   1668*   1669*   1670*   1671*   1673*
                          1675    1758    2380*
```

```
RSLT1   014764          1700    1715    1716    1722*   1723*   1724*   1725*   1729*   1730*   1731*   1732*   1733*   1735*
                        1736    1762    2385#
RSLT2   015032          1122    1202    2390#
RSLT3   015060          1165    1206    2395#
RSVMSG  016376          2584    2627#
RSV1    016400          2573*   2628#
RSV2    016402          2574*   2629#
RSV3    016403          2575*   2630#
RSX1    016405          2579*   2631#
RSX2    016406          2580*   2632#
RSX3    016407          2581*   2633#
RSX4    016410          2582*   2634#
R0      =%000000         221#    603*    608*    695     712*    713*    714     717*    719*   1637*   1640    1641    1649
                        1653*   1654*   1655*   1656*   1657*   1658*   1661    1699*   1702    1703    1711    1715*   1716*
                        1717*   1718*   1719*   1720*   1723    1782*   1812*   1815    1842    1852*   1956    1982    1983
                        1986*   1914    1936*   1960*   1988*   2034*   2036    2072    2074*   2076*   2078*   2089    2092*
                        2087*   2452    2476*   2487*   2488    2490*   2491    2493    2495    2496    2499    2500    2501*
                        2522    2558*   2559*   2560*   2564*   2723    2724*   2725*   2726*   2727*   2728*   2729*   2730
                        2731*   2732    2735*   2738*   2739*   2740*   2741*   2744*   2745*   2746*   2747*   2986    3000*
                        3003    3019*   3033    3034*   3035*   3042*   3043*   3044*   3045*   3046*   3047    3052    3057*
                        3059*   3063    3065    3079    3104*   3224    3225*   3230    3235    3238*   3291    3299*   3303
                        3304    3306*   3308*   3308    3330*   3349    3350*   3351    3352*   3353*   3354*   3355*
R1      =%000001         222#    677*    678*    679*    680     718*    719     720     721     1121*   1124    1125    1135
                        1152*   1153    1164*   1167    1168    1178    1195*   1196    1659*   1662*   1663    1664    1665
                        1673*   1673*   1675    1678    1682    1690    1691    1721*   1724*   1725    1726    1727*   1734*
                        1736*   1736    1739    1743    1751    1762    1843    1856*   1857    1861    1885*   1915    1935*
                        1960*   1962    1984*   1995    1996*   2004*   2005*   2035*   2040*   2073    2085*   2086    2090*
                        2096*   2096*   2696*   2697    2997    3001*   3005*   3007*   3009*   3012*   3015    3019*   3090
                        3103*   3092    3259*
R2      =%000002
R3      =%000003
R4      =%000004
R5      =%000005
SP      =%000006
PC      =%000007
SCR     =%000010         1170    1180    1215    1225    1249    1255    1292    1313    1330    1353    1371
SCRPS   =%000040         1135    1195    1235    1245    1259    1266    1295    1342    1354    1358
SCRPS   =%000040         2506    2536    2635    2637    2657    2658    2659    2660    2661    2662    2663    2664    2665
```

```
SKPMSG  014242          2322#  2545
SP      =000036          229#   611*   619    637*   655*   665*   667    700*   961*   965*  1272*  1276*  1803*
                        1842*  1843*  1844*  1845*  1946*  1847*  1848   1851*  1864   1866*  1868   1878   1880
                        1882   1883   1884   1885   1886   1888*  1889*  1914*  1915*  1916*  1917*  1947   1957
                        1985   1986   1987   1988   1995*  2007   2025*  2029*  2036*  2072*  2073*  2081   2082
                        2083*  2086   2087   2438*  2517*  2522*  2532   2542*  2546*  2550*  2554*  2609*  2612
                        2771*  2774   2776   2777   2806   2907   2911*  2837   2857*  2860*  2879*  2880*  2881*
                        2886*  2889*  2890*  2893   2996*  2899   2901   2903   2904*  2906   2908   2910   2911*
                        2912*  2913*  2917*  2918   2920*  2921*  2922*  2923*  2924*  2934*  2935*  2938*  2939*
                        2940   2942   2944*  2953*  2958   2969   2970*  2971*  2972*  2994*  2995*  2996*  2997*
                        2998*  3000   3003*  3011*  3012   3014   3015*  3017   3018   3019   3033*  3038*  3058
                        3063*  3079*  3080*  3131*  3082*  3083*  3084*  3085*  3086   3094*  3098   3099   3100
                        3101   3102   3103   3104   3109*  3150*  3151   3152   3153*  3158*  3159*  3160*  3165
                        3191   3192   3193   3194*  3195*  3224*  3225   3235*  3237   3238   3239*  3241   3243
                        3245   3251   3253*  3255*  3263*  3267   3271   3272   3276   3291*  3292*  3299   3300*
                        3311   3312*  3313*  3323   3324*  3329   3330   3349*  3350
SPREAD  011660           825*   840*   855*   870*   885*   900*   915*   929*   942*  1148*  1191*  1235*  1265*
                        1486*  1505*  1523*  1530*  1549*  1556*  1574*  1593*  1607*  1625*  1652*  1714*  2053*
                        2079   2362   2371   2374
SP3MSG  016543          2039   2653#
STACK = 001000           204#   611    637
STDMSG  016554          2569   2656#
STKLMT= 177774           215#
SWDIST  015746          2531   2539#
SWR     001136           405#   657*   659    663*   673*   955   1198   1269   1452   1754   2473   2511   2530
                        2766   2780   2782   2788   2795   2833   2840   2852   2955   2875   2903*  2915*  3085
                        3098*
SWREG   000176           337#   663    2875   2886
SW0     = 000001         268#
SW00    = 000001         258#   268
SW01    = 000002         257#   267
SW02    = 000004         256#   266
SW03    = 000010         255#   265
SW04    = 000020         254#   264
SW05    = 000040         253#   263
SW06    = 000100         252#   262
SW07    = 000200         251#   261
SW08    = 000400         250#   260
SW09    = 001000         249#   259
SW1     = 000002         267#
SW10    = 002000         248#
SW11    = 004000         247#
SW12    = 010000         246#
SW13    = 020000         245#
SW14    = 040000         244#
SW15    = 100000         243#
SW2     = 000004         266#
SW3     = 000010         265#
SW4     = 000020         264#
SW5     = 000040         263#
SW6     = 000100         262#
SW7     = 000200         261#
SW8     = 000400         260#
SW9     = 001000         259#
TBIT    = 000010         301#
TKB     015216           806*   807*   943*   944*  2433#  2479*  2517   2526*  2540*  2570   2591   2593   2595
```

```
                        2602*   2604
TKVEC  = 000060          308#
TPVEC  = 000064          309#
TRAPVE= 000034           307#    643*    644*
TRTVEC= 000014           302#
TST1    002542           408#
TST10   003340           887      894#
TST11   003410           902      909#
TST12   003460           917      923#
TST13   003530           931      937#
TST14   003736           956      973#
TST15   004010           981      987#
TST16   004066           996     1002#
TST17   004140          1010     1016#
TST2    002702           790      796#
TST20   004212          1024     1031#
TST21   004266          1039     1046#
TST22   004334          1054     1061#
TST23   004406          1069     1076#
TST24   004464          1092#
TST25   004564          1112     1119#
TST26   004752          1155     1162#
TST27   005204          1199     1209    1215#
TST3    003030           819#
TST30   005332          1237     1239    1245#
TST31   005524          1270     1280    1287#
TST32   005600          1300     1307#
TST33   005654          1320     1327#
TST34   005730          1340     1347#
TST35   006004          1360     1367#
TST36   006076          1382     1389#
TST37   006170          1404     1411#
TST4    003100           827      834#
TST40   006262          1426     1433#
TST41   006450          1453     1475#
TST42   006534          1488     1494#
TST43   006620          1507     1512#
TST44   006734          1532     1539#
TST45   007050          1558     1563#
TST46   007140          1576     1582#
TST47   007230          1595     1600#
TST5    003150           842      849#
TST50   007324          1618#
TST51   007420          1635#
TST52   007712          1697#
TST53   010250          1755     1769#
TST6    003220           857      864#
TST7    003270           872      879#
TYANIX  016541          2589     2652#
TYANIXX 016552          2520     2655#
TYHIGH  016442          2601     2640#
TYLOW   016414          2599     2636#
TYMEAN  016472          2597     2644#
TYPOS  = 104404         1810     3370#
TYPE   = 104400          692      696     703     707     957     963     964     968    1200    1204    1208    1271    1275
                        1279     1454    1458    1462    1466    1470    1756    1760    1764    1909    1811    1997    3029
```

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                    2039    2475    2516    2520    2525    2541    2545    2549    2553    2557    2563    2567    2569
                    3593    2589    2597    2599    2601    2606    2608    2835    2843    2883    2885    2889    2895
                    2914    2961    2964    2968    3032    3049    3051    3054    3056    3060    3067    3107    3185
                    3246    3366*
TYPDC = 104401       962    2887    3040    3064    3367*
TYPDN = 104403      3369*
TYPDS = 104402       701     966    1273    1277    2026    2030    2037    2518    2523    2543    2547    2551    2555
                    2610    3369*
TYPSTG  011510      1201    1205    1757    1761    2034*
VARLT1  017004      2675    2702*
VARLT2  017022      2681    2710*
VAR4    016772       941     942    2696*
VCREG1  016640      2435*   2440*   2442*   2460    2462*   2667*
VCREG2  016642      2436*   2441*   2443*   2457*   2458    2463*   2668*
VCSTAT  001506       597*    770*    772*    773     779*    780     787*    788     798*    803*    804     814*    975*
                     989*    990*   1004*   1018*   1033*   1048*   1063*   1078*   1087*   2439*   2617*   2618
VCXREG  001510       595*   1096    1124*   1134*   1171    1181    1219    1226    1249    1256    1369*   1392*   1416
                    1438    1565*   1586    1602*   1611*   1643    1703*
VCYREG  001512       599*   1097    1128    1138    1167*   1177*   1217*   1247*   1291    1311    1331    1351    1372
                    1394    1414*   1436*   1478    1497    1515    1541    1567    1584*   1620*   1629*   1641*   1705
V1      017000      2495    2699*
V1754   016764       881    2672    2693*
V24     016766       885     911     915    2694*
V50     016770       900    2695*
V62     016774      1148    1191    1486    1505    1523    1549    2697*
V77     016776      1574    1593    1652    1714    2698*
WFADJ   016646       684    2672*
WFTEST  016762       604*    607*   2673    2691*
WIDE    015212      2431*   2483*   2504*   2554    2559
WIDMSG  014360      2336*   2557
XDACPK  015142      1401*   1465    2411*
XDACRM  015140      1379*   1464    2410*
YDACPK  015146      1445*   1469    2413*
YDACRM  015144      1423*   1468    2412*
$APTHD  001000       366     372*
$ARG1   002110       669*
$ASTAT= ****** U    3317    3332
$ATYC   021552      3288    3290*
$ATY1   021526      3286*
$ATY3   021534      3231    3287*
$ATY4   021544      2848    3289*
$BASE   001254       474*    613     628    1777
$BDADR  001122       399*
$BDCAT  001126       401*    635     773*    774     780*    781     788*    789     809*    810     824*    939*    954*
                     869*    884*    899*    914*    928*    949*    950     979*    980     994*    995    1009*   1029
                    1022*   1023    1037*   1038    1052*   1053    1067*   1068    1082*   1093    1101*   1105*   1119*
                    1111    1144*   1145*   1146    1187*   1189*   1189    1231*   1232*   1233    1261*   1262*   1263
                    1296*   1299    1316*   1319    1336*   1339    1356*   1359    1373*   1379*   1379    1391    1399*
                    1400*   1401    1403    1421*   1422*   1423    1425    1443*   1444*   1445    1447    1494*   1523*
                    1521*   1528*   1547*   1554*   1571*   1572*   1590*   1591*   1606*   1624*   1675*   1736*   2375
                    2362    2365    2367    2369    2371    2374
$BELL   001170       421*    2835    2867
$CDW1   001260       476*
$CDW2   001262       477*
$CHARC  021522      3248*   3258*   3265    3274*   3279*
$CHSWR  017646      2875*   3371
```

```
$CMTAB  001100            387*    632     633     641     647     648     649
$CM1   = 000002            417*    418*    419*
$CM2   = 000004            417*    418*    419*
$CM3   = 000002            415*    417
$CNTLO  020311            2883    2978*
$CNTLO  020304            2895    2977*
$CPUOP  001226             445*
$CRLF   001175             423*   2843    2867    2914    2977    3032    3051    3056    3060    3247    3292
$DBLK   010706            1853    1887    1895*
$DDW0   001264             478*
$DDW1   001266             479*
$DDW10  001310             488*
$DDW11  001312             489*
$DDW12  001314             490*
$DDW13  001316             491*
$DDW14  001320             492*
$DDW15  001322             493*
$DDW2   001270             480*
$DDW3   001272             481*
$DDW4   001274             482*
$DDW5   001276             483*
$DDW6   001300             484*
$DDW7   001302             485*
$DDW8   001304             486*
$DDW9   001306             487*
$DEVCT  001210             436*
$DEVM   001256             475*
$DOAGN  010446            1804    1813    1819*
$DTBL   010676            1856    1891*
$ENDAD  010436             351    1815*   2862
$ENDCT  010404             647    1806*
$ENDMG  010455            1808    1823*
$ENULL  010452            1811    1822*
$ENV    001220             441*   2845    3226    3295    3319
$ENVM   001221             442*    671    3228    3233    3297
$EOP    010350            1781    1796*
$EOPCT  010376             647*   1803*   1807
$ERFLG  001103             390*   2755    2784    2796    2792*   2. 4    2830*   2867
$ERMAX  001115             396*    650*   2786    2809*   2814
$ERROR  017452             641    2829*
$ERRPC  001116             397*   2362    2365    2367    2369    2371    2374    2937*   2938*   2939    2967    3039
$ERRTB  001324             513*   3046
$ERRTY  020442            2842    3031*
$ERTTL  001112             394*   2836*   2867
$ESCAP  001166             420*    649*   2808*   2858    2860    2867
$ETABL  001220             440*
$ETEND  001324             378     496*
$FATAL  001202             433*   3323*
$FFLG   021772            3286*   3289*   3317    3325*   3334*
$FILLC  001154             413*   3251    3282
$FILLS  001153             412*   3282
$GOADP  001120             398*
$GOCAT  001124             400*    771*    772     774     778*    781     786*    789     801*    802     810     921*    935*
                           851*    866*    881*    896*    911*    925*    941*    976*    990     991*    995    1005*   1009
                          1019*   1023    1034*   1038    1049*   1053    1064*   1069    1079*   1083    1100*   1110*   1111
                          1147*   1190*   1234*   1264*   1298*   1299    1319*   1319    1338*   1339    1359*   1359    1393*
```

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                        1381    1402*   1403    1424*   1425    1446*   1447    1485*   1504*   1522*   1529*   1548*   1555*
                        1573*   1592*   1603*   1612*   1621*   1630*   1651*   1713*   2074    2362    2365    2367    2369
                        2371    2374
$GET42  010426          1812*
$HD   = 000200           200
$HIBTS  001000           373*
$HIOCT  020440          3016*   3021*
$ICNT   001104           391*   2799*   2800    2802*   2813
$ILLUP  020742          3077    3093    3112*
$ITEMB  001114           395*   2839*   2847    2867    3035
$LF     001176           424*   2867    2968    2977    3282
$LFLG   021771          3327*   3333*
$LPADR  001106           392*    651*   2790*   2806*   2811    2813
$LPERR  001110           393*    652*   2790    2807*   2813    2857
$MADR1  001232           458*
$MADR2  001236           462*
$MADR3  001242           465*
$MADR4  001246           468*
$MAIL   001200           374     378     431*    669     2805    2845    3226
$MAMS1  001230           452*
$MAMS2  001234           460*
$MAMS3  001240           463*
$MAMS4  001244           466*
$MBADR  001002           374*
$MFLG   021770          3287*   3293    3328*   3332*
$MNEW   020327          2888    2981*
$MSGAD  001214           438*   3303*   3306
$MSG_G  001216           439*   3308*
$MSGTY  001200           432*   3301    3309*   3321    3325*
$MSWR   020316          2885    2979*
$MTYP1  001231           459*
$MTYP2  001235           461*
$MTYP3  001241           464*
$MTYP4  001245           467*
$MXCNT  017450          2803    2813*
$NULL   001152           411*   3253    3282
$NWTST= 000001           765*    793*    816*    831*    846*    861*    876*    891*    906*    920*    934*    970*    984*
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H07


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MULT     311#
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PUSH     311#   1841   2996   3079   3085   3290   3292   3313
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STARS    311#    347    359    361    368    382    425    429    765    767    793    795    816    819    831
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N07

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.IFF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	354	[illegible]	362	363	383	396	399	[illegible]
.IFT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.IFTF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
.IIF	[illegible]	649	651	652	668	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

```
                2760    2761    2765    2793    2794    2810    2913    2914    2821    2822    2823    2824    2825    2830    2855
                2852    2867    2871    2887    2969    2977    2983    3039    3064    3282    3366    3367    3368    3369    3370
                3371    3372    3373    3374
.ERR              632     655     793     816     831     846     861     876     891     906     920     934     970     984     999
                 1013    1038    1043    1058    1073    1089    1116    1159    1212    1242    1284    1304    1324    1344    1364
                 1386    1408    1430    1472    1491    1509    1535    1560    1579    1597    1615    1632    1694    1766    1942
                 1988    2665    2996    3012    3079    3085    3099    3099    3291    3292    3313    3329    3330
.ERRST            311     321     335     415     417     418     419     426     430     632     653     695     699     706
                  793     865     869     893     897     816     820     831     835     846     850     861     865     876     880
                  899     895     906     910     920     924     934     938     960     970     974     984     988     999    1003
                 1013    1012    1026    1032    1043    1047    1058    1062    1073    1077    1089    1093    1116    1120    1159
                 1263    1216    1242    1246    1284    1288    1304    1308    1324    1328    1344    1348    1364    1368
                 1386    1390    1408    1412    1430    1434    1472    1476    1491    1495    1509    1513    1535    1539    1560
                 1564    1579    1583    1597    1601    1615    1619    1632    1636    1694    1698    1766    1770    1798    1914
                 2760    2662    2946    3357    3366    3367    3368    3369    3370    3371    3372    3373    3374    3375
.MSG              379     669     3357
.PAGE             190     426     653
.REM              190     311     327     335     415     417     418     419     426     430     632     653     695     699     706
                  793     865     869     893     897     816     820     831     835     846     850     861     865     876     880
                  899     895     906     910     920     924     934     938     960     970     974     984     988     999    1003
                 1013    1012    1028    1032    1043    1047    1058    1062    1073    1077    1089    1093    1116    1120    1159
                 1263    1216    1242    1246    1284    1288    1304    1308    1324    1328    1344    1348    1364    1368
                 1386    1390    1408    1412    1430    1434    1472    1476    1491    1495    1509    1513    1535    1539    1560
                 1564    1579    1583    1597    1601    1615    1619    1632    1636    1694    1698    1766    1770    1798    1914
                 2760    2662    2946    3357    3366    3367    3368    3369    3370    3371    3372    3373    3374    3375
.PAGE             379     425
.REM                1
.SBTTL            335     417
.SBTTL            190     316     329     339     345     357     380     427     499     601     723     762     763     764     765
                  793     816     831     846     861     876     891     906     920     934     970     984     999    1013    1029
                 1043    1058    1073    1089    1116    1159    1212    1242    1284    1304    1324    1344    1364    1386    1408
                 1430    1472    1491    1509    1535    1560    1579    1597    1615    1632    1694    1766    1784    1797    1883
                 1986    1991    2089    2401    2671    2718    2750    2815    2868    2984    3024    3073    3125    3203    3283
                 3341    3358
.TITLE            190
.WORD             335     336     337     353     373     374     375     376     377     378     398     399     392     393     394
                  399     398     399     400     401     402     403     404     405     406     415     417     418     432     433
                  434     436     436     437     438     439     443     444     445     458     463     465     468     474     475
                  476     477     478     479     480     481     482     483     484     495     486     499     488     489     490
                  491     492     493     702    1803    1806    1921    3021    3050    3055    3109    3110    3231    3232    3249
                 3318
```

ERRORS DETECTED: 0
DEFAULT GLOBALS GENERATED: 0

```
$,DZARCB.SEQ/SOL CRF=DZARCB.P11
RUN-TIME:  65 38 0 SECONDS
RUN-TIME RATIO: 237/113=2.0
CORE USED:  25K  (49 PAGES)
```

Spooler runtime 14 Seconds, 64 KCS, 379 disk reads, 3 disk writes, 92 pages

```
                                ...F1     2555   016032  104402   ...F5
                    000020      ...G1     2611   016330     004   ...G5
                    000240      ...H1     2667   016640  000000   ...H5
                                ...I1     2723   017050  010037   ...I5
                    000052      ...J1     2758                    ...J5
 388   001100   000000          ...K1     2814   017450  003720   ...K5
 434   001204   000000          ...L1     2870                    ...L5
 490   001314   000000          ...M1     2926                    ...M5
 545   001374   012161          ...N1     2982   020334  036440   ...N5

 560   001420   014650          ...B2     3038   020460  013746   ...B6
 612   001554   012737          ...C2     3080   020614  010146   ...C6
 668   002104   012637          ...D2     3132                    ...D6
 724                            ...E2     3188   021210  002402   ...E6
 774   002600   023737          ...F2     3244   021356  001006   ...F6
 825   003062   012737          ...G2     3300   021610  062766   ...G6
 870   003252   012737          ...H2     3356   022014  000200   ...H6
 915   003442   013737          ...I2                             ...I6
 971                            ...J2   ARBVCT  001466            ...J6
1022   004172   013737          ...K2   CH16  = 000016            ...K6
1067   004366   013737          ...L2   DIFERR  015742            ...L6
1098   004504      001          ...M2   NBEXT   001472            ...M6
1125   004610   010137          ...N2   RSX2    016406            ...N6

1169   004776   010137          ...B3                             ...B7
1221   005232   001771          ...C3   TST13   003530            ...C7
1251   005360   000010          ...D3   VARLT1  017004            ...D7
1293   005544   001000          ...E3   $DDWD   001264            ...E7
1333   005674   000003          ...F3   $ITEMB  001114            ...F7
1373   006030      000          ...G3                             ...G7
1417   006214      000          ...H3   $40CAT= ****** U          ...H7
1473                           ...I3   NEWTST    311#    755     ...I7
1518   006642   000201          ...J3   .$CMTA    190#    379#RE  ...J7
1569   007076   001001          ...K3   BCC      1867    2455     ...K7
1606   007262   013737          ...L3            1540    1550     ...L7
1641   007444   012077          ...M3   TSTB      904     947     ...M7
1697   007712   000004          ...N3             645     647     ...N7

1743   010202   001341          ...B4             891     895     ...B8
1794                           ...C4   **END** USER DAVIES.TJM   ...C8
1836                           ...D4
1892   010700   001750          ...E4
1906                           ...F4
1962   011220   020103          ...G4
2001   011402   100373          ...H4
2052   011576   123777          ...I4
2099   012012   050124          ...J4
2155   012451      105          ...K4
2211   013146   024040          ...L4
2267   013606   020051          ...M4
2323   014250   050111          ...N4
```