DL11-W

DIAGNOSTIC

MD-11-DZDLD-A

EP-DZDLD-A-DL-A

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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZDLD-A

PRODUCT NAME: DL11-W DIAGNOSTIC

DATE CREATED: JUNE 11, 1976

MAINTAINER: DIAGNOSTIC ENGINEERING (CC301)

AUTHOR: DAN CASALETTO

1.0 GENERAL INFORMATION

1.1 ABSTRACT

THIS DIAGNOSTIC IS A LOGIC TEST TO VERIFY THE OPERATION OF THE DL11-W SERIAL LINE/ REAL TIME CLOCK INTERFACE. THE PROGRAM WILL RUN WITHOUT ANY SPECIAL TEST FIXTURES BY DEFAULT. HOWEVER, A WRAP CABLE CAN BE USED AND TESTED BY OPTIO (BIT7 OF SWR).

THIS TEST OPERATES ON THE CONSOLE DL11-W SERIAL LINE AND CLOCK INTERFACES AS WELL AS UP TO FIFTEEN(15) ADDITIONAL DL11-W SERIAL LINE INTERFACES. THE DEFAULT ADDRESSES ARE:

A. CONSOLE - 177560 SERIAL LINE
177546 CLOCK

B. OTHER SERIAL LINE - 776500 FIRST SERIAL LINE ADDRESS OF 15 CONSECUTIVE SERIAL LINE ADDRESSES

THIS PROGRAM IS DESIGNED TO RUN ON ANY PDP-11 WITH 8K OF MEMORY AND A DL11-W MODULE. IT CAN BE RUN UNDER XXDP,APT, AND ACT MONITORS, AND ON PROCESSORS WITH NO HARDWARE SWITCH REGISTER, SOFTWARE SWITCH REGISTER = LOCATION 176

POWER FAILURE IS SUPPORTED FOR SYSTEMS WITH CORE MEMORY.

1.2 SYSTEM REQUIREMENTS

1.2.1 EQUIPMENT

STANDARD 11 FAMILY COMPUTER WITH A CONSOLE OUTPUT DEVICE AND 8K OF MEMORY.

1.2.2 STORAGE

THE PROGRAM USES MEMORY FROM 00000 TO 21510.

1.3 ASSUMPTIONS

A. IF THE UNIT UNDER TEST (UUT) IS THE CONSOLE , THE PROGRAM WILL ASSUME THE REAL TIME CLOCK (RTC) IS ENABLED AND WILL TEST IT UNLESS THE TESTS ARE DISABLED BY BIT6 OF THE SWR.

B. IF THE UUT IS NOT THE CONSOLE, THE RTC IS NOT TESTED FOR THAT DEVICE.

C. THE PROGRAM WILL ASSUME THE ERROR FLAG BITS AND THE BREAK FUNCTION OF THE DL11-W ARE DISABLED AND WILL NOT TEST THESE FUNCTIONS UNLESS ENABLED BY BIT10 (FOR ERROR FLAGS) AND BIT8 (FOR BREAK) OF THE SWR.

2.0 OPERATING INSTRUCTIONS

2.1 LOADING PROCEDURE

USE STANDARD PROCEDURE FOR PDP-11 ABSOLUTE BINARY FORMATTED TAPES.

2.2 STARTING PROCEDURE

LOAD THE SWITCH REGISTER WITH SETTING
(SOFTWARE SWITCH REGISTER LOCATION = 176)

A. START AT 200.
AFTER CHECKING THE TRANSMITTER, THE PROGRAM WILL PRINT ITS IDENTIFICATION AND REPORT THE NUMBER OF DEVICES UNDER TEST (NUMBER IS OCTAL).
"END PASS" IS PRINTED AFTER A FULL PASS HAS BEEN MADE ON ALL DEVICES UNDER TEST.

B. START AT 204.
THE "ECHO" TEST WILL BE EXECUTED. AN "#" IS PRINTED AT THE BEGINNING OF THE TEST. THE ECHO TEST READS A CHARACTER FROM THE TERMINAL,WRITES THAT CHARACTER TO THE TERMINAL AND REPORTS ANY ERROR FLAGS SET IN THE RECEIVER BUFFER.
A CONTROL-C HALTS THE TEST AND PRINTS "STOP" AT THE TERMINAL CONTINUING RESTARTS THE ECHO TEST.

C. START AT 210.
THE TERMINAL OUTPUT TEST WILL BE EXECUTED. DEPRESSING ANY CHARACTER AT THE TERMINAL, HALTS THE TEST. CONTINUING RESTARTS THE TEST.
THE TEST OUTPUTS 32 CHARACTERS ON A LINE AND REPEATS THE PATTERN EVERY THREE LINES. THE PATTERN IS AS FOLLOWS (OCTAL CODE 040 --> 377):

```
                                                (OCTAL CODE)
 !"#$%&'()*+,-./0123456789:;<=>?                (040 --> 077)
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]↑←                (100 --> 137)
`abcdefghijklmnopqrstuvwxyz{|                   (140 --> 177) [LOWER CASE ALPHA]
```

THIS BOTTOM LINE COULD BE THE FOLLOWING IF THE TERMINAL DOES NOT HAVE LOWER CASE:

E01

@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\ [UPPER CASE ALPHA] SEQ 0004

2.3 OPERATING PROCEDURE

2.3.1 OPERATIONAL SWITCH SETTINGS

NOTE: IF NO HARDWARE SWITCH REGISTER IS AVAILABLE THE PROGRAM WILL AUTOMATICALLY USE THE CONTENTS OF LOCATION 176 AS THE SOFTWARE SWITCH REGISTER. THE USER SHOULD SET THIS LOCATION BEFORE STARTING THE PROGRAM. IF A HARDWARE SWITCH IS AVAILABLE AND A SOFTWARE SWR IS DESIRED, PUT ALL SWITCHES UP.

BIT15	- HALT ON ERROR
BIT14	- SCOPE LOOP
BIT13	- INHIBIT ERROR TYPEOUT
BIT12	- UNUSED
BIT11	- UNUSED
BIT10	- ENABLE ERROR FLAGS TESTS
BIT09	- LOOP ON ERROR
BIT08	- ENABLE BREAK FUNCTION TESTS
BIT07	- ENABLE DATA TEST WITH WRAP CABLE
BIT06	- INHIBIT RTC TESTS
BIT05	- ALLOW MANUAL SETTING OF "SDEVM" (DEVICE MAP)

BUILT INTO THE PROGRAM IS THE ABILITY TO DYNAMICALLY CHANGE THE CONTENTS OF SWREG DURING PROGRAM EXECUTION. BY STRIKING ↑G (CNTL G) ON CONSOLE TTY THE OPERATOR SETS A REQUEST FLAG TO CHANGE THE CONTENTS OF SWREG, WHICH IS PROCESSED IN KEY AREAS OF THE PROGRAM CODE (IE) ERROR ROUTINES, AFTER HALTS END OF PASS, AND OTHER APPLICABLE AREAS. BECAUSE THIS DIAGNOSTIC USES THE MAINTENANCE BIT OF THE SERIAL LINE, THE CONTROL-G SHOULD BE ISSUED DURING PROGRAM TYPEOUTS AT THAT TIME THE MAINTENANCE BIT IS SURE TO BE CLEAR.

IF A CONTROL-G IS DETECTED, UPON EXECUTION THE CONTENTS OF THE SWREG ARE DUMPED IN OCTAL ON THE CONSOLE TTY AND ANY CHANGES ARE REQUESTED

```
(IE)    SWR=XXXXXX  NEW=
```

POSSIBLE RESPONSES ARE:

1.	<CR>	IF NO CHANGES ARE TO BE MADE
2.	6 DIGITS 0-7	TO REPRESENT IN OCTAL THE NEW SWITCH REGISTER VALUE ;LAST DIGIT FOLLOWED BY <CR>.
3.	↑U	TO ALLOW REENTERING VALUE IF ERROR IS COMMITTED KEYING IN SWREG VALUE.

2.3.2 RUNNING UNDER APT

THE APT MAILBOX IS LOCATED AT LOCATION 500, TO ALLOW ADDITIONAL SERIAL LINE VECTOR ASSIGNMENTS TO THE 400 AREA OF MEMORY.

THE EXECUTION TIMES PROVIDED ARE FOR EXECUTION WITH AN 11/34 PROCESSOR, CORE MEMORY, AND 110 BAUD.

2.3.3 RUN WITH ALTERNATE CONSOLE ADDRESS

TO USE A CONSOLE ADDRESS OTHER THAN 177560, OR VECTOR OTHER THAN 60, THE OPERATOR MUST SUPPLY THE PROGRAM WITH THE CORRECT ADDRESSES BY INSERTING THEM AT THE TAG LABELED "CRCSR":

```
CRCSR:  ADDRESS OF RECEIVER RCSR
CRBUF:  ADDRESS OF RECEIVER BUFFER
CTCSR:  ADDRESS OF TRANSMITTER CSR
CTBUF:  ADDRESS OF TRANSMITTER BUFFER
CRVECT: ADDRESS OF RECEIVER VECTOR
CRPSW:  ADDRESS OF ASSOCIAED PSW
CTVECT: ADDRESS OF TRANSMITTER VECTOR
CTPSW:  ADDRESS OF ASSOCIATED PSW
```

2.3.4 TESTING ADDITIONAL SERIAL LINES

THIS PROGRAM WILL SUPPORT TESTING OF MULTIPLE SLU'S. IT REQUIRES THE ADDRESS OF THE FIRST ADDITIONAL RCSR (STORED AT "SBASE") AND ITS INTERRUPT VECTOR (STORED AT "SVECT1"); AND WILL BE ABLE TO ADDRESS ANY SLU STARTING AT THE SPECIFIED BASE ADDRESS UP TO 15 CONSECUTIVE DEVICES.

```
EXAMPLE:        SBASE:  776500
                SVECT1: 300
```

THE PROGRAM WILL BE ABLE TO TEST THE CONSOLE PLUS ANY ADDITIONAL DL11-W SLU'S WITHIN THE RANGE 776500 --> 776660

SBASE AND SVECT1 DEFAULT TO 776500 AND 300 RESPECTIVELY.

H01

SEQ 0007

THE PROGRAM ASSOCIATES UNIT NUMBERS TO DEVICES AS FOLLOWS:
(NUMBERS IN PARENTHESIS ARE OCTAL)

```
UNIT# 0 -->  CONSOLE [ADDRESS STORED AT "CRCSR"]
UNIT# 1 -->  BASE ADDRESS STORED AT "$BASE"
             ASSOCIATED BASE VECTOR STORED AT"$VECT1"
UNIT# 2 -->  BASE ADDRESS + (10)
             BASE VECTOR + (10)
UNIT# 3 -->  BASE ADDRESS + (20)
             BASE VECTOR + (20)
UNIT# 4 -->  BASE ADDRESS + (30)
             BASE VECTOR + (30)
                 :
                 :
                 :
                 V
UNIT#15 -->  BASE ADDRESS + (160)
             BASE VECTOR + (160)
```

STARTING AT LOCATION 200 AND HAVING BITS OF SWR CLEAR, THE PROGRAM WILL SELF SIZE THE NUMBER OF DEVICES (STARTING AT THE BAS ADDRESS) AND STORE A BIT MAP AT "$DEVM" (DEVICE MAP) TO INDICATE WHICH UNIT NUMBERS ARE PRESENT AND WILL BE TESTED:

UNIT 15	UNIT 14	.....	UNIT 2	UNIT 1	CONSOLE

A BIT MAP CAN BE ENTERED AT "$DEVM" PRIOR TO STARTING THE PROGRAM SETTING BITS OF THE SWR INHIBITS THE SELF-SIZING AND DEVICE MAP GENERATION, AND USES THE VALUE STORED BY THE OPERATOR.

EXAMPLE:

```
SWR   =  000040          [BINARY  0 000 000 000 100 000]
$BASE:   776500
$VECT1:  300

$DEVM:   13      [BINARY - 0 000 000 000 001 011]

THE PROGRAM WILL TEST -
        UNIT# 0 = CONSOLE
        UNIT# 1 = 776500 ; 300
        UNIT# 3 = 776520 ; 320
```

2.4 EXECUTION TIMES - (110 BAUD)

```
LONGEST SUBTEST TIME = 50 SECONDS
PASS TIME            = 60 SECONDS
ADDITIONAL DEVICES   = 55 SECONDS/DEVICE
```

3.0 ERROR REPORTING

IF A ROUTINE FAILS AND THE INHIBIT ERROR TYPEOUT (BIT13) OF THE SWR IS NOT SET, A PRINTOUT RESULTS IN THE FORM:

```
"(SOME ASCII MESSAGE)"
TEST#   ERR PC   RCSR    [ANY APPLICABLE DAT HEADINGS]
XXXXXX  XXXXXX   XXXXXX   [ANY APPLICABLE DATA]

        NOTE: "RCSR" IS DEPENDENT ON THE FAILURE
              & THEREFORE COULD BE TCSR,RBUF,TBUF,OR LKS
```

WHERE "XXXXXX" IS AN OCTAL NUMBER.
THIS ERROR PRINTOUT OCCURS PROVIDED THE ERROR THAT EXISTS WOULD NOT HINDER THE TYPEOUT. IN CASES WHERE IT IS NOT POSSIBLE TO PRINT AN ERROR MESSAGE (I.E. FATAL CONSOLE TRANSMITTER FAILURES), A HALT OCCURS AND THE PC CAN BE EXAMINED BY THE OPERATOR TO FIND THE ERROR INFORMATION IN THE PROGRAM LISTING.

NOTE: FOR SOFTWARE SWITCH OPERATION, THE SWITCH REGISTER CAN BE CHANGED BY TYPING A CONTROL-G AT THE CONSOLE DURING ERROR PRINTOUTS. AFTER CONTINUING FROM THE ERROR HALT THE OLD SWR CONTENTS IS DISPLAYED AND THE NEW CONTENTS CAN BE ENTERED.
IF ERROR HALTS ARE DISABLED, THE CONTROL-G RESPONSE OCCURS IMMEDIATELY FOLLOWING THE TYPEOUT.

4.0 SUBROUTINE ABSTRACTS

4.1 TRAPCATCHER

THIS IS A SERIES OF INSTRUCTIONS STARTING AT LOCATION 0 DESIGNED TO DETECT AND ISOLATE UNEXPECTED TRAPS TO THE TRAP AND INTERRUPT VECTOR AREA OF MEMORY.

EACH VECTOR ENTRANCE ADDRESS IS LOADED WITH THE ADDRESS OF THE NEXT LOCATION. THE NEXT LOCATION IS LOADED WITH A BREAK POINT TRAP (000003). THUS AN ILLEGAL TRAP OR INTERRUPT CAUSES A TRAP THROUGH THE BPT VECTOR(14) WHICH POINTS TO THE "CATCH" ROUTINE.

THE "CATCH" ROUTINE REPORTS THE PC THAT CAUSED THE ORIGINAL TRAP AND THE LOCATION OF THE TRAP VECTOR (IF UNDER APT, AN ERROR IS INDICATED TO APT). AFTER REPORTING THE ERROR THE PROGRAM HALTS. THE PROGRAM MUST BE RESTARTED AT THIS POINT.

4.2 WRPSW

THIS ROUTINE IS USED TO WRITE THE PSW BY POPPING VALUES FROM THE STACK. THIS METHOD IS USED TO BE COMPATIBLE WITH ALL 11 FAMILY PROCESSORS.

4.3 SCOPE

THIS ROUTINE CALL IS PLACED BETWEEN EACH SUBTEST. IT RECORDS THE STARTING ADDRESS OF EACH SUBTEST AS IT IS BEING ENTERED AND UPDATES THE TEST NUMBER. IF A SCOPE LOOP IS REQUESTED, IT WILL JUMP TO THE START OF THE SUBTEST AT WHICH THE SCOPE LOOP IS REQUESTED.

4.4 ERROR

THIS ROUTINE CALL IS PLACED WHEREEVER AN ERROR REPORT
IS DESIRED. THE LOWER BYTE OF THIS CALL IS USED AS THE ERROR NUMBER
AND AS A POINTER INTO THE ERROR TABLE . THIS ROUTINE REPORTS ERRORS
TO APT USING "$APTYPE" AND TYPES ERROR REPORTS TO THE CONSOLE
USING "$ERRTYPE".

4.5 $POWER

THIS ROUTINE SAVES ALL GENERAL REGISTERS DURING POWER-DOWN
AND RESTORES THEM AT POWER-UP. IF A POWER FAILURE OCCURS
"POWER" IS PRINTED AT THE CONSOLE AFTER POWER IS RESTORED.

4.6 CKSWR

THIS ROUTINE CALL IS USED TO DETECT THE RECEPTION OF A CONTROL-G
FROM THE CONSOLE. THE CALL USES "$READ" TO PERFORM THE CONTROL-G
SEQUENCE OF DISPLAYING THE CONTENTS OF THE SOFTWARE SWITCH REGISTER
AND THE ENTERING THE NEW CONTENTS FROM THE TERMINAL.

↑A

```
                        .ENABLE ABS
                        .LIST   ME
                        .NLIST  MC,MD,CND



                        .MCALL  .$TYPE,.$TYPOC,.$TRAP
                        .MCALL  .SETUP,STARS,PUSH,POP,SETUP,.EQUAT, $ERRTYP
                        .MCALL  .$APTHDR,.$APTBLS,.$ACT11,.$SCOPE
                        .MCALL  .$CMTAG,.$EOP,.$READ
                        .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
```

```
                        SW12=   10000
                        SW11=   4000
                        SW10=   2000
                        SW09=   1000
                        SW08=   400
                        SW07=   200
                        SW06=   100
                        SW05=   40
                        SW04=   20
                        SW03=   10
                        SW02=   4
                        SW01=   2
                        SW00=   1
                        .EQUIV  SW09,SW9
                        .EQUIV  SW08,SW8
                        .EQUIV  SW07,SW7
                        .EQUIV  SW06,SW6
                        .EQUIV  SW05,SW5
                        .EQUIV  SW04,SW4
                        .EQUIV  SW03,SW3
                        .EQUIV  SW02,SW2
                        .EQUIV  SW01,SW1
                        .EQUIV  SW00,SW0

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
                        BIT15=  100000
                        BIT14=  40000
                        BIT13=  20000
                        BIT12=  10000
                        BIT11=  4000
                        BIT10=  2000
                        BIT09=  1000
                        BIT08=  400
                        BIT07=  200
                        BIT06=  100
                        BIT05=  40
                        BIT04=  20
                        BIT03=  10
                        BIT02=  4
                        BIT01=  2
                        BIT00=  1
                        .EQUIV  BIT09,BIT9
                        .EQUIV  BIT08,BIT8
                        .EQUIV  BIT07,BIT7
                        .EQUIV  BIT06,BIT6
                        .EQUIV  BIT05,BIT5
                        .EQUIV  BIT04,BIT4
                        .EQUIV  BIT03,BIT3
                        .EQUIV  BIT02,BIT2
                        .EQUIV  BIT01,BIT1
                        .EQUIV  BIT00,BIT0

                        ;*BASIC "CPU" TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014                  TBITVEC=14              ;;"T" BIT
```

```
                        TRTVEC= 14              ;;[illegible]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=  176500
                                AVECT1= 300
                                $TN=    1
                                $SWR=   161000
                                BPT=    000003          ;THIS IS THE COMMAND FOR A TRAP
                                                        ;   THROUGH 14 (BPT TRAP)

                        000000          .=0
                        ;;*****************************************************************
                                ;*ALL UNUSED LOCATIONS FROM 4-776 CONTAIN A ".+2,BPT"
                                ;*SEQUENCE TO CATCH ILLEGAL TRAPS & INTERRUPTS
                                ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS


                        000014          .=14                    ;THE BPT TRAP VECTOR POINTS TO THE
000014  011602                  .WORD   CATCH                   ;   ILLEGAL TRAP HANDLER "CATCH"
000016  000340                  .WORD   340

                        000042          .=      42
000042  000000                  .WORD   0


                        000174          .=      174
000174  000000          DISPREG:.WORD   0
000176  000000          SWREG:  .WORD   0

                        000200          .=200
000200  000167  002302          JMP     START           ;DO INTERFACE TEST
000204  000167  014100          JMP     ECHO            ;DO ECHO TEST
000210  000167  014314          JMP     OUTTST          ;DO OUTPUT TEST TO TERMINAL
```

```
                        000500                          .=      500
                                                .SBTTL  ACT11 HOOKS

                                                ;;******************************************************************
                                                ;HOOKS REQUIRED BY ACT11
                        000500                          $SVPC=.                 ;SAVE PC
                        000046                          .=46
000046  011500                                          $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .SEOP
                        000052                          .=52
000052  000000                                          .WORD   0               ;;2)SET LOC.52 TO ZERO
                        000500                          .=$SVPC                 ;; RESTORE PC
                                                .SBTTL  APT PARAMETER BLOCK

                                                ;;******************************************************************
                                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                                ;;******************************************************************
                        000500                          .$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  000500                                          $APTHDR ;;POINT TO APT HEADER BLOCK
                        000500                          .=.$X   ;;RESET LOCATION COUNTER
                                                ;;******************************************************************
                                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                                ;INTERFACE SPEC.

000500                                          $APTHD:
000500  000000                                  $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
000502  001066                                  $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
000504  000050                                  $TSTM:  .WORD   50      ;;RUN TIM OF LONGEST TEST
000506  000060                                  $PASTM: .WORD   60      ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
000510  000055                                  $UNITM: .WORD   55      ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
000512  000030                                          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                        .SBTTL  COMMON TAGS

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

001000                  .=1000
001000                  $CMTAG:                 ;;START OF COMMON TAGS
001000  000000          .WORD   0
001002  000             $TSTNM: .BYTE   0       ;;CONTAINS THE TEST NUMBER
001003  000             $ERFLG: .BYTE   0       ;;CONTAINS ERROR FLAG
001004  000000          $ICNT:  .WORD   0       ;;CONTAINS SUBTEST ITERATION COUNT
001006  000000          $LPADR: .WORD   0       ;;CONTAINS SCOPE LOOP ADDRESS
001010  000000          $LPERR: .WORD   0       ;;CONTAINS SCOPE RETURN FOR ERRORS
001012  000000          $ERTTL: .WORD   0       ;;CONTAINS TOTAL ERRORS DETECTED
001014  000             $ITEMB: .BYTE   0       ;;CONTAINS ITEM CONTROL BYTE
001015  001             $ERMAX: .BYTE   1       ;;CONTAINS MAX. ERRORS PER TEST
001016  000000          $ERRPC: .WORD   0       ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001020  000000          $GDADR: .WORD   0       ;;CONTAINS ADDRESS OF 'GOOD' DATA
001022  000000          $BDADR: .WORD   0       ;;CONTAINS ADDRESS OF 'BAD' DATA
001024  000000          $GDDAT: .WORD   0       ;;CONTAINS 'GOOD' DATA
001026  000000          $BDDAT: .WORD   0       ;;CONTAINS 'BAD' DATA
001030  000000                  .WORD   0       ;;RESERVED--NOT TO BE USED
001032  000000                  .WORD   0
001034  000             $AUTOB: .BYTE   0       ;;AUTOMATIC MODE INDICATOR
001035  000             $INTAG: .BYTE   0       ;;INTERRUPT MODE INDICATOR
001036  000000                  .WORD   0
001040  177570          $WR:    .WORD   DSWR    ;;ADDRESS OF SWITCH REGISTER
001042  177570          DISPLAY: .WORD  DDISP   ;;ADDRESS OF DISPLAY REGISTER
001044  177560          $TKS:   177560          ;;TTY KBD STATUS
001046  177562          $TKB:   177562          ;;TTY KBD BUFFER
001050  177564          $TPS:   177564          ;;TTY PRINTER STATUS REG. ADDRESS
001052  177566          $TPB:   177566          ;;TTY PRINTER BUFFER REG. ADDRESS
001054  000             $NULL:  .BYTE   0       ;;CONTAINS NULL CHARACTER FOR FILLS
001055  002             $FILLS: .BYTE   2       ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001056  012             $FILLC: .BYTE   12      ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001057  000             $TPFLG: .BYTE   0       ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001060  000000          $ESCAPE:0               ;;ESCAPE ON ERROR ADDRESS
001062  077             $QUES:  .ASCII  /?/     ;;QUESTION MARK
001063  015             $CRLF:  .ASCII  <15>    ;;CARRIAGE RETURN
001064  000012          $LF:    .ASCIZ  <12>    ;;LINE FEED
                        ;;*****************************************************************
                        .SBTTL  APT MAILBOX-ETABLE

                        ;;*****************************************************************
                        .EVEN
001066                  $MAIL:                  ;;APT MAILBOX
001066  000000          $MSGTY: .WORD   AMSGTY  ;;MESSAGE TYPE CODE
001070  000000          $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
001072  000000          $TESTN: .WORD   ATESTN  ;;TEST NUMBER
001074  000000          $PASS:  .WORD   APASS   ;;PASS COUNT
001076  000000          $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
001100  000000          $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
001102  000000          $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001104  000000          $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001106                  $ETABLE:                ;;APT ENVIRONMENT TABLE
```

D02


```
                                        $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
                                        $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
                                        $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
                                        $USWR:  .WORD   AUSWR   ;;USER SWITCHES
                                        $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
001116  000             $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
001117  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
001120  000000          $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                                        ;*                      MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
001122  000             $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
001123  000             $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
001124  000000          $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
001126  000             $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
001127  000             $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
001130  000000          $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
001132  000             $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
001133  000             $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
001134  000000          $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
001136  000300          $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
001140  000000          $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
001142  176500          $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001144  000000          $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
001146                  $ETEND:
                        .MEXIT
```

E02


```
                        .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 SITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                        ;*NOTE1:        IF SITEMB IS 0 THE ONLY PERTINENT DATA IS (SERRPC).
                        ;*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


001146                  SERRTB:

001146                  .SERRTB:
001146  014614                  EM1                     ;"CAN NOT ACCESS TCSR"
001150  020575                  DH1                     ;"TEST# ERR PC  TCSR"
001152  021340                  DT1                     ;STESTN,SERRPC,TCSR
001154  000000                  0

001156  014640                  EM2                     ;"CAN NOT ACCESS TBUF"
001160  020622                  DH2                     ;"TEST# ERR PC  TBUF"
001162  021350                  DT2                     ;STESTN,SERRPC,TBUF
001164  000000                  0

001166  014664                  EM3                     ;"TCSR DONE NOT CLEARED WITH TBUF FULL"
001170  020575                  DH1                     ;"TEST# ERR PC  TCSR"
001172  021340                  DT1                     ;STESTN,SERRPC,TCSR
001174  000000                  0

001176  014731                  EM4                     ;"TCSR DONE NOT SET"
001200  020575                  DH1                     ;"TEST# ERR PC  TCSR"
001202  021340                  DT1                     ;STESTN,SERRPC,TCSR
001204  000000                  0

001206  014753                  EM5                     ;TCSR DONE NOT SET WITH RESET
001210  020575                  DH1                     ;"TEST# ERR PC  TCSR"
001212  021340                  DT1                     ;STESTN,SERRPC,TCSR
001214  000000                  0

001216  015010                  EM6                     ;"CAN NOT ACCESS RCSR"
001220  020647                  DH6                     ;"TEST# ERR PC  RCSR"
001222  021360                  DT6                     ;STESTN,SERRPC,RCSR
001224  000000                  0

001226  015034                  EM7                     ;"CAN NOT ACCESS RBUF"
001230  020674                  DH7                     ;"TEST# ERR PC  RBUF"
001232  021370                  DT7                     ;STESTN,SERRPC,RBUF
001234  000000                  0

001236  015060                  EM10                    ;"CAN NOT ACCESS LKS"
001240  020721                  DH10                    ;"TEST# ERR PC  LKS"
001242  021400                  DT10                    ;STESTN,SERRPC,LKS
001244  000000                  0
```

```
                        
001246  015103          EM11    ;"BIT0 OF TCSR NOT CLEAR AFTER RESET"
001250  020575          DH1     ;"TEST# ERR PC  TCSR
001252  021340          DT1     ;$TESTN,$ERRPC,TCSR
001254  000000          0
                        
001256  015146          EM12    ;"CAN NOT SET BIT0 OF TCSR"
001260  020575          DH1     ;"TEST# ERR PC  TCSR"
001262  021340          DT1     ;$TESTN,$ERRPC,TCSR
001264  000000          0
                        
001266  015177          EM13    ;"CAN NOT CLEAR BIT0 OF TCSR"
001270  020575          DH1     ;"TEST# ERR PC  TCSR"
001272  021340          DT1     ;$TESTN,$ERRPC,TCSR
001274  000000          0
                        
001276  015232          EM14    ;"RESET DID NOT CLEAR BIT0 OF TCSR"
001300  020575          DH1     ;"TEST# ERR PC  TCSR"
001302  021340          DT1     ;$TESTN,$ERRPC,TCSR
001304  000000          0
                        
001306  015273          EM15    ;"BIT2 OF TCSR NOT CLEAR AFTER RESET"
001310  020575          DH1     ;"TEST# ERR PC  TCSR"
001312  021340          DT1     ;$TESTN,$ERRPC,TCSR
001314  000000          0
                        
001316  015336          EM16    ;"CAN NOT SET BIT2 OF TCSR"
001320  020575          DH1     ;"TEST# ERR PC  TCSR"
001322  021340          DT1     ;$TESTN,$ERRPC,TCSR
001324  000000          0
                        
001326  015367          EM17    ;"CAN NOT CLEAR BIT2 OF TCSR"
001330  020575          DH1     ;"TEST# ERR PC  TCSR"
001332  021340          DT1     ;$TESTN,$ERRPC,TCSR
001334  000000          0
                        
001336  015422          EM20    ;"RESET DID NOT CLEAR BIT2 OF TCSR"
001340  020575          DH1     ;"TEST# ERR PC  TCSR"
001342  021340          DT1     ;$TESTN,$ERRPC,TCSR
001344  000000          0
                        
001346  015463          EM21    ;"BIT6 OF TCSR NOT CLEAR AFTER RESET2
001350  020575          DH1     ;"TEST# ERR PC  TCSR"
001352  021340          DT1     ;$TESTN,$ERRPC,TCSR
001354  000000          0
                        
001356  015527          EM22    ;"XMIT INTERRUPT WITH PRIORITY 7"
001360  020575          DH1     ;"TEST# ERR PC  TCSR"
001362  021340          DT1     ;$TESTN,$ERRPC,TCSR
001364  000000          0
                        
001366  015564          EM23    ;"CAN NOT SET BIT6 OF TCSR"
001370  020575          DH1     ;"TEST# ERR PC  TCSR"
001372  021340          DT1     ;$TESTN,$ERRPC,TCSR
001374  000000          0
```

```
                        
  391  001376  015615                 EM24            ;"CAN NOT CLEAR BIT6 OF TCSR"
  392  001400  020575                 DH1             ;"TEST# ERR PC  TCSR"
  393  001402  021340                 DT1             ;$TESTN,$ERRPC,TCSR
  394  001404  000000                 0
  395
  396  001406  015650                 EM25            ;"RESET DID NOT CLEAR BIT6 OF TCSR"
  397  001410  020575                 DH1             ;"TEST# ERR PC  TCSR"
  398  001412  021340                 DT1             ;$TESTN,$ERRPC,TCSR
  399  001414  000000                 0
  400
  401  001416  015711                 EM26            ;"BIT6 OF RCSR NOT CLEAR AFTER RESET"
  402  001420  020647                 DH6             ;"TEST# ERR PC  RCSR"
  403  001422  021360                 DT6             ;$TESTN,$ERRPC,RCSR
  404  001424  000000                 0
  405
  406  001426  015754                 EM27            ;"RCVR INTERRUPT WITH PRIORITY 7"
  407  001430  020647                 DH6             ;"TEST# ERR PC  RCSR"
  408  001432  021360                 DT6             ;$TESTN,$ERRPC,RCSR
  409  001434  000000                 0
  410
  411  001436  016013                 EM30            ;"CAN NOT SET BIT6 OF RCSR"
  412  001440  020647                 DH6             ;"TEST# ERR PC  RCSR"
  413  001442  021360                 DT6             ;$TESTN,$ERRPC,RCSR
  414  001444  000000                 0
  415
  416  001446  016044                 EM31            ;"CAN NOT CLEAR BIT6 OF RCSR"
  417  001450  020647                 DH6             ;"TEST# ERR PC  RCSR"
  418  001452  021360                 DT6             ;$TESTN,$ERRPC,RCSR
  419  001454  000000                 0
  420
  421  001456  016077                 EM32            ;"CAN NOT CLEAR BIT6 OF RCSR WITH RESET2
  422  001460  020647                 DH6             ;"TEST# ERR PC  RCSR"
  423  001462  021360                 DT6             ;$TESTN,$ERRPC,RCSR
  424  001464  000000                 0
  425
  426  001466  016145                 EM33            ;"BIT6 OF LKS NOT CLEAR AFTER RESET"
  427  001470  020721                 DH10            ;"TEST# ERR PC  LKS"
  428  001472  021400                 DT10            ;$TESTN,$ERRPC,LKS
  429  001474  000000                 0
  430
  431  001476  016207                 EM34            ;"LKS INTERRUPT WITH PRIORITY 7"
  432  001500  020721                 DH10            ;"TEST# ERR PC  LKS"
  433  001502  021400                 DT10            ;$TESTN,$ERRPC,LKS
  434  001504  000000                 0
  435
  436  001506  016245                 EM35            ;"CAN NOT SET BIT6 OF LKS"
  437  001510  020721                 DH10            ;"TEST# ERR PC  LKS"
  438  001512  021400                 DT10            ;$TESTN,$ERRPC,LKS
  439  001514  000000                 0
  440
  441  001516  016275                 EM36            ;"CAN NOT CLEAR BIT6 OF LKS"
  442  001520  020721                 DH10            ;"TEST# ERR PC  LKS"
  443  001522  021400                 DT10            ;$TESTN,$ERRPC,LKS
  444  001524  000000                 0
  445
  446  001526  016327                 EM37            ;"RESET DID NOT CLEAR BIT6 OF LKS"
```

```
                001530  020721                  DH10            ;"TEST# ERR PC  LKS"
                001532  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001534  000000                  0

                001536  016367                  EM40            ;"DUAL ADDRESSING ERROR"
                001540  020745                  DH40            ;"TEST# ERR PC  GOOD    BAD"
                001542  021410                  DT40            ;$TESTN,$ERRPC,RCSR,BDCSR
                001544  000000                  0

                001546  016415                  EM41            ;"BIT7 OF LKS NOT SET AFTER RESET2
                001550  020721                  DH10            ;"TEST# ERR PC  LKS"
                001552  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001554  000000                  0

                001556  016455                  EM42            ;"CAN NOT CLEAR BIT7 OF LKS"
                001560  020721                  DH10            ;"TEST# ERR PC  LKS"
                001562  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001564  000000                  0

                001566  016507                  EM43            ;"BIT7 OF LKS DOES NOT SET"
                001570  020721                  DH10            ;"TEST# ERR PC  LKS"
                001572  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001574  000000                  0

                001576  016540                  EM44            ;"RTC INTERRUPT AT PRIORITY 7"
                001600  020721                  DH10            ;"TEST# ERR PC  LKS"
                001602  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001604  000000                  0

                001606  016574                  EM45            ;"RTC INTERRUPTS WHEN DISABLED"
                001610  020721                  DH10            ;"TEST# ERR PC  LKS"
                001612  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001614  000000                  0

                001616  016631                  EM46            ;"RTC INTERRUPT DID NOT OCCUR"
                001620  020721                  DH10            ;"TEST# ERR PC  LKS"
                001622  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001624  000000                  0

                001626  016631                  EM47            ;"RTC INTERRUPT DID NOT OCCUR"
                001630  020721                  DH10            ;"TEST# ERR PC  LKS"
                001632  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001634  000000                  0

                001636  016665                  EM50            ;"RTC DOUBLE INTERRUPT"
                001640  020721                  DH10            ;"TEST# ERR PC  LKS"
                001642  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001644  000000                  0

                001646  016712                  EM51            ;"RESET DID NOT CLEAR RTC INTERRUPT"
                001650  020721                  DH10            ;"TEST# ERR PC  LKS"
                001652  021400                  DT10            ;$TESTN,$ERRPC,LKS
                001654  000000                  0

                001656  016742                  EM52            ;"RTC INTERRUPT DID NOT CLEAR WITH BIT7 OF LKS"
                001660  020721                  DH10            ;"TEST# ERR PC  LKS"
```

```
  503  001662  021400                    DT10            ;$TESTN,$ERRPC,LKS
  504  001664  000000                    0
  505
  506  001666  017017                    EM53
  507  001670  021001                    DH53            ;"TEST# ERR PC  LKS   CNT1   CNT2"
  508  001672  021422                    DT53            ;$TESTN,$ERRPC,LKS,FIRST,SECND
  509  001674  000000                    0
  510
  511  001676  017043                    EM54            ;"XMIT INTERRUPTS WHEN DISABLED"
  512  001700  020575                    DH1             ;"TEST# ERR PC  TCSR"
  513  001702  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  514  001704  000000                    0
  515
  516  001706  017201                    EM55            ;"XMIT DID NOT INTERRUPT"
  517  001710  020575                    DH1             ;"TEST# ERR PC  TCSR"
  518  001712  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  519  001714  000000                    0
  520
  521  001716  017101                    EM56            ;"XMIT INTERRUPT AT PRIORITY 7"
  522  001720  020575                    DH1             ;"TEST# ERR PC  TCSR"
  523  001722  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  524  001724  000000                    0
  525
  526  001726  017137                    EM57            ;"XMIT INTERRUPTS WITH ENABLE CLEAR"
  527  001730  020575                    DH1             ;"TEST# ERR PC  TCSR"
  528  001732  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  529  001734  000000                    0
  530
  531  001736  017201                    EM60            ;"XMIT DID NOT INTERRUPT"
  532  001740  020575                    DH1             ;"TEST# ERR PC  TCSR"
  533  001742  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  534  001744  000000                    0
  535
  536  001746  017230                    EM61            ;"XMIT RE-INTERRUPTED"
  537  001750  020575                    DH1             ;"TEST# ERR PC  TCSR"
  538  001752  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  539  001754  000000                    0
  540
  541  001756  017254                    EM62            ;"LOADING TBUF DID NOT CLEAR INTERRUPT"
  542  001760  020575                    DH1             ;"TEST# ERR PC  TCSR"
  543  001762  021340                    DT1             ;$TESTN,$ERRPC,TCSR
  544  001764  000000                    0
  545
  546  001766  017321                    EM63            ;"RCVR ACTIVE NOT SET"
  547  001770  020647                    DH6             ;"TEST# ERR PC  RCSR"
  548  001772  021360                    DT6             ;$TESTN,$ERRPC,RCSR
  549  001774  000000                    0
  550
  551  001776  017345                    EM64            ;"RECEIVER DONE NEVER SET"
  552  002000  020647                    DH6             ;"TEST# ERR PC  RCSR"
  553  002002  021360                    DT6             ;$TESTN,$ERRPC,RCSR
  554  002004  000000                    0
  555
  556  002006  017371                    EM65            ;"RCVR ACTIVE NOT CLEARED WITH DONE SET2
  557  002010  020647                    DH6             ;"TEST# ERR PC  RCSR"
  558  002012  021360                    DT6             ;$TESTN,$ERRPC,RCSR
```

```
   559  002014  000000                        0
   560
   561  002016  017437                        EM66    ;"RESET DID NOT CLEAR RCVR DONE"
   562  002020  020647                        DH6     ;"TEST# ERR PC  RCSR"
   563  002022  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   564  002024  000000                        0
   565
   566  002026  017475                        EM67    ;"RDR ENABLE SET DID NOT CLEAR RCVR DONE"
   567  002030  020647                        DH6     ;"TEST# ERR PC  RCSR"
   568  002032  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   569  002034  000000                        0
   570
   571  002036  017540                        EM70    ;"READING RBUF DID NOT CLEAR RCVR DONE"
   572  002040  020647                        DH6     ;"TEST# ERR PC  RCSR"
   573  002042  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   574  002044  000000                        0
   575
   576  002046  017605                        EM71    ;"RCVR INTERRUPTS WITH ENABLE CLEAR"
   577  002050  020647                        DH6     ;"TEST# ERR PC  RCSR"
   578  002052  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   579  002054  000000                        0
   580
   581  002056  017754                        EM72    ;"RCVR DID NOT INTERRUPT"
   582  002060  020647                        DH6     ;"TEST# ERR PC  RCSR"
   583  002062  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   584  002064  000000                        0
   585
   586  002066  017647                        EM73    ;"RCVR INTERRUPTS AT PRIORITY 7"
   587  002070  020647                        DH6     ;"TEST# ERR PC  RCSR"
   588  002072  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   589  002074  000000                        0
   590
   591  002076  017705                        EM74    ;"RCVR INTERRUPT REQUEST PASSED WITH ENABLE CLEAR"
   592  002100  020647                        DH6     ;"TEST# ERR PC  RCSR"
   593  002102  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   594  002104  000000                        0
   595
   596  002106  017754                        EM75    ;"RCVR DID NOT INTERRUPT"
   597  002110  020647                        DH6     ;"TEST# ERR PC  RCSR"
   598  002112  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   599  002114  000000                        0
   600
   601  002116  020003                        EM76    ;"RECEIVER RE-INTERRUPTED"
   602  002120  020647                        DH6     ;"TEST# ERR PC  RCSR"
   603  002122  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   604  002124  000000                        0
   605
   606  002126  020027                        EM77    ;"READING RBUF DID NOT CLEAR INTERRUPT"
   607  002130  020647                        DH6     ;"TEST# ERR PC  RCSR"
   608  002132  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   609  002134  000000                        0
   610
   611  002136  020074                        EM100   ;"RESET DID NOT CLEAR RCVR INTERRUPT"
   612  002140  020647                        DH6     ;"TEST# ERR PC  RCSR"
   613  002142  021360                        DT6     ;$TESTN,$ERRPC,RCSR
   614  002144  000000                        0
```

```
                                
002146  020137                  EM101           ;"'OR' FLAG DID NOT SET"
002150  020647                  DH6
002152  021360                  DT6             ;$TESTN,$ERRPC,RCSR
002154  000000                  0
                                
002156  020165                  EM102           ;"'ERROR' NOT SET WITH 'OR' FLAG"
002160  020647                  DH6             ;"TEST# ERR PC  RCSR"
002162  021360                  DT6             ;$TESTN,$ERRPC,RCSR
002164  000000                  0
                                
002166  020224                  EM103           ;"BREAK DID NOT TRANSMIT ALL ZEROES"
002170  021046                  DH103           ;"TEST# ERR PC  RCSR  DATA"
002172  021436                  DT103           ;$TESTN,$ERRPC,RCSR,$BDDAT
002174  000000                  0
                                
002176  020262                  EM104           ;"BREAK DID NOT SET FRAMING ERROR"
002200  020647                  DH6             ;"TEST# ERR PC  RCSR"
002202  021360                  DT6             ;$TESTN,$ERRPC,RCSR
002204  000000                  0
                                
002206  020317                  EM105           ;"DATA COMPARE ERROR"
002210  021103                  DH105           ;"TEST# ERR PC  RCSR  GOOD  BAD"
002212  021450                  DT105           ;$TESTN,$ERRPC,RCSR,GD,BD
002214  000000                  0
                                
002216  020342                  EM106           ;"DATA COMPARE ERROR WITH CABLE"
002220  021103                  DH105           ;"TEST# ERR PC  RCSR    GOOD    BAD"
002222  021450                  DT105           ;$TESTN,$ERRPC,RCSR,GD,BD
002224  000000                  0
                                
002226  020400                  EM107           ;"TIMEOUT IN EXERCISER TEST"
002230  020647                  DH6             ;"TEST# ERR PC  RCSR"
002232  021360                  DT6             ;$TESTN,$ERRPC,RCSR
002234  000000                  0
                                
002236  020432                  EM110           ;"INCORRECT RECEIVE COUNT
002240  021147                  DH110           ;"TEST# ERR PC  RCSR    TRANS   RCV"
002242  021464                  DT110           ;$TESTN,$ERRPC,RCSR,XMTCNT,RCVCNT
002244  000000                  0
                                
002246  020462                  EM111           ;"DATA COMPARE ERROR IN EXERCISER"
002250  021103                  DH105           ;"TEST# ERR PC  RCSR    GOOD    BAD"
002252  021450                  DT105           ;$TESTN,$ERRPC,RCSR,GD,BD
002254  000000                  0
                                
002256  020522                  EM112           ;"TRAP CATCHER"
002260  021213                  DH112           ;"TEST#   ERR PC  RCSR   OLDPC  TRAP ADR"
002262  021500                  DT112           ;$TESTN,$ERRPC,RCSR,OLDPC,BDVECT
002264  000000                  0
                                
002266  020537                  EM113           ;"NO CLK INTERRUPT IN EXERCISER"
002270  020721                  DH10            ;"TEST#  ERR PC  LKS"
002272  021400                  DT10            ;$TESTN,$ERRPC,LKS
002274  000000                  0
```

```
                                ;CONSLE UNDER TEST FLAG
002276  000000          CTSTFL: .WORD   0
002300  000000          TMP1:   .WORD   0               ;TEMP LOCATION FOR TABLE OFFSETS
002302  000000          TMP2:   .WORD   0               ;TEMP LOCATION FOR DEVICE COUNT
002304  000000          TMP3:   .WORD   0               ;LOCATION FOR DEVICE MAP BIT TEST MASK
                        ;REGISTER AND VECTOR ADDRESSES FOR THE DL-11W UNDER TEST

002306  000000          RCSR:   .WORD   0
002310  000000          RBUF:   .WORD   0
002312  000000          TCSR:   .WORD   0
002314  000000          TBUF:   .WORD   0
002316  000000          RVECT:  .WORD   0
002320  000000          RPSW:   .WORD   0
002322  000000          TVECT:  .WORD   0
002324  000000          TPSW:   .WORD   0

                        ;CONSOLE REGISTER AND VECTOR ADDRESSES FOR THE DL-11W

002326  177560          CRCSR:  177560                  ;ADDRESS OF RECEIVER COMMAND/STATUS REGISTER
002330  177562          CRBUF:  177562                  ;ADDRESS OF RECEIVER BUFFER
002332  177564          CTCSR:  177564                  ;ADDRESS OF TRANSMITTER COMMAND/STATUS REGISTER
002334  177566          CTBUF:  177566                  ;ADDRESS OF TRANSMITTER BUFFER
002336  000060          CRVECT: 60                      ;RECEIVER INTERRUPT VECTOR
002340  000062          CRPSW:  62
002342  000064          CTVECT: 64                      ;TRANSMITTER INTERRUPT VECTOR
002344  000066          CTPSW:  66

                        ;REAL TIME CLOCK REGISTER AND VECTOR ADDRESSES
002346  177546          LKS:    .WORD   177546
002350  000100          RTCVT:  .WORD   100
002352  000102          RTCPSW: .WORD   102

002354  000020          ADRTBL: .BLKW   20
002414  000020          VCTTBL: .BLKW   20


                        ;SUBROUTINE TO GENERATE DEVICE ADDRESS TABLE

002454  012702  002354  DEVADR: MOV     #ADRTBL,R2      ;POINT R2 TO THE DEVICE ADDRESS TABLE
002460  016700  176456          MOV     $BASE,R0        ;LOAD BASE DEVICE ADDRESS IN R0
002464  010001                  MOV     R0,R1           ;
002466  062701  000170          ADD     #170,R1         ;POINT R1 TO LAST DEVICE ADDRESS
002472  010022  1$:             MOV     R0,(R2)+        ;MOVE DEVICE ADDRESS TO TABLE
002474  062700  000010          ADD     #10,R0          ;POINT R0 TO NEXT DEVICE ADDRESS
002500  020001                  CMP     R0,R1           ;FINISHED GENERATING TABLE?
002502  003773                  BLE     1$              ;BR, IF LAST DEVICE ADDRESS NOT LOADED
002504  000207                  RTS     PC


002506  005067  176356  START:  CLR     $FATAL          ;CLEAR ERROR NO.
002512  005067  176350          CLR     $MSGTYP         ;CLEAR MESSAGE TYPE
002516  005067  176350          CLR     $TESTN          ;CLEAR TEST NO.
002522  005067  177550          CLR     CTSTFL          ;CLEAR CONSOLE UNDER TEST FLAG
002526  005067  176344          CLR     $DEVCT          ;CLEAR DEVICE COUNT
002532  005067  176342          CLR     $UNIT           ;CLEAR UNIT NUMBER
```

```
   727  002536  012737  000006  000004          MOV     #6,@#4          ;INITIALIZE TIMEOUT VECTORS TO TRAP
   728  002544  012737  000003  000006          MOV     #3,@#6          ;  CATCHER ROUTINE
   729
   730                                  .SBTTL  INITIALIZE THE COMMON TAGS
   731                                  ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
   732  002552  012706  001000                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
   733  002556  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
   734  002560  022706  001040                  CMP     #SWR,R6 ;;DONE?
   735  002564  001374                          BNE     .-6             ;;LOOP BACK IF NO
   736  002566  012706  001000                  MOV     #1000,SP                ;;SETUP THE STACK POINTER
   737                                  ;;INITIALIZE A FEW VECTORS
   738  002572  012737  012326  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
   739  002600  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
   740  002606  012737  011632  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
   741  002614  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
   742  002622  012737  014232  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
   743  002630  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
   744  002636  012737  012150  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
   745  002644  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
   746  002652  016767  006602  006572          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
   747  002660  005067  176174                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
   748  002664  112767  000001  176123          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
   749  002672  012767  002672  176106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
   750  002700  012767  002700  176102          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
   751                                  ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
   752                                  ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
   753  002706  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
   754  002712  012737  002746  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
   755  002720  012767  177570  176112          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
   756  002726  012767  177570  176106          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
   757  002734  022777  177777  176076          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
   758  002742  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
   759                                                                  ;;AND  THE HARDWARE SWR IS NOT = -1
   760  002744  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
   761  002746  012716  002754          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
   762  002752  000002                          RTI
   763  002754  012767  000176  176056  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
   764  002762  012767  000174  176052          MOV     #DISPREG,DISPLAY
   765  002770  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
   766
   767  002774  005067  176074                  CLR     $PASS           ;;CLEAR PASS COUNT
   768  003000  132767  000200  176101          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
   769  003006  001403                          BEQ     67$             ;;YES,USE NON-APT SWITCH
   770  003010  012767  001110  176022          MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
   771  003016                          67$:
   772  003016  132767  000001  176062          BITB    #BIT0,$ENV      ;CHECK IF ON APT
   773  003024  001404                          BEQ     MANL            ;BR IF NOT APT
   774  003026  132767  000200  176053          BITB    #BIT7,$ENVM     ;DID APT SIZE
   775  003034  001056                          BNE     APTSZD          ;BR, IF APT SIZED
   776  003036  032777  000040  175774  MANL:   BIT     #BIT5,@SWR      ;WAS "$DEVM" MANUALLY SET?
   777  003044  001052                          BNE     APTSZD          ;IF YES, SKIP SELF-SIZING
   778
   779  003046  004767  177402          SIZE:   JSR     PC,DEVADR       ;GENERATE DEVICE ADDRESS TABLE
   780  003052  005067  177224                  CLR     TMP2            ;CLR TEMP LOCATION TO KEEP DEVICE COUNT
   781  003056  005067  176062                  CLR     $DEVM           ;CLEAR DEVICE MAP
   782  003062  013703  000004                  MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
```

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  783  003066  012737  003116  000004          MOV     #4$,@#4         ;SET TIMEOUT POINTER
  784  003074  016700  176042                  MOV     $BASE,R0        ;LOAD BASE ADDRESS
  785  003100  062700  000160                  ADD     #160,R0         ;POINT R0 TO UNIT #15 (UNIT#0=CONSOLE)
  786  003104  005710                  3$:     TST     (R0)            ;CHECK FOR DEVICE EXISTANCE
  787  003106  005267  176032                  INC     $DEVM           ;INDICATE DEVICE EXISTANCE IN DEVICE MAP
  788  003112  005267  177164                  INC     TMP2            ;INCREMENT DEVICE COUNT
  789  003116  012706  001000          4$:     MOV     #1000,SP                ;RESET STACK POINTER
  790  003122  006367  176016                  ASL     $DEVM           ;ADJUST DEVICE MAP FOR NEXT UNIT CHECK
  791  003126  162700  000010                  SUB     #10,R0          ;POINT R0 TO NEXT DEVICE NUMBER
  792  003132  026700  176004                  CMP     $BASE,R0        ;FINISHED SIZING?
  793  003136  003762                          BLE     3$              ;BR, IF BASE ADDRESS HAS NOT BEEN CHECKED
  794  003140  016700  177162                  MOV     CRCSR,R0        ;LOAD CONSOLE DEVICE ADDRESS
  795  003144  012737  003164  000004          MOV     #5$,@#4         ;SET UP TIMEOUT POINTER
  796  003152  005710                          TST     (R0)            ;TEST FOR CONSOLE EXISTANCE
  797  003154  005267  175764                  INC     $DEVM           ;INDICATE CONSOLE EXISTANCE IN DEVICE MAP
  798  003160  005267  177116                  INC     TMP2            ;INCREMENT DEVICE COUNT
  799  003164  010337  000004          5$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR
  800  003170  000415                          BR      VCTADR          ;BR TO GENERATE VECTOR ADDRESS TABLE
  801
  802  003172  005067  177104          APTSZD: CLR     TMP2            ;CLEAR TEMP LOCATION TO KEEP DEVICE CNT
  803  003176  016702  175742                  MOV     $DEVM,R2        ;MOVE DEVICE MAP TO R2
  804  003202  005702                  TSTDVM: TST     R2              ;TEST MSB OF DEVICE MAP
  805  003204  100002                          BPL     1$              ;BR, IF MSB IS ZERO
  806  003206  005267  177070                  INC     TMP2            ;INCREMENT DEVICE COUNT, IF MSB=1
  807  003212  006302                  1$:     ASL     R2              ;SHIFT NEXT BIT INTO MSB POSITION
  808  003214  001401                          BEQ     DVADT           ;BR, IF NO OTHER BITS ARE SET IN $DEVM
  809  003216  000771                          BR      TSTDVM          ;CONTINUE CHECKING $DEVM, IF MORE BITS SET
  810  003220  004767  177230          DVADT:  JSR     PC,DEVADR       ;GENERATE DEVICE ADDRESS TABLE
  811
  812                                  ;GENERATE VECTOR ADDRESS TABLE
  813
  814  003224  012702  002414          VCTADR: MOV     #VCTTBL,R2      ;GET LOCATION OF VECTOR TABLE
  815  003230  113700  001136                  MOVB    @#$VECT1,R0     ;COPY BASE VECTOR
  816  003234  042700  177400                  BIC     #177400,R0      ;CLEAR BYTE SIGN EXTENSION
  817  003240  010001                          MOV     R0,R1           ;
  818  003242  062701  000170                  ADD     #170,R1         ;POINT R1 TO LAST DEVICE VECTOR
  819  003246  010022          1$:     MOV     R0,(R2)+        ;PUT VECTOR ADDRESS IN TABLE
  820  003250  062700  000010                  ADD     #10,R0          ;POINT R0 TO NEXT VECTOR ADDRESS
  821  003254  020001                          CMP     R0,R1           ;FINISHED GENERATING VECTOR TABLE?
  822  003256  003773                          BLE     1$              ;BR, IF LAST VECTOR IS NOT LOADED
  823
  824                                  ;MOVE DEVICE COUNT INTO DEVICE COUNT MESSAGE
  825
  826  003260  016700  177016                  MOV     TMP2,R0         ;COPY DEVICE COUNT INTO R0
  827  003264  005001                          CLR     R1              ;CLEAR AUXILARY REGISTER
  828  003266  000300                          SWAB    R0              ;PUT DEVICE COUNT IN UPPER BYTE OF R0
  829  003270  006300                          ASL     R0              ;MOVE MSB OF COUNT INTO
  830  003272  006300                          ASL     R0              ;MSB OF R0
  831  003274  006300          SHIFT:  ASL     R0              ;PUT MSB OF COUNT INTO CARRY
  832  003276  106101                          ROLB    R1              ;MOVE MSB OF COUNT INTO R1
  833  003300  006300                          ASL     R0              ;MOVE NEXT BIT TO CARRY
  834  003302  106101                          ROLB    R1              ;MOVE INTO R1
  835  003304  006300                          ASL     R0              ;MOVE LAST BIT OF DIGIT
  836  003306  106101                          ROLB    R1              ;INTO R1
  837  003310  062701  000060                  ADD     #60,R1          ;CONVERT DIGIT TO ASCII
  838  003314  000301                          SWAB    R1              ;MOVE DIGIT TO UPPER BYTE
```

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                                                BIT     #BIT4,R1        ;HAVE BOTH DIGITS BEEN MOVED TO R1?
                                                BEQ     SHIFT           ;BR, IF NOT
                                                MOV     R1,M2A          ;MOVE DEVICE COUNT TO OUTPUT MESSAGE

                                BEGIN:          BIS     #BIT1,TMP3      ;SET UP BIT MASK TO TEST $DEVM FOR DEVICES EXCEPT CONSOL
                                                CLR     TMP1            ;CLEAR LOCATION TO STORE TABLE OFFSETS
                                                BIT     #BIT0,$DEVM     ;IS CONSOLE TO BE TESTED?
                                                BNE     TCONS           ;BR, IF CONSOLE IS TO BE TESTED
                                                BR      TSTDEV          ;BR, TO TEST OTHER DEVICES
                                TCONS:          INC     CTSTFL          ;INDICATE CONSOLE UNDER TEST
                                                MOV     #CRCSR,R0       ;SET UP CONSOLE DEVICE ADDRESSES
                                                MOV     #RCSR,R1        ;POINT R1 TO UUT ADDRESS TABLE
                                1$:             MOV     (R0)+,(R1)+     ;TRANSFER CONSOLE ADDRESSES
                                                CMP     #TPSW,R1        ;FINISHED TRANSFER?
                                                BGE     1$              ;BR, IF NOT
                                                JMP     TST1            ;GO TEST CONSOLE INTERFACE

                                ;PREPARE ADDRESSES AND VECTORS FOR UUT
                                TSTDEV:         BIT     TMP3,$DEVM      ;CHECK TO SEE IF DEVICE IS TO BE TESTED
                                                BNE     SETADR          ;BR, IF YES
                                                ASL     TMP3            ;SHIFT MASK TO CHECK NEXT $DEVM BIT
                                                ADD     #2,TMP1         ;INCREMENT TABLE INDEX
                                                INC     $UNIT           ;INCREMENT UNIT NUMBER
                                                BR      TSTDEV          ;GO TEST NEXT BIT OF DEVICE MAP

                                SETADR:         INC     $UNIT           ;UPDATE UNIT NUMBER
                                                ASL     TMP3            ;UPDATE DEVICE MAP TEST MASK
                                                MOV     TMP1,R2         ;MOVE TABLE OFFSET TO R2
                                                ADD     #2,TMP1         ;UPDATE TABLE OFFSET FOR NEXT DEVICE
                                                MOV     ADRTBL(R2),R0   ;PUT UUT ADDRESS INTO R0
                                                MOV     #RCSR,R1        ;POINT R1 TO STORAGE AREA FOR UUT ADDRESSES
                                ADR:            MOV     R0,(R1)+        ;TRANSFER UUT ADDRESS
                                                ADD     #2,R0           ;POINT TO NEXT UUT REGISTER
                                                BIT     R0,#6           ;FINISHED TRANSFER?
                                                BNE     ADR             ;BR, IF NOT

                                                MOV     VCTTBL(R2),R0   ;PUT UUT VECTOR INTO R0
                                VECT:           MOV     R0,(R1)+        ;TRANSFER UUT VECTORS TO ACTIVE TABLE AREA
                                                ADD     #2,R0           ;POINT TO NEXT VECTOR
                                                BIT     R0,#6           ;FINISHED TRANSFER?
                                                BNE     VECT            ;BR, IF NOT
                                                JMP     TST1            ;GO TEST DEVICE
```

```
                                        ;;*********************************************************************
                                        ;*TEST 1         TEST ABILITY TO REFERENCE TCSR
                                        ;;*********************************************************************
003526  000004                TST1:   SCOPE
003530  013703  000004                MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
003534  012737  003550  000004        MOV     #1$,@#4         ;SET UP TIMEOUT VECTOR
003542  005777  176544                TST     @TCSR           ;REFERENCE THE XMIT COMMAND/STATUS REG.
003546  000412                        BR      4$              ; GO TO END OF TEST

003550  022626                1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER TIMEOUT
003552  005767  176520                TST     CTSTFL          ;CHECK IF DEVICE IS CONSOLE
003556  001002                        BNE     2$              ;IF YES, SKIP ERROR TYPEOUT
003560  104001                        ERROR   1               ;REPORT ERROR TO APT & TTY
003562  000404                        BR      4$              ;BR TO END OF TEST
003564                          2$:
003564  004767  006726                JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
003570  000001                        1                               ;;THE ERROR NUMBER (FROM APT LIST)
003572  000000                3$:     HALT
003574  010337  000004        4$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR


                                        ;;*********************************************************************
                                        ;*TEST 2         TEST ABILITY TO REFERENCE TBUF
                                        ;;*********************************************************************
003600  000004                TST2:   SCOPE
003602  013703  000004                MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
003606  012737  003622  000004        MOV     #1$,@#4         ;SET UP TIMEOUT VECTOR
003614  005777  176474                TST     @TBUF           ;REFERENCE THE XMIT BUFFER
003620  000412                        BR      4$              ;GO TO END OF  TEST

003622  022626                1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER TIMEOUT
003624  005767  176446                TST     CTSTFL          ;CHECK IF DEVICE IS CONSOLE
003630  001002                        BNE     2$              ;IF YES, SKIP ERROR TYPEOUT
003632  104002                        ERROR   2               ;REPORT ERROR TO APT & TTY
003634  000404                        BR      4$              ;BR TO END OF TEST
003636                          2$:
003636  004767  006654                JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
003642  000002                        2                               ;;THE ERROR NUMBER (FROM APT LIST)
003644  000000                3$:     HALT
003646  010337  000004        4$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 3        TEST THAT TCSR BIT7(DONE) CLEARS WHEN XBUF IS LOADED
                                ;;*****************************************************************
003652  000004                  TST3:   SCOPE
003654  005077  176434                  CLR     @TBUF           ;LOAD XBUF
003660  105777  176426                  TSTB    @TCSR           ;CHECK DONE
003664  100016                          BPL     3$              ;BR IF CLEAR
                                                                ;FILL SECOND BUFFER, BECAUSE REFRESH COULD CAUSE
                                                                ;   FIRST TEST TO FAIL
003666  005077  176422                  CLR     @TBUF           ;FILL DOUBLE BUFFER
003672  105777  176414                  TSTB    @TCSR           ;CHECK DONE
003676  100011                          BPL     2$              ;BR IF CLEAR

003700  005767  176372                  TST     CTSTFL          ;CHECK IF DEVICE IS CONSOLE
003704  001002                          BNE     1$              ;IF YES, SKIP ERROR TYPEOUT
003706  104003                          ERROR   3               ;DONE NOT CLEARED WITH TBUF FULL
003710  000404                          BR      3$              ;BR TO END OF TEST
003712                          1$:
003712  004767  006600                  JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
003716  000003                          3                               ;;THE ERROR NUMBER (FROM APT LIST)
003720  000000                  2$:     HALT                    ;TCSR "DONE" NOT CLEARED WITH TBUF FULL
003722  005000                  3$:     CLR     R0              ;CLEAR TIMER
003724  105777  176362          4$:     TSTB    @TCSR           ;CHECK FOR XMIT DONE
003730  100414                          BMI     6$              ;IF DONE SETS, BR TO NEXT TEST
003732  005200                          INC     R0              ;INCREMENT TIMER
003734  001373                          BNE     4$              ;BR IF TIMER NOT DONE

003736  005767  176334                  TST     CTSTFL          ;CHECK IF DEVICE IS CONSOLE
003742  001002                          BNE     5$
003744  104004                          ERROR   4               ;TCSR "DONE" DOES NOT SET
003746  000405                          BR      6$              ;BR TO END OF TEST
003750                          5$:
003750  004767  006542                  JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
003754  000004                          4                               ;;THE ERROR NUMBER (FROM APT LIST)
003756  000000                          HALT
003760  000415                          BR      TST4            ;BR TO NEXT TEST, AND SKIP THE TYPEOUT THAT FOLLOWS
                                                                ;  BECAUSE OF THIS FAILURE

003762  005737  000042          6$:     TST     @#42            ;UNDER ACT11?
003766  001012                          BNE     TST4            ;IF YES, SKIP IDENT. TYPEOUT
003770  005767  175100                  TST     $PASS           ;IS THIS THE FIRST PASS?
003774  001007                          BNE     TST4            ;IF NOT BR TO NEXT TEST & SKIP THE IDENTIFICATION TYPEOU
003776  005767  175074                  TST     $DEVCT          ;IS THIS THE FIRST SUBPASS?
004002  001004                          BNE     TST4            ;IF NOT, BRTO NEXT TEST
004004  104401                          TYPE                    ;TYPE PROGRAM INDENTIFICATION
004006  021264                          M1
004010  104401                          TYPE                    ;TYPE NUMBER OF DEVICES UNDER TEST
004012  021306                          M2
```

E03


```
                                ;;*****************************************************************
                                ;*TEST 4         TEST THAT TCSR "DONE" SETS WITH RESET
                                ;;*****************************************************************
004014  000004                  TST4:   SCOPE
004016  005077  176272                  CLR     @TBUF           ;LOAD TRANSMIT BUFFER
004022  105777  176264          1$:     TSTB    @TCSR           ;WAIT FOR DONE
004026  100375                          BPL     1$
004030  005077  176260                  CLR     @TBUF           ;LOAD SECOND BUFFER
004034  000240                          NOP
004036  000005                          RESET                   ;CLEAR DONE WITH RESET
004040  105777  176246                  TSTB    @TCSR           ;CHECK FOR DONE SET
004044  100401                          BMI     TST5            ;BR TO NEXT TEST IF DONE SET

004046  104005                          ERROR   5               ;TCSR "DONE" DOES NOT SET WITH RESET


                                ;;*****************************************************************
                                ;*TEST 5         TEST ABILITY TO ACCESS RCSR
                                ;;*****************************************************************
004050  000004                  TST5:   SCOPE
004052  013703  000004                  MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
004056  012737  004072  000004          MOV     #1$,@#4         ;SET UP TIMEOUT VECTOR
004064  005777  176216                  TST     @RCSR           ;ACCESS RCSR
004070  000402                          BR      2$              ;BR TO END OF TEST

004072  022626          1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER TIMEOUT
004074  104006                  ERROR   6               ;CAN NOT ACCESS RCSR
004076  010337  000004  2$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 6         TEST ABILITY TO ACCESS RBUF
                                ;;*****************************************************************
004102  000004                  TST6:   SCOPE
004104  013703  000004                  MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
004110  012737  004124  000004          MOV     #1$,@#4         ;SET UP TIMEOUT VECTOR
004116  005777  176166                  TST     @RBUF           ;ACCESS RBUF
004122  000402                         BR      2$              ;BR TO END OF TEST

004124  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER TIMEOUT
004126  104007                          ERROR   7               ;CAN NOT ACCESS RBUF
004130  010337  000004          2$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR


                                ;;*****************************************************************
                                ;*TEST 7         TEST ABILITY TO ACCESS LKS
                                ;;*****************************************************************
004134  000004                  TST7:   SCOPE
004136  005767  176134                  TST     CTSTFL          ;IS CONSOLE UNDER TEST?
004142  001420                          BEQ     TST10           ;IF NOT, SKIP THIS TEST
004144  032777  000100  174666          BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
004152  001014                          BNE     TST10           ;IF YES, SKIP THIS TEST
004154  013703  000004                  MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
004160  012737  004174  000004          MOV     #1$,@#4         ;SET UP TIMEOUT VECTOR
004166  005777  176154                  TST     @LKS            ;ACCESS LKS
004172  000402                         BR      2$              ;NO TIMEOUT -  BR TO END OF TEST

004174  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER TIMEOUT
004176  104010                          ERROR   10              ;CAN NOT ACCESS LKS

004200  010337  000004          2$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR
```

```
                                        ;;*********************************************************************
                                        ;*TEST 10       TEST THAT BIT0(BREAK BIT) CAN BE SET & CLEARED & RESET
                                        ;;*********************************************************************
004204  000004                  TST10:  SCOPE
004206  032777  000400  174624          BIT     #BIT8,@SWR      ;IS BREAK FUNCTION ENABLED?
004214  001462                          BEQ     TST11           ;BR TO NEXT TEST, IF NOT
004216  000005                          RESET                   ;CLEAR EVERYTHING
004220  032777  000001  176064          BIT     #BIT0,@TCSR     ;CHECK BIT0 OF TCSR CLEAR
004226  001411                          BEQ     3$              ;BR IF CLEAR
004230  005767  176042                  TST     CTSTFL
004234  001002                          BNE     1$
004236  104011                          ERROR   11              ;BIT0 WAS NOT CLEAR AFTER RESET
004240  000404                          BR      3$
004242                          1$:
004242  004767  006250                  JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
004246  000011                          11                              ;;THE ERROR NUMBER (FROM APT LIST)
004250  000000                  2$:     HALT
004252  052777  000001  176032  3$:     BIS     #BIT0,@TCSR     ;SET BIT0 IN TCSR
004260  032777  000001  176024          BIT     #BIT0,@TCSR     ;TEST BIT0 OF TCSR
004266  001001                          BNE     4$              ;BR IF SET
004270  104012                          ERROR   12              ;BIT0 OF TCSR WILL NOT SET
004272  042777  000001  176012  4$:     BIC     #BIT0,@TCSR     ;CLEAR BIT0 OF TCSR
004300  032777  000001  176004          BIT     #BIT0,@TCSR     ;TEST BIT0 OF TCSR
004306  001411                          BEQ     7$
004310  005767  175762                  TST     CTSTFL
004314  001002                          BNE     5$
004316  104013                          ERROR   13              ;BIT0 OF TCSR WILL NOT CLEAR
004320  000404                          BR      7$
004322                          5$:
004322  004767  006170                  JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
004326  000013                          13                              ;;THE ERROR NUMBER (FROM APT LIST)
004330  000000                  6$:     HALT
004332  052777  000001  175752  7$:     BIS     #BIT0,@TCSR     ;SET BIT0 IN TCSR
004340  000005                          RESET                   ;CLEAR BIT0 WITH RESET
004342  032777  000001  175742          BIT     #BIT0,@TCSR     ;TEST BIT0 CLEAR
004350  001404                          BEQ     TST11           ;BR IF CLEAR
004352  042777  000001  175732          BIC     #BIT0,@TCSR     ;CLEAR BIT0, TO PRINT ERROR
004360  104014                          ERROR   14              ;RESET DID NOT CLEAR BIT0 OF TCSR
```

```
                                ;;*****************************************************************
                                ;*TEST 11       TEST THAT BIT2(MAINT. BIT) CAN BE SET & RESET
                                ;;*****************************************************************
004362  000004                  TST11:  SCOPE
004364  000005                          RESET                   ;CLEAR EVERYTHING
004366  032777  000004  175716          BIT     #BIT2,@TCSR     ;TEST FOR BIT2 OF TCSR CLEAR
004374  001411                          BEQ     3$              ;BR IF CLEAR

004376  005767  175674                  TST     CTSTFL          ;CHECK IF DEVICE IS CONSOLE
004402  001002                          BNE     1$              ;IF YES, SKIP ERROR TYPEOUT
004404  104015                          ERROR   15              ;BIT2 OF TCSR NOT CLEAR AFTER RESET
004406  000404                          BR      3$

004410                          1$:
004410  004767  006102                  JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
004414  000015                          15                              ;;THE ERROR NUMBER (FROM APT LIST)
004416  000000                  2$:     HALT

004420  052777  000004  175664  3$:     BIS     #BIT2,@TCSR     ;SET BIT2 OF TCSR
004426  032777  000004  175656          BIT     #BIT2,@TCSR     ;TEST FOR BIT2 SET
004434  001001                          BNE     4$              ;BR IF SET

004436  104016                          ERROR   16              ;BIT2 OF TCSR WILL NOT SET

004440  042777  000004  175644  4$:     BIC     #BIT2,@TCSR     ;CLEAR BIT2 OF TCSR
004446  032777  000004  175636          BIT     #BIT2,@TCSR     ;TEST BIT2 CLEAR
004454  001411                          BEQ     7$              ;BR IF CLEAR

004456  005767  175614                  TST     CTSTFL          ;CHECK IF DEVICE IS CONSOLE
004462  001002                          BNE     5$              ;IF YES, SKIP ERROR TYPEOUT
004464  104017                          ERROR   17
004466  000404                          BR      7$
004470                          5$:
004470  004767  006022                  JSR     PC,$ATY4                ;;ONLY REPORT A FATAL ERROR
004474  000017                          17                              ;;THE ERROR NUMBER (FROM APT LIST)
004476  000000                  6$:     HALT                    ;BIT0 OF TCSR WILL NOT CLEAR

004500  052777  000004  175604  7$:     BIS     #BIT2,@TCSR     ;SET BIT2 OF TCSR
004506  000005                          RESET                   ;CLEAR BIT2 WITH RESET
004510  032777  000004  175574          BIT     #BIT2,@TCSR     ;TEST FOR BIT2 CLEAR
004516  001404                          BEQ     TST12           ;IF CLEAR, GO TO NEXT TEST

004520  042777  000004  175564          BIC     #BIT2,@TCSR     ;CLEAR BIT2, TO PRINT ERROR
004526  104020                          ERROR   20
                                                                ;RESET DID NOT CLEAR BIT2 OF TCSR
```

```
                                ;;*****************************************************************
                                ;*TEST 12       TEST THAT BIT6(XMIT INT EN) CAN BE SET & RESET
                                ;;*****************************************************************
004530  000004                  TST12:  SCOPE
004532  000005                          RESET                   ;CLEAR EVERYTHING
004534  017703  175562                  MOV     @TVECT,R3       ;SAVE XMIT VECTOR
004540  012777  004570  175554          MOV     #1$,@TVECT      ;SET UP INTERRUPT VECTOR FOR ERROR REPORT
004546  004767  005016                  JSR     PC,NRPSW                ;SET PSW TO PRIORITY=7
004552  000340                          .WORD   340
004554  032777  000100  175530          BIT     #BIT6,@TCSR     ;TEST BIT6 OF TCSR
004562  001404                          BEQ     2$              ;BR IF ZERO
004564  104021                          ERROR   21
                                                                ;BIT6 IN TCSR NOT CLEAR AFTER RESET
004566  000402                          BR      2$

004570  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
004572  104022                          ERROR   22
                                                                ;XMIT INTERRUPT OCCURRED  PRIO=7

004574  052777  000100  175510  2$:     BIS     #BIT6,@TCSR     ;SET BIT6 OF TCSR
004602  032777  000100  175502          BIT     #BIT6,@TCSR     ;TEST BIT6 OF TCSR
004610  001001                          BNE     3$              ;BR, IF SET

004612  104023                          ERROR   23
                                                                ;CANNOT SET BIT6 OF TCSR

004614  042777  000100  175470  3$:     BIC     #BIT6,@TCSR     ;CLEAR BIT6 OF TCSR
004622  032777  000100  175462          BIT     #BIT6,@TCSR     ;TEST BIT6 OF TCSR
004630  001401                          BEQ     4$              ;BR IF CLEAR
004632  104024                          ERROR   24
                                                                ;CANNOT CLEAR BIT6 OF TCSR

004634  052777  000100  175450  4$:     BIS     #BIT6,@TCSR     ;SET BIT6 OF TCSR
004642  000005                          RESET                   ;CLEAR BIT6 WITH RESET
004644  032777  000100  175440          BIT     #BIT6,@TCSR     ;TEST BIT6 OF TCSR
004652  001401                          BEQ     5$              ;BR IF CLEAR

004654  104025                          ERROR   25
                                                                ;CANNOT CLEAR BIT6 OF TCSR WITH RESET
004656  010377  175440          5$:     MOV     R3,@TVECT       ;RESTORE XMIT VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 13       TEST THAT BIT6 OF RCSR CAN BE SET & RESET
                                ;;*****************************************************************
004662  000004            TST13:  SCOPE
004664  000005                    RESET                   ;CLEAR EVERYTHING
004666  017703  175424            MOV     @RVECT,R3       ;SAVE RECEIVE VECTOR
004672  012777  004722  175416    MOV     #1$,@RVECT      ;SET UP INTERRUPT VECTOR FOR ERROR REPORT
004700  004767  004664            JSR     PC,WRPSW        ;SET PSW TO PRIORITY=7
004704  000340                    .WORD   340
004706  032777  000100  175372    BIT     #BIT6,@RCSR     ;TEST BIT6 OF RCSR
004714  001404                    BEQ     2$
004716  104026                    ERROR   26
                                                        ;BIT6 OF RCSR NOT CLEAR AFTER RESET
004720  000402                    BR      2$

004722  022626            1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
004724  104027                    ERROR   27
                                                        ;RCVR INTERRUPT WITH PRIORITY=7
004726  052777  000100  175352  2$:     BIS     #BIT6,@RCSR     ;SET BIT6 OF RCSR
004734  032777  000100  175344        BIT     #BIT6,@RCSR     ;TEST BIT6 OF RCSR
004742  001001                    BNE     3$              ;BR, IF SET

004744  104030                    ERROR   30
                                                        ;CANNOT SET BIT6 OF RCSR

004746  042777  000100  175332  3$:     BIC     #BIT6,@RCSR     ;CLEAR BIT6 OF RCSR
004754  032777  000100  175324        BIT     #BIT6,@RCSR     ;TEST BIT6 OF RCSR
004762  001401                    BEQ     4$              ;BR, IF CLEAR

004764  104031                    ERROR   31
                                                        ;CANNOT CLEAR BIT6 OF RCSR

004766  052777  000100  175312  4$:     BIS     #BIT6,@RCSR     ;SET BIT6 OF RCSR
004774  000005                    RESET                   ;CLEAR BIT6OF RCSR WITH RESET
004776  032777  000100  175302        BIT     #BIT6,@RCSR     ;TEST BIT6 OF RCSR
005004  001401                    BEQ     5$              ;BR, IF CLEAR

005006  104032                    ERROR   32
                                                        ;CANNOT CLEAR BIT6 OF RCSR WITH RESET
005010  010377  175302        5$:     MOV     R3,@RVECT       ;RESTORE RECEIVE VECTOR
```

```
                        ;;*****************************************************************
                        ;*TEST 14       TEST THAT BIT6 OF LKS CAN BE SET & RESET
                        ;;*****************************************************************
005014  000004          TST14:  SCOPE
005016  005767  175254          TST     CTSTFL          ;IS CONSOLE UNDER TEST?
005022  001460          TST15   BEQ     TST15           ;IF NOT, SKIP THIS TEST
005024  032777  000100  174006  BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
005032  001054          BNE     TST15           ;IF YES, SKIP THIS TEST
005034  000005          RESET
005036  017703  175306  MOV     @RTCVT,R3       ;SAVE LINE CLOCK VECTOR
005042  012777  005072  175300  MOV     #1$,@RTCVT      ;SET UP INTERRUPT VECTOR FOR ERROR REPORT
005050  004767  004514  JSR     PC,ARPSW        ;SET PSW TO PRIORITY 7
005054  000340                  .WORD   340
005056  032777  000100  175262  BIT     #BIT6,@LKS      ;TEST BIT6 OF LKS
005064  001404          BEQ     2$
005066  104033          ERROR   33
                                                ;BIT6 OF LKS NOT CLEAR AFTER RESET
005070  000402          BR      2$

005072  022626          1$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
005074  104034          ERROR   34
                                                ;LKS INTERRUPT WITH PRIORITY=7

005076  052777  000100  175242  2$:     BIS     #BIT6,@LKS      ;SET BIT6 OF LKS
005104  032777  000100  175234          BIT     #BIT6,@LKS      ;TEST BIT6 OF LKS
005112  001001          BNE     3$              ;BR IF SET

005114  104035          ERROR   35
                                                ;CANNOT SET BIT6 OF LKS

005116  042777  000100  175222  3$:     BIC     #BIT6,@LKS      ;CLEAR BIT6 OF LKS
005124  032777  000100  175214          BIT     #BIT6,@LKS      ;TEST BIT6 OF LK
005132  001401          BEQ     4$
005134  104036          ERROR   36
                                                ;CANNOT CLEAR BIT6 OF LKS
005136  052777  000100  175202  4$:     BIS     #BIT6,@LKS      ;SET BIT6 OF LKS
005144  000005          RESET                   ;CLEAR BIT6 OF LKS WITH RESET
005146  032777  000100  175172          BIT     #BIT6,@LKS      ;TEST BIT6 OF LKS
005154  001401          BEQ     5$              ;BR IF CLEAR

005156  104037          ERROR   37
                                                ;CANNOT CLEAR BIT6 OF LKS WITH RESET
005160  010377  175164  5$:     MOV     R3,@RTCVT       ;RESTORE LINE CLOCK VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 15       TEST THAT REGISTERS CAN NOT BE ADDRESSES AS ANYTHING BUT 17XXXX
                                ;;*****************************************************************
005164  000004                  TST15:  SCOPE
005166  013703  000004                  MOV     @#4,R3          ;SAVE TIMEOUT VECTOR
005172  013704  000006                  MOV     @#6,R4          ;SAVE TIMEOUT PSW
005176  012737  005250  000004          MOV     #2$,@#4         ;SET UP TIMEOUT VECTOR
005204  012737  000340  000006          MOV     #340,@#6        ;KEEP PRIO=7
005212  000005                        RESET                   ;CLEAR EVERYTHING
005214  012700  000002                  MOV     #BIT1,R0        ;SET UP BIT MASK
005220  016767  175062  173574  1$:     MOV     RCSR,$BDADR     ;MOVE GOOD RCSR ADDRESS INTO TEST ADDRESS
005226  040067  173570                  BIC     R0,$BDADR       ;CREATE BAD ADDRESS BY COMPLEMENTING ONE BIT
005232  026767  175050  173562          CMP     RCSR,$BDADR     ;ARE ADDRESSES IDENTICAL\
005240  001415                          BEQ     3$              ;IF YES,DO NOT TEST THIS ADDRESS
005242  052777  000100  173552          BIS     #BIT6,@$BDADR   ;SET BIT6 USING BAD ADDRESS
005250  032777  000100  175030  2$:     BIT     #BIT6,@RCSR     ;CHECK TO SEE IF GOOD ADDRESS CONTAINS BIT6
005256  001014                          BNE     4$              ;BR IF SET ---> ERROR
005260  022706  001000                  CMP     #1000,SP                ;DID TEST CAUSE A TIMEOUT?
005264  001003                          BNE     3$              ;IF YES, SKIP RESTORE OF MEMORY
005266  042777  000100  173526          BIC     #BIT6,@$BDADR   ;RESTORE ANY MEMORY LOCATION THAT WAS ALTERED
005274  012706  001000          3$:     MOV     #1000,SP                ;RESTORE SP IN CASE A TIMEOUT OCCURRED
005300  006300                          ASL     R0              ;SHIFT BIT MASK TO NEXT POSITION
005302  005700                          TST     R0              ;COMPLEMENTED ALL BITS FROM 1 - 15?
005304  001345                          BNE     1$              ;BR, IF NOT
005306  000403                          BR      5$              ;BR TO NEXT TEST

005310  012706  001000          4$:     MOV     #1000,SP                ;RESET STACK PIONTER
005314  104040                          ERROR   40
005316  010337  000004          5$:     MOV     R3,@#4          ;RESTORE TIMEOUT VECTOR
005322  010437  000006                  MOV     R4,@#6          ;RESTORE TIMEOUT PSW
```

```
                                        ;;*****************************************************************
                                        ;*TEST 16       TEST THAT BIT7 OF LKS SETS & CAN BE CLEARED
                                        ;;*****************************************************************
005326  000004                  TST16:  SCOPE
005330  005767  174742                  TST     CTSTFL          ;IS CONSOLE UNDER TEST?
005334  001431                  BEQ     TST17           ;IF NOT, SKIP THIS TEST
005336  032777  000100  173474          BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
005344  001025                  BNE     TST17           ;IF YES, SKIP THIS TEST
005346  000005                  RESET                   ;CLEAR EVERYTHING & SET BIT7 OF LKS
005350  000240                  NOP
005352  105777  174770          1$:     TSTB    @LKS            ;TEST FOR BIT7 OF LKS
005356  100401                  BMI     2$              ;BR IF SET
005360  104041                  ERROR   41              ;BIT7 OF LKS DID NOT SET WITH RESET
005362  042777  000200  174756  2$:     BIC     #BIT7,@LKS      ;CLEAR BIT7 OF LKS
005370  032777  000200  174750          BIT     #BIT7,@LKS      ;TEST BIT7 OF LKS
005376  001401                  BEQ     3$

005400  104042                  ERROR   42
                                                        ;CAN NOT CLEAR BIT7 OF LKS
005402  005000                  3$:     CLR     R0              ;CLEAR TIMER
005404  105777  174736          CONT:   TSTB    @LKS            ;TEST FOR BIT7 OF LKS
005410  100403                  BMI     TST17           ;BR, IF SET
005412  005200                  INC     R0              ;INCREMENT TIMER
005414  001373                  BNE     CONT            ;CONTINUE UNTIL TIME EXPIRES

005416  104043                  ERROR   43              ;BIT7 OF LKS DOES NOT SET
```

```
                        ;;*****************************************************************
                        ;*TEST 17       TEST THAT THE REAL TIME CLOCK INTERRUPTS PROPERLY
                        ;;*****************************************************************
005420 000004           TST17:  SCOPE
005422 005767 174650            TST     CTSTFL          ;IS CONSOLE UNDER TEST?
005426 001477                   BEQ     TST20           ;IF NOT, SKIP THIS TEST
005430 032777 000100 173402     BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
005436 001073                   BNE     TST20           ;IF YES, SKIP THIS TEST
005440 004767 004124            JSR     PC,WRPSW        ;SET PSW TO PRIORITY 7
005444 000340                   .WORD   340
005446 017703 174676            MOV     @RTCVT,R3       ;SAVE LINE CLOCK VECTOR
005452 012777 005514 174670     MOV     #2$,@RTCVT      ;SET RTC INTERRUPT VECTOR TO ERROR REPORT
005460 012777 000340 174664     MOV     #340,@RTCPSW    ;KEEP PRIORITY AT 7
005466 052777 000100 174652     BIS     #BIT6,@LKS      ;SET INTERRUPT ENABLE
005474 042777 000200 174644     BIC     #BIT7,@LKS      ;CLEAR CLOCK DONE FLAG
005502 105777 174640    1$:     TSTB    @LKS            ;WAIT FOR RTC DONE(INTERRUPT REQUEST)
005506 100375                   BPL     1$
005510 000240                   NOP                     ;GIVE TIME FOR ANY INTERRUPTS
005512 000402                   BR      3$              ;BR, IF NO INTERRUPT OCCURS

005514 022626           2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
005516 104044                   ERROR   44              ;RTC INTERRUPTS AT PRIORITY 7

005520 005077 174622    3$:     CLR     @LKS    ;DISABLE RTC INTERRUPTS & CLEAR DONE
005524 012777 005552 174616     MOV     #4$,@RTCVT      ;SET RTC INTERRUPT VECTOR FOR ERROR
005532 004767 004032            JSR     PC,WRPSW        ;CHANGE PSW TO PRIORITY 5
005536 000240                   .WORD   240
005540 105777 174602    20$:    TSTB    @LKS            ;WAIT FOR DONE (NTERRUPT REQUEST)
005544 100375                   BPL     20$
005546 000240                   NOP                     ;GIVE TIME FOR ANY INTERRUPT
005550 000402                   BR      5$              ;IF NO INTERRUPT - BR TO CONTINUE TEST

005552 022626           4$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
005554 104045                   ERROR   45              ;RTC INTERRUPTS WITH INTERRUPTS DISABLED

005556 012777 005612 174564 5$: MOV     #7$,@RTCVT      ;POINT RTC VECTOR TO END OF TEST
005564 052777 000100 174554     BIS     #BIT6,@LKS      ;ALLOW INTERRUPTS
005572 042777 000200 174546     BIC     #BIT7,@LKS      ;CLEAR CLOCK DONE FLAG
005600 105777 174542    6$:     TSTB    @LKS            ;WAIT FOR RTC DONE
005604 100375                   BPL     6$
005606 000240                   NOP                     ;GIVE TIME FOR INTERRUPT

005610 104046                   ERROR   46              ;RTC INTERRUPT DID NOT OCCUR

005612 022626           7$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
005614 042777 000100 174524     BIC     #BIT6,@LKS      ;DISABLE INTERRUPTS
005622 010377 174522            MOV     R3,@RTCVT       ;RESTORE LINE CLOCK VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 20       TEST RTC FOR DOUBLE INTERRUPTS
                                ;;*****************************************************************
005626  000004                  TST20:  SCOPE
005630  005767  174442                  TST     @TSTFL          ;IS CONSOLE UNDER TEST?
005634  001453                  BEQ     TST21           ;IF NOT, SKIP THIS TEST
005636  032777  000100  173174  BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
005644  001047                  BNE     TST21           ;IF YES, SKIP THIS TEST
005646  000005                  RESET                   ;CLEAR EVERYTHING
005650  017703  174474          MOV     @RTCVT,R3       ;SAVE LINE CLOCK VECTOR
005654  012777  005724  174466  MOV     #2$,@RTCVT      ;SET UP RTC INTERRUPT VECTOR
005662  012777  000340  174462  MOV     #340,@RTCPSW    ;DISALLOW INTERRUPTS AFTER THE INTERRUPT
005670  004767  003674          JSR     PC,WRPSW        ;SET PRIORITY TO 5
005674  000240                          .WORD   240
005676  052777  000100  174442  BIS     #BIT6,@LKS      ;ENABLE CLOCK INTERRUPTS
005704  042777  000200  174434  BIC     #BIT7,@LKS      ;CLEAR CLOCK DONE FLAG
005712  105777  174430          1$:     TSTB    @LKS            ;WAIT FOR DONE
005716  100375                  BPL     1$
005720  000240                  NOP                     ;GIVE TIME FOR ANY INTERRUPT
005722  104047                  ERROR   47              ;RTC INTERRUPT DID NOT OCCUR
005724  022626                  2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
005726  012777  005746  174414  MOV     #3$,@RTCVT      ;POINT RTC VECTOR TO ERROR REPORT
005734  004767  003630          JSR     PC,WRPSW        ;SET PSW TO PRIORITY 5
005740  000240                          .WORD   240
005742  000240                  NOP                     ;GIVE SOME TIME FOR AN INTERRUPT
005744  000402                  BR      4$              ;NO INTERRUPT - BR TO END OF TEST
005746  022626                  3$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
005750  104050                  ERROR   50              ;INTERRUPT SEQUENCE DID NOT CLEAR
                                                        ;INTERRUPT REQUEST
005752  042777  000100  174366  4$:     BIC     #BIT6,@LKS      ;DISABLE CLOCK INTERRUPTS
005760  010377  174364          MOV     R3,@RTCVT       ;RESTORE LINE CLOCK VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 21       TEST THAT INTERRUPT CLEARS WITH RESET
                                ;;*****************************************************************
005764  000004                  TST21:  SCOPE
005766  005767  174304                  TST     @TSTFL          ;IS CONSOLE UNDER TEST?
005772  001442                  BEQ     TST22           ;IF NOT, SKIP THIS TEST
005774  032777  000100  173036  BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
006002  001036                  BNE     TST22           ;IF YES, SKIP THIS TEST
006004  004767  003560          JSR     PC,WRPSW        ;SET PRIORITY TO 7
006010  000340                  .WORD   340
006012  017703  174332          MOV     @RTCVT,R3       ;SAVE LINE CLOCK VECTOR
006016  012777  006070  174324  MOV     #2$,@RTCVT      ;POINT RTC VECTOR TO ERROR REPORT
006024  052777  000100  174314  BIS     #BIT6,@LKS      ;ENABLE CLOCK INTERRUPTS
006032  042777  000200  174306  BIC     #BIT7,@LKS      ;CLEAR CLOCK DONE FLAG
006040  105777  174302  1$:     TSTB    @LKS            ;WAIT FOR DONE (INTERRUPT REQUEST)
006044  100375                  BPL     1$
006046  000005                  RESET                   ;CLEAR PENDING INTERRUPT WITH RESET
006050  004767  003514          JSR     PC,WRPSW        ;SET PRIORITY TO 5
006054  000240                  .WORD   240
006056  000240                  NOP                     ;GIVE TIME FOR ANY INTERRUPT
006060  042777  000100  174260  BIC     #BIT6,@LKS      ;DISALLOW INTERRUPTS
006066  000402                  BR      3$              ;BR TO END OF TEST

006070  022626          2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006072  104051                  ERROR   51              ;RESET DID NOT CLEAR INTERRUPT

006074  010377  174250  3$:     MOV     R3,@RTCVT       ;RESTORE LINE CLOCK VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 22       TEST THAT RTC INTERRUPT CLEARS BY CLEARING BIT7 OF LKS
                                ;;*****************************************************************
006100 000004                   TST22:  SCOPE
006102 005767 174170                    TST     CTSTFL          ;IS CONSOLE UNDER TEST?
006106 001444                           BEQ     TST23           ;IF NOT, SKIP THIS TEST
006110 032777 000100 172722             BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
006116 001040                           BNE     TST23           ;IF YES, SKIP THIS TEST
006120 004767 003444                    JSR     PC,WRPSW        ;SET PRIORITY TO 7
006124 000340                                   .WORD   340
006126 017703 174216                    MOV     @RTCVT,R3       ;SAVE LINE CLOCK VECTOR
006132 012777 006210 174210             MOV     #2$,@RTCVT      ;POINT RTC VECTOR TO ERROR REPORT
006140 052777 000100 174200             BIS     #BIT6,@LKS      ;ENABLE CLOCK INTERRUPTS
006146 042777 000200 174172             BIC     #BIT7,@LKS      ;CLEAR CLOCK DONE FLAG
006154 105777 174166            1$:     TSTB    @LKS            ;WAIT FOR DONE (INTERRUPT REQUEST)
006160 100375                           BPL     1$
006162 042777 000200 174156             BIC     #BIT7,@LKS      ;CLEAR DONE & INTERRUPT
006170 004767 003374                    JSR     PC,WRPSW        ;ALLOW INTERRUPTS
006174 000240                                   .WORD   240
006176 000240                           NOP                     ;GIVE TIME FOR ANY INTERRUPT
006200 042777 000100 174140             BIC     #BIT6,@LKS      ;DISALLOW INTERRUPTS
006206 000402                           BR      3$              ;BR TO END OF TEST

006210 022626                   2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006212 104052                           ERROR   52              ;CLEARING BIT7 OF LKS DID NOT CLEAR INTERRUPT

006214 010377 174130            3$:     MOV     R3,@RTCVT       ;RESTORE LINE CLOCK VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 23       TEST CLOCK REPEATABILITY
                                ;;*****************************************************************
006220  000004                  TST23:  SCOPE
006222  005767  174050                  TST     CTSTFL          ;IS CONSOLE UNDER TEST?
006226  001452                  BEQ     TST24           ;IF NOT, SKIP THIS TEST
006230  032777  000100  172602          BIT     #BIT6,@SWR      ;ARE LINE CLOCK TESTS INHIBITED?
006236  001046                  BNE     TST24           ;IF YES, SKIP THIS TEST

006240  005000                  CLR     R0              ;CLEAR A TIMER
006242  012701  177777          MOV     #-1,R1          ;SET A FLAG INDICATING FIRST PASS THRU THIS LOOP
006246  005002          1$:     CLR     R2              ;CLEAR CLOCK COUNTER
006250  005077  174072          CLR     @LKS            ;CLEAR DONE
006254  105777  174066  2$:     TSTB    @LKS            ;SYNC ON DONE
006260  100375                  BPL     2$
006262  005077  174060          CLR     @LKS            ;CLEAR DONE
006266  105777  174054  3$:     TSTB    @LKS            ;IS CLOCK DONE?
006272  100003                  BPL     4$              ;BR IF NOT , TO INCREMENT TIMER
006274  005202                  INC     R2              ;IF DONE, INCREMENT CLOCK COUNT
006276  005077  174044          CLR     @LKS            ;CLEAR DONE
006302  005200          4$:     INC     R0              ;INCREMENT TIMER
006304  001370                  BNE     3$              ;BR IF TIME REMAINS
006306  005201                  INC     R1              ;INCREMENT LOOP PASS FLAG
006310  001003                  BNE     CMPARE          ;BR IF TWO PASSES HAVE BEEN MADE
006312  010267  000032          MOV     R2,FIRST        ;IF NOT, STORE FIRST CLOCK COUNT
006316  000753                  BR      1$              ;DO LOOP AGAIN
006320  016701  000024  CMPARE: MOV     FIRST,R1        ;RECALL FIRST CLOCK COUNT
006324  160201                  SUB     R2,R1           ;CALCULATE DIFFERENCE OF TWO COUNTS
006326  100001                  BPL     TOLER           ;IF POSITIVE,SKIP NEGATION OF DIFFERENCE
006330  005401                  NEG     R1              ;MAKE DIFFERENCE A POSITIVE NUMBER
006332  020127  000000  TOLER:  CMP     R1,#0           ;COMPARE DIFFERENCE WITH DESIRED TOLERANCE
006336  003406                  BLE     TST24           ;BR, IF LOWER/EQUAL TO TOLERANCE

006340  010267  000006          MOV     R2,SECND        ;STORE SECOND COUNT
006344  104053                  ERROR   53              ;CLOCK REPEATABILITY ERROR

006346  000402                  BR      TST24
006350  000000          FIRST:  .WORD   0
006352  000000          SECND:  .WORD   0
```

F04


```
                                ;;*****************************************************************
                                ;*TEST 24       TEST THAT XMIT INTERRUPTS ONLY WHEN ENABLED
                                ;;*****************************************************************
006354  000004                  TST24:  SCOPE
006356  042777  000100  173726          BIC     #BIT6,@TCSR     ;CLEAR TRANSMIT INTERRUPT ENABLE
006364  105777  173722          1$:     TSTB    @TCSR           ;WAIT FOR DONE
006370  100375                          BPL     1$
006372  017703  173724                  MOV     @TVECT,R3       ;SAVE XMIT VECTOR
006376  012777  006420  173716          MOV     #2$,@TVECT      ;POINT XMIT VECTOR TO ERROR REPORT
006404  005077  173714                  CLR     @TPSW
006410  004767  003154                  JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
006414  000140                          .WORD   140
006416  000402                          BR      3$

006420  022626                  2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006422  104054                          ERROR   54
                                                                ;XMIT INTERRUPTS WITH INTERRUPT ENABLE CLEAR
006424  012777  006444  173670  3$:     MOV     #4$,@TVECT      ;SET XMIT VECTOR TO END OF TEST
006432  052777  000100  173652          BIS     #BIT6,@TCSR     ;ENABLE INTERRUPTS
006440  000240                          NOP

006442  104055                          ERROR   55              ;XMIT DID NOT INTERRUPT

006444  042777  000100  173640  4$:     BIC     #BIT6,@TCSR     ;DISABLE INTERRUPTS
006452  022626                          CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006454  010377  173642                  MOV     R3,@TVECT       ;RESTORE XMIT VECTOR
```

```
1542
1543                                    ;;#################################################################
1544                                    ;;#TEST 25       TEST THAT XMIT INTERRUPTS DO NOT OCCUR WHEN DISABLED
1545                                    ;;#################################################################
1546  006460  000004                    TST25:  SCOPE
1547  006462  042777  000100  173622            BIC     #BIT6,@TCSR     ;DISABLE INTERRUPTS
1548  006470  004767  003074                    JSR     PC,WRPSW        ;SET PSW TO PRIORITY 7
1549  006474  000340                                    ,WORD   340
1550  006476  017703  173620                    MOV     @TVECT,R3       ;SAVE XMIT VECTOR
1551  006502  012777  006530  173612            MOV     #2$,@TVECT      ;POINT XMIT VECTOR TO ERROR REPORT
1552  006510  105777  173576          1$:       TSTB    @TCSR           ;WAIT FOR DONE
1553  006514  100375                            BPL     1$
1554  006516  052777  000100  173566            BIS     #BIT6,@TCSR     ;ENABLE INTERRUPT
1555  006524  000240                            NOP
1556  006526  000402                            BR      3$              ;CONTINUE TEST
1557
1558  006530  022626                  2$:       CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
1559  006532  104056                            ERROR   56
1560                                                                    ;XMIT INTERRUPTS AT PRIORITY=7
1561  006534  042777  000100  173550  3$:       BIC     #BIT6,@TCSR     ;CLEAR INTERRUPT ENABLE
1562  006542  012777  006562  173552            MOV     #4$,@TVECT      ;POINT XMIT VECTOR TO ERROR REPORT
1563  006550  004767  003014                    JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
1564  006554  000140                                    .WORD   140
1565  006556  000240                            NOP
1566  006560  000402                            BR      5$              ;BR TO END OF TEST-NO INTERRUPT
1567
1568  006562  022626                  4$:       CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
1569  006564  104057                            ERROR   57
1570                                                                    ;XMIT INTERRUPT OCCURES WITH BIT6 CLEAR
1571  006566  010377  173530          5$:       MOV     R3,@TVECT       ;RESTORE XMIT VECTOR
```

```
                                        ;;*****************************************************************
                                        ;*TEST 26       TEST TRANSMITTER FOR DOUBLE INTERRUPTS
                                        ;;*****************************************************************
006572  000004                  TST26:  SCOPE
006574  042777  000100  173510          BIC     #BIT6,@TCSR     ;CLEAR INTERRUPT ENABLE
006602  017703  173514                  MOV     @TVECT,R3       ;SAVE XMIT VECTOR
006606  012777  006642  173506          MOV     #2$,@TVECT      ;SET UP XMIT VECTOR
006614  004767  002750                  JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
006620  000140                          .WORD   140
006622  105777  173464          1$:     TSTB    @TCSR           ;WAIT FOR DONE
006626  100375                          BPL     1$
006630  052777  000100  173454          BIS     #BIT6,@TCSR     ;ENABLE INTERRUPTS
006636  000240                          NOP
006640  104060                          ERROR   60
                                                                ;XMIT INTERRUPT DID NOT OCCUR
006642  022626                  2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006644  012777  006664  173450          MOV     #4$,@TVECT      ;POINT XMIT VECTOR TO ERROR
006652  000240                          NOP
006654  042777  000100  173430          BIC     #BIT6,@TCSR     ;DISABLE INTERRUPTS
006662  000402                          BR      5$              ;BR TO END OF TEST
006664  022626                  4$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006666  104061                          ERROR   61
                                                                ;XMIT RE-INTERRUPTED
006670  010377  173426          5$:     MOV     R3,@TVECT       ;RESTORE XMIT VECTOR
                                        ;;*****************************************************************
                                        ;*TEST 27       TEST THAT XMIT INTERRUPT CLEARS WITH LOADING TBUF
                                        ;;*****************************************************************
006674  000004                  TST27:  SCOPE
006676  042777  000100  173406          BIC     #BIT6,@TCSR     ;DISABLE INTERRUPTS
006704  004767  002660                  JSR     PC,WRPSW        ;SET PSW TO PRIORITY 7
006710  000340                          .WORD   340
006712  052777  000100  173372          BIS     #BIT6,@TCSR     ;ENABLE INTERRUPTS
006720  017703  173376                  MOV     @TVECT,R3       ;SAVE XMIT VECTOR
006724  012777  006770  173370          MOV     #2$,@TVECT      ;POINT XMIT VECTOR TO ERROR
006732  005077  173356                  CLR     @TBUF           ;LOAD TBUF
006736  105777  173350          1$:     TSTB    @TCSR           ;WAIT FOR DONE (INTERRUPT)
006742  100375                          BPL     1$
006744  005077  173344                  CLR     @TBUF           ;FILL SECOND BUFFER TO RESET INT.
006750  004767  002614                  JSR     PC,WRPSW        ;ALLOW INTERRUPTS
006754  000140                          .WORD   140
006756  000240                          NOP
006760  042777  000100  173324          BIC     #BIT6,@TCSR     ;DISABLE INTERRUPTS
006766  000402                          BR      3$              ;BR TO END OF TEST
006770  022626                  2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
006772  104062                          ERROR   62
                                                                ;LOADING TBUF DID NOT CLEAR INTERRUPT.
006774  010377  173322          3$:     MOV     R3,@TVECT       ;RESTORE XMIT VECTOR
```

```
                        ;;=================================================================
                        ;*TEST 30       TEST THAT RCVR ACTIVE (BIT11) OF RCSR SETS WHILE RECEIVING
                        ;;=================================================================
007000  000004          TST30:  SCOPE
007002  000005                  RESET                           ;CLEAR EVERYTHING
007004  052777  000004  173300  BIS     #BIT2,@TCSR             ;SET MAINTENANCE WRAP
007012  005077  173276          CLR     @TBUF                   ;LOAD TRANSMIT BUFFER
007016  005000                  CLR     R0                      ;CLEAR A TIMER
007020  032777  004000  173260  WACTV:  BIT     #BIT11,@RCSR    ;TEST RCVR ACTIVE BIT
007026  001006                  BNE     2$                      ;BR IF SET
007030  005200                  INC     R0                      ;INCREMENT TIMER IF NOT SET
007032  001372                  BNE     WACTV                   ;CONTINUE WAIT IF TIME REMAINS
007034  042777  000004  173250  BIC     #BIT2,@TCSR             ;CLEAR MAINTENANCE BIT

007042  104063                  ERROR   63                      ;RCVR ACTIVE DID NOT SET WHILE RECEIVING

007044  005000          2$:     CLR     R0                      ;CLEAR TIMER
007046  105777  173234  WDONE:  TSTB    @RCSR                   ;CHECK FOR RECEIVER DONE
007052  100406                  BMI     3$                      ;BR IF DONE
007054  005200                  INC     R0                      ;INCREMENT TIMER, IF NOT DONE
007056  001373                  BNE     WDONE                   ;CONTINUE WAIT IF TIME REMAINS
007060  042777  000004  173224  BIC     #BIT2,@TCSR             ;CLEAR MAINTENANCE BIT
007066  104064                  ERROR   64
                                                                ;RECEIVER DONE NEVER SET

007070  032777  004000  173210  3$:     BIT     #BIT11,@RCSR    ;CHECK FOR RCVR ACTIVE CLEAR
007076  001404                  BEQ     4$                      ;BR IF CLEAR
007100  042777  004000  173200          BIC     #BIT11,@RCSR    ;CLEAR MAINTENANCE BIT
007106  104065                  ERROR   65
                                                                ;RCVR ACTIVE DID NOT CLEAR WITH RCVR DONE

007110  000005          4$:     RESET                           ;CLEAR DONE WITH RESET
007112  105777  173170          TSTB    @RCSR                   ;CHECK FOR DONE CLEAR
007116  001404                  BEQ     5$

007120  042777  000004  173164  BIC     #BIT2,@TCSR             ;CLEAR MAINTENANCE BIT
007126  104066                  ERROR   66
                                                                ;RESET DID NOT CLEAR RCVR DONE

007130  042777  000004  173150  5$:     BIC     #BIT2,@RCSR     ;CLEAR MAINTENANCE BIT
007136  000400                  BR      TST31                   ;BR TO NEXT TEST
```

```
                                        ;;*****************************************************************
                                        ;*TEST 31       TEST THAT RDR ENABLE CLEARS RECEIVER DONE FLAG
                                        ;;*****************************************************************
007140  000004                  TST31:  SCOPE
007142  000005                          RESET                           ;CLEAR EVERYTHING
007144  052777  000004  173140          BIS     #BIT2,@TCSR             ;SET MAINTENANCE WRAP
007152  005077  173136                  CLR     @TBUF                   ;LOAD TRANSMITTER
007156  105777  173124          1$:     TSTB    @RCSR                   ;WAIT FOR RECEIVER DONE
007162  100375                          BPL     1$
007164  052777  000001  173114          BIS     #BIT0,@RCSR             ;CLEAR DONE BY SETTING RDR ENABLE
007172  105777  173110                  TSTB    @RCSR                   ;CHECK FOR DONE CLEAR
007176  001404                          BEQ     TST32                   ;BR, IF CLEAR TO NEXT TEST
007200  042777  000004  173104          BIC     #BIT2,@TCSR             ;CLEAR MAINTENANCE BIT
007206  104067                          ERROR   67
                                                                        ;SETTING RDR ENABLE DID NOT CLEAR RCVR DONE

                                        ;;*****************************************************************
                                        ;*TEST 32       TEST THAT READING RBUF CLEARS RECEIVER DONE
                                        ;;*****************************************************************
007210  000004                  TST32:  SCOPE
007212  000005                          RESET                           ;CLEAR EVERYTHING
007214  052777  000004  173070          BIS     #BIT2,@TCSR             ;SET MAINTENANCE WRAP
007222  005077  173066                  CLR     @TBUF                   ;LOAD TRANSMITTER
007226  105777  173054          1$:     TSTB    @RCSR                   ;WAIT FOR RECEIVER DONE
007232  100375                          BPL     1$
007234  017700  173050                  MOV     @RBUF,R0                ;READ RECEIVE BUFFER
007240  042777  000004  173044          BIC     #BIT2,@TCSR             ;CLEAR MAINTENANCE BIT
007246  105777  173034                  TSTB    @RCSR                   ;CHECK FOR RECEIVE DONE CLEAR
007252  001401                          BEQ     TST33                   ;BR, IF CLEAR TO NEXT TEST
007254  104070                          ERROR   70
                                                                        ;READING RBUF DID NOT CLEAR RCVR DONE
```

```
                                        ;;*****************************************************************
                                        ;*TEST 33       TEST THAT RCVR INTERRUPTS ONLY WHEN ENABLED
                                        ;;*****************************************************************
007256  000004                  TST33:  SCOPE
007260  042777  000100  173024          BIC     #BIT6,@TCSR     ;DISABLE TRANSMIT INTERRUPTS
007266  042777  000100  173012          BIC     #BIT6,@RCSR     ;DISABLE RECEIVER INTERRUPTS
007274  052777  000004  173010          BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
007302  017703  173010                  MOV     @RVECT,R3       ;SAVE RECEIVE VECTOR
007306  012777  007350  173002          MOV     #2$,@RVECT      ;POINT RCV VECTOR TO ERROR REPORT
007314  005077  173000                  CLR     @RPSW           ;PSW VECTOR CLEAR
007320  004767  002244                  JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
007324  000140                          .WORD   140
007326  005077  172762                  CLR     @TBUF           ;SEND A CHARACTER
007332  105777  172750          1$:     TSTB    @RCSR           ;WAIT FOR RECEIVER DONE
007336  100375                          BPL     1$
007340  042777  000004  172744          BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007346  000405                          BR      3$              ;CONTINUE TEST
007350  042777  000004  172734  2$:     BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007356  022626                          CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
007360  104071                          ERROR   71
                                                                ;RECEIVER INTERRPUTS WITH INT. ENABLE CLEAR
007362  012777  007412  172726  3$:     MOV     #4$,@RVECT      ;POINT RCV VECTOR TO END OF TEST
007370  052777  000100  172710          BIS     #BIT6,@RCSR     ;ENABLE RCV INTERRUPTS
007376  000240                          NOP                     ;GIVE ANY INTERRUPTS TIME
007400  042777  000004  172704          BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007406  022626                          CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
007410  104072                          ERROR   72
                                                                ;RCVR DID NOT INTERRUPT
007412  042777  000004  172672  4$:     BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007420  010377  172672                  MOV     R3,@RVECT       ;RESTORE RECEIVE VECTOR
007424  042777  000100  172654          BIC     #BIT6,@RCSR     ;DISABLE INTERRUPTS
```

```
                                ;;*****************************************************************
                                ;*TEST 34       TEST THAT RCVR INTERRUPTS DO NOT OCCUR WHEN DISABLED
                                ;;*****************************************************************
007432  000004          TST34:  SCOPE
007434  000005                  RESET                           ;CLEAR EVERYTHING
007436  052777  000004  172646          BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
007444  004767  002120                  JSR     PC,WRPSW        ;SET PSW TO PRIORITY 7
007450  000340                          .WORD   340
007452  017703  172640                  MOV     @RVECT,R3       ;SAVE RECEIVE VECTOR
007456  012777  007514  172632          MOV     #2$,@RVECT      ;POINT RCVR VECTOR TO ERROR REPORT
007464  005077  172630                  CLR     @RPSW           ;PSW VECTOR CLEAR
007470  005077  172620                  CLR     @TBUF           ;SEND A CHARACTER
007474  105777  172606          1$:     TSTB    @RCSR           ;WAIT FOR RECEIVER DONE
007500  100375                          BPL     1$
007502  052777  000100  172576          BIS     #BIT6,@RCSR     ;ENABLE INTERRUPTS
007510  000240                          NOP                     ;GIVE TIME FOR INTERRUPT
007512  000405                          BR      3$              ;CONTINUE TEST
007514  042777  000004  172570  2$:     BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007522  022626                          CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
007524  104073                          ERROR   73
                                                                ;RCVR INTERRUPTS AT PRIORITY 7
007526  042777  000100  172552  3$:     BIC     #BIT6,@RCSR     ;CLEAR INTERRUPT ENABLE
007534  012777  007562  172554          MOV     #4$,@RVECT      ;POINT RCVR VECTOR TO ERROR REPORT
007542  004767  002022                  JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
007546  000140                          .WORD   140
007550  000240                          NOP                     ;GIVE TIME FOR ANY INTERRUPT
007552  042777  000004  172532          BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007560  000405                          BR      5$              ;BR TO END OF TEST, IF NO INTERRUPT

007562  042777  000004  172522  4$:     BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007570  022626                          CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
007572  104074                          ERROR   74
                                                                ;RCVR INTERRUPT REQUEST PASSED WITH BIT6 CLEAR
007574  010377  172516          5$:     MOV     R3,@RVECT       ;RESTORE RECEIVE VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 35        TEST RECEIVER FOR DOUBLE INTERRUPTS
                                ;;*****************************************************************
007600  000004          TST35:  SCOPE
007602  000005                  RESET                   ;CLEAR EVERYTHING
007604  052777  000004  172500          BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
007612  017703  172500          MOV     @RVECT,R3       ;SAVE RECEIVE VECTOR
007616  012777  007670  172472          MOV     #2$,@RVECT      ;POINT RCV VECTOR TO CONTINUE TEST
007624  005077  172470          CLR     @RPSW           ;CLEAR PSW VECTOR
007630  004767  001734          JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
007634  000140                  .WORD   140
007636  005077  172452          CLR     @TBUF           ;SEND A CHARACTER
007642  105777  172440  1$:     TSTB    @RCSR           ;WAIT FOR RCVR DONE
007646  100375                  BPL     1$
007650  042777  000004  172434          BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
007656  052777  000100  172422          BIS     #BIT6,@RCSR     ;ENABLE RCV INTERRUPTS
007664  000240                  NOP                     ;GIVE SOME TIME
007666  104075                  ERROR   75
                                                        ;RCVR INTERRUPT DID NOT OCCUR
007670  022626          2$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
007672  012777  007716  172416          MOV     #3$,@RVECT      ;POINT RCV VECTOR TO ERROR REPORT
007700  000240                  NOP                     ;GIVE SOME TIME
007702  042777  000100  172376          BIC     #BIT6,@RCSR     ;CLEAR INTERRUPT ENABLE
007710  010377  172402                  MOV     R3,@RVECT       ;RESTORE RECEIVE VECTOR
007714  000402                  BR      4$              ;BR TO END OF TEST
007716  022626          3$:     CMP     (SP)+,(SP)+     ;RESTORE SP AFTER INTERRUPT
007720  104076                  ERROR   76
                                                        ;RECEIVER RE-INTERRUPTED
007722  010377  172370  4$:     MOV     R3,@RVECT       ;RESTORE RECEIVE VECTOR
```

```
                                        ;;=================================================================
                                        ;*TEST 36       TEST THAT RCVR INTERRUPT CLEARS BY READING RBUF
                                        ;;=================================================================
007726  000004                TST36:  SCOPE
007730  000005                        RESET                           ;CLEAR EVERYTHING
007732  004767  001632                JSR     PC,WRPSW                ;SET PSW PRIORITY TO 7
007736  000340                        .WORD   340
007740  017703  172352                MOV     @RVECT,R3               ;SAVE RECEIVE VECTOR
007744  012777  010036  172344        MOV     #2$,@RVECT              ;POINT RCV VECTOR TO ERROR REPORT
007752  005077  172342                CLR     @RPSW                   ;CLEAR PSW VECTOR
007756  052777  000100  172322        BIS     #BIT6,@RCSR             ;SET RCVR INTERRUPT ENABLE
007764  052777  000004  172320        BIS     #BIT2,@TCSR             ;SET MAINTENANCE WRAP
007772  005077  172316                CLR     @TBUF                   ;SEND A CHARACTER
007776  105777  172304        1$:     TSTB    @RCSR                   ;WAIT FOR DONE
010002  100375                        BPL     1$
010004  042777  000004  172300        BIC     #BIT2,@TCSR             ;CLEAR MAINTENANCE BIT
010012  005077  172272                CLR     @RBUF                   :READ RBUF TO CLEAR PENDING INTERRPUT
010016  004767  001546                JSR     PC,WRPSW                ;SET PSW TO PRIORITY 3
010022  000140                        .WORD   140
010024  000240                        NOP
010026  042777  000100  172252        BIC     #BIT6,@RCSR             ;NO INTERRUPT-CLEAR INT. ENABLE
010034  000402                        BR      3$

010036  022626                2$:     CMP     (SP)+,(SP)+             ;RESTORE SP AFTER INTERRUPT
010040  104077                        ERROR   77                      ;READING RBUF DID NOT CLEAR INTERRUPT

010042  010377  172250        3$:     MOV     R3,@RVECT               ;RESTORE RECEIVE VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 37       TEST THAT RESET CLEARS RECEIVE INTERRUPT
                                ;;*****************************************************************
010046  000004                  TST37:  SCOPE
010050  000005                          RESET                           ;CLEAR EVERYTHING
010052  004767  001512                  JSR     PC,@RPSW                ;SET PSW TO PRIORITY 7
010056  000340                          .WORD   340
010060  017703  172232                  MOV     @RVECT,R3               ;SAVE RECEIVE VECTOR
010064  012777  010150  172224          MOV     #2$,@RVECT              ;POINT RCV VECTOR TO ERROR REPORT
010072  005077  172222                  CLR     @RPSW                   ;CLEAR PSW VECTOR
010076  052777  000100  172202          BIS     #BIT6,@RCSR             ;SET RCV INTERRUPT ENABLE
010104  052777  000004  172200          BIS     #BIT2,@TCSR             ;SET MAINTENANCE WRAP
010112  012777  000377  172174          MOV     #377,@TBUF              ;SEND AN ALL 1'S CHARACTER
010120  105777  172162          1$:     TSTB    @RCSR                   ;WAIT FOR RCV DONE
010124  100375                          BPL     1$
010126  000005                          RESET                           ;CLEAR RCV INTERRUPT & RBUF
010130  004767  001434                  JSR     PC,@RPSW                ;SET PSW TO PRIORITY 3
010134  000140                          .WORD   140
010136  000240                          NOP
010140  042777  000100  172140          BIC     #BIT6,@RCSR             ;NO INTERRUPT-CLEAR INT. ENABLE
010146  000402                          BR      3$                      ;CONTINUE TEST

010150  022626                  2$:     CMP     (SP)+,(SP)+             ;RESTORE SP AFTER INTERRUPT
010152  104100                          ERROR   100                     ;RESET DID NOT CLEAR RCVR INTERRUPT

010154  010377  172136          3$:     MOV     R3,@RVECT               ;RESTORE RECEIVE VECTOR
```

```
                                ;;*****************************************************************
                                ;*TEST 40       TEST THAT THE "OR" ERROR (BIT14) & "ERROR" (BIT15) CAN BE SET
                                ;;*****************************************************************
000000                  TST40:  SCOPE
010160  032777  002000  170650          BIT     #BIT10,@SWR     ;IS THIS TEST ENABLED
010166  001440                          BEQ     TST41           ;IF NOT ENABLED, BR TO NEXT TEST
010170  000005                          RESET                   ;CLEAR EVERYTHING
010172  052777  000004  172110          BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
010200  012700  000003                  MOV     #3,R0           ;SET CHARACTER COUNT TO SEND 3 CHAR.
010204  005077  172102          1$:     CLR     @TBUF           ;LOAD TRANSMIT BUFFER
010210  105777  172074          2$:     TSTB    @TCSR           ;WAIT FOR TRANSMIT DONE
010214  100375                          BPL     2$
010216  005300                          DEC     R0              ;DECREMENT CHARACTER COUNT
010220  001371                          BNE     1$              ;BR IF ALL CHARACTERS NOT TRANSMITTED
010222  032777  040000  172056          BIT     #BIT14,@RBUF    ;TEST FOR "OR" ERROR FLAG
010230  001004                          BNE     3$              ;BR, IF SET
010232  042777  000004  172050          BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
010240  104101                          ERROR   101
                                                                ;"OR" ERROR FLAG DID NOT SET
010242  032777  100000  172036  3$:     BIT     #BIT15,@RBUF    ;TEST "ERROR" FLAG
010250  001004                          BNE     4$              ;BR, IF SET
010252  042777  000004  172030          BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
010260  104102                          ERROR   102
                                                                ;"ERROR" FLAG DID NOT SET WITH "OR" FLAG
010262  042777  000004  172020  4$:     BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
```

```
                                ;;#################################################################
                                ;#TEST 41        TEST THAT BREAK TRANSMITS ALL ZEROES
                                ;;#################################################################
010272  000004                  TST41:  SCOPE
010274  032777  000400  170536          BIT     #BIT8,@SWR      ;IS BREAK FUNCTION TEST ENABLED?
010302  001444                          BEQ     TST42           ;BR TO NEXT TEST, IF NOT ENABLED
010304  000005                          RESET                   ;CLEAR EVERYTHING
010306  052777  000004  171776          BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
010314  012777  177777  171772          MOV     #-1,@TBUF       ;TRANSMIT ALL ONES TO RCVR
010322  105777  171760          1$:     TSTB    @RCSR           ;WAIT FOR RCVR DONE
010326  100375                          BPL     1$
010330  005077  171754                  CLR     @RBUF           ;CLEAR DONE (LEAVING ALL ONES IN RBUF)
010334  052777  000001  171750          BIS     #BIT0,@TCSR     ;TRANSMIT BREAK
010342  005000                          CLR     R0              ;CLEAR A TIMER
010344  117767  171736  170454  2$:     MOVB    @RCSR,$BDDAT    ;WAIT FOR RCVR DONE
010352  100406                          BMI     CONT41          ;BR IF DONE
010354  005200                          INC     R0              ;IF NOT, INCREMENT TIMER
010356  001372                          BNE     2$              ;BR IF TIME REMAINS
                                
010360  042777  000005  171724          BIC     #BIT0!BIT2,@TCSR  ;CLEAR MAINTENANCE & BREAK BITS
010366  104103                          ERROR   103             ;BREAK DID NOT TRANSMIT ANYTHING
                                
010370  105777  171714          CONT41: TSTB    @RBUF           ;CHECK RECEIVE BUFFER FOR ZERO
010374  001404                          BEQ     3$              ;BR, IF ZERO
010376  042777  000005  171706          BIC     #BIT0!BIT2,@TCSR  ;CLEAR MAINTENANCE & BREAK BITS
                                
010404  104103                          ERROR   103             ;BREAK DID NOT TRANSMIT ALL ZEROES
                                
010406  042777  000005  171676  3$:     BIC     #BIT0!BIT2,@TCSR ;CLEAR MAINTENANCE & BREAK BITS
```

```
 1927
 1928
 1929                                   ;;#################################################################
 1930                                   ;*TEST 42       TEST THAT "FR" ERROR CAN BE SET DURING BREAK
 1931                                   ;;#################################################################
 1932  010414  000004                   TST42:  SCOPE
 1933  010416  032777  002000  170414           BIT     #BIT10,@SWR     ;IS THE "TEST ERROR FLAGS" BIT SET
 1934  010424  001435                           BEQ     TST43           ;BR TO NEXT TEST, IF NOT SET
 1935  010426  032777  000400  170404           BIT     #BIT8,@SWR      ;IS BREAK FUNCTION ENABLED
 1936  010434  001431                           BEQ     TST43           ;BR TO NEXT TEST, IF NOT SET
 1937  010436  000005                           RESET                   ;CLEAR EVERYTHING
 1938  010440  052777  000004  171644           BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
 1939  010446  052777  000001  171636           BIS     #BIT0,@TCSR     ;SEND BREAK
 1940  010454  005077  171634                   CLR     @TBUF           ;TRANSMIT A CHARACTER TO TIME BREAK
 1941  010460  105777  171626           1$:     TSTB    @TCSR           ;WAIT FOR XMIT DONE
 1942  010464  100375                           BPL     1$
 1943  010466  005077  171622                   CLR     @TBUF           ;FILL SECOND BUFFER
 1944  010472  105777  171614           2$:     TSTB    @TCSR           ;WAIT ONE CHARACTER TIME (DONE)
 1945  010476  100375                           BPL     2$
 1946  010500  042777  000005  171604           BIC     #BIT0!BIT2,@TCSR ;CLEAR MAINTENANCE & BREAK BITS
 1947  010506  032777  020000  171574           BIT     #BIT13,@RBUF    ;CHECK FOR FRAMING ERROR FLAG
 1948  010514  001001                           BNE     TST43           ;BR, IF SET
 1949
 1950  010516  104104                           ERROR   104
 1951                                                                   ;BREAK DID NOT SET FRAMING ERROR
```

```
                                ;;#################################################################
                                ;*TEST 43       TEST DATA PATH FROM TRANSMITTER TO RECEIVER USING MAINTENANCE WRAP
                                ;;#################################################################
010520  000004                TST43:  SCOPE

010522  000005                        RESET                   ;CLEAR EVERYTHING
010524  005001                        CLR     R1              ;CLEAR REGISTER FOR TEST DATA
010526  052777  000004  171556      BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
010534  010177  171554        1$:   MOV     R1,@TBUF        ;XMIT A CHARACTER
010540  105777  171542        2$:   TSTB    @RCSR           ;WAIT FOR RECEIVER DONE
010544  100375                      BPL     2$
010546  017702  171536              MOV     @RBUF,R2        ;GET RECEIVED CHARACTER
010552  020102                      CMP     R1,R2           ;COMPARE DATA
010554  001003                      BNE     3$              ;BR, IF NON-COMPARE
010556  105201                      INCB    R1              ;INCREMENT TEST DATA
010560  001411                      BEQ     4$              ;BR, IF FINISHED
010562  000764                      BR      1$              ;CONTINUE IF NOT
010564  010167  170234        3$:   MOV     R1,$GDDAT                       ;STORE THE EXPECTED DATA
010570  010267  170232              MOV     R2,$BDDAT                       ;STORE RECEIVED DATA
010574  042777  000004  171510      BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT
010602  104105                      ERROR   105             ;DATA COMPARE DATA

010604  042777  000004  171500  4$: BIC     #BIT2,@TCSR     ;CLEAR MAINTENANCE BIT


                                ;;#################################################################
                                ;*TEST 44       TEST DATA PATHS USING WRAP CABLE
                                ;;#################################################################
010612  000004                TST44:  SCOPE
010614  032777  000200  170216      BIT     #BIT7,@SWR      ;IS THIS TEST ENABLED
010622  001427                      BEQ     TST45           ;BR, IF NOT
010624  005001                      CLR     R1              ;CLEAR REGISTER FOR TEST DATA
010626  000005                      RESET                   ;CLEAR EVERYTHING
010630  010177  171460        1$:   MOV     R1,@TBUF        ;XMIT A CHARACTER
010634  005000                      CLR     R0              ;CLEAR A TIMER
010636  105777  171444        2$:   TSTB    @RCSR           ;WAIT FOR RECEIVER DONE
010642  100403                      BMI     3$              ;BR IF DONE
010644  005200                      INC     R0              ;INCREMENT TIMER IF NOT
010646  001373                      BNE     2$              ;BR IF TIME REMAINS

010650  104064                      ERROR   64              ;RECEIVER DONE NOT SET

010652  017702  171432        3$:   MOV     @RBUF,R2        ;GET RECEIVED CHARACTER
010656  020102                      CMP     R1,R2           ;COMPARE DATA
010660  001003                      BNE     4$              ;BR, IF NON-COMPARE
010662  105201                      INCB    R1              ;INCREMENT TEST DATA
010664  001406                      BEQ     TST45           ;BR, IF FINISHED
010666  000760                      BR      1$              ;CONTINUE IF NOT
010670  010167  170130        4$:   MOV     R1,$GDDAT       ;STORE EXPECTED DATA
010674  010267  170126              MOV     R2,$BDDAT       ;STORE RECEIVED DATA

010700  104106                      ERROR   106             ;DATA COMPARE ERROR WITH WRAP CABLE
```

```
                                ;;*****************************************************************
                                ;*TEST 45       TEST DL11-W LOGIC BY EXERCISING THE XMIT,RECEIVE, & CLOCK(IF AVAILABLE)
                                ;;*****************************************************************
010702  000004                TST45:  SCOPE
                                        RESET                   ;CLEAR EVERYTHING
010704  000005
010706  017703  171410                MOV     @TVECT,R3       ;SAVE XMIT VECTOR
010712  017704  171400                MOV     @RVECT,R4       ;SAVE RECEIVE VECTOR
010716  012777  011214  171376        MOV     #XMIT,@TVECT    ;POINT TRANSMIT VECTOR TO TRANSMIT ROUTINE
010724  005077  171374                CLR     @TPSW           ;ALLOW INTERRUPTS AFTER XMIT INTERRUPT
010730  012777  011250  171360        MOV     #RCV,@RVECT     ;POINT RECEIVE VECTOR TO RECEIVE ROUTINE
010736  005077  171356                CLR     @RPSW           ;ALLOW INTERRPUTS AFTER RCVR INTERRUPT
010742  005767  171330                TST     CTSTFL          ;IS CONSOLE UNDER TEST?
010746  001416                        BEQ     1$              ;IF NOT SKIP CLOCK SET UP
010750  032777  000100  170062        BIT     #BIT6,@SWR      ;IF YES, ARE CLOCK TEST DISABLED?
010756  001012                        BNE     1$              ;IF YES, SKIP CLOCK SET UP
010760  017705  171364                MOV     @RTCVT,R5       ;SAVE CLOCK VECTOR
010764  012777  011264  171356        MOV     #CLK,@RTCVT     ;POINT VECTOR TO CLOCK INTERRUPT ROUTINE
010772  005077  171354                CLR     @RTCPSW         ;ALLOW INTERRUPTS AFTER CLOCK INTERRUPT
010776  052777  000100  171342        BIS     #BIT6,@LKS      ;ENABLE CLOCK INTERRUPTS
011004  052777  000004  171300  1$:   BIS     #BIT2,@TCSR     ;SET MAINTENANCE WRAP
011012  052777  000100  171272        BIS     #BIT6,@TCSR     ;ENABLE TRANSMIT INTERRUPTS
011020  052777  000100  171260        BIS     #BIT6,@RCSR     ;ENABLE RECEIVE INTERRUPTS
011026  005067  000242                CLR     XMTCNT          ;CLEAR XMIT INTERRUPT COUNTER
011032  005067  000234                CLR     RCVCNT          ;CLEAR RCV INTERRUPT COUNTER
011036  004767  000526                JSR     PC,WRPSW        ;SET PSW TO PRIORITY 3
011042  000140                                ,WORD   140
011044  005001                        CLR     R1              ;CLEAR A REGISTER FOR TEST DATA USE
011046  005000                        CLR     R0              ;CLEAR TIMER
011050  012702  011300                MOV     #BUF,R2         ;POINT R2 TO RECEIVE DATA STORAGE
011054  005077  171234                CLR     @TBUF           ;SEND FIRST CHARACTER
011060  005200                2$:     INC     R0              ;WAIT FOR INTERRPUTS
011062  001376                        BNE     2$
011064  032777  000100  171220        BIT     #BIT6,@TCSR     ;FINISHED ENTIRE TRANSMISSION
011072  001402                        BEQ     3$              ;BR, IF INTERRPUTS ARE DISABLED (FINISHED)
011074  000005                        RESET                   ;CLEAR EVERYTHING

011076  104107                        ERROR   107             ;TRANSMIT INTERRUPT TIMEOUT IN MAIN. DATA TEST

011100  026767  000170  000164  3$:   CMP     XMTCNT,RCVCNT   ;COMPARE THE NUMBER OF INTERRUPTS
011106  001402                        BEQ     4$              ;BR, IF EQUAL
011110  000005                        RESET                   ;CLEAR EVERY?HING

011112  104110                        ERROR   110             ;RECEIVER DID NOT GET FULL TRANSMISSION
                                                                ;   IF RCVCNT=0, NO DATA RECEIVED
                                                                ;   IF RCVCNT?0, TEN (XMTCNT-RCVCNT)
                                                                ;   EQUALS THE NO, OF INTERRUPTS LOST.
```

```
                                                ;IS CONCOLE UNDER TEST?
011114  005767  171156          4$:   TST     CTSTFL
011120  001410                        BEQ     5$              ;IF NOT, SKIP CLOCK COUNT CHECK
011122  032777  000100  167710        BIT     #BIT6,@SWR      ;IF YES, ARE CLOCK TESTS DISABLED?
011130  001004                        BNE     5$              ;IF YES, SKIP CLOCK COUNT CHECK
011132  005767  000140                TST     CLKCNT          ;CHECK FOR AT LESST ONE CLOCK INTERRUPT
011136  001001                        BNE     5$              ;BR IF INTERRUPTS OCCURRED

011140  104113                        ERROR   113             ;NO CLOCK INTERRUPTS IN EXERCISER

011142  000005          5$:   RESET                           ;CLEAR EVERYTHING
011144  012700  011300                MOV     #BUF,R0         ;LOAD RECEIVED DATA POINTER TO R0
011150  005001                        CLR     R1              ;SET UP REGISTER FOR COMPARISON
011152  022001          COMP: CMP     (R0)+,R1                ;COMPARE XMIT & RCV DATA
011154  001005                        BNE     6$              ;BR, IF NOT EQUAL
011156  105201                        INCB    R1              ;INCREMENT COMPARE DATA
011160  032701  000010                BIT     #BIT3,R1        ;FINISHED CHECKING RECEIVED DATA?
011164  001372                        BNE     COMP            ;BR, IF NOT FINISHED
011166  000405                        BR      7$              ;BR TO END OF TEST

011170  014067  167632          6$:   MOV     -(R0),$BDDAT    ;STORE BAD DATA FOR ERROR REPORT
011174  010167  167624                MOV     R1,$GDDAT       ;STORE GOOD DATA FOR ERROR REPORT
011200  104111                        ERROR   111             ;DATA COMPARE ERROR IN EXERCISER

011202  010377  171114          7$:   MOV     R3,@TVECT       ;RESTORE XMIT VECTOR
011206  010477  171104                MOV     R4,@RVECT       ;RESTORE RECEIVE VECTOR
011212  000472                        BR      ENDEV           ;BR TO END OF DEVICE TEST ROUTINE

011214  005267  000054          XMIT: INC     XMTCNT          ;INCREMENT XMIT INTERRUPT COUNTER
011220  105201                        INCB    R1              ;INCREMENT TEST DATA
011222  032701  000040                BIT     #BIT5,R1        ;SEND DATA PATTERN FROM 00 --> 37
011226  001404                        BEQ     XCONT           ;BR, IF MORE DATA TO BE SENT
011230  042777  000100  171054        BIC     #BIT6,@TCSR     ;CLEAR XMIT INTERRUPT ENABLE
011236  000402                        BR      XRET            ;RETURN, WITHOUT SENDING ANY MORE DATA
011240  110177  171050          XCONT: MOVB   R1,@TBUF        ;SEND NEW CHARACTER
011244  005000          XRET: CLR     R0                      ;CLEAR TIMER
011246  000002                        RTI                     ;RETURN

011250  017722  171034          RCV:  MOV     @RBUF,(R2)+     ;STORE RECEIVED DATA
011254  005267  000012                INC     RCVCNT          ;INCREMENT RCV INTERRUPT COUNTER
011260  005000                        CLR     R0              ;CLEAR TIMER
011262  000002                        RTI                     ;RETURN

011264  005267  000006          CLK:  INC     CLKCNT          ;INCREMENT CLOCK INTERRUPT COUNT
011270  000002                        RTI                     ;RETURN

011272  000000          RCVCNT: .WORD 0
011274  000000          XMTCNT: .WORD 0
011276  000000          CLKCNT: .WORD 0
011300  000040          BUF:    .BLKW 40
```

```
                                        ;END OF DEVICE PASS ROUTINE
                                
011400  005067  167376          ENDEV:  CLR     $TSTNM          ;CLEAR TEST NO. COUNT FOR SCOPE ROUTINE
011404  005267  167466                  INC     $DEVCT          ;INCREMENT DEVICE COUNTER
011410  026767  170666  167460          CMP     TMP2,$DEVCT     ;ALL DEVICES TESTED
011416  001404                          BEQ     $EOP            ;BR, IF YES
011420  005067  170652                  CLR     CTSTFL          ;CLEAR CONSOLE UNDER TEST FLAG
011424  000167  171754                  JMP     TSTDEV          ;GO TEST NEXT DEVICE
                                
                                
                                        .SBTTL  END OF PASS ROUTINE
                                
                                        ;;**************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO GOAGIN
                                
011430                          $EOP:
011430  000004                          SCOPE
011432  005067  167344                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
011436  005267  167432                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
011442  042767  100000  167424          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
011450  005327                          DEC     (PC)+           ;;LOOP?
011452  000001                  $EOPCT: .WORD   1
011454  003015                          BGT     $DOAGN          ;;YES
011456  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
011460  000001                  $ENDCT: .WORD   1
011462  011452                          $EOPCT
011464  104401  011520                  TYPE    ,ENDMG          ;;TYPE "END PASS"
011470  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
011474  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
011476  000005                          RESET                   ;;CLEAR THE WORLD
011500  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
011502  000240                          NOP                     ;;SAVE ROOM
011504  000240                          NOP                     ;;FOR
011506  000240                          NOP                     ;;ACT11
011510                          $DOAGN:
011510  000137                          JMP     @(PC)+          ;;RETURN
011512  011534                  $RTNAD: .WORD   GOAGIN
011514    377     377     000   $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
        011520                          .EVEN
011520  005015  047105  020104  ENDMG:  .ASCIZ  <CR><LF>/END PASS /
011526  040520  051523  000040
```

```
2153
2154  011534  005067  167336          GOAGIN: CLR     $DEVCT          ;CLEAR DEVICE COUNT
2155  011540  022767  000001  170534          CMP     #1,TMP2         ;IS THERE ONLY ONE DEVICE UNDER TEST?
2156  011546  001004                          BNE     RSTRT           ;BR, IF NOT
2157  011550  012706  001000                  MOV     #1000,SP                ;RESET STACK POINTER
2158  011554  000167  171746                  JMP     TST1            ;GO DO ANOTHER PASS
2159
2160  011560  005067  167314          RSTRT:  CLR     $UNIT           ;CLEAR UNIT NUMBER
2161  011564  000167  171540                  JMP     BEGIN
2162
2163  011570  011646                  WRPSW:  MOV(SP),-(SP)           ;COPY RETUN PC
2164  011572  013616                          MOV     @(SP)+,(SP)     ;MOVE NEW PSW TO STACK
2165  011574  062746  000002                  ADD     #2,-(SP)        ;ADJUST JSR RETURN
2166  011600  000006                          RTT                     ;POP RETURN PC & NEW PSW
2167
2168                                  ;SUBROUTINE TO REPORT UNEXPECTED OR ERRONEOUS TRAPS OR INTERRUPTS
2169
2170  011602  012600                  CATCH:  MOV     (SP)+,R0        ;GET ADDRESS OF TRAP VECTOR + 4
2171  011604  162700  000004                  SUB     #4,R0           ;ADJUST TO POINT TO TRAP ADDRESS
2172  011610  010067  000014                  MOV     R0,BDVECT       ;STORE TRAP OR INTERRUPT ADDRESS
2173  011614  016667  000002  000004          MOV     2(SP),OLDPC     ;GET PC WHERE TRAP OR INTERRUPT OCCURRED
2174  011622  104112                          ERROR   112             ;REPORT ERROR
2175
2176  011624  000000                          HALT                    ;PROGRAM MUST BE RESTARTED AT THIS POINT
2177  011626  000000                  OLDPC:  .WORD   0
2178  011630  000000                  BDVECT: .WORD   0
2179
```

```
                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;*SAVE THE ERROR ITEM NUMBER AND ADDRESS OF THE ERROR CALL
                                ;*AND GO TO $ERRTYP ON ERROR
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW15=1         HALT ON ERROR
                                ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                ;*SW09=1         LOOP IN ERROR
                                ;*CALL
                                ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
                                ;;*****************************************************************

011632                          $ERROR:
011632  105267  167145          7$:     INCB    $ERFLG          ;SET THE ERROR FLAG
011636  001775                  BEQ     7$              ;DON'T LET FLAG GO TO ZERO
011640  016777  167136  167174          MOV     $TSTNM,@DISPLAY ;DISPLAY TEST NUMBER AND ERROR FLAG
011646  005267  167140                  INC     $ERTTL          ;INCREMENT ERROR COUNT
011652  011667  167140                  MOV     (SP),$ERRPC     ;GET ADDRESS OF ERROR INSTRUCTION
011656  162767  000002  167132          SUB     #2,$ERRPC
011664  117767  167126  167122          MOVB    @$ERRPC,$ITEMB  ;STRIP AND SAVE THE ERROR ITEM CODE
011672  032777  020000  167140          BIT     #BIT13,@$WR     ;SKIP TYPEOUT IF SET
011700  001004                  BNE     20$             ;SKIP TYPEOUTS
011702  004767  000106                  JSR     PC,$ERRTYP      ;GO TO USER ERROR ROUTINE
011706  104401  001063                  TYPE    ,$CRLF
011712                          20$:
011712  122767  000001  167166          CMPB    #APTENV,$ENV    ;RUNNING IN APT MODE
011720  001007                  BNE     2$              ;NO, SKIP APT ERROR REPORT
011722  116767  167066  000004          MOVB    $ITEMB,21$      ;SET ITEM NUMBER AS ERROR NUMBER
011730  004767  000562                  JSR     PC,$ATY4        ;REPORT FATAL ERROR TO APT
011734     000                  21$:    .BYTE   0
011735     000                          .BYTE   0
011736  000777                  22$:    BR      22$             ;APT ERROR LOOP
011740  005777  167074          2$:     TST     @$WR            ;HALT ON ERROR
011744  100001                  BPL     3$              ;SKIP IF CONTINUE
011746  000000                  HALT                    ;HALT ON ERROR!
011750  104406                  3$:     CKSWR                   ;TEST FOR CHANGE IN SOFT-SWR
011752  032777  001000  167060          BIT     #BIT09,@$WR     ;LOOP ON ERROR SWITCH SET?
011760  001402                  BEQ     4$              ;BR IF NO
011762  016716  167022                  MOV     $LPERR,(SP)     ;FUDGE RETURN FOR LOOPING
011766  005767  167066          4$:     TST     $ESCAPE         ;CHECK FOR AN ESCAPE ADDRESS
011772  001402                  BEQ     5$              ;BR IF NONE
011774  016716  167060                  MOV     $ESCAPE,(SP)    ;FUDGE RETURN ADDRESS FOR ESCAPE
012000                          5$:
012000  022737  011500  000042          CMP     #$ENDAD,@#42    ;ACT-11 AUTO-ACCEPT?
012006  001001                  BNE     6$              ;BR IF NO
012010  000000                  HALT                    ;YES
012012                          6$:
012012  000002                  RTI                     ;RETURN
```

```
                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

012014                          $ERRTYP:
012014  104401  001063                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
012020  010046                  MOV     R0,-(SP)        ;;SAVE R0
012022  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
012024  153700  001014          BISB    @#$ITEMB,R0
012030  001004                  BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                        ;;TYPE THE PC OF THE ERROR
012032  016746  166760          MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                        ;;ERROR ADDRESS
012036  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
012040  000426                  BR      6$              ;;GET OUT
012042  005300          1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
012044  006300                  ASL     R0              ;;      WORK FOR THE ERROR TABLE
012046  006300                  ASL     R0
012050  006300                  ASL     R0
012052  062700  001146          ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
012056  012067  000004          MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
012062  001404                  BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
012064  104401                  TYPE                    ;;TYPE THE "ERROR MESSAGE"
012066  000000          2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
012070  104401  001063          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
012074  012067  000004          3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
012100  001404                  BEQ     5$              ;;SKIP TYPEOUT IF 0
012102  104401                  TYPE                    ;;TYPE THE "DATA HEADER"
012104  000000          4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
012106  104401  001063          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
012112  011000          5$:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
012114  001004                  BNE     7$              ;;GO TYPE THE DATA
012116  012600          6$:     MOV     (SP)+,R0        ;;RESTORE R0
012120  104401  001063          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
012124  000207                  RTS     PC              ;;RETURN
012126                          7$:
012126  013046                  MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
012130  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
012132  005710                  TST     (R0)            ;;IS THERE ANOTHER NUMBER?
012134  001770                  BEQ     6$              ;;BR IF NO
012136  104401  012144          TYPE    ,8$             ;;TYPE TWO(2) SPACES
012142  000771                  BR      7$              ;;LOOP
012144  020040      000 8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
        012150                  .EVEN
```

```
                                        .SBTTL  POWER DOWN AND UP ROUTINES
                                        ;;*****************************************************************
                                        ;*POWER DOWN ROUTINE
                                        ;;*****************************************************************
012150  012737  012310  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;SET FOR FAST UP
012156  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;PRIO:7
012164  010046                        MOV     R0,-(SP)        ;PUSH R0 ON STACK
012166  010146                        MOV     R1,-(SP)        ;PUSH R1 ON STACK
012170  010246                        MOV     R2,-(SP)        ;PUSH R2 ON STACK
012172  010346                        MOV     R3,-(SP)        ;PUSH R3 ON STACK
012174  010446                        MOV     R4,-(SP)        ;PUSH R4 ON STACK
012176  010546                        MOV     R5,-(SP)        ;PUSH R5 ON STACK
012200  017746  166634                MOV     @SWR,-(SP)      ;PUSH @SWR ON STACK
012204  010667  000104                MOV     SP,$SAVR6       ;SAVE SP
012210  012737  012222  000024        MOV     #$PWRUP,@#PWRVEC ;SET UP VECTOR
012216  000000                        HALT
012220  000776                        BR      .-2             ;HANG UP

                                        ;;*****************************************************************
                                        ;*POWER UP ROUTINE
                                        ;;*****************************************************************
012222  012737  012310  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;SET FOR FAST DOWN
012230  016706  000060                MOV     $SAVR6,SP       ;GET SP
012234  012677  166600                MOV     (SP)+,@SWR      ;POP STACK INTO @SWR
012240  012605                        MOV     (SP)+,R5
012242  012604                        MOV     (SP)+,R4        ;POP STACK INTO R4
012244  012603                        MOV     (SP)+,R3        ;POP STACK INTO R3
012246  012602                        MOV     (SP)+,R2        ;POP STACK INTO R2
012250  012601                        MOV     (SP)+,R1        ;POP STACK INTO R1
012252  012600                        MOV     (SP)+,R0        ;POP STACK INTO R0
012254  012737  012150  000024        MOV     #$PWRDN,@#PWRVEC ;SET UP THE POWER DOWN VECTOR
012262  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;PRIO:7
012270  005067  000020                CLR     $SAVR6          ;WAIT LOOP FOR THE TTY
012274  005267  000014          1$:   INC     $SAVR6          ;WAIT FOR THE INC
012300  001375                        BNE     1$              ;OF WORD
012302  104401                        TYPE                    ;REPORT THE POWER FAILURE
012304  012316          $PWRMG: .WORD   $POWER                  ;POWER FAIL MESSAGE POINTER
012306  000002                        RTI
012310  000000          $ILLUP: HALT                            ;THE POWER UP SEQUENCE WAS STARTED
012312  000776                        BR      .-2             ; BEFORE THE POWER DOWN WAS COMPLETE
012314  000000          $SAVR6: 0                               ;PUT THE SP HERE
012316  005015  047520  042527  $POWER: .ASCIZ  <15><12>"POWER"
012324  000122
```

```
                                .SBTTL  SCOPE HANDLER ROUTINE

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

012326                          $SCOPE:
012326  104406                         CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
012330  032777  040000  166502  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
012336  001052                         BNE     $OVER           ;;YES IF SW14=1
                                ;#####START OF CODE FOR THE XOR TESTER#####
012340  000416                 $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
012342  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
012346  012737  012366  000004         MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
012354  005737  177060                 TST     @#177060        ;;TIME OUT ON XOR?
012360  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
012364  000421                         BR      $SVLAD          ;;GO TO THE NEXT TEST
012366  022626                 5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
012370  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
012374  000407                         BR      7$              ;;LOOP ON THE PRESENT TEST
012376                          6$:;#####END OF CODE FOR THE XOR TESTER#####
012376  105767  166401         2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
012402  001412                         BEQ     $SVLAD          ;;BR IF NO
012404  032777  001000  166426         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
012412  001404                         BEQ     4$              ;;BR IF NO
012414  016767  166370  166364  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
012422  000420                         BR      $OVER
012424  105067  166353         4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
012430  105267  166346         $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
012434  116767  166342  166430         MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
012442  011667  166340                 MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
012446  011667  166336                 MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
012452  005067  166402                 CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
012456  112767  000001  166331         MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
012464  016777  166312  166350  $OVER: MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
012472  016716  166310                 MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
012476  000002                         RTI                     ;;FIXES PS
```

```
                                        ;;*****************************************************************
                                        .SBTTL  APT COMMUNICATIONS ROUTINE
                                        ;;*****************************************************************

012500  112767  000001  000236  $ATY1:  MOVB    #1,$FFLG        ;TO REPORT FATAL ERROR
012506  112767  000001  000226  $ATY3:  MOVB    #1,$MFLG        ;TO TYPE A MESSAGE
012514  000403                  BR      $ATYC
012516  112767  000001  000220  $ATY4:  MOVB    #1,$FFLG        ;TO ONLY REPORT FATAL ERROR
012524                          $ATYC:
012524  010046                  MOV     R0,-(SP)        ;PUSH R0 ON STACK
012526  010146                  MOV     R1,-(SP)        ;PUSH R1 ON STACK
012530  105767  000206          TSTB    $MFLG           ;SHOULD TYPE A MESSAGE?
012534  001450                  BEQ     5$              ;IF NOT: BR
012536  122767  000001  166342  CMPB    #APTENV,$ENV    ;OPERATING UNDER APT?
012544  001031                  BNE     3$              ;IF NOT: BR
012546  132767  000100  166333  BITB    #APTSPOOL,$ENVM ;SHOULD SPOOL MESSAGE?
012554  001425                  BEQ     3$              ;IF NOT: BR
012556  017600  000004          MOV     @4(SP),R0       ;GET MESSAGE ADDRESS
012562  062766  000002  000004  ADD     #2,4(SP)        ;BUMP RETURN ADDRESS
012570  005767  166272  1$:     TST     $MSGTYPE                ;SEE IF DONE W/ LAST XMISSION?
012574  001375                  BNE     1$              ;IF NOT: WAIT
012576  010067  166300          MOV     R0,$MSGAD       ;PUT ADDRESS IN MAILBOX
012602  105720          2$:     TSTB    (R0)+           ;FIND END OF MESSAGE
012604  001376                  BNE     2$
012606  166700  166270          SUB     $MSGAD,R0       ;SUB START OF MESSAGE
012612  006200                  ASR     R0              ;GET MESSAGE LENGTH IN WORDS
012614  010067  166264          MOV     R0,$MSGLGT      ;PUT LENGTH IN MAILBOX
012620  012767  000004  166240  MOV     #4,$MSGTYPE     ;TELL APT TO TAKE MESSAGE
012626  000413                  BR      5$
012630  017667  000004  000016  3$:     MOV     @4(SP),4$       ;PUT MSG ADDR IN JSR LINKAGE
012636  062766  000002  000004          ADD     #2,4(SP)        ;BUMP RETURN ADDRESS
012644  016746  165126          MOV     177776,-(SP)    ;PUSH 177776 ON STACK
012650  004767  000072          JSR     PC,$TYPE        ;CALL TYPE MACRO
012654  000000          4$:     .WORD   0
012656                  5$:
012656  105767  000062  10$:     TSTB    $FFLG           ;SHOULD REPORT FATAL ERROR?
012662  001413                  BEQ     12$             ;IF NOT: BR
012664  005767  166216          TST     $ENV            ;RUNNING UNDER APT?
012670  001410                  BEQ     12$             ;IF NOT: BR
012672  005767  166170  11$:     TST     $MSGTYPE        ;FINISHED LAST MESSAGE?
012676  001375                  BNE     11$             ;IF NOT: WAIT
012700  017667  000004  166162  MOV     @4(SP),$FATAL   ;GET ERROR #
012706  005267  166154          INC     $MSGTYPE        ;TELL APT TO TAKE ERROR
012712  062766  000002  000004  12$:     ADD     #2,4(SP)        ;BUMP RETURN ADDRESS
012720  105067  000020          CLRB    $FFLG           ;CLEAR FATAL FLAG
012724  105067  000013          CLRB    $LFLG           ;CLEAR LOG FLAG
012730  105067  000006          CLRB    $MFLG           ;CLEAR MESSAGE FLAG
012734  012601                  MOV     (SP)+,R1        ;POP STACK INTO R1
012736  012600                  MOV     (SP)+,R0        ;POP STACK INTO R1
012740  000207                  RTS     PC              ;RETURN
012742  000          $MFLG:  .BYTE   0
012743  000          $LFLG:  .BYTE   0               ;LOG FLAG
012744  000          $FFLG:  .BYTE   0               ;FATAL FLAG

012746                          .EVEN
```

```
2427            000200                  APTSIZE=200
2428            000001                  APTENV=001
2429            000100                  APTSPOOL=100
2430            000040                  APTCSUP=040
2431
```

```
                                        .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
                                        ;*

012746  105767  166105          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
012752  100002                          BPL     1$              ;;BR IF YES
012754  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
012756  000430                          BR      3$              ;;LEAVE
012760  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
012762  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
012766  122767  000001  166112          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
012774  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
012776  132767  000100  166103          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
013004  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
013006  010067  000004                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
013012  004767  177470                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
013016  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
013020  132767  000040  166061  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
013026  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
013030  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
013032  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
013034  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
013036  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
013040  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
013044  000002                          RTI                     ;;RETURN
013046  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
013052  001430                          BEQ     8$
013054  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
013060  001006                          BNE     5$
013062  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
013064  104401                          TYPE                    ;;TYPE A CR AND LF
013066  001063                          $CRLF
013070  105067  000130                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
013074  000755                          BR      2$              ;;GET NEXT CHARACTER
013076  004767  000056          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
013102  126726  165750          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
013106  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
013110  016746  165740                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
013114  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
013120  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
013122  004767  000032                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
```

```
                                        DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
                                        BR      7$              ;;LOOP

                                ;HORIZONTAL TAB PROCESSOR

                                8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
                                9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
                                        BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
                                        BNE     9$              ;;TAB STOP
                                        TST     (SP)+           ;;POP SPACE OFF STACK
                                        BR      2$              ;;GET NEXT CHARACTER
                                $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
                                        BPL     $TYPEC
                                        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
                                        CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
                                        BNE     1$              ;;BRANCH IF NO
                                        CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
                                        BR      $TYPEX          ;;EXIT
                                1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
                                        BEQ     $TYPEX          ;;BRANCH IF YES
                                        INCB    (PC)+           ;;COUNT THE CHARACTER
                                $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
                                $TYPEX: RTS     PC

                                .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

                                $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
                                        MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
                                        MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
                                        ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
                                        BR      $TYPON
                                $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
                                        MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
```

```
2544  013270  112767  000005  000154  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
2545  013276  010346                  MOV     R3,-(SP)        ;;SAVE R3
2546  013300  010446                  MOV     R4,-(SP)        ;;SAVE R4
2547  013302  010546                  MOV     R5,-(SP)        ;;SAVE R5
2548  013304  116704  000145          MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
2549  013310  005404                  NEG     R4
2550  013312  062704  000006          ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
2551  013316  110467  000132          MOVB    R4,$OMODE       ;;SAVE IT FOR USE
2552  013322  116704  000125          MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
2553  013326  016605  000012          MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
2554  013332  005003                  CLR     R3              ;;CLEAR THE OUTPUT WORD
2555  013334  006105          1$:     ROL     R5              ;;ROTATE MSB INTO "C"
2556  013336  000404                  BR      3$              ;;GO DO MSB
2557  013340  006105          2$:     ROL     R5              ;;FORM THIS DIGIT
2558  013342  006105                  ROL     R5
2559  013344  006105                  ROL     R5
2560  013346  010503                  MOV     R5,R3
2561  013350  006103          3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
2562  013352  105367  000076          DECB    $OMODE          ;;TYPE THIS DIGIT?
2563  013356  100016                  BPL     7$              ;;BR IF NO
2564  013360  042703  177770          BIC     #177770,R3      ;;GET RID OF JUNK
2565  013364  001002                  BNE     4$              ;;TEST FOR 0
2566  013366  005704                  TST     R4              ;;SUPPRESS THIS 0?
2567  013370  001403                  BEQ     5$              ;;BR IF YES
2568  013372  005204          4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
2569  013374  052703  000060          BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
2570  013400  052703  000040  5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
2571  013404  110367  000040          MOVB    R3,8$           ;;SAVE FOR TYPING
2572  013410  104401  013450          TYPE    ,8$             ;;GO TYPE THIS DIGIT
2573  013414  105367  000032  7$:     DECB    $OCNT           ;;COUNT BY 1
2574  013420  003347                  BGT     2$              ;;BR IF MORE TO DO
2575  013422  002402                  BLT     6$              ;;BR IF DONE
2576  013424  005204                  INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
2577  013426  000744                  BR      2$              ;;GO DO THE LAST DIGIT
2578  013430  012605          6$:     MOV     (SP)+,R5        ;;RESTORE R5
2579  013432  012604                  MOV     (SP)+,R4        ;;RESTORE R4
2580  013434  012603                  MOV     (SP)+,R3        ;;RESTORE R3
2581  013436  016666  000002  000004  MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
2582  013444  012616                  MOV     (SP)+,(SP)
2583  013446  000002                  RTI                     ;;RETURN
2584  013450  000000          8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
2585  013451  000000                  .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
2586  013452  000000          $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
2587  013453  000000          $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
2588  013454  000000          $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
2589
```

```
                                .SBTTL  TTY INPUT ROUTINE

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

                                ;;*****************************************************************
                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                ;*WHEN OPERATING IN TTY FLAG MODE.
013456  022767  000176  165354  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
013464  001074                          BNE     15$             ;;BRANCH IF NO
013466  105777  165352                  TSTB    @$TKS           ;;CHAR THERE?
013472  100071                          BPL     15$             ;;IF NO, DON'T WAIT AROUND
013474  117746  165346                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
013500  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
013504  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
013510  001062                          BNE     15$             ;;NO, RETURN TO USER
013512  126727  165316  000001          CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
013520  001456                          BEQ     15$             ;;BRANCH IF YES

013522  104401  014203                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
013526  104401  014210          $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
013532  016746  164440                  MOV     $SWREG,-(SP)    ;;SAVE SWREG FOR TYPEOUT
013536  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
013540  104401  014221                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
013544  005046                  19$:     CLR     -(SP)           ;;CLEAR COUNTER
013546  005046                          CLR     -(SP)           ;;THE NEW SWR
013550  105777  165270          7$:     TSTB    @$TKS           ;;CHAR THERE?
013554  100375                          BPL     7$              ;;IF NOT TRY AGAIN

013556  117746  165264                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
013562  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII


013566  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
013572  001005                          BNE     10$             ;;BRANCH IF NOT
013574  104401  014176                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
013600  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
013604  000757                          BR      19$             ;;LET'S TRY IT AGAIN


013606  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
013612  001022                          BNE     16$             ;;BRANCH IF NO
013614  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
013620  001403                          BEQ     11$             ;;BRANCH IF YES
013622  016677  000002  165210          MOV     2(SP),@SWR      ;;SAVE NEW SWR
013630  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
013634  104401  001063          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
013640  126727  165171  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
013646  001003                          BNE     15$             ;;BRANCH IF NOT
013650  012777  000100  165166          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
013656  000002                  15$:    RTI                     ;;RETURN
013660  004767  177274          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
```

```
                                                ;;CHAR < 0?
                                                ;;BRANCH IF YES
                                                ;;CHAR > 7?
                                                ;;BRANCH IF YES
                                                ;;STRIP-OFF ASCII
                                                ;;IS THIS THE FIRST CHAR
                                                ;;BRANCH IF YES
                                                ;;NO, SHIFT PRESENT
                                                ;;   CHAR OVER TO MAKE
                                                ;;   ROOM FOR NEW ONE.
                                                ;;KEEP COUNT OF CHAR
                                                ;;SET IN NEW CHAR
                                                ;;GET THE NEXT ONE
                                                ;;TYPE ?<CR><LF>
                                                ;;SIMULATE CONTROL-U
                                                ;;*****************************************************************
                                                ;;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                                ;;*CALL:
                                                ;;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
                                                ;;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                                ;;*                              ;;WITH PARITY BIT STRIPPED OFF
                                                ;;
                                                ;;
                                                ;;PUSH DOWN THE PC
                                                ;;SAVE THE PS
                                                ;;WAIT FOR
                                                ;;A CHARACTER
                                                ;;READ THE TTY
                                                ;;GET RID OF JUNK IF ANY
                                                ;;IS IT A CONTROL-S?
                                                ;;BRANCH IF NO
                                                ;;WAIT FOR A CHARACTER
                                                ;;LOOP UNTIL ITS THERE
                                                ;;GET CHARACTER
                                                ;;MAKE IT 7-BIT ASCII
                                                ;;IS IT A CONTROL-Q?
                                                ;;IF NOT DISCARD IT
                                                ;;YES, RESUME
                                                ;;IS IT UPPER CASE?
                                                ;;BRANCH IF YES
                                                ;;IS IT A SPECIAL CHAR?
                                                ;;BRANCH IF YES
                                                ;;MAKE IT UPPER CASE
                                                ;;GO BACK TO USER
                                                ;;*****************************************************************
                                                ;;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                                ;;*CALL:
                                                ;;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                                ;;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                                ;;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
                                                ;;
                                                ;;SAVE R3
                                                ;;GET ADDRESS
```

```
2702  014066  022703  014176          2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
2703  014072  101405                          BLOS    4$              ;;BR IF YES
2704  014074  104407                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
2705  014076  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
2706  014100  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
2707  014104  001003                          BNE     3$              ;;SKIP IF NOT
2708  014106  104401  001062          4$:     TYPE    $QUES           ;;TYPE A '?'
2709  014112  000763                          BR      1$              ;;CLEAR THE BUFFER AND LOOP
2710  014114  111367  000044          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
2711  014120  104401  014164                  TYPE    9$
2712  014124  122723  000015                  CMPB    #15,(R3)+       ;;CHECK FOR RETURN
2713  014130  001356                          BNE     2$              ;;LOOP IF NOT RETURN
2714  014132  105063  177777                  CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
2715  014136  104401  001064                  TYPE    $LF             ;;TYPE A LINE FEED
2716  014142  012603                          MOV     (SP)+,R3        ;;RESTORE R3
2717  014144  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
2718  014146  016666  000004  000002          MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
2719  014154  012766  014166  000004          MOV     #$TTYIN,4(SP)
2720  014162  000002                          RTI                     ;;RETURN
2721  014164     000          9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
2722  014165     000                  .BYTE   0                       ;;TERMINATOR
2723  014166  000010          $TTYIN: .BLKB   8.                      ;;RESERVE 8 BYTES FOR TTY INPUT
2724  014176  052536  005015  000   $CNTLU: .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
2725  014203     136  006507  000012 $CNTLG: .ASCIZ  /↑G/<15><12>    ;;CONTROL "G"
2726  014210  005015  053523  020122 $MSWR:  .ASCIZ  <15><12>/SWR = /
2727  014216  020075     000
2728  014221     040  047040  053505 $MNEW:  .ASCIZ  /  NEW = /
2729  014226  036440  000040
2730
```

```
                                        .SBTTL  TRAP DECODER

                                        ;;**********************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.

014232  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
014234  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
014240  005740                          TST     -(R0)           ;;BACKUP BY 2
014242  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
014244  006300                          ASL     R0              ;;POSITION FOR INDEXING
014246  016000  014266                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
014252  000200                          RTS     R0              ;;GO TO ROUTINE

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

014254  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
014256  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
014264  000002                          RTI                     ;;RESTORE THE PSW

                                        .SBTTL  TRAP TABLE

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

                                        ;       ROUTINE
                                        ;       -------
014266  014254                  $TRPAD: .WORD   $TRAP2
014270  012746                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
014272  013254                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
014274  013230                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
014276  013270                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)

014300  013526                          $GTSWR  ;;CALL=GTSWR    TRAP+5(104405)  GET SOFT-SWR SETTING

014302  013456                          $CKSWR  ;;CALL=CKSWR    TRAP+6(104406)  TEST FOR CHANGE IN SOFT-SWR
014304  013740                          $RDCHR  ;;CALL=RDCHR    TRAP+7(104407)  TTY TYPEIN CHARACTER ROUTINE
014306  014060                          $RDLIN  ;;CALL=RDLIN    TRAP+10(104410) TTY TYPEIN STRING ROUTINE
```

```
                                        .SBTTL  ECHO TEST
                                ;;**************************************************************
                                        ;*THIS ROUTINE WILL ECHO ANY CHARACTER TYPED
                                        ;*AT THE CONSOLE
                                        ;*THE TEST IS HALTED BY TYPING A CONTROL-C
                                        ;*TEST CAN BE RESTARTED AFTER HALTING BY JUST CONTINUING
                                ;;**************************************************************
014310                          ECHO:
014310  000005                          RESET                   ;CLEAR EVERYTHING
014312  112777  000052  166014          MOVB    #'*,@CTBUF      ;TRANSMIT PROMPT "*"
014320  105777  166002          2$:     TSTB    @CRCSR          ;WAIT FOR INPUT
014324  100375                          BPL     2$
014326  117777  165776  166000          MOVB    @CRBUF,@CTBUF   ;ECHO INPUT
014334  017700  165770                  MOV     @CRBUF,R0       ;STORE INPUT
014340  100023                          BPL     5$              ;BR IF "ERROR"NOT SET
014342  052701  010000                  BIS     #BIT12,R1       ;SET PARITY ERROR TEST MASK
014346  030100                          BIT     R1,R0           ;CHECK  FOR PARITY ERROR FLAG
014350  001403                          BEQ     3$              ;BR IF NOT SET
014352  004767  000056                  JSR     PC,MSG          ;REPORT PARITY ERROR
014356  014462                          MPAR
014360  006301                  3$:     ASL     R1              ;SHIFT MASK TO TEST "FR" FLAG
014362  030100                          BIT     R1,R0           ;TEST FOR FRAMING ERROR FLAG
014364  001403                          BEQ     4$              ;BR IF NOT SET
014366  004767  000042                  JSR     PC,MSG          ;REPSORT FRAMING ERROR
014372  014473                          MFR
014374  006301                  4$:     ASL     R1              ;SHIFT MASK TO TEST "OR" FLAG
014376  030100                          BIT     R1,R0           ;TEST FOR OVERFLOW ERROR
014400  001403                          BEQ     5$              ;BR IF NOT SET
014402  004767  000026                  JSR     PC,MSG          ;REPORT OVERFLOW ERROR
014406  014505                          MOR
014410  042700  000200          5$:     BIC     #BIT7,R0        ;CLEAR ANY PARITY BIT
014414  022700  000003                  CMP     #3,R0           ;WAS INPUT CONTROL-C
014420  001337                          BNE     2$              ;BR IF NOT
014422  004767  000006                  JSR     PC,MSG          ;REPORT PROGRAM STOP
014426  014520                          MSTOP
014430  000000                          HALT                    ;END OF TEST HALT
014432  000726                          BR      ECHO            ;AFTER END OF TEST HALT
                                                                ;   PRESS CONTINUE TO RESTART ECHO TEST

014434  013600                  MSG:    MOV     @(SP)+,R0       ;PICK UP MESSAGE POINTER
014436  062746  000002                  ADD     #2,-(SP)        ;ADJUST RETURN PC
014442  105777  165664          WAIT:   TSTB    @#TCSR          ;WAIT FOR XMIT DONE
014446  100375                          BPL     WAIT
014450  112077  165660                  MOVB    (R0)+,@CTBUF    ;SEND CHARACTER
014454  105710                          TSTB    (R0)            ;IS THIS END OF MESSAGE?
014456  001371                          BNE     WAIT            ;BR IF NOT
014460  000207                          RTS     PC              ;RETURN

014462  005015  040520  044522  MPAR:   .ASCIZ  <CR><LF>/PARITY/
014470  054524     000
014473     015  043012  040522  MFR:    .ASCIZ  <CR><LF>/FRAMING/
014500  044515  043516     000
014505     015  047412  042526  MOR:    .ASCIZ  <CR><LF>/OVERFLOW/
014512  043122  047514  000127
014520  005015  052123  050117  MSTOP:  .ASCIZ  <CR><LF>/STOP/
014526     000
```

```
                        014530                          .EVEN

                                                .SBTTL  TERMINAL OUTPUT TEST

                                                ;;*****************************************************************
                                                        ;*THIS ROUTINE WILL OUTPUT ALL WRITABLE CHARACTERS FOR THE
                                                        ;*THE OCTAL CODE 040 --> 377
                                                        ;*32 CHARACTERS ARE PRINTED ON EACH LINE
                                                        ;*THE PATTERN IS REPEATED EVERY THREE LINES
                                                        ;*
                                                ;;*****************************************************************

014530  012701  000040          OUTTST: MOV     #40,R1          ;LOAD FIRST WRITABLE CHARACTER
014534  012700  000040          1$:     MOV     #40,R0          ;LOAD CHAR COUNT PER LINE
014540  105777  165566          2$:     TSTB    @#TCSR          ;WAIT FOR DONE
014544  100375                          BPL     2$
014546  010177  165562                  MOV     R1,@#TBUF       ;TRANSMIT A CHARACTER
014552  105201                          INCB    R1              ;INCREMENT CHARACTER CODE
014554  005300                          DEC     R0              ;DECREMENT CHAR COUNT
014556  001370                          BNE     2$              ;BR IF LINE NOT COMPLETE
014560  004767  177650                  JSR     PC,MSG          ;SSUE CR,LINE FEED

014564  001063                          $CRLF
014566  105777  165534                  TSTB    @#RCSR          ;ANY CHARACTER RECEIVED?
014572  100404                          BMI     3$              ;BR IF YES
014574  032701  000200                  BIT     #BIT7,R1        ;FINISHED ONE PASS OF WRITABLE CHARACTERS?
014600  001353                          BNE     OUTTST          ;BR IF YES
014602  000754                          BR      1$              ;IF NOT WRITE NEXT LINE

014604  005077  165520          3$:     CLR     @#RBUF          ;CLEAR RECEIVER
014610  000000                          HALT                    ;STOP TEST
014612  000746                          BR      OUTTST          ;RESTART TEST IF CONTINUED
```

```
2865
2866
2867  014614  040503  020116  047516  EM1:    .ASCIZ  /CAN NOT ACCESS TCSR/
2868  014622  020124  041501  042503
2869  014630  051523  052040  051503
2870  014636  000122
2871  014640  040503  020116  047516  EM2:    .ASCIZ  /CAN NOT ACCESS TBUF/
2872  014646  020124  041501  042503
2873  014654  051523  052040  052502
2874  014662  000106
2875  014664  041524  051123  042040  EM3:    .ASCIZ  /TCSR DONE NOT CLEARED WITH TBUF FULL/
2876  014672  047117  020105  047516
2877  014700  020124  046103  040505
2878  014706  042522  020104  044527
2879  014714  044124  052040  052502
2880  014722  020106  052506  046114
2881  014730     000
2882  014731     124  051503  020122  EM4:    .ASCIZ  /TCSR DONE NOT SET/
2883  014736  047504  042516  047040
2884  014744  052117  051440  052105
2885  014752     000
2886  014753     124  051503  020122  EM5:    .ASCIZ  /TCSR DONE NOT SET WITH RESET/
2887  014760  047504  042516  047040
2888  014766  052117  051440  052105
2889  014774  053440  052111  020110
2890  015002  042522  042523  000124
2891  015010  040503  020116  047516  EM6:    .ASCIZ  /CAN NOT ACCESS RCSR/
2892  015016  020124  041501  042503
2893  015024  051523  051040  051503
2894  015032  000122
2895  015034  040503  020116  047516  EM7:    .ASCIZ  /CAN NOT ACCESS RBUF/
2896  015042  020124  041501  042503
2897  015050  051523  051040  052502
2898  015056  000106
2899  015060  040503  020116  047516  EM10:   .ASCIZ  /CAN NOT ACCESS LKS/
2900  015066  020124  041501  042503
2901  015074  051523  046040  051513
2902  015102     000
2903  015103     102  052111  020060  EM11:   .ASCIZ  /BITO OF TCSR NOT CLEAR AFTER RESET/
2904  015110  043117  052040  051503
2905  015116  020122  047516  020124
2906  015124  046103  040505  020122
2907  015132  043101  042524  020122
2908  015140  042522  042523  000124
2909  015146  040503  020116  047516  EM12:   .ASCIZ  /CAN NOT SET BITO OF TCSR/
2910  015154  020124  042523  020124
2911  015162  044502  030124  047440
2912  015170  020106  041524  051123
2913  015176     000
2914  015177     103  047101  047040  EM13:   .ASCIZ  /CAN NOT CLEAR BITO OF TCSR/
2915  015204  052117  041440  042514
2916  015212  051101  041040  052111
2917  015220  020060  043117  052040
2918  015226  051503  000122
2919  015232  042522  042523  020124  EM14:   .ASCIZ  /RESET DID NOT CLEAR BITO OF TCSR/
2920  015240  044504  020104  047516
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 2921  015246  020124  046103  040505
 2922  015254  020122  044502  030124
 2923  015262  047440  020106  041524
 2924  015270  051123     000
 2925  015273     102  052111  020062  EM15:   .ASCIZ  /BIT2 OF TCSR NOT CLEAR AFTER RESET/
 2926  015300  043117  052040  051503
 2927  015306  020122  047516  020124
 2928  015314  046103  040505  020122
 2929  015322  043101  042524  020122
 2930  015330  042522  042523  000124
 2931  015336  040503  020116  047516  EM16:   .ASCIZ  /CAN NOT SET BIT2 OF TCSR/
 2932  015344  020124  042523  020124
 2933  015352  044502  031124  047440
 2934  015360  020106  041524  051123
 2935  015366     000
 2936  015367     103  047101  047040  EM17:   .ASCIZ  /CAN NOT CLEAR BIT2 OF TCSR/
 2937  015374  052117  041440  042514
 2938  015402  051101  041040  052111
 2939  015410  020062  043117  052040
 2940  015416  051503  000122
 2941  015422  042522  042523  020124  EM20:   .ASCIZ  /RESET DID NOT CLEAR BIT2 OF TCSR/
 2942  015430  044504  020104  047516
 2943  015436  020124  046103  040505
 2944  015444  020122  044502  031124
 2945  015452  047440  020106  041524
 2946  015460  051123     000
 2947  015463     102  052111  020066  EM21:   .ASCIZ  ;BIT6 OF TCSR NOT CLEAR AFTER RESET/
 2948  015470  043117  052040  051503
 2949  015476  020122  047516  020124
 2950  015504  046103  040505  020122
 2951  015512  043101  042524  020122
 2952  015520  042522  042523  027524
 2953  015526     000
 2954  015527     130  044515  020124  EM22:   .ASCIZ  /XMIT INTERRUPT AT PRIORITY 7/
 2955  015534  047111  042524  051122
 2956  015542  050125  020124  052101
 2957  015550  050040  044522  051117
 2958  015556  052111  020131  000067
 2959  015564  040503  020116  047516  EM23:   .ASCIZ  /CAN NOT SET BIT6 OF TCSR/
 2960  015572  020124  042523  020124
 2961  015600  044502  033124  047440
 2962  015606  020106  041524  051123
 2963  015614     000
 2964  015615     103  047101  047040  EM24:   .ASCIZ  /CAN NOT CLEAR BIT6 OF TCSR/
 2965  015622  052117  041440  042514
 2966  015630  051101  041040  052111
 2967  015636  020066  043117  052040
 2968  015644  051503  000122
 2969  015650  042522  042523  020124  EM25:   .ASCIZ  /RESET DID NOT CLEAR BIT6 OF TCSR/
 2970  015656  044504  020104  047516
 2971  015664  020124  046103  040505
 2972  015672  020122  044502  033124
 2973  015700  047440  020106  041524
 2974  015706  051123     000
 2975  015711     102  052111  020066  EM26:   .ASCIZ  /BIT6 OF RCSR NOT CLEAR AFTER RESET/
 2976  015716  043117  051040  051503
```

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2977  015724  020122  047516  020124
2978  015732  046103  040505  020122
2979  015740  043101  042524  020122
2980  015746  042522  042523  000124
2981  015754  041522  051126  044440  EM27:   .ASCIZ  /RCVR INTERRUPT WITH PRIORITY 7/
2982  015762  052116  051105  052522
2983  015770  052120  053440  052111
2984  015776  020110  051120  047511
2985  016004  044522  054524  033440
2986  016012     000
2987  016013     103  047101  047040  EM30:   .ASCIZ  /CAN NOT SET BIT6 OF RCSR/
2988  016020  052117  051440  052105
2989  016026  041040  052111  020066
2990  016034  043117  051040  051503
2991  016042  000122
2992  016044  040503  020116  047516  EM31:   .ASCIZ  /CAN NOT CLEAR BIT6 OF RCSR/
2993  016052  020124  046103  040505
2994  016060  020122  044502  033124
2995  016066  047440  020106  041522
2996  016074  051123     000
2997  016077     103  047101  047040  EM32:   .ASCIZ  /CAN NOT CLEAR BIT6 OF RCSR WITH RESET/
2998  016104  052117  041440  042514
2999  016112  051101  041040  052111
3000  016120  020066  043117  051040
3001  016126  051503  020122  044527
3002  016134  044124  051040  051505
3003  016142  052105     000
3004  016145     102  052111  020066  EM33:   .ASCIZ  /BIT6 OF LKS NOT CLEAR AFTER RESET/
3005  016152  043117  046040  051513
3006  016160  047040  052117  041440
3007  016166  042514  051101  040440
3008  016174  052106  051105  051040
3009  016202  051505  052105     000
3010  016207     114  051513  044440  EM34:   .ASCIZ  /LKS INTERRUPT WITH PRIORITY 7/
3011  016214  052116  051105  052522
3012  016222  052120  053440  052111
3013  016230  020110  051120  047511
3014  016236  044522  054524  033440
3015  016244     000
3016  016245     103  047101  047040  EM35:   .ASCIZ  /CAN NOT SET BIT6 OF LKS/
3017  016252  052117  051440  052105
3018  016260  041040  052111  020066
3019  016266  043117  046040  051513
3020  016274     000
3021  016275     103  047101  047040  EM36:   .ASCIZ  /CAN NOT CLEAR BIT6 OF LKS/
3022  016302  052117  041440  042514
3023  016310  051101  041040  052111
3024  016316  020066  043117  046040
3025  016324  051513     000
3026  016327     122  051505  052105  EM37:   .ASCIZ  /RESET DID NOT CLEAR BIT6 OF LKS/
3027  016334  042040  042111  047040
3028  016342  052117  041440  042514
3029  016350  051101  041040  052111
3030  016356  020066  043117  046040
3031  016364  051513     000
3032  016367     104  040525  020114  EM40:   .ASCIZ  /DUAL ADDRESSING ERROR/
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3033  016374  042101  051104  051505
3034  016402  044523  043516  042440
3035  016410  051122  051117     000
3036  016415     102  052111  020066  EM41:   .ASCIZ  /BIT6 OF LKS NOT SET AFTER RESET/
3037  016422  043117  046040  051513
3038  016430  047040  052117  051440
3039  016436  052105  040440  052106
3040  016444  051105  051040  051505
3041  016452  052105     000
3042  016455     103  047101  047040  EM42:   .ASCIZ  /CAN NOT CLEAR BIT7 OF LKS/
3043  016462  052117  041440  042514
3044  016470  051101  041040  052111
3045  016476  020067  043117  046040
3046  016504  051513     000
3047  016507     102  052111  020067  EM43:   .ASCIZ  /BIT7 OF LKS DOES NOT SET/
3048  016514  043117  046040  051513
3049  016522  042040  042517  020123
3050  016530  047516  020124  042523
3051  016536  000124
3052  016540  052122  020103  047111  EM44:   .ASCIZ  /RTC INTERRUPT AT PRIORITY 7/
3053  016546  042524  051122  050125
3054  016554  020124  052101  050040
3055  016562  044522  051117  052111
3056  016570  020131  000067
3057  016574  052122  020103  047111  EM45:   .ASCIZ  /RTC INTERRUPTS WHEN DISABLED/
3058  016602  042524  051122  050125
3059  016610  051524  053440  042510
3060  016616  020116  044504  040523
3061  016624  046102  042105     000
3062  016631                          EM47:
3063  016631     122  041524  044440  EM46:   .ASCIZ  /RTC INTERRUPT DID NOT OCCUR/
3064  016636  052116  051105  052522
3065  016644  052120  042040  042111
3066  016652  047040  052117  047440
3067  016660  041503  051125     000
3068  016665     122  041524  042040  EM50:   .ASCIZ  /RTC DOUBLE INTERRUPT/
3069  016672  052517  046102  020105
3070  016700  047111  042524  051122
3071  016706  050125  000124
3072  016712  042522  042523  020124  EM51:   .ASCIZ  /RESET DID NOT INTERRUPT/
3073  016720  044504  020104  047516
3074  016726  020124  047111  042524
3075  016734  051122  050125  000124
3076  016742  052122  020103  047111  EM52:   .ASCIZ  /RTC INTERRUPT DID NOT CLEAR WITH BIT7 OF LKS/
3077  016750  042524  051122  050125
3078  016756  020124  044504  020104
3079  016764  047516  020124  046103
3080  016772  040505  020122  044527
3081  017000  044124  041040  052111
3082  017006  020067  043117  046040
3083  017014  051513     000
3084  017017     103  047514  045503  EM53:   .ASCIZ  /CLOCK REPEATABILITY/
3085  017024  051040  050105  040505
3086  017032  040524  044502  044514
3087  017040  054524     000
3088  017043     130  044515  020124  EM54:   .ASCIZ  /XMIT INTERRUPTS WHEN DISABLED/
```

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 3089  017050  047111  042524  051122
 3090  017056  050125  051524  053440
 3091  017064  042510  020116  044504
 3092  017072  040523  046102  042105
 3093  017100     000
 3094  017101     130  044515  020124  EM56:   .ASCIZ  /XMIT INTERRUPTS AT PRIORITY 7/
 3095  017106  047111  042524  051122
 3096  017114  050125  051524  040440
 3097  017122  020124  051120  047511
 3098  017130  044522  054524  033440
 3099  017136     000
 3100  017137     130  044515  020124  EM57:   .ASCIZ  /XMIT INTERRUPTS WITH ENABLE CLEAR/
 3101  017144  047111  042524  051122
 3102  017152  050125  051524  053440
 3103  017160  052111  020110  047105
 3104  017166  041101  042514  041440
 3105  017174  042514  051101     000
 3106  017201                          EM55:
 3107  017201     130  044515  020124  EM60:   .ASCIZ  /XMIT DID NOT INTERRUPT/
 3108  017206  044504  020104  047516
 3109  017214  020124  047111  042524
 3110  017222  051122  050125  000124
 3111  017230  046530  052111  051040  EM61:   .ASCIZ  /XMIT RE-INTERRUPTED/
 3112  017236  026505  047111  042524
 3113  017244  051122  050125  042524
 3114  017252  000104
 3115  017254  047514  042101  047111  EM62:   .ASCIZ  /LOADING TBUF DID NOT CLEAR INTERRUPT/
 3116  017262  020107  041124  043125
 3117  017270  042040  042111  047040
 3118  017276  052117  041440  042514
 3119  017324  051101  044440  052116
 3120  017312  051105  052522  052120
 3121  017320     000
 3122  017321     122  053103  020122  EM63:   .ASCIZ  /RCVR ACTIVE NOT SET/
 3123  017326  041501  044524  042526
 3124  017334  047040  052117  051440
 3125  017342  052105     000
 3126  017345     122  053103  020122  EM64:   .ASCIZ  /RCVR DONE NEVER SET/
 3127  017352  047504  042516  047040
 3128  017360  053105  051105  051440
 3129  017366  052105     000
 3130  017371     122  053103  020122  EM65:   .ASCIZ  /RCVR ACTIVE NOT CLEARED WITH DONE SET/
 3131  017376  041501  044524  042526
 3132  017404  047040  052117  041440
 3133  017412  042514  051101  042105
 3134  017420  053440  052111  020110
 3135  017426  047504  042516  051440
 3136  017434  052105     000
 3137  017437     122  051505  052105  EM66:   .ASCIZ  /RESET DID NOT CLEAR RCVR DONE/
 3138  017444  042040  042111  047040
 3139  017452  052117  041440  042514
 3140  017460  051101  051040  053103
 3141  017466  020122  047504  042516
 3142  017474     000
 3143  017475     122  051104  042440  EM67:   .ASCIZ  /RDR ENABLE DID NOT CLEAR RCVR DONE/
 3144  017502  040516  046102  020105
```

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3145  017510  044504  020104  047516
3146  017516  020124  046103  040505
3147  017524  020122  041522  051126
3148  017532  042040  047117  000105
3149  017540  042522  042101  047111  EM70:   .ASCIZ  /READING RBUF DID NOT CLEAR RCVR DONE/
3150  017546  020107  041122  043125
3151  017554  042040  042111  047040
3152  017562  052117  041440  042514
3153  017570  051101  051040  053103
3154  017576  020122  047504  042516
3155  017604     000
3156  017605     122  053103  020122  EM71:   .ASCIZ  /RCVR INTERRUPTS WITH ENABLE CLEAR/
3157  017612  047111  042524  051122
3158  017620  050125  051524  053440
3159  017626  052111  020110  047105
3160  017634  041101  042514  041440
3161  017642  042514  051101     000
3162  017647     122  053103  020122  EM73:   .ASCIZ  /RCVR INTERRUPTS AT PRIORITY 7/
3163  017654  047111  042524  051122
3164  017662  050125  051524  040440
3165  017670  020124  051120  047511
3166  017676  044522  054524  033440
3167  017704     000
3168  017705     122  053103  020122  EM74:   .ASCIZ  /RCVR INT RQST PASSED WITH ENABLE CLEAR/
3169  017712  047111  020124  050522
3170  017720  052123  050040  051501
3171  017726  042523  020104  044527
3172  017734  044124  042440  040516
3173  017742  046102  020105  046103
3174  017750  040505  000122
3175  017754                          EM72:
3176  017754  041522  051126  042040  EM75:   .ASCIZ  /RCVR DID NOT INTERRUPT/
3177  017762  042111  047040  052117
3178  017770  044440  052116  051105
3179  017776  052522  052120     000
3180  020003     122  053103  020122  EM76:   .ASCIZ  /RCVR RE-INTERRUPTED/
3181  020010  042522  044455  052116
3182  020016  051105  052522  052120
3183  020024  042105     000
3184  020027     122  040505  044504  EM77:   .ASCIZ  /READING RBUF DID NOT CLEAR INTERRUPT/
3185  020034  043516  051040  052502
3186  020042  020106  044504  020104
3187  020050  047516  020124  046103
3188  020056  040505  020122  047111
3189  020064  042524  051122  050125
3190  020072  000124
3191  020074  042522  042523  020124  EM100:  .ASCIZ  /RESET DID NOT CLEAR RCVR INTERRUPT/
3192  020102  044504  020104  047516
3193  020110  020124  046103  040505
3194  020116  020122  041522  051126
3195  020124  044440  052116  051105
3196  020132  052522  052120     000
3197  020137     047  051117  020047  EM101:  .ASCIZ  /'OR' FLAG DID NOT SET/
3198  020144  046106  043501  042040
3199  020152  042111  047040  052117
3200  020160  051440  052105     000
```

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3201  020165     047  051105  047522  EM102:  .ASCIZ  /'ERROR' NOT SET WITH 'OR' FLAG/
3202  020172  023522  047040  052117
3203  020200  051440  052105  053440
3204  020206  052111  020110  047447
3205  020214  023522  043040  040514
3206  020222  000107
3207  020224  051102  040505  020113  EM103:  .ASCIZ  /BREAK DID NOT XMIT ALL ZEROES/
3208  020232  044504  020104  047516
3209  020240  020124  046530  052111
3210  020246  040440  046114  055040
3211  020254  051105  042517  000123
3212  020262  051102  040505  020113  EM104:  .ASCIZ  /BREAK DID NOT SET 'FR' ERROR/
3213  020270  044504  020104  047516
3214  020276  020124  042523  020124
3215  020304  043047  023522  042440
3216  020312  051122  051117     000
3217  020317     104  052101  020101  EM105:  .ASCIZ  /DATA COMPARE ERROR/
3218  020324  047503  050115  051101
3219  020332  020105  051105  047522
3220  020340  000122
3221  020342  040504  040524  041440  EM106:  .ASCIZ  /DATA COMPARE ERROR WITH CABLE/
3222  020350  046517  040520  042522
3223  020356  042440  051122  051117
3224  020364  053440  052111  020110
3225  020372  040503  046102  000105
3226  020400  044524  042515  052517  EM107:  .ASCIZ  /TIMEOUT IN EXERCISER TEST/
3227  020406  020124  047111  042440
3228  020414  042530  041522  051511
3229  020422  051105  052040  051505
3230  020430  000124
3231  020432  047111  047503  051122  EM110:  .ASCIZ  /INCORRECT RECEIVE COUNT/
3232  020440  041505  020124  042522
3233  020446  042503  053111  020105
3234  020454  047503  047125  000124
3235  020462  040504  040524  041440  EM111:  .ASCIZ  /DATA COMPARE ERROR IN EXERCISER/
3236  020470  046517  040520  042522
3237  020476  042440  051122  051117
3238  020504  044440  020116  054105
3239  020512  051105  044503  042523
3240  020520  000122
3241  020522  051124  050101  041440  EM112:  .ASCIZ  /TRAP CATCHER/
3242  020530  052101  044103  051105
3243  020536     000
3244  020537     116  020117  046103  EM113:  .ASCIZ  /NO CLK INTERRUPT IN EXERCISER/
3245  020544  020113  047111  042524
3246  020552  051122  050125  020124
3247  020560  047111  042440  042530
3248  020566  041522  051511  051105
3249  020574     000
3250
3251  020575     124  051505  021524  DH1:    .ASCIZ  /TEST#   ERROR#  TCSR/
3252  020602  020040  042440  051122
3253  020610  051117  020043  052040
3254  020616  051503  000122
3255  020622  042524  052123  020043  DH2:    .ASCIZ  /TEST#   ERR PC  TBUF/
3256  020630  020040  051105  020122
```

```
3257  020636  041520  020040  041124
3258  020644  043125     000
3259  020647     124  051505  021524  DH6:    .ASCIZ  /TEST#  ERR PC  RCSR/
3260  020654  020040  042440  051122
3261  020662  050040  020103  051040
3262  020670  051503  000122
3263  020674  042524  052123  020043  DH7:    .ASCIZ  /TEST#  ERR PC  RBUF/
3264  020702  020040  051105  020122
3265  020710  041520  020040  041122
3266  020716  043125     000
3267  020721     124  051505  021524  DH10:   .ASCIZ  /TEST#  ERR PC  LKS/
3268  020726  020040  042440  051122
3269  020734  050040  020103  046040
3270  020742  051513     000
3271  020745     124  051505  021524  DH40:   .ASCIZ  /TEST#  ERR PC  GOOD    BAD/
3272  020752  020040  042440  051122
3273  020760  050040  020103  043440
3274  020766  047517  020104  020040
3275  020774  041040  042101     000
3276  021001     124  051505  021524  DH53:   .ASCIZ  /TEST#  ERR PC  LKS     CNT1    CNT2/
3277  021006  020040  042440  051122
3278  021014  050040  020103  046040
3279  021022  051513  020040  020040
3280  021030  041440  052116  020061
3281  021036  020040  041440  052116
3282  021044  000062
3283  021046  042524  052123  020043  DH103:  .ASCIZ  /TEST#  ERR PC  RCSR    DATA/
3284  021054  020040  051105  020122
3285  021062  041520  020040  041522
3286  021070  051123  020040  020040
3287  021076  040504  040524     000
3288  021103     124  051505  021524  DH105:  .ASCIZ  /TEST#  ERR PC  RCSR    GOOD    BAD/
3289  021110  020040  042440  051122
3290  021116  050040  020103  051040
3291  021124  051503  020122  020040
3292  021132  043440  047517  020104
3293  021140  020040  041040  042101
3294  021146     000
3295  021147     124  051505  021524  DH110:  .ASCIZ  /TEST#  ERR PC  RCSR    TRANS   RCV/
3296  021154  020040  042440  051122
3297  021162  050040  020103  051040
3298  021170  051503  020122  020040
3299  021176  052040  040522  051516
3300  021204  020040  051040  053103
3301  021212     000
3302  021213     124  051505  021524  DH112:  .ASCIZ  /TEST#  ERR PC  RCSR    OLDPC   TRAP ADR/
3303  021220  020040  042440  051122
3304  021226  050040  020103  051040
3305  021234  051503  020122  020040
3306  021242  047440  042114  041520
3307  021250  020040  052040  040522
3308  021256  020120  042101  000122
3309                          .EVEN
3310  021264  005015  040515  047111  M1:     .ASCIZ  <CR><LF>/MAINDEC-DZDLD-A/
3311  021272  042504  026503  055104
3312  021300  046104  026504  000101
```

```
3313                                                    .EVEN
3314  021306  005015                            M2:     .ASCII  <CR><LF>
3315  021310  020040  042040  053105            M2A:    .ASCIZ  /   DEVICES UNDER TEST  /
3316  021316  041511  051505  052440
3317  021324  042116  051105  052040
3318  021332  051505  020124  000040
3319
3320                                                    .EVEN
3321  021340  001072  001016  002312            DT1:    .WORD   $TESTN,$ERRPC,TCSR,0
3322  021346  000000
3323  021350  001072  001016  002314            DT2:    .WORD   $TESTN,$ERRPC,TBUF,0
3324  021356  000000
3325  021360  001072  001016  002306            DT6:    .WORD   $TESTN,$ERRPC,RCSR,0
3326  021366  000000
3327  021370  001072  001016  002310            DT7:    .WORD   $TESTN,$ERRPC,RBUF,0
3328  021376  000000
3329  021400  001072  001016  002346            DT10:   .WORD   $TESTN,$ERRPC,LKS,0
3330  021406  000000
3331  021410  001072  001016  002306            DT40:   .WORD   $TESTN,$ERRPC,RCSR,$BDADR,0
3332  021416  001022  000000
3333  021422  001072  001016  002346            DT53:   .WORD   $TESTN,$ERRPC,LKS,FIRST,SECND,0
3334  021430  006350  006352  000000
3335  021436  001072  001016  002306            DT103:  .WORD   $TESTN,$ERRPC,RCSR,$BDDAT,0
3336  021444  001026  000000
3337  021450  001072  001016  002306            DT105:  .WORD   $TESTN,$ERRPC,RCSR,$GDDAT,$BDDAT,0
3338  021456  001024  001026  000000
3339  021464  001072  001016  002306            DT110:  .WORD   $TESTN,$ERRPC,RCSR,XMTCNT,RCVCNT,0
3340  021472  011274  011272  000000
3341  021500  001072  001016  002306            DT112:  .WORD   $TESTN,$ERRPC,RCSR,OLDPC,BDVECT,0
3342  021506  011626  011630  000000
3343          000001                                    .END
```

```
ABASE = 176500            122#    234     275
ACDW1 = 000000            234
ACDW2 = 000000            234
ACPUOP= 000000            234     249
ADDW0 = 000000            234
ADDW1 = 000000            234
ADDW10= 000000            234
ADDW11= 000000            234
ADDW12= 000000            234
ADDW13= 000000            234
ADDW14= 000000            234
ADDW15= 000000            234
ADDW2 = 000000            234
ADDW3 = 000000            234
ADDW4 = 000000            234
ADDW5 = 000000            234
ADDW6 = 000000            234
ADDW7 = 000000            234
ADDW8 = 000000            234
ADDW9 = 000000            234
ADEVCT= 000000            234     240
ADEVM = 000000            234     276
ADR     003466            871#    874
ADRTBL  002354            703#    709     869
AENV  = 000000            234     245
AENVM = 000000            234     246
AFATAL= 000000            234     237
AMADR1= 000000            234     262
AMADR2= 000000            234     266
AMADR3= 000000            234     269
AMADR4= 000000            234     272
AMAMS1= 000000            234     256
AMAMS2= 000000            234     264
AMAMS3= 000000            234     267
AMAMS4= 000000            234     270
AMSGAD= 000000            234     242
AMSGLG= 000000            234     243
AMSGTY= 000000            234     236
AMTYP1= 000000            234     257
AMTYP2= 000000            234     265
AMTYP3= 000000            234     268
AMTYP4= 000000            234     271
APASS = 000000            234     239
APRIOR= 000000            234
APTCSU= 000040           2430#   2463
APTENV= 000001           2206    2385    2428#   2456
APTSIZ= 000200            768    2427#
APTSPO= 000100           2387    2429#   2458
APTSZD  003172            775     777     802#
ASWREG= 000000            234     247
ATESTN= 000000            234     238
AUNIT = 000000            234     241
AUSWR = 000000            234     248
AVECT1= 000300            123#    234     273
AVECT2= 000000            234     274
BDVECT  011630           2172*   2178#   3341
```

```
BEGIN   003330          844#  2161
BIT0  = 000001          107#   772   846  1052  1063  1064  1069  1070  1081  1083  1085  1679  1910
                       1917  1922  1926  1939  1946
BIT00 = 000001           97#   107
BIT01 = 000002           96#   106
BIT02 = 000004           95#   105
BIT03 = 000010           94#   104
BIT04 = 000020           93#   103
BIT05 = 000040           92#   102
BIT06 = 000100           91#   101
BIT07 = 000200           90#   100
BIT08 = 000400           89#    99
BIT09 = 001000           88#    98  2217  2356
BIT1  = 000002          106#   844  1275
BIT10 = 002000           87#  1874  1933
BIT11 = 004000           86#  1635  1652  1654
BIT12 = 010000           85#  2790
BIT13 = 020000           84#  1947  2201
BIT14 = 040000           83#  1884  2340
BIT15 = 100000           82#  1890
BIT2  = 000004          105#  1094  1107  1108  1113  1114  1126  1128  1131  1632  1639  1648  1662
                       1666  1675  1682  1693  1698  1711  1720  1722  1730  1735  1745  1757  1767
                       1770  1782  1791  1822  1826  1852  1877  1886  1892  1895  1905  1917  1922
                       1926  1938  1946  1961  1973  1976  2028
BIT3  = 000010          104#  2073
BIT4  = 000020          103#   839
BIT5  = 000040          102#   776  2087
BIT6  = 000100          101#  1031  1145  1155  1156  1162  1163  1168  1170  1187  1197  1198  1204
                       1205  1211  1213  1227  1234  1244  1245  1251  1252  1256  1258  1280  1281
                       1285  1304  1332  1339  1362  1371  1384  1392  1411  1421  1427  1435  1450
                       1456  1464  1480  1519  1533  1538  1547  1554  1561  1578  1585  1593  1605
                       1608  1618  1709  1710  1728  1737  1754  1762  1792  1801  1821  1831  1851
                       1860  2022  2027  2029  2030  2041  2060  2089
BIT7  = 000200          100#   774  1311  1312  1340  1363  1393  1428  1457  1460  1984  2805  2858
BIT8  = 000400           99#  1049  1902  1935
BIT9  = 001000           98#
BPT   = 000003          126#
BPTVEC= 000014          114#
BUF     011300         2037  2068  2106#
CATCH   011602          137  2170#
CKSWR = 104406         2216  2339  2771#
CLK     011264         2025  2100#
CLKCNT  011276         2062  2100*  2105#
CMPARE  006320         1497  1500#
COMP    011152         2070#  2074
CONT    005404         1318#  1321
CONT41  010370         1913  1920#
CR    = 000015           22#  2151  2502  2512  2823  2825  2827  2829  3310  3314
CRBUF   002330          690#  2787  2788  2862*
CRCSR   002326          689#   794   850  2785  2856
CRLF  = 000200           23#  2473  2512
CRPSW   002340          694#
CRVECT  002336          693#
CTBUF   002334          692#  2784*  2787*  2818*  2849*
CTCSR   002332          691#  2816  2847
CTPSW   002344          696#
```

```
CTSTFL  002276          672#   724*   849*   896   918   942   956  1029  1054  1072  1097  1117  1225
                       1302   1330   1382  1419  1448  1478  2020  2058  2115*
CTVECT  002342          695#
DDISP = 177570           29#   217    756
DEVADR  002454          709#   779    810
DH1     020575          297    307    312   317   337   342   347   352   357   362   367   372   377
                        382    387    392   397   512   517   522   527   532   537   542  3251#
DH10    020721          332    427    432   437   442   447   457   462   467   472   477   482   487
                        492    497    502   668  3267#
DH103   021046          628   3283#
DH105   021103          638    643    658  3288#
DH110   021147          653   3295#
DH112   021213          663   3302#
DH2     020622          302   3255#
DH40    020745          452   3271#
DH53    021001          507   3276#
DH6     020647          322    402    407   412   417   422   547   552   557   562   567   572   577
                        582    587    592   597   602   607   612   618   623   633   648  3259#
DH7     020674          327   3263#
DISPLA  001042          217#   756*   764*  2196*  2367*
DISPRE  000174          147#   764
DSWR  = 177570           28#   216    755
DT1     021340          298    308    313   318   338   343   348   353   358   363   368   373   378
                        383    388    393   398   513   518   523   528   533   538   543  3321#
DT10    021400          333    428    433   438   443   448   458   463   468   473   478   483   488
                        493    498    503   669  3329#
DT103   021436          629   3335#
DT105   021450          639    644    659  3337#
DT110   021464          654   3339#
DT112   021500          664   3341#
DT2     021350          303   3323#
DT40    021410          453   3331#
DT53    021422          508   3333#
DT6     021360          323    403    408   413   418   423   548   553   558   563   568   573   578
                        583    588    593   598   603   608   613   619   624   634   649  3325#
DT7     021370          328   3327#
DVADT   003220          808    810#
ECHO    014310          152   2782#  2811
EMTVEC= 000030          117#   740*   741*
EM1     014614          296   2867#
EM10    015060          331   2899#
EM100   020074          611   3191#
EM101   020137          617   3197#
EM102   020165          622   3201#
EM103   020224          627   3207#
EM104   020262          632   3212#
EM105   020317          637   3217#
EM106   020342          642   3221#
EM107   020400          647   3226#
EM11    015103          336   2903#
EM110   020432          652   3231#
EM111   020462          657   3235#
EM112   020522          662   3241#
EM113   020537          667   3244#
EM12    015146          341   2909#
EM13    015177          346   2914#
```

```
EM14    015232              351    2919#
EM15    015273              356    2925#
EM16    015336              361    2931#
EM17    015367              366    2936#
EM2     014640              301    2871#
EM20    015422              371    2941#
EM21    015463              376    2947#
EM22    015527              381    2954#
EM23    015564              386    2959#
EM24    015615              391    2964#
EM25    015650              396    2969#
EM26    015711              401    2975#
EM27    015754              406    2981#
EM3     014664              306    2875#
EM30    016013              411    2987#
EM31    016044              416    2992#
EM32    016077              421    2997#
EM33    016145              426    3004#
EM34    016207              431    3010#
EM35    016245              436    3016#
EM36    016275              441    3021#
EM37    016327              446    3026#
EM4     014731              311    2882#
EM40    016367              451    3032#
EM41    016415              456    3036#
EM42    016455              461    3042#
EM43    016507              466    3047#
EM44    016540              471    3052#
EM45    016574              476    3057#
EM46    016631              481    3063#
EM47    016631              486    3062#
EM5     014753              316    2886#
EM50    016665              491    3068#
EM51    016712              496    3072#
EM52    016742              501    3076#
EM53    017017              506    3084#
EM54    017043              511    3088#
EM55    017201              516    3106#
EM56    017101              521    3094#
EM57    017137              526    3100#
EM6     015010              321    2891#
EM60    017201              531    3107#
EM61    017230              536    3111#
EM62    017254              541    3115#
EM63    017321              546    3122#
EM64    017345              551    3126#
EM65    017371              556    3130#
EM66    017437              561    3137#
EM67    017475              566    3143#
EM7     015034              326    2895#
EM70    017540              571    3149#
EM71    017605              576    3156#
EM72    017754              581    3175#
EM73    017647              586    3162#
EM74    017705              591    3168#
EM75    017754              596    3176#
```

```
EM76    020003            601    3180#
EM77    020027            606    3184#
ENDEV   011400           2083    2111#
ENDMG   011520           2138    2151#
ERRVEC= 000004            110#    753     754*    765*    2345    2346*   2348*   2351*
FIRST   006350           1498*   1500    1511#   3333
GNS   = ****** U         2764    2765    2766    2767    2769    2771    2772    2773
GOAGIN  011534           2148    2154#
GTSWR = 104405           2769#
HT    = 000011             20#   2471    2512
IOTVEC= 000020            115#    738*    739*
LF    = 000012             21#   2151    2506    2512    2823    2825    2827    2829    3310    3314
LKS     002346            699#   1035    1234    1244*   1245    1251*   1252    1256*   1258    1308    1311*   1312    1318
                         1339*   1340*   1341    1349*   1353    1362*   1363*   1364    1371*   1392*   1393*   1394    1411*
                         1427*   1428*   1429    1435*   1456*   1457*   1458    1460*   1464*   1486*   1487    1489*   1490
                         1493*   2027*   3329    3333
MANL    003036            773    776#
MFR     014473           2799   2825#
MOR     014505           2804   2827#
MPAR    014462           2794   2823#
MSG     014434           2793   2798    2803    2808    2814#   2853
MSTOP   014520           2809   2829#
M1      021264            974   3310#
M2      021306            976   3314#
M2A     021310            841*  3315#
OLDPC   011626           2173*  2177#   3341
OUTTST  014530            153   2845#   2859    2864
PC    =%000007             41#    717*    779*    810*    901*    923*    947*    961*   1059*   1077*   1103*   1122*   1143*
                         1185*   1232*   1334*   1351*   1390*   1402*   1423*   1432*   1452*   1461*   1525*   1548*   1563*
                         1581*   1606*   1615*   1715*   1746*   1764*   1786*   1816*   1828*   1846*   1857*   2033*   2132*
                         2135*   2142*   2147    2203*   2209*   2268*   2404*   2421*   2461*   2480*   2487*   2494*   2508*
                         2510*   2645*   2793*   2798*   2803*   2808*   2821*   2853*
PIRQ  = 177772             27#
PIRQVE= 000240            121#
PR0   = 000000             44#
PR1   = 000040             45#
PR2   = 000100             46#
PR3   = 000140             47#
PR4   = 000200             48#
PR5   = 000240             49#
PR6   = 000300             50#
PR7   = 000340             51#
PS    = 177776             24#    25
PSW   = 177776             25#
PWRVEC= 000024            116#    744*    745*   2284*   2285*   2294*   2302*   2311*   2312*
RBUF    002310            679#   1016    1697    1827*   1884    1890    1909*   1920    1947    1965    1997    2095    3327
RCSR    002306            678#    851     870    1002    1187    1197*   1198    1204*   1205    1211*   1213    1276    1278
                         1281    1635    1644    1652    1654*   1659    1666*   1677    1679*   1680    1695    1699    1710*
                         1718    1728*   1737*   1752    1754*   1762*   1789    1792*   1801*   1821*   1824    1831*   1851*
                         1854    1860*   1907    1912    1963    1990    2030*   3325    3331    3335    3337    3339    3341
RCV     011250           2018   2095#
RCVCNT  011272           2032*  2047    2096*   2103#   3339
RDCHR = 104407           2704   2772#
RDLIN = 104410           2773#
RESVEC= 000010            111#
RPSW    002320            683#   1714*   1750*   1785*   1820*   1850*   2019*
```

```
RSTRT   011560          2156  2160#
RTCPSW  002352           701#  1338*  1389*  2026*
RTCVT   002350           700#  1230   1231*  1263*  1336   1337*  1350*  1361*  1372*  1387   1388*  1401*  1412*
                        1425   1426*  1441*  1454   1455*  1471*  2024   2025*
RVECT   002316           682#  1183   1184*  1218*  1712   1713*  1727*  1736*  1748   1749*  1763*  1774*  1783
                        1784*  1799*  1802*  1808*  1818   1819*  1837*  1848   1849*  1867*  2015   2018*  2082*
R0      =%000000           32#   710*   711    713    714*   715    784*   785*   786    791*   792    794*   796
                         815*   816*   817    819    820*   821    826*   828*   829*   830*   831*   833*   835*
                         850*   852    869*   871    872*   873    876*   877    878*   879    950*   953*   1275*
                        1277   1287*  1288   1317*  1320*  1483*  1494*  1634*  1637*  1643*  1646*  1697*  1878*
                        1882*  1911*  1914*  1989*  1992*  2036*  2039*  2068*  2070   2077   2092*  2097*  2139*
                        2142   2170*  2171*  2172   2240   2241*  2242*  2249*  2250*  2251*  2252*  2253*  2254
                        2259   2264*  2266*  2270   2272   2286   2310*  2381   2389*  2393   2394   2396*  2397*
                        2398   2420*  2454   2455*  2460   2465   2468*  2741   2742*  2743   2744*  2745*  2746*
                        2747*  2788*  2791   2796   2801   2805*  2806   2814*  2818   2819   2846*  2851*
R1      =%000001           33#   711*   712*   715    817*   818*   821    827*   832*   834*   836*   837*   838*
                         839    841    851*   852*   853    870*   871*   877*   1484*  1496*  1500*  1501*  1503*
                        1504   1960*  1962   1966   1968*  1971   1986*  1988   1998   2000*  2003   2035*  2069*
                        2070   2072*  2073   2078   2086*  2087   2091   2287   2309*  2382   2419*  2790*  2791
                        2795*  2796   2800*  2801   2845*  2849   2850*  2858
R2      =%000002           34#   709*   713*   803*   804    807*   814*   819*   867*   869    876    1485*  1492*
                        1498   1501   1507   1965*  1966   1972   1997*  1998   2004   2037*  2095*  2288   2308*
R3      =%000003           35#   782*   799    890*   904    912*   926    1000*  1007   1014*  1021   1033*  1041
                        1141*  1175   1183*  1218   1230*  1263   1270*  1294   1336*  1372   1387*  1412   1425*
                        1441   1454*  1471   1522*  1540   1550*  1571   1579*  1599   1609*  1624   1712*  1736
                        1748*  1774   1783*  1802   1808   1818*  1837   1848*  1867   2014*  2081   2289   2307*
                        2545   2554*  2560*  2561*  2564*  2569*  2570*  2571   2580*  2700   2701*  2702   2705*
                        2706   2710   2712   2714*  2716*
R4      =%000004           36#   1271*  1295   2015*  2082   2290   2306*  2546   2548*  2549*  2550*  2551   2552*
                        2566   2568*  2576*  2579*
R5      =%000005           37#   2024*  2291   2305*  2547   2553*  2555*  2557*  2558*  2559*  2560   2578*
R6      =%000006           38#    40    732*   733*   734
R7      =%000007           39#    41
SECND   006352          1507*  1512#  3333
SETADR  003434           859    865#
SHIFT   003274           831#   840
SIZE    003046           779#
SP      =%000006           40#   736*   753*   761*   765    789*   895    917    1005   1019   1038   1151   1193
                        1240   1283   1286*  1292*  1346   1358   1370   1400   1407   1438   1468   1529   1539
                        1558   1568   1590   1596   1621   1723   1731   1758   1771   1798   1805   1834   1864
                        2157*  2163*  2164*  2165*  2170   2173   2198   2219*  2222*  2240*  2245*  2266   2270*
                        2286*  2287*  2288*  2289*  2290*  2291*  2292*  2293   2303*  2304   2305   2306   2307
                        2308   2309   2310   2345*  2348   2350   2351   2363   2364   2368*  2381*  2382*  2383
                        2390*  2401   2402*  2403*  2413   2415*  2419   2420   2454*  2455   2465*  2467   2468
                        2469*  2471   2473   2475   2481   2483*  2485*  2493*  2497   2501   2502   2506   2537*
                        2538   2539   2540*  2545*  2546*  2547*  2553   2578   2579   2580   2581*  2582*  2605*
                        2606*  2607   2614*  2617*  2618*  2622*  2623*  2627   2630*  2634   2636   2638   2639*
                        2646   2648   2650*  2651   2653*  2654*  2655*  2656*  2657*  2672*  2673*  2676*  2677*
                        2678   2682*  2683*  2684   2687   2689   2691*  2700*  2705   2716   2717*  2718*  2719*
                        2741*  2742   2752*  2753*  2814   2815*
STACK = 001100           15#
START   002506          151    721#
STKLMT= 177774           26#
SWR     001040           216#   734    755*   757    763*   770*   776    1031   1049   1227   1304   1332   1384
                        1421   1450   1480   1874   1902   1933   1935   1984   2022   2060   2201   2213   2217
                        2292   2304*  2340   2356   2601   2638*
```

```
SWREG   000176          148#    763    2601    2614
SW0     =  000001        79#
SW00    =  000001        69#     79
SW01    =  000002        68#     78
SW02    =  000004        67#     77
SW03    =  000010        66#     76
SW04    =  000020        65#     75
SW05    =  000040        64#     74
SW06    =  000100        63#     73
SW07    =  000200        62#     72
SW08    =  000400        61#     71
SW09    =  001000        60#     70
SW1     =  000002        78#
SW10    =  002000        59#
SW11    =  004000        58#
SW12    =  010000        57#
SW13    =  020000        56#
SW14    =  040000        55#
SW15    =  100000        54#
SW2     =  000004        77#
SW3     =  000010        76#
SW4     =  000020        75#
SW5     =  000040        74#
SW6     =  000100        73#
SW7     =  000200        72#
SW8     =  000400        71#
SW9     =  001000        70#
TBITVE=  000014         112#
TBUF    002314          681#    914     933#    938#    983#    986#   1611#   1614#   1633#   1676#   1694#   1717#   1751#
                       1788#   1823#   1853#   1879#   1906#   1940#   1943#   1962#   1988#   2038#   2091#   3323
TCONS   003354           847     849#
TCSR    002312          680#     892     934     939     951     984     989    1052   1063#    1064   1069#    1070   1081#
                       1083    1085#   1094    1107#   1108   1113#    1114   1126#    1128   1131#    1145   1155#    1156
                       1162#   1163    1168#   1170    1519#   1520    1533#   1538#   1547#    1552   1554#   1561#   1578#
                       1583    1585#   1593#   1605#   1608#   1612    1618#   1632#   1639#   1648#   1662#   1675#   1682#
                       1693#   1698#   1709#   1711#   1720#   1722#   1730#   1735#   1745#   1757#   1767#   1770#   1782#
                       1791#   1822#   1826#   1852#   1877#   1880    1886#   1892#   1895#   1905#   1910#   1917#   1922#
                       1926#   1938#   1939#   1941    1944    1946#   1961#   1973#   1976#   2028#   2029#   2041    2089#
                       3321
TKVEC   =  000060        119#
TMP1    002300          673#    845#    861#    867     868#
TMP2    002302          674#    780#    788#    798#    802#    806#    826    2113    2155
TMP3    002304          675#    844#    858     860#    866#
TOLER   006332         1502    1504#
TPSW    002324          685#    853     1524#   2017#
TPVEC   =  000064        120#
TRAPVE=  000034         118#    742#    743#
TRTVEC=  000014         113#
TSTDEV  003404           848    858#     863    2116
TSTDVM  003202           804#    809
TST1    003526           855     881     889#   2158
TST10   004204          1030    1032    1048#
TST11   004362          1050    1084    1092#
TST12   004530          1129    1139#
TST13   004662          1181#
TST14   005014          1224#
```

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TST15   005164          1226    1228    1269#
TST16   005326          1301#
TST17   005420          1303    1305    1319    1329#
TST2    003600           911#
TST20   005626          1331    1333    1381#
TST21   005764          1383    1385    1418#
TST22   006100          1420    1422    1447#
TST23   006220          1449    1451    1477#
TST24   006354          1479    1481    1505    1510    1518#
TST25   006460          1546#
TST26   006572          1577#
TST27   006674          1604#
TST3    003652           932#
TST30   007000          1630#
TST31   007140          1667    1673#
TST32   007210          1681    1691#
TST33   007256          1700    1708#
TST34   007432          1743#
TST35   007600          1780#
TST36   007726          1814#
TST37   010046          1844#
TST4    004014           964     968     970     972     982#
TST40   010160          1873#
TST41   010272          1875    1901#
TST42   010414          1903    1932#
TST43   010520          1934    1936    1948    1957#
TST44   010612          1983#
TST45   010702          1985    2001    2012#
TST5    004050           990     999#
TST6    004102          1013#
TST7    004134          1028#
TVECT   002322           684#   1141    1142*   1175*   1522    1523*   1532*   1540*   1550    1551*   1562*   1571*   1579
                        1580*   1591*   1599*   1609    1610*   1624*   2014    2016*   2081*
TYPE  = 104401           973     975     2138    2204    2239    2256    2258    2261    2263    2267    2274    2316    2476
                        2572    2612    2613    2616    2629    2640    2659    2708    2711    2715    2764#
TYPOC = 104402          2247    2271    2615    2765#
TYPON = 104404          2767#
TYPOS = 104403          2766#
VCTADR  003224           800     814#
VCTTBL  002414           704#    814     876
VECT    003506           877#    880
WACTV   007020          1635#   1638
WAIT    014442          2816#   2817    2820
WDONE   007046          1644#   1647
WRPSW   011570          1143    1185    1232    1334    1351    1390    1402    1423    1432    1452    1461    1525    1548
                        1563    1581    1606    1615    1715    1746    1764    1786    1816    1828    1846    1857    2033
                        2163#
XCONT   011240          2088    2091#
XMIT    011214          2016    2085#
XMTCNT  011274          2031*   2047    2085*   2104#   3339
XRET    011244          2090    2092#
$APTHD  000500           175     181#
$ASTAT= ****** U         901     923     947     961     1059    1077    1103    1122
$ATYC   012524          2378    2380#
$ATY1   012500          2376#
$ATY3   012506          2377#   2461
```

```
$ATY4   012516            901   923   947   961  1059  1077  1103  1122  2209  2379#
$AUTOB  001034            213#  2609  2730
$BASE   001142            275#   710   784   792
$BDADR  001022            208#  1276* 1277* 1278  1280* 1285* 3331
$BDDAT  001026            210#  1912* 1972* 2004* 2077* 3335  3337
$CHARC  013224           2478* 2488* 2495  2504* 2509#
$CKSWR  013456           2601#  2771
$CMTAG  001000            196#   731   732   740   746   747
$CM3  =  000000            226#
$CNTLG  014203           2612  2725#
$CNTLU  014176           2629  2724#
$CPUOP  001114            249#
$CRLF   001063            228#  2204  2239  2258  2263  2267  2477  2512  2640  2724  2855
$DEVCT  001076            240#   725*  971  2112* 2113  2154*
$DEVM   001144            276#   781*  787*  790*  797*  803   846   858
$DOAGN  011510           2134  2140  2146#
$ENDAD  011500            162   2142# 2224
$ENDCT  011460            746   2136#
$ENULL  011514           2149#
$ENV    001106            245#   772  2206  2385  2409  2456
$ENVM   001107            246#   768   774  2387  2458  2463
$EOP    011430           2114  2127#
$EOPCT  011452            746*  2133# 2137
$ERFLG  001003            199#  2194* 2331  2354  2360* 2370
$ERMAX  001015            205#   748* 2366* 2370
$ERROR  011632            740   2193#
$ERRPC  001016            206#  2198* 2199* 2200  2245  3321  3323  3325  3327  3329  3331  3333  3335
                         3337  3339  3341
$ERRTB  001146            293#  2253
$ERRTY  012014           2203  2238#
$ERTTL  001012            203#  2197*
$ESCAP  001060            226#   747* 2220  2222  2365*
$ETABL  001106            244#
$ETEND  001146            187   277#
$FATAL  001070            237#   721* 2413*
$FFLG   012744           2376* 2379* 2407  2416* 2424#
$FILLC  001056            224#  2481  2512
$FILLS  001055            223#  2512
$GDADR  001020            207#
$GDDAT  001024            209#  1971* 2003* 2078* 3337
$GET42  011470           2139#
$GTSWR  013526           2613#  2769
$HIBTS  000500            182#
$ICNT   001004            200#
$ILLUP  012310           2284  2302  2319#
$INTAG  001036            214#  2641  2730
$ITEMB  001014            204#  2200* 2208  2242
$LF     001064            229#  2512  2715  2724
$LFLG   012743           2417* 2423#
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                         1705#  1740#  1777#  1811#  1841#  1870#  1898#  1929#  1954#  1980#  2009#
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                         1547   1578   1605   1631   1674   1692   1709   1744   1781   1815   1845   1874   1902
                         1933   1958   1984   2013   2124   2130   2141   2147   2149   2332   2333   2334   2335
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                    1692#  1705    1709#  1740    1744#  1777    1781#  1811    1815#  1841    1845#  1870    1874#
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$TYPON  013270      2541   2544#   2767
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                     174#   176#    195#   230    703#   704#   735    749    750    2106#  2149   2150#  2277#
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ENDCOM      1#   122#
ENDPAS      7#  2138
ERROR      16#   898   920   944   958   992  1006  1020  1039  1056  1067  1074  1086  1099  1111
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          1254  1261  1293  1310  1315  1323  1347  1359  1368  1398  1408  1439  1469  1508  1530
          1536  1559  1569  1588  1597  1622  1641  1649  1655  1663  1683  1701  1724  1732  1759
          1772  1795  1806  1835  1865  1887  1893  1918  1924  1950  1974  1995  2006  2045  2051
          2065  2079  2174
ESCAPE      1#   122#
GETPRI      1#   122#
GETSWR      1#   122#
MULT        1#   122#
NEWTST      1#   122#   886   908   929   979   996  1010  1025  1045  1089  1136  1178  1221  1266
          1298  1326  1378  1415  1444  1474  1515  1543  1574  1601  1627  1670  1688  1705  1740
          1777  1811  1841  1870  1898  1929  1954  1980  2009
POP         1#    9#   122#
PUSH        1#    9#   122#
REPORT      1#   122#   900   922   946   960  1058  1076  1102  1121
SCOPE      17#   889   911   932   982   999  1013  1028  1048  1092  1139  1181  1224  1269  1301
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          1814  1844  1873  1901  1932  1957  1983  2012  2128
SETPRI      1#   122#
SETTRA   2756#  2765  2766  2767  2769  2771  2772  2773
SETUP       1#    9#   122#   730
SKIP        1#   122#
SLASH       1#   122#
SPACE     122#
STARS       1#    9#   122#   130   158   168   170   177   191   230   233   886   888   908   910
          929   931   979   981   996   998  1010  1012  1025  1027  1045  1047  1089  1091  1136
         1138  1178  1180  1221  1223  1266  1268  1298  1300  1326  1328  1378  1380  1415  1417
         1444  1446  1474  1476  1515  1517  1543  1545  1574  1576  1601  1603  1627  1629  1670
         1672  1688  1690  1705  1707  1740  1742  1777  1779  1811  1813  1841  1843  1870  1872
         1898  1900  1929  1931  1954  1956  1980  1982  2009  2011  2122  2181  2191  2233  2281
         2283  2299  2301  2328  2372  2374  2435  2514  2593  2596  2664  2693  2735  2776  2781
         2837  2843
SWRSU       1#   122#   751#
TRMTRP   2756#
TYPBIN      1#   122#
TYPDEC      1#   122#
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TYPOCS      1#   122#
TYPOCT      1#   122#  2245  2269  2614
TYPTXT      1#   122#
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$$CMRE    189#
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$$NEWT      1#   122#   886   908   929   979   996  1010  1025  1045  1089  1136  1178  1221  1266
          1298  1326  1378  1415  1444  1474  1515  1543  1574  1601  1627  1670  1688  1705  1740
          1777  1811  1841  1870  1898  1929  1954  1980  2009
$$SET    2756#  2765  2766  2767  2769  2771  2772  2773
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.SAPTB          1#      10#   2318
.SAPTH          1#      10#    166
.SAPTY          1#
.SASTA          1#
.SCATC          1#
.SCMTA          1#      11#    189
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.SDB2O          1#
.SDIV           1#
.SEOP           1#      11#   2120
.SERRO          1#
.SERRT          1#       9#   2231
.SMULT          1#
.SPOWE          1#
.SRAND          1#
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       2655  2745  2795  2800
ASR    2397
BEQ     769   773   808   840  1030  1050  1053  1071  1084  1095  1115  1129  1146  1164  1171
       1188  1206  1214  1226  1235  1253  1259  1279  1303  1313  1331  1383  1420  1449  1479
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BGE     854
BGT    2134  2574  2649  2690
BIC     816  1069  1085  1113  1131  1162  1204  1251  1277  1285  1311  1340  1363  1371  1393
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       1767  1770  1791  1801  1826  1831  1860  1886  1892  1895  1917  1922  1926  1946  1973
       1976  2089  2131  2564  2606  2623  2650  2677  2683  2691  2805
BIS     844  1063  1081  1107  1126  1155  1168  1197  1211  1244  1256  1280  1339  1362  1392
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       2569  2570  2657  2790
BISB   2242
BIT     776   839   846   858   873   879  1031  1049  1052  1064  1070  1083  1094  1108  1114
       1128  1145  1156  1163  1170  1187  1198  1205  1213  1227  1234  1245  1252  1258  1281
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       1947  1984  2022  2041  2060  2073  2087  2201  2217  2340  2356  2791  2796  2801  2858
BITB    768   772   774  2387  2458  2463  2495
BLE     716   793   822  1505
BLOS   2703
BLT    2486  2575  2647  2688
BMI     952   990  1309  1319  1645  1913  1991  2857
BNE     735   758   775   777   847   859   874   880   897   919   943   954   957   968   970
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      1915  1948  1967  1993  1999  2023  2040  2061  2063  2071  2074  2156  2202  2207  2225
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BPL     805   935   940   985  1342  1354  1365  1395  1430  1459  1488  1491  1502  1521  1553
      1584  1613  1678  1696  1719  1753  1790  1825  1855  1881  1908  1942  1945  1964  2214
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      2083  2090  2212  2248  2275  2296  2320  2343  2349  2352  2359  2378  2400  2453  2479
      2489  2498  2505  2541  2556  2577  2631  2658  2660  2686  2709  2811  2860  2864
CLR     721   722   723   724   725   726   733   747   767   780   781   802   827   845   933
      938   950   983   986  1317  1349  1483  1485  1486  1489  1493  1524  1611  1614  1633
     1634  1643  1676  1694  1714  1717  1750  1751  1785  1788  1820  1823  1827  1850  1879
     1909  1911  1940  1943  1960  1986  1989  2017  2019  2026  2031  2032  2035  2036  2038
     2069  2092  2097  2111  2115  2129  2154  2160  2241  2313  2365  2554  2617  2618  2862
CLRB   2360  2416  2417  2418  2478  2504  2714
CMP     715   734   757   792   821   853   895   917  1005  1019  1038  1151  1193  1240  1278
     1283  1346  1358  1370  1400  1407  1438  1468  1504  1529  1539  1558  1568  1590  1596
     1621  1723  1731  1758  1771  1798  1805  1834  1864  1966  1998  2047  2070  2113  2155
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DZDLDA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS SEQ 0100

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DECB    2485  2488  2562  2573
EMT       16
HALT     903   925   949   963  1061  1079  1105  1124  2176  2215  2226  2295  2319  2452  2810
        2863
INC      787   788   797   798   806   849   862   865   953  1320  1492  1494  1496  1637  1646
        1914  1992  2039  2085  2096  2100  2112  2130  2197  2314  2414  2568  2576  2656
INCB    1968  2000  2072  2086  2194  2361  2508  2850
IOT       17
JMP      151   152   153   855   881  2116  2147  2158  2161
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        1390  1402  1423  1432  1452  1461  1525  1548  1563  1581  1606  1615  1715  1746  1764
        1786  1816  1828  1846  1857  2033  2142  2203  2209  2404  2461  2480  2487  2494  2645
        2793  2798  2803  2808  2853
MOV      709   710   711   713   727   728   732   736   738   739   740   741   742   743   744
         745   746   749   750   753   754   755   756   761   763   764   765   770   782   783
         784   789   794   795   799   803   814   817   819   826   841   850   851   852   867
         869   870   871   876   877   890   891   904   912   913   926  1000  1001  1007  1014
        1015  1021  1033  1034  1041  1141  1142  1175  1183  1184  1218  1230  1231  1263  1270
        1271  1272  1273  1275  1276  1286  1292  1294  1295  1336  1337  1338  1350  1361  1372
        1387  1388  1389  1401  1412  1425  1426  1441  1454  1455  1471  1484  1498  1500  1507
        1522  1523  1532  1540  1550  1551  1562  1571  1579  1580  1591  1599  1609  1610  1624
        1697  1712  1713  1727  1736  1748  1749  1763  1774  1783  1784  1799  1802  1808  1818
        1819  1837  1848  1849  1853  1867  1878  1906  1962  1965  1971  1972  1988  1997  2003
        2004  2014  2015  2016  2018  2024  2025  2037  2068  2077  2078  2081  2082  2095  2135
        2139  2157  2163  2164  2170  2172  2173  2196  2198  2219  2222  2240  2245  2254  2259
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        2363  2364  2367  2368  2381  2382  2389  2393  2398  2399  2401  2403  2413  2419  2420
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        2582  2614  2638  2643  2672  2673  2700  2701  2716  2717  2718  2719  2741  2742  2746
        2752  2753  2788  2814  2845  2846  2849
MOVB     748   815  1912  2091  2200  2208  2362  2366  2376  2377  2379  2465  2493  2501  2538
        2539  2542  2543  2544  2548  2551  2552  2571  2605  2622  2676  2682  2705  2710  2744
        2784  2787  2818
NEG     1503  2549
NOP      987  1307  1343  1355  1366  1396  1404  1434  1463  1534  1555  1565  1586  1592  1617
        1729  1755  1766  1793  1800  1830  1859  2143  2144  2145
RESET    988  1051  1082  1093  1127  1140  1169  1182  1212  1229  1257  1274  1306  1386  1431
        1631  1658  1674  1692  1744  1781  1815  1845  1856  1876  1904  1937  1959  1987  2013
        2043  2049  2067  2141  2783
ROL     2555  2557  2558  2559  2561
ROLB     832   834   836
RTI      762  2093  2098  2101  2228  2318  2369  2470  2583  2644  2692  2720  2754
RTS      717  2268  2421  2510  2747  2821
RTT     2166
SUB      791  1501  2171  2199  2396
SWAB     828   838
TRAP    2756  2765  2766  2767  2769  2771  2772  2773
TST      786   796   804   892   896   914   918   942   956   967   969   971  1002  1016  1029
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        2062  2213  2220  2272  2347  2391  2409  2411  2467  2475  2497  2566  2636  2651  2743
TSTB     934   939   951   984   989  1308  1318  1341  1353  1364  1394  1429  1458  1487  1490
        1520  1552  1583  1612  1644  1659  1677  1680  1695  1699  1718  1752  1789  1824  1854
        1880  1907  1920  1941  1944  1963  1990  2354  2383  2394  2407  2450  2499  2603  2619
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N08

Spooler runtime 14 Seconds, 61 KCS, 390 disk reads, 3 disk writes, 103 pages