Micro Fiche Scan

Name of device(s) tested:
    DEC/X11,DHV11
Test description:
    DHV11 DEC/X11 MODULE
MAINDEC Number or Package Identifier (after SEP 1977):
    CXDHVD0
Fiche Document Part Number:
    AH-T674D-MC
Fiche preparation date unknown, using copyright year:
    1985
Image resolution:
    1-bit black&white, compressed for minimal file size

```
                .SBTTL  DOCUMENTATION
                .REM    -
```

IDENTIFICATION

PRODUCT CODE: AC-T673D MC

PRODUCT NAME: CXDHVD0 DHV11 DEC/X11 MODULE

PRODUCT DATE: FEBRUARY 1985

MAINTAINER: DEC/X11 SUPPORT GROUP

DOCUMENTATION

1. ABSTRACT:

This document describes the DHV11 DEC/X11 EXERCISER MODULE. The program exercises up to FOUR (consecutively addressed) DHV11 asynchronous interfaces. Maintenance mode is used to transmit and receive a binary count pattern outputted and received in 108 character bursts. All devices selected for testing are activated and run concurrently. All eight lines are run on each selected device.

This program will be runnable only on a 'Q' bus processor. This program will not support any device other than the DHV11.

The DHV11 is an asynchronous multiplexer that provides an interface between eight asynchronous serial data communications channels and any 'Q' bus processor. DHV11 is compatible with both 'Q18' and 'Q22' buses.

The DHV11 provides RS232-A and RS423-A interfaces with enough modem control to permit full duplex point to point operation or dial up (auto answer) operation over the Public Switched Telephone Network.

For each line the characteristics are set under program control, the only information that is set via switches on the card being the Q bus address and the vector address.

2. REQUIREMENTS:

HARDWARE:
- o An LSI-11 System with Q18 or Q22 bus.
- o 32 K bytes of memory (Total) on the system.
- o 1-4 DHV11 interfaces. No wraparound or maintenance cable is needed if running in local loopback mode.

  When running in normal operation mode, 2 BC05L cables will be required for each device, and an H325 line loopback connector.

STORAGE: This module (DHV11) requires:

1. DECIMAL WORDS: 2240 ;RG001
2. OCTAL WORDS: 4300 ;RG001
3. OCTAL BYTES: 10600 ;RG001

SOFTWARE: Latest revision of the DEC/X11 Monitor & Linker.

3. PASS DEFINITION:

ONE PASS OF THE DHV MODULE CONSISTS OF MULTIPLE ITERATIONS OF THE FOLLOWING FOR A PERIOD OF APPROXIMATELY 1 MINUTE:

TRANSMITTING AND RECEIVING 108 CHARACTERS PER ITERATION ON ALL LINES SELECTED FOR EACH DHV11 SELECTED.

4. EXECUTION TIME:

EXECUTION TIME IS PROPORTIONAL TO THE BAUD RATE BUT SHOULD TAKE AN AVERAGE OF ONE MINUTE TO COMPLETE ONE PASS WHEN RUNNING ALONE ON A PDP11/23 AT 9600. BAUD.

5. CONFIGURATION PARAMETERS:

DEFAULT PARAMETERS:

DVA: 1, VCT: 1, BR1: 5, BR2: 5, DVC: 1, SR1: 0

REQUIRED PARAMETERS:

AT CONFIGURATION TIME THE USER MUST SPECIFY:

DVA: ADDRESS OF FIRST DHV11 CSR REG.
VCT: VECTOR ADDRESS OF FIRST DHV11
DVC: NO. OF DHV11'S IF GREATER THAN 1

MODULE LOCATION DVID1 MAY BE MODIFIED (MOD DHVD 14) TO EXERCISE ANY COMBINATION OF DHV11'S. (SEE ITEM #8, "OPERATOR OPTIONS").

6. DEVICE OPTION SETUP:

NONE REQUIRED

7. MODULE OPERATION:

The DHV11 DEC/X11 Module is assembled and linked according to standards outlined in the DEC/X11 Module Programmer's Guide.

DOCUMENTATION

THE MAIN ALGORITHM:

The testing is performed with internal loopback selected, via
maintenance mode.
The characters 224 - 377 (octal) are transmitted on 8 lines simultaneously via
direct memory access. The receiver, not operating on a DMA basis,
will receive characters on a per/character basis into the receive
silo. If successful, 108 (decimal) characters per line should be received.
Each received line will be checked for properly received data by
comparing each received character to its expected value.

START:

- SETUP # OF DHV's TO BE TESTED.

RESTRT:

- SETUP DEVICE ADDRESSES & VECTORS.

SELFTEST:

- RUN INTERNAL SELF TEST DIAGNOSTICS ON ALL DHV11s
  SELECTED FOR TESTING.

DHVT02:

- GET LINES TO BE TESTED ON THIS DHV11.

DHVBUF:

- SET-UP WRITE COUNT PATTERN INTO XMIT BUFFER.
- SET-UP LINE PARAMETERS.
  (9600 BAUD, 8 BIT/CHAR., ENABLE RECEIVER)
- START ALL LINES/DHV11 SELECTED.
- ENDPASS WHEN ALL LINES OF ALL DHV11s HAVE PASSED 256
  CHARACTERS EACH, FOR 20 ITERATIONS.

XMITTER ROUTINE:

- ALL DATA IS MOVED VIA DMAs.
- XMITTER ROUTINE RE-QUEUES BUFFER.

RECEIVER ROUTINE:

- RECEIVES EACH CHARACTER OF EACH LINE UPON GETTING
  SILO INTERRUPTS.
- VERIFIES CORRECT DATA AT LOWERED PRIORITY.

8. OPERATOR OPTIONS:

1). TESTING MULTIPLE DHVS:

MODULE LOCATION DVID1 (MOD DHVD 14) MAY BE MODIFIED TO EXERCISE ANY COMBINATION OF FOUR DHV11'S:

DEVICE TO TEST	DVID1 =
# 1	1
2	2
3	4
4	10
1,2	3
1,3	5
1,4	11
2,3	6
2,4	12
3,4	14
1,2,3	7
1,2,4	13
1,3,4	15
2,3,4	16
1,2,3,4	17

2). SELECTABLE BAUD RATE:

THE BAUD RATE MAY BE SELECTED BASED ON THE CODE BELOW. THE SELECTION PROCEDURE IS VERY SIMPLE.

IF YOU WANT TO USE 9600 BITS/SEC. THEN SIMPLY LEAVE BOTH SR1 & SR2 "0". THIS IS THE DEFAULT VALUE.

IF YOU WISH TO USE OTHER BAUD RATES THEN FOLLOW THIS PROCEDURE:

A. SELECT THE BAUD RATE YOU DESIRE FROM THE BAUD RATE TABLE. WE WILL USE 38.4 K FOR EXAMPLE.

NOTE#1: THE TRANSMIT & RECEIVE BAUD RATES WILL BE THE SAME.

NOTE#2: IF USING 38.4 K BAUD RATE, A MAXIMUM OF 2 LINES MAY BE USED AT ONE TIME.

IF USING 19.2 K BAUD RATE, A MAXIMUM OF 4 LINES MAY BE USED AT ONE TIME.

THE VARIABLE "LINESELECT" MUST BE CHANGED TO REFLECT THE MAXIMUM ALLOWABLE # OF LINES THAT MAY BE TESTED. (2 LINES @ 38.4, 4 LINES @ 19.2)

B. PLACE THE BINARY CODE FOR THE PARTICULAR BAUD RATE INTO SR1. FOR OUR EXAMPLE 38.4 K HAS A BINARY CODE VALUE OF 17.

C. PLACE A "1' IN SR2. SR2 MUST ALWAYS CONTAIN A ONE WHENEVER A BAUD RATE (OTHER THAN THE DEFAULT) IS SELECTED.

D. IN ORDER FOR THE PROGRAM TO RUN FOR 1 MINUTE, THE VALUE "ICONT" MUST BE MODIFIED FOR EACH SELECTED BAUD RATE. THE APPROPRIATE VALUE FOR "ICONT" MAY BE FOUND IN THE BAUD RATE TABLE. THE 1 MINUTE RUNTIME IS BASED ON RUNNING 1 DHV11. THE RUNTIME WILL BE PROPORTIONATLY LONGER FOR EACH ADDITIONAL DHV11 SELECTED FOR TESTING.

THE BAUD RATE MAY BE SELECTED AT TIME OF CONFIGURATION OR AT RUNTIME BY CHANGING THE CONTENTS OF SR1, SR2, & ICONT TO SELECT A PARTICULAR BAUD RATE.

LOCATION SR1 (MOD DHVD 16).
LOCATION SR2 (MOD DHVD 20).
LOCATION ICONT (MOD DHVD 36).

(NOTE: IF SR2 CONTAINS A "0", THE BAUD RATE SELECTED WILL BE 9600 NO MATTER WHAT IS IN SR1!!)

BAUD RATE TABLE

DATA RATE (BITS/SEC)	BINARY CODE (SR1 =)	ICONT =
50	0	2
75	1	3
110	2	4
134.5	3	5
150	4	5
300	5	10
600	6	12
1200	7	14
1800	10	15
2000	11	15
2400	12	16
4800	13	16
7200	14	16
9600	15	16
19200	16	17
38400	17	17

3). MAY CHOOSE BETWEEN INTERNAL LOOPBACK OR NORMAL OPERATION.

A. INTERNAL LOOPBACK REQUIRES NO CABLES, ONLY THE MODULE IS TESTED.

B. NORMAL OPERATION ALLOWS THE OPERATOR TO TEST NOT ONLY THE MODULE, BUT THE CABLES TOO. HOWEVER, ONLY ONE LINE MAY BE TESTED AT ANY ONE TIME.

REQUIRES 2 BC05L CABLEs AND AN H325 LOOPBACK CONNECTOR.

INTERNAL LOOPBACK: LEAVE SR3 "0".
NORMAL OPERATION: PLACE INTO SR3 THE BIT MASK OF THE LINE DESIRED FOR TESTING, (SEE BIT MASK VALUES BELOW). (THE SAME LINE NUMBER WILL BE TESTED ON ALL DEVICES SELECTED).

LOCATION SR3: (MOD DHVD 22).

BIT MASK VALUES FOR TESTING A LINE IN NORMAL OPERATION

LINE # DESIRED	SR3 =
0	1
1	2
2	4
3	10
4	20
5	40
6	100
7	200

4). INDIVIDUAL & MULTIPLE LINE TESTING

MODULE VARIABLE "LINESELECT" MAY BE MODIFIED TO EXERCISE ANY COMBINATION OF EIGHT LINES:

LINE # TO BE TESTED	LINESELECT =
0	1
1	2
2	4
3	10
4	20
5	40
6	100
7	200
1,2	3
1,3	5
1,4	11
ETC.	
ALL 8 LINES	377

9. ERROR REPORTS:

STANDARD ERROR REPORTS ARE GENERATED EXCEPT AS NOTED UNDER THE DESCRIPTION FOR NON-STANDARD PRINTOUTS. SEE THE DEC/X11 USERS GUIDE FOR EXAMPLES.

10. NON-STANDARD PRINTOUTS:

A. HARD ERROR REPORT

ASTAT (STATC) IS THE CONTENTS OF THE RECEIVER BUFFER.

B. DATA ERROR REPORT

WRADR IS THE LINE NUMBER.
RDADR HAS NO MEANING AND WILL ALWAYS EQUAL "0".

11. MNEMONICS:

THE FOLLOWING INFORMATION SHOULD BE USEFUL IN UNDERSTANDING NAMES GIVEN TO VARIABLES IN THIS PROGRAM:

```
LINESELECT:     ;  INDICATES LINES SELECTED. (8 LINES UNLESS CHANGED BY OPERATOR).
LINESDONE:      ;  INDICATES HOW MANY LINES ARE DONE.
LINECOUNT:      ;  # OF LINES BEING TESTED.

DHVSDONE:       ;  INDICATES HOW MANY DHV'S ARE DONE.
DHVSLEFT:       ;  INDICATES DHV'S LEFT TO DO.
DHV.LIVE:       ;  BIT MAP OF NUMBER OF DHV'S TO TEST.
DHVNOW:         ;  CURRENT DHV #.
DHVCSR:         ;  DHV CSR.

POINT:          ;  POINTS TO CURRENT DHV BEING TESTED.
OFFSET:         ;  OFFSET TO INDICATE SPECIFIC UNIT.
BUFADR:         ;  HOLDS CURRENT BUFFER ADDRESS FOR BINARY COUNT PATTERN.
CDHVCSR:        ;  HOLDS CSR.
LCKOUT:         ;  ALLOWS ONLY 1 DHV TO RUN TEST AT A TIME.

TXSPEED:        ;  TRANSMIT SPEED (BAUD RATE).
RCVSPEED:       ;  RECEIVE  SPEED (BAUD RATE).

DHXBUF:         ;  HOLDS TRANSMIT MESSAGE
DHR0BUF:        ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #1.
DHR1BUF:        ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #2.
DHR2BUF:        ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #3.
DHR3BUF:        ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #4.
DHVVECT:        ;  HOLDS THE VECTOR ADDRESS OF CURRENT DHV.
```

```
;       VA:             ;  VIRTUAL ADDRESS.
;       PA:             ;  PHYSICAL ADDRESS.
;       EA:             ;  EXTENDED ADDRESS.
;       PA22:           ;  PHYSICAL ADDRESS (22 BIT).
;       EA22:           ;  EXTENDED ADDRESS (22 BIT).
;
;       ADDR0:          ;  HOLDS CSR ADDRESS OF DHV #1.
;       ADDR1:          ;  HOLDS CSR ADDRESS OF DHV #2.
;       ADDR2:          ;  HOLDS CSR ADDRESS OF DHV #3.
;       ADDR3:          ;  HOLDS CSR ADDRESS OF DHV #4.
;
;       FLAG:           ;  INDICATES IF DEVICE CAN INTERRUPT O.K.
;       XOFF:           ;  INDICATES STATUS OF "XOFF".
;       LPR:            ;  LPR BEFORE SETTING BAUD RATES.
;       LPRSELECT:      ;  LPR AFTER SETTING BAUD RATES.  NEEDED BECAUSE
;                       ;  THE BAUD RATES ARE SET TO DEFAULTS DURING SELF TEST.
;
;*****************************************************************************
;
;       EDIT    DATE            BY              REASON
;       ----    ----            -               -----
;--
;       A.0     ??JUL-83        N.MACCAMY       First release
;--
;       B.0     ??-OCT-83       N.MACCAMY       Secound release
;--
;       C.0     15-DEC-83       A.HYATT         Third release
;
;               ADDED SHIFTS TO 18 BIT ADDRESS ON NON 22 BIT MACHINE. RCVBUF
;               CLEARING CHANGED TO STOP THE OVER WRITTING OF NEXT
;               LOCATIONS. INTERUPT ENABLING IN DMA SECTION MOVED TO THE
;               POINT WHERE ALL BOARDS ARE SET UP, THIS AVOIDS A RACE
;               BETWEEN SETUP OF BOARDS AND COMPLETION OF DMA.
;               ADDED THIS REVISION HISTORY.
;--
;       001     26-FEB-1985     R. GAUDET       INCREASE THE LOOP COUNT OF THE
;                                               WATCHDOG TIMER TO ALLOW SELF-TEST
;                                               TO COMPLETE ON FASTER PROCESSORS
;                                               THAN THE F-11.
;                                               UPDATE THE MODULE ID NUMBER AND
;                                               DOCUMENTATION.
;--
;*****************************************************************************
;
```

```
                                        .SBTTL MODULE DEFINITIONS
                                        .LIST SEQ,LOC,BIN
                                        .TITLE  DHVD DEC/X11 SYSTEM EXERCISER MODULE
                                ;       DDXCOM  VERSION  6.4    28-JAN-82
                                        .LIST   BIN
                                ;*****************************************************************************
000000                          BEGIN:
000000  104  110  126           MODNAM: .ASCII  /DHVD / ;MODULE NAME.
000003  104  040
000005  000                     XFLAG:  .BYTE   OPEN            ;USED TO KEEP TRACK OF WBUFF USAGE
000006  000001                  ADDR:   1+0             ;1ST DEVICE ADDR.
000010  000001                  VECTOR: 1+0                     ;1ST DEVICE VECTOR.
000012  240                     BR1:    .BYTE   PRTY5+0         ;1ST BR LEVEL.
000013  240                     BR2:    .BYTE   PRTY5+0         ;2ND BR LEVEL.
000014  000020                  DVID1:  17+1                    ;DEVICE INDICATOR 1.
000016  000000                  SR1:    OPEN                    ;SWITCH REGISTER 1
000020  000000                  SR2:    OPEN                    ;SWITCH REGISTER 2
000022  000000                  SR3:    OPEN                    ;SWITCH REGISTER 3
000024  000000                  SR4:    OPEN                    ;SWITCH REGISTER 4
                                ;*****************************************************************************
000026  140000                  STAT:   140000                  ;STATUS WORD.
000030  004344'                 INIT:   START                   ;MODULE START ADDR.
000032  000224'                 SPOINT: MODSP                   ;MODULE STACK POINTER.
000034  000000                  PASCNT: 0                       ;PASS COUNTER.
000036  000016                  ICONT:  16                      ;# OF ITERATIONS PER PASS=16
000040  000000                  ICOUNT: 0                       ;LOC TO COUNT ITERATIONS
000042  000000                  SOFCNT: 0                       ;LOC TO SAVE TOTAL SOFT ERRORS
000044  000000                  HRDCNT: 0                       ;LOC TO SAVE TOTAL HARD ERRORS
000046  000000                  SOFPAS: 0                       ;LOC TO SAVE SOFT ERRORS PER PASS
000050  000000                  HRDPAS: 0                       ;LOC TO SAVE HARD ERRORS PER PASS
000052  000000                  SYSCNT: 0                       ;# OF SYS ERRORS ACCUMULATED
000054  000000                  RANNUM: 0                       ;HOLDS RANDOM # WHEN RAND MACRO IS CALLED
000056                          CONFIG:                         ;RESERVED FOR MONITOR USE
000056  000000                  RES1:   0                       ;RESERVED FOR MONITOR USE
000060  000000                  RES2:   0                       ;RESERVED FOR MONITOR USE
000062  000000                  SVR0:   OPEN                    ;LOC TO SAVE R0,
000064  000000                  SVR1:   OPEN                    ;LOC TO SAVE R1.
000066  000000                  SVR2:   OPEN                    ;LOC TO SAVE R2.
000070  000000                  SVR3:   OPEN                    ;LOC TO SAVE R3.
000072  000000                  SVR4:   OPEN                    ;LOC TO SAVE R4.
000074  000000                  SVR5:   OPEN                    ;LOC TO SAVE R5.
000076  000000                  SVR6:   OPEN                    ;LOC TO SAVE R6.
000100  000000                  CSRA:   OPEN                    ;ADDR OF CURRENT CSR.
000102                          SBADR:                          ;ADDR OF GOOD DATA, OR
000102  000000                  ACSR:   OPEN                    ;CONTENTS OF CSR.
000104                          WASADR:                         ;ADDR OF BAD DATA, OR
000104  000000                  ASTAT:  OPEN                    ;STATUS REG CONTENTS.
000106                          ERRTYP:                         ;TYPE OF ERROR
000106  000000                  ASB:    OPEN                    ;EXPECTED DATA.
000110  000000                  AWAS:   OPEN                    ;ACTUAL DATA.
000112  004360'                 RSTRT:  RESTRT                  ;RESTART ADDRESS AFTER END OF PASS
000114  000000                  WDTO:   OPEN                    ;WORDS TO MEMORY PER ITERATION
000116  000000                  WDFR:   OPEN                    ;WORDS FROM MEMORY PER ITERATION
000120  000000                  INTR:   OPEN                    ;# OF INTERRUPTS PER ITERATION
```

```
MODULE DEFINITIONS

        000122  000144                  IDNUM:  144                     ;MODULE IDENTIFICATION NUMBER=144
                000040                          .REPT   SPSIZ           ;MODULE STACK STARTS HERE.
        000224                          MODSP:
                                        ;******************************************************************************

    460
    461
    462                                 ;  BIT DEFINITIONS
    463
    464         100000                          BIT15   =  100000
    465         040000                          BIT14   =  40000
    466         020000                          BIT13   =  20000
    467         010000                          BIT12   =  10000
    468         004000                          BIT11   =  4000
    469         002000                          BIT10   =  2000
    470         001000                          BIT9    =  1000
    471         000400                          BIT8    =  400
    472         000200                          BIT7    =  200
    473         000100                          BIT6    =  100
    474         000040                          BIT5    =  40
    475         000020                          BIT4    =  20
    476         000010                          BIT3    =  10
    477         000004                          BIT2    =  4
    478         000002                          BIT1    =  2
    479         000001                          BIT0    =  1
    480
    481
    482                                 ;  OFFSETS FOR REGISTERS (BASE IS CSR).
    483
    484         000000                          CSR         =    0
    485         000002                          RBUF        =    2
    486         000002                          TXCHAR      =    2
    487         000004                          LPR         =    4
    488         000010                          LNCTRL      =    10
    489         000012                          TX1BUFADR   =    12
    490         000014                          TX2BUFADR   =    14
    491         000016                          TXBUFCNTR   =    16
    492
    493
    494                                 ;  REGISTER DEFINITIONS.
    495
    496                                      ;  CSR(R2)  =======  CSR.
    497                                      ;  RBUF(R2)  ======  RECEIVE BUFFER.
    498                                      ;  TXCHAR(R2)  ====  TRANSMIT CHARACTER REGISTER.
    499                                      ;  LPR(R2)  =======  LINE PARAMETER REGISTER.
    500                                      ;  LNCTRL(R2)  ====  LINE CONTROL REGISTER.
    501                                      ;  TX1BUFADR(R2)  =  TRANSMIT BUFFER ADDRESS REGISTER 1.
    502                                      ;  TX2BUFADR(R2)  =  TRANSMIT BUFFER ADDRESS REGISTER 2.
    503                                      ;  TXBUFCNTR(R2)  =  TRANSMIT DMA BUFFER COUNTER.
    504
    505
    506                                 ;  CSR BIT DEFINITIONS.
    507
    508         100000                          TX.ACTION       -       BIT15
    509         040000                          TXINTR.ENABLE   -       BIT14
    510         020000                          DIAG.FAIL       =       BIT13
```

MODULE DEFINITIONS

```
                        010000                  TXDMA.ERROR     =       BIT12
                        000200                  RCVDATA.AVAIL   =       BIT7
                        000100                  RCVINTR.ENABLE  =       BIT6
                        000040                  MASTER.RESET    =       BIT5


                                        ;  RECEIVE BUFFER BIT DEFINITIONS.

                        100000                  DATA.VALID      =       BIT15
                        040000                  OVERRUN.ERROR   -       BIT14
                        020000                  FRAMING.ERROR   =       BIT13
                        010000                  PARITY.ERROR    =       BIT12


                                        ;  TRANSMIT CHARACTER REGISTER BIT DEFINITIONS.

                        100000                  TXDATA.VALID    =       BIT15


                                        ;  LINE CONTROL REGISTER BIT DEFINITIONS.

                        000200                  LOCAL.LOOP      =       BIT7
                        000004                  RX.ENABLE       =       BIT2
                        000020                  AUTO0           =       BIT4
                        000002                  AUTO1           =       BIT1


                                        ;  TRANSMIT BUFFER ADDRESS 2 BIT DEFINITIONS.

                        100000                  TX.ENABLE       =       BIT15
                        000200                  DMA.START       =       BIT7


                                        ;  THESE ARE THE PROGRAM PARAMETERS:

 000224  000377                         LINESELECT:  .WORD   377     ;  INDICATES LINES SELECTED. (8 LINES UNLESS
                                                                     ;  CHANGED BY OPERATOR).
 000226                                 LINESDONE:   .BLKW   4       ;  INDICATES HOW MANY LINES ARE DONE.
 000236  000000                         LINECOUNT:   .WORD   0       ;  # OF LINES BEING TESTED.

 000240  000000                         DHVSDONE:    .WORD   0       ;  INDICATES HOW MANY DHV'S ARE DONE.
 000242  000000                         DHVSLEFT:    .WORD   0       ;  INDICATES DHV'S LEFT TO DO.
 000244  000000                         DHV.LIVE:    .WORD   0       ;  BIT MAP OF NUMBER OF DHV'S TO TEST.
 000246  000000                         DHVNOW:      .WORD   0       ;  CURRENT DHV #.
 000250  000000                         DHVCSR:      .WORD   0       ;  DHV CSR.

 000252  000000                         POINT:       .WORD   0       ;  POINTS TO CURRENT DHV BEING TESTED.
 000254  000000                         OFFSET:      .WORD   0       ;  OFFSET TO INDICATE SPECIFIC UNIT.
 000256  000000                         BUFADR:      .WORD   0       ;  HOLDS CURRENT BUFFER ADDRESS FOR BINARY COUNT PATTERN.
 000260  000000                         CDHVCSR:     .WORD   0       ;  HOLDS CSR.
 000262  000000                         LCKOUT:      .WORD   0       ;  ALLOWS ONLY 1 DHV TO RUN TEST AT A TIME.

 000264  000000                         TXSPEED:     .WORD   0       ;  TRANSMIT SPEED (BAUD RATE).
 000266  000000                         RCVSPEED:    .WORD   0       ;  RECEIVE  SPEED (BAUD RATE).
```

MODULE DEFINITIONS

```
                                TXBUF:      .BLKB   256.    ;  HOLDS TRANSMIT MESSAGE
                                DHR0BUF:    .BLKB   256.    ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #1.
                                DHR1BUF:    .BLKB   256.    ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #2.
                                DHR2BUF:    .BLKB   256.    ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #3.
                                DHR3BUF:    .BLKB   256.    ;  HOLDS THE BINARY COUNT PATTERN FOR DEVICE #4.
000000                          DHVVECT:    .WORD   0       ;  HOLDS THE VECTOR ADDRESS OF CURRENT DHV.

000000                          VA:         .WORD   0       ;  VIRTUAL ADDRESS.
000000                          PA:         .WORD   0       ;  PHYSICAL ADDRESS.
000000                          EA:         .WORD   0       ;  EXTENDED ADDRESS.
000000                          PA22:       .WORD   0       ;  PHYSICAL ADDRESS (22 BIT).
000000                          EA22:       .WORD   0       ;  EXTENDED ADDRESS (22 BIT).

000000                          ADDR0:      .WORD   0       ;  HOLDS CSR ADDRESS OF DHV #1.
000000                          ADDR1:      .WORD   0       ;  HOLDS CSR ADDRESS OF DHV #2.
000000                          ADDR2:      .WORD   0       ;  HOLDS CSR ADDRESS OF DHV #3.
000000                          ADDR3:      .WORD   0       ;  HOLDS CSR ADDRESS OF DHV #4.

000000                          FLAG:       .WORD   0       ;  INDICATES IF DEVICE CAN INTERRUPT O.K.
000000                          XOFF:       .WORD   0       ;  INDICATES STATUS OF "XOFF".
000030                          DHVLPR:     .WORD   30      ;  LPR BEFORE SETTING BAUD RATES.
000000                          LPRSELECT:  .WORD   0       ;  LPR AFTER SETTING BAUD RATES.  NEEDED BECAUSE
                                                            ;  THE BAUD RATES ARE SET TO DEFAULTS DURING SELF TEST.


                            ;  THESE ARE THE ERROR MESSAGES

                                        .NLIST  BEX
045     106     101     ERR.A:  .ASCIZ  '%FATAL ERROR!!  CANNOT SELECT MORE THAN 4 LINES @19.2 K BAUD!!%'
045     106     101     ERR.B:  .ASCIZ  '%FATAL ERROR!!  CANNOT SELECT MORE THAN 2 LINES @38.4 K BAUD!!%'
045     106     101     ERR.C:  .ASCIZ  '%FATAL ERROR!!  SELF-TEST TIMED OUT!!  DROP THE UNIT!!%'
045     106     101     ERR.D:  .ASCIZ  '%FATAL ERROR!!  SELF-TEST DIAGNOSTICS FAILED!!  DROP THE UNIT!!%'
045     106     101     ERR.E:  .ASCIZ  '%FATAL ERROR!!  DATA VALID DID NOT SET!!  DROP THE UNIT!!%'
045     106     101     ERR.F:  .ASCIZ  '%FATAL ERROR!!  OVERRUN,PARITY, OR FRAMING ERROR!!  DROP THE UNIT!!%'
045     106     101     ERR.G:  .ASCIZ  '%FATAL ERROR!!  SELF-TEST ERROR CODE INDICATES AN ERROR!!  DROP THE UNIT!!%

045     105     122     ERR.H:  .ASCIZ  '%ERROR!!  ILLEGAL TRANSMIT INTERRUPT!!%'
045     105     122     ERR.I:  .ASCIZ  '%ERROR!!  OVERRUN,PARITY, OR FRAMING ERROR!!%'
045     105     122     ERR.J:  .ASCIZ  '%ERROR!!  DATA ERROR!!%'
045     105     122     ERR.K:  .ASCIZ  '%ERROR!!  NO LINES SELECTED!!%'
045     106     101     ERR.L:  .ASCIZ  '%FATAL ERROR!!  DEVICE DID NOT INTERRUPT PROPERLY!!  DROP THE UNIT!!%'
045     106     101     ERR.M:  .ASCII  '%FATAL ERROR!!  DEVICE DID NOT INTERRUPT PROPERLY!!%'
045     103     110             .ASCIZ  '%CHECK EXTERNAL CABLE OR TURNAROUND CONNECTION!!  DROP THE UNIT!!%'
                                .LIST   BEX
                                .EVEN
```

```
                                        .SBTTL INITIAL SETUP & SELF-TEST

                                ;  START THE PROGRAM.

004344                          START:

004344  016767  173444  173672        MOV     DVID1,DHV.LIVE    ;  SETUP # OF DHV'S TO BE TESTED.
004352  001002                        BNE     RESTRT            ;  IF THERE ARE NO DHV'S TO TEST,

004354                          DROP:                             ;  THEN DROP THE MODULE.

004354  104410  000000'              END$,BEGIN              ;

004360                          RESTRT:

004360  042767  177760  173656        BIC     #^C<17>,DHV.LIVE  ;  # OF DHV'S TO BE TESTED.


                                ;  WE MUST CONVERT THE 16 BIT VIRTUAL ADDRESS (TXBUF) TO AN 18 AND/OR 22 BIT PHYSICAL
                                ;  ADDRESS DEPENDING ON THE PROCESSOR.

004366  012767  000270'  176276        MOV     #TXBUF,VA         ;  GET THE TRANSMIT BUFFER ADDRESS.
004374  104415  000000'  002672'      GETPA$,BEGIN, VA                ;GET PHYSICAL ADDRESS FROM 16-BIT VA
004402  016767  176266  176270        MOV     PA,PA22           ;  NOW WE HAVE THE 18 BIT PHYSICAL ADDRESS AND
004410  016767  176262  176264        MOV     EA,EA22           ;  THE 18 BIT EXTENDED ADDRESS.

004416  032767  001000  173432        BIT     #ADDR22,CONFIG    ;  CAN THE PROCESSOR HANDLE 22 BIT ADDRESSING?
004424  001404                        BEQ     5$                ;  IF NOT, KEEP AS AN 18 BIT ADDRESS.

004426  104416  000000'  002674'      MAP22$, BEGIN,PA                ; GET 22 BIT ADDR FROM 18-BIT ADDR
004434  000410                        BR      SETUP1

004436                          5$:
004436  006267  176240                ASR     EA22              ;  SHIFT THE EXTENDED ADDRESS BITS
004442  006267  176234                ASR     EA22              ;  SO THEY ARE CORRECT FOR THE DHU
004446  006267  176230                ASR     EA22              ;  NOTE GETPA PUTS THE EXTENDED ADDRESS
004452  006267  176224                ASR     EA22              ;  BITS IN BITS 4 AND 5

004456                          SETUP1:

004456  016701  173562                MOV     DHV.LIVE,R1       ;  ANY DHV'S TO TEST?
004462  001734                        BEQ     DROP              ;  NO, DROP THE MODULE.

004464  012767  000001  173560        MOV     #1,POINT          ;  YES, SETUP DEVICE POINTER TO POINT TO 1ST DEVICE.
004472  016767  173310  173550        MOV     ADDR,DHVCSR       ;  GET THE CSR ADDRESS FOR FIRST DEVICE.
004500  016767  173304  176162        MOV     VECTOR,DHVVECT    ;  GET THE DEVICE VECTOR.

004506  012703  007522'              MOV     #DHR0,R3          ;  SETUP ADDRESS OF RECEIVER INTERRUPT ROUTINE.
004512  012704  007214'              MOV     #DHX0,R4          ;  SETUP ADDRESS OF TRANSMIT INTERRUPT ROUTINE.
004516  012701  002704'              MOV     #ADDR0,R1         ;  SETUP DEVICE ADDRESS TABLE FOR 1ST DEVICE.


                                ;  DETERMINE WHICH UNITS REQUIRE TESTING.

004522                          SETUP2:
```

INITIAL SETUP & SELF-TEST

```
                                                BIT     POINT,DHV.LIVE   ;  DOES OPERATOR WANT THIS DHV11 TESTED?
                                                BNE     1$               ;  YES, GO TEST IT.
                                                JMP     NEXTDHV          ;  NO, GO GET ANOTHER DHV.

                                        1$:
                                                MOV     DHVCSR,R2        ;  YES, SAVE THE CSR ADDRESS OF THIS DHV11.


                                        ;  ROUTINE TO MAKE SURE THE TRANSMIT & RECEIVE INTERRUPTS WORK O.K.

                                                MOV     R1,-(SP)         ;  SAVE REGISTERS.
                                                MOV     R2,-(SP)
                                                MOV     R3,-(SP)
                                                MOV     R4,-(SP)
                                                MOV     R5,-(SP)


                                        INITIALIZE:                              ;  FIRST WE INITIALIZE THE DEVICE.

                                                MOV     #4000,R1                 ;  SET-UP WATCHDOG TIMER.      ;RG001
                                                BIS     #MASTER.RESET,CSR(R2)    ;  SET MASTER RESET IN CSR.
                                        10$:
                                                BIT     #MASTER.RESET,CSR(R2)    ;  IS MASTER RESET STILL SET?
                                                BEQ     20$                      ;  NO, SELF TEST IS DONE.

                                                BREAK$,BEGIN             ;TEMPORARY RETURN TO MONITOR....
                                                BREAK$,BEGIN             ;THEN CONTINUE AT NEXT INSTRUCTION.

                                                DEC     R1               ;  DECREMENT WATCHDOG TIMER.
                                                BNE     10$              ;  YES, WAIT FOR MASTER RESET TO CLEAR.



                                        ;  SELF-TEST TIMED OUT!!  FATAL ERROR!!  DROP THE UNIT!!


                                                MOV     DHVCSR,CSRA      ;  YES, MASTER RESET DIDN'T SET. REPORT AN ERROR.
                                                MOV     CSR(R2),ACSR     ;  PRINTOUT THE CSR ADDRESS (CSRA), THE CONTENTS
                                                MOV     RBUF(R2),ASTAT   ;  OF THE CSR (ACSR), AND RBUF (ASTAT).
                                                MOV     #34,ERRTYP

                                                MSG$,BEGIN,ERR.C         ;ASCII MESSAGE CALL
                                                ;*****************************************************************
                                                HRDER$,BEGIN,NULL        ;
                                                ;*****************************************************************

                                                BIC     POINT,DHV.LIVE   ;  FATAL ERROR!! DROP THIS DHV11 UNIT!!

                                                MOV     (SP)+,R5         ;  RESTORE REGISTERS.
                                                MOV     (SP)+,R4
                                                MOV     (SP)+,R3
                                                MOV     (SP)+,R2
                                                MOV     (SP)+,R1
```

```
                                                JMP     NEXTDHV         ;  GO BACK FOR ANOTHER DHV11.

                                        20$:

                                        ROUTINE:

                                        30$:
                                                MOV     RBUF(R2),R0     ;  FLUSH OUT RECEIVER SILO.
                                                BPL     40$
                                                BR      30$

                                        40$:
                                                MOV     DHVVECT,R5      ;  POINT TO VECTOR ADDRESS.

                                                MOV     #RCV,(R5)+      ;  LOAD INTERRUPT RECEIVE ROUTINE ADDRESS.
                                                MOVB    BR1,(R5)+       ;  LOAD PRIORITY.
                                                CLRB    (R5)+
                                                MOV     #TX,(R5)+       ;  LOAD INTERRUPT TRANSMIT ROUTINE ADDRESS.
                                                MOVB    BR1,(R5)+       ;  LOAD PRIORITY.
                                                CLRB    (R5)

                                                CLR     R0              ;  START WITH LINE ZERO.
                                                MOV     #1,R1           ;  POINT TO IT.
                                        50$:
                                                CLR     FLAG            ;  INIT. INTERRUPT INDICATOR.
                                                BIT     R1,LINESELECT   ;  IS THIS LINE ON THE DHV SELECTED FOR TESTING?
                                                BEQ     70$             ;  NO, DON'T SET IT UP.

                                                MOV     R0,CSR(R2)      ;  SELECT LINE NUMBER IN CSR.
                                                                        ;  NOTE THE INITAL RESET SELECTED A
                                                                        ;  XMIT AND RECEIVE BAUD OF 9600, NO PARITY,
                                                                        ;  1 STOP BIT, NORMAL OPERATION.  WE'RE
                                                                        ;  NOT GOING TO CHANGE THAT HERE.

                                                BIT     R1,SR3          ;  DOES THE OPERATOR WANT TO TEST IN LOCAL LOOPBACK?
                                                BEQ     52$             ;  YES, SET-UP FOR LOCAL LOOPBACK.

                                                                        ;  NO, SET-UP IN NORMAL OPERATION.

                                                MOV     #RX.ENABLE!AUTO1!AUTO0,LNCTRL(R2)     ;  SET RX ENABLE & NORMAL
                                                                                              ;  OPERATION IN LNCTRL.
                                                BR      100$

                                        52$:
                                                MOV     #LOCAL.LOOP!RX.ENABLE!AUTO1!AUTO0,LNCTRL(R2)   ;  SET RX ENABLE & LOCAL
                                                                                                       ;  LOOPBACK IN LNCTRL.

                                        100$:

                                                MOV     R0,R4
                                                BIS     #TXINTR.ENABLE!RCVINTR.ENABLE,R4     ;  SET TRANSMIT & RECEIVE
                                                                                             ;  INTERRUPT ENABLES.
                                                MOV     R4,CSR(R2)
```

INITIAL SETUP & SELF TEST

```
    773 005024  012762  100000  000002          MOV     #TXDATA.VALID,TXCHAR(R2)        ;  SET TX DATA VALID BIT TO SEND
    774                                                                                   ;  THE CHARACTER.
    775
    776 005032  012703  010000                  MOV     #10000,R3                       ;  SET WATCHDOG TIMER.  WE WILL
    777                                                                                   ;  TIME OUT IF IT TAKES TOO LONG
    778                                                                                   ;  TO INTERRUPT SUCCESSFULLY.
    779
    780 005036                          2$:
    781 005036  104407  000000'                 BREAK$,BEGIN            ;TEMPORARY RETURN TO MONITOR....
        005042  104407  000000'                 BREAK$,BEGIN            ;THEN CONTINUE AT NEXT INSTRUCTION.
    782
    783 005046  005303                          DEC     R3                ;  UPDATE COUNTDOWN.
    784 005050  001044                          BNE     3$                ;  HAS THE TIMER TIMED OUT?
    785
    786 005052  016767  173172  173020          MOV     DHVCSR,CSRA       ;  YES, THE DEVICE DID NOT INTERRUPT PROPERLY!
    787                                                                   ;  REPORT AN ERROR.
    788 005060  016267  000000  173014          MOV     CSR(R2),ACSR      ;  PRINTOUT THE CSR ADDRESS (CSRA), THE CONTENTS
    789 005066  016267  000002  173010          MOV     RBUF(R2),ASTAT    ;  OF THE CSR (ACSR), AND RBUF (ASTAT).
    790
    791 005074  022767  000002  175612          CMP     #BIT1,FLAG        ;  DID TRANSMITTER INTERRUPT?
    792 005102  001007                          BNE     80$               ;  NO IT DIDN'T, REPORT INTERRUPT ERROR.
    793 005104  030167  172712                  BIT     R1,SR3            ;  EXTERNAL LOOPBACK MODE (NORMAL)?
    794 005110  001404                          BEQ     80$               ;  NO, REPORT INTERRUPT ERROR.
    795 005112  104401  000000' 004154'         MSG$,BEGIN,ERR.M        ;ASCII MESSAGE CALL
    796 005120  000403                          BR      85$
    797 005122                          80$:
    798 005122  104401  000000' 004046'         MSG$,BEGIN,ERR.L        ;ASCII MESSAGE CALL
    799 005130                          85$:
    800                                         ;*****************************************************************
        005130  104405  000000' 000000         HRDER$,BEGIN,NULL       ;
                                                ;*****************************************************************
    801
    802 005136  046767  173110  173100          BIC     POINT,DHV.LIVE    ;  FATAL ERROR!! DROP THIS DHV11 UNIT!!
    803
    804 005144  012605                          MOV     (SP)+,R5          ;  RESTORE REGISTERS.
    805 005146  012604                          MOV     (SP)+,R4
    806 005150  012603                          MOV     (SP)+,R3
    807 005152  012602                          MOV     (SP)+,R2
    808 005154  012601                          MOV     (SP)+,R1
    809
    810 005156  000167  000514                  JMP     NEXTDHV           ;  GO BACK FOR ANOTHER DHV11.
    811
    812 005162                          3$:
    813 005162  022767  000006  175524          CMP     #6,FLAG           ;  HAVE WE INTERRUPTED SUCCESSFULLY?
    814 005170  001322                          BNE     2$                ;  NO, WAIT FOR FLAG TO SET.
    815
    816 005172  012762  000000  000000          MOV     #0,CSR(R2)                      ;  DISABLE TRANSMIT & RECEIVER INTERRUPTS.
    817 005200  042762  100000  000002          BIC     #TXDATA.VALID,TXCHAR(R2)        ;  DISABLE TRANSMIT DATA VALID.
    818
    819 005206                          70$:
    820 005206  005200                          INC     R0                      ;  UPDATE LINE NUMBER FOR CSR.
    821 005210  106301                          ASLB    R1                      ;  POINT TO NEXT LINE.
    822 005212  001256                          BNE     50$                     ;  HAVE WE DONE 8 LINES?
    823
    824 005214  000167  000040                  JMP     EX                ;  FINISHED TESTING INTERRUPT CAPABILITIES.
```

```
                                TX:                             ;  TRANSMIT ROUTINE.
                                ;------- -- --  ---     - - ---- -   - --   ----  --- ----- -
005220  000004  000000' 005226'         PIRQ$,BEGIN,1$          ; QUEUE UP TO CONTINUE AT 1$ AND RTI
                                ;---- --------- -  ------- -- ----------   ---- --------------
                                1$:
005226  052767  000002  175460         BIS     #BIT1,FLAG      ;  SET FLAG INDICATING SUCCESSFUL TRANSMIT INTERRUPT.
005234  104400  000000'                 EXIT$,BEGIN                     ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.

                                RCV:                            ;  RECEIVE ROUTINE.
                                ;  --------        ----  -     -------- - - - -------- --- ----
005240  000004  000000' 005246'         PIRQ$,BEGIN,1$          ; QUEUE UP TO CONTINUE AT 1$ AND RTI
                                ;----- - ----  --- --------  -------------  -    --------- - -
                                1$:
005246  052767  000004  175440         BIS     #BIT2,FLAG      ;  SET FLAG INDICATING SUCCESSFUL RECEIVE INTERRUPT.
005254  104400  000000'                 EXIT$,BEGIN                     ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.

                                EX:
005260  012701  002000                 MOV     #2000,R1                ;  SET-UP WATCHDOG TIMER.
005264  052762  000040  000000         BIS     #MASTER.RESET,CSR(R2)   ;  SET MASTER RESET IN CSR.
005272                                  10$:
005272  032762  000040  000000         BIT     #MASTER.RESET,CSR(R2)   ;  IS MASTER RESET STILL SET?
005300  001406                         BEQ     20$                     ;  NO, SELF-TEST IS DONE.

005302  104407  000000'                BREAK$,BEGIN            ;TEMPORARY RETURN TO MONITOR....
005306  104407  000000'                BREAK$,BEGIN            ;THEN CONTINUE AT NEXT INSTRUCTION.

005312  005301                         DEC     R1                      ;  DECREMENT WATCHDOG TIMER.
005314  001366                         BNE     10$                     ;  YES, WAIT FOR MASTER RESET TO CLEAR.

                                20$:
005316  012605                         MOV     (SP)+,R5        ;  RESTORE REGISTERS.
005320  012604                         MOV     (SP)+,R4
005322  012603                         MOV     (SP)+,R3
005324  012602                         MOV     (SP)+,R2
005326  012601                         MOV     (SP)+,R1


                                ;  SET UP THE BAUD RATES.

                                CHECKLINES:

005330  022767  000000  172666         CMP     #0,LINESELECT   ;  MAKE SURE THERE ARE LINES SELECTED.
005336  001024                         BNE     3$              ;  YES, THERE ARE.  GO TEST THEM.

005340  016767  172704  172532         MOV     DHVCSR,CSRA     ;  NO, THERE ARE NO LINES SELECTED.  REPORT AN ERROR.
005346  016267  000000  172526         MOV     CSR(R2),ACSR    ;  PRINTOUT THE CSR ADDRESS (CSRA), THE CONTENTS
005354  016267  000002  172522         MOV     RBUF(R2),ASTAT  ;  OF THE CSR (ACSR), AND RBUF (ASTAT).

005362  104401  000000' 004007'         MSG$,BEGIN,ERR.K        ;ASCII MESSAGE CALL
                                ;*****************************************************************
005370  104405  000000' 000000         HRDER$,BEGIN,NULL       ;
                                ;*****************************************************************

005376  046767  172650  172640         BIC     POINT,DHV.LIVE  ;  FATAL ERROR!! DROP THIS DHV11 UNIT!!
```

INITIAL SETUP & SELF-TEST

```
873 005404  000167  000266                 JMP     NEXTDHV          ;  GO BACK FOR ANOTHER DHV11.
874
875 005410                          3$:
876 005410  012700  000010                 MOV     #8.,R0           ;  SET-UP BIT COUNTER.
877 005414  005067  172616                 CLR     LINECOUNT        ;  INITIALIZE THE "LINES SELECTED INDICATOR".
878 005420  022767  000000  172372         CMP     #0,SR2           ;  DOES OPERATOR WANT TO RUN AT 9600 BAUD?
879 005426  001005                         BNE     5$               ;  NO, DETERMINE THE BAUD RATE DESIRED.
880
881 005430  012767  000015  172360         MOV     #15,SR1          ;  YES, SET-UP BAUD USING 9600.
882 005436  000167  000200                 JMP     12$              ;  GO DO THE SET-UP.
883
884 005442                          5$:                              ;  FIRST, HOWEVER, WE MUST DETERMINE HOW MANY
885                                                                  ;  LINES HAVE BEEN SELECTED FOR TESTING.
886
887 005442  106167  172556                 ROLB    LINESELECT       ;  PLACE THE LINESELECT BIT INTO THE CARRY BIT.
888 005446  103002                         BCC     7$               ;  IS THIS LINE SELECTED?
889 005450  005267  172562                 INC     LINECOUNT        ;  YES, INDICATE THAT IT IS.
890
891 005454                          7$:
892 005454  077006                         SOB     R0,5$            ;  UPDATE COUNT-DOWN UNTIL ALL BITS ARE CHECKED.
893
894 005456  106167  172542                 ROLB    LINESELECT       ;  RESTORE LINESELECT.
895 005462  022767  000016  172326         CMP     #16,SR1          ;  IS SELECTED BAUD RATE 19.2 K?
896 005470  001030                         BNE     10$              ;  NO, SEE IF IT IS SET FOR 38.4 K.
897 005472  022767  000004  172536         CMP     #4,LINECOUNT     ;  YES.  ARE THERE MORE THAN 4 LINES SELECTED?
898 005500  002060                         BGE     12$              ;  NO, THAT'S GOOD.  GO SET-UP THE BAUD RATE.
899
900 005502  016767  172542  172370         MOV     DHVCSR,CSRA      ;  YES, TOO MANY LINES SELECTED.  REPORT AN ERROR.
901 005510  016267  000000  172364         MOV     CSR(R2),ACSR     ;  PRINTOUT THE CSR ADDRESS (CSRA), THE CONTENTS
902 005516  016267  000002  172360         MOV     RBUF(R2),ASTAT   ;  OF THE CSR (ACSR), AND RBUF (ASTAT).
903
904 005524  104401  000000' 002724'        MSG$,BEGIN,ERR.A        ;ASCII MESSAGE CALL
905                                                                  ;  RUNNING CONCURRENTLY AT 19.2 K BAUD!
906                                                                  ;*****************************************************************
    005532  104405  000000' 000000        HRDER$,BEGIN,NULL       ;
                                                                     ;*****************************************************************
907
908 005540  046767  172506  172476         BIC     POINT,DHV.LIVE   ;  FATAL ERROR!! DROP THIS DHV11 UNIT!!
909 005546  000167  000124                 JMP     NEXTDHV          ;  GO BACK FOR ANOTHER DHV11.
910
911 005552                              10$:
912 005552  022767  000017  172236         CMP     #17,SR1          ;  IS SELECTED BAUD RATE 38.4 K?
913 005560  001030                         BNE     12$              ;  NO, GO SETUP ITS BAUD RATE.
914 005562  022767  000002  172446         CMP     #2,LINECOUNT     ;  YES.  ARE THERE MORE THAN 2 LINES SELECTED?
915 005570  002024                         BGE     12$              ;  NO, GO SET-UP THE BAUD RATE.
916
917 005572  016767  172452  172300         MOV     DHVCSR,CSRA      ;  YES, TOO MANY LINES SELECTED.  REPORT AN ERROR.
918 005600  016267  000000  172274         MOV     CSR(R2),ACSR     ;  PRINTOUT THE CSR ADDRESS (CSRA), THE CONTENTS
919 005606  016267  000002  172270         MOV     RBUF(R2),ASTAT   ;  OF THE CSR (ACSR), AND RBUF (ASTAT).
920
921 005614  104401  000000' 003024'        MSG$,BEGIN,ERR.B        ;ASCII MESSAGE CALL
922                                                                  ;  RUNNING CONCURRENTLY AT 38.4 K BAUD!
923
924                                                                  ;*****************************************************************
    005622  104405  000000' 000000        HRDER$,BEGIN,NULL       ;
```

```
                                        ;*****************************************************************
 925
 926 005630  046767  172416  172406          3IC     POINT,DHV.LIVE    ;  FATAL ERROR!! DROP THIS DHV11 UNIT!!
 927 005636  000167  000034                    JMP     NEXTDHV           ;  GO BACK FOR ANOTHER DHV11.
 928
 929 005642                          12$:
 930 005642  004767  002656                    JSR     PC,BAUDRATE       ;  GO SET-UP THE BAUDRATE.
 931
 932
 933                                 ;  SETUP VECTOR ADDRESSES.
 934
 935 005646                          VECT:
 936 005646  016705  175016                    MOV     DHVVECT,R5        ;  POINT TO THE VECTOR.
 937 005652  016711  172372                    MOV     DHVCSR,(R1)       ;  MOVE THE CSR ADDRESS INTO THE ADDRESS TABLE.
 938 005656  010325                            MOV     R3,(R5)+          ;  MOVE THE ADDRESS OF THE RECEIVER INTERRUPT
 939                                                                      ;  ROUTINE & THE PRIORITY OF THIS DHV11 INTO
 940 005660  116725  172126                    MOVB    BR1,(R5)+         ;  THE VECTOR ADDRESS FOR THIS DHV.
 941 005664  105025                            CLRB    (R5)+
 942 005666  010425                            MOV     R4,(R5)+          ;  MOVE THE ADDRESS OF THE TRANSMIT INTERRUPT
 943                                                                      ;  ROUTINE & THE PRIORITY OF THIS DHV11 INTO
 944 005670  116725  172116                    MOVB    BR1,(R5)+         ;  THE VECTOR ADDRESS FOR THIS DHV.
 945 005674  105015                            CLRB    (R5)
 946
 947 005676                          NEXTDHV:
 948
 949 005676  006367  172350                    ASL     POINT             ;  POINT TO NEXT DHV11.
 950 005702  062701  000002                    ADD     #2,R1             ;  POINT TO NEXT LOC. IN ADDRESS TABLE.
 951 005706  062703  000034                    ADD     #DHR1-DHR0,R3     ;  POINT TO NEXT DHV'S RX INTERRUPT ROUTINE.
 952 005712  062704  000020                    ADD     #DHX1-DHX0,R4     ;  POINT TO NEXT DHV'S TX INTERRUPT ROUTINE.
 953
 954 005716  032767  000020  172326          BIT     #20,POINT         ;  HAVE WE SETUP ALL DHV11s?
 955 005724  001010                            BNE     SELFTEST          ;  YES, LET'S GO TEST THEM!
 956
 957 005726  062767  000020  172314          ADD     #20,DHVCSR        ;  NO, GO SETUP ANOTHER DHV11.
 958 005734  062767  000010  174726          ADD     #10,DHVVECT
 959 005742  000167  176554                    JMP     SETUP2
 960
 961
 962                                 ;  NOW BEGIN THE SELF TEST
 963
 964 005746                          SELFTEST:
 965
 966 005746  012767  000001  172276          MOV     #1,POINT          ;  SETUP DEVICE POINTER TO POINT TO 1ST DEVICE.
 967 005754  016767  172026  172266          MOV     ADDR,DHVCSR       ;  SETUP ADDRESS OF 1ST DEVICE.
 968
 969 005762                          DHV.L1:
 970
 971 005762  036767  172264  172254          BIT     POINT,DHV.LIVE    ;  DOES THE OPERATOR WANT TO TEST THIS DEVICE?
 972 005770  001002                            BNE     5$                ;  YES, GO TEST IT.
 973 005772  000167  000502                    JMP     DHV.N1            ;  NO, GO LOOK AT THE NEXT DHV.
 974 005776                          5$:
 975 005776  016702  172246                    MOV     DHVCSR,R2         ;  SETUP THIS DHV'S DEVICE ADDRESS.
 976 006002  012701  003720                    MOV     #2000.,R1         ;  SETUP WATCHDOG TIMER.
 977
 978
```

```
                                        ;  THE ONBOARD SELF-TEST DIAGNOSTIC WILL NOW BE RUN.
                                        ;  THIS IS ACCOMPLISHED BY SETTING THE MASTER RESET IN THE CSR.  THE
                                        ;  CSR MASTER RESET BIT IS CLEARED WHEN THE SELF TEST IS COMPLETED.

006006  052762  000040  000000          BIS     #MASTER.RESET,CSR(R2)    ;  SET MASTER RESET IN CSR.
006014                                10$:
006014  032762  000040  000000          BIT     #MASTER.RESET,CSR(R2)    ;  IS MASTER RESET STILL SET?
006022  001435                          BEQ     20$                      ;  NO, SELF-TEST IS DONE.

006024  104407  000000'                 BREAK$,BEGIN            ;TEMPORARY RETURN TO MONITOR....
006030  104407  000000'                 BREAK$,BEGIN            ;THEN CONTINUE AT NEXT INSTRUCTION.

006034  005301                          DEC     R1               ;  DECREMENT WATCHDOG TIMER.
006036  001366                          BNE     10$              ;  YES, WAIT FOR MASTER RESET TO CLEAR.


                                        ;  SELF-TEST TIMED OUT!!  FATAL ERROR!!  DROP THE UNIT!!

006040  016767  172204  172032          MOV     DHVCSR,CSRA      ;  YES, MASTER RESET DIDN'T SET. REPORT AN ERROR.
006046  016267  000000  172026          MOV     CSR(R2),ACSR     ;  PRINTOUT THE CSR ADDRESS (CSRA), THE CONTENTS
006054  016267  000002  172022          MOV     RBUF(R2),ASTAT   ;  OF THE CSR (ACSR), AND RBUF (ASTAT).
006062  012767  000034  172016          MOV     #34,ERRTYP

006070  104401  000000' 003124'         MSG$,BEGIN,ERR.C        ;ASCII MESSAGE CALL
                                        ;*************************************************************
006076  104405  000000' 000000          HRDER$,BEGIN,NULL       ;
                                        ;*************************************************************

006104  046767  172142  172132          BIC     POINT,DHV.LIVE   ;  FATAL ERROR!! DROP THIS DHV11 UNIT!!
006112  000167  000362                  JMP     DHV.N1           ;  GO BACK FOR ANOTHER DHV11.


                                        ;  THE SELF-TEST DID COMPLETE FOR THIS DHV11.  BUT, WERE THERE ANY FAILURES?

006116                                20$:
006116  032777  020000  172124          BIT     #DIAG.FAIL,@DHVCSR       ;  DID SELF-TEST DIAGNOSTICS PASS?
006124  001426                          BEQ     30$                      ;  YES, IF "DIAGNOSTICS FAILURE" BIT CLEAR.


                                        ;  SELF-TEST DIAGNOSTICS FAILED!!  FATAL ERROR!!  DROP THE UNIT!!

006126  016767  172116  171744          MOV     DHVCSR,CSRA      ;  REPORT CSR.
006134  016267  000000  171740          MOV     CSR(R2),ACSR     ;  REPORT CSR CONTENTS.
006142  010567  171736                  MOV     R5,ASTAT         ;  REPORT CONTENTS OF RBUF.
006146  012767  000034  171732          MOV     #34,ERRTYP       ;  REPORT ERROR TYPE.

006154  104401  ^00000' 003214'         MSG$,BEGIN,ERR.D        ;ASCII MESSAGE CALL
                                        ;*************************************************************
006162  104405  000000' 000000          HRDER$,BEGIN,NULL       ;
                                        ;*************************************************************

006170  046767  172056  172046          BIC     POINT,DHV.LIVE   ;  REMOVE THIS FAULTY DEVICE FROM TESTING.
006176  000167  000276                  JMP     DHV.N1           ;  GO GET NEXT DHV.
```

```
1029                                    ;  SELF-TEST PASSED O.K.
1030
1031 006202                             30$:
1032 006202  012704  000007                    MOV     #7.,R4          ;  SETUP TO READ 8 CHAR. CODES FROM RBUF.
1033 006206  012701  003720                    MOV     #2000.,R1       ;  SETUP WATCHDOG TIMER.
1034 006212                             40$:
1035 006212  016203  000002                    MOV     RBUF(R2),R3     ;  READ RBUF FIFO.  A VALID CHAR. WILL SET BIT
1036 006216  100434                            BMI     50$             ;  #15 (FIFO NOT EMPTY).
1037
1038 006220  104407  000000'                   BREAK$,BEGIN            ;TEMPORARY RETURN TO MONITOR....
     006224  104407  000000'                   BREAK$,BEGIN            ;THEN CONTINUE AT NEXT INSTRUCTION.
1039
1040 006230  005301                            DEC     R1              ;  DECREMENT WATCHDOG TIMER.
1041 006232  001367                            BNE     40$             ;  WAIT, WE WANT TO READ RBUF FIFO.
1042
1043
1044                                    ;  DATA VALID DID NOT SET!!  FATAL ERROR!!  DROP THIS DHV11!!
1045
1046                                                                    ;  BIT #15 DIDN'T SET!  REPORT AN ERROR!
1047 006234  016767  172010  171636            MOV     DHVCSR,CSRA     ;  REPORT CSR.
1048 006242  016267  000000  171632            MOV     CSR(R2),ACSR    ;  REPORT CSR CONTENTS.
1049 006250  010367  171630                    MOV     R3,ASTAT        ;  REPORT CONTENTS OF RBUF.
1050 006254  012767  000034  171624            MOV     #34,ERRTYP      ;  REPORT ERROR TYPE.
1051
1052 006262  104401  000000' 003315'          MSG$,BEGIN,ERR.E        ;ASCII MESSAGE CALL
1053                                           ;*****************************************************************
     006270  104405  000000' 000000          HRDER$,BEGIN,NULL       ;
                                               ;*****************************************************************
1054
1055 006276  046767  171750  171740          BIC     POINT,DHV.LIVE  ;  REMOVE THIS FAULTY DHV FROM TESTING.
1056 006304  000167  000170                    JMP     DHV.N1          ;  GO GET NEXT DHV.
1057
1058
1059                                    ;  IT IS A VALID CHARACTER.  CHECK BITS 12-14 FOR A POSSIBLE ERROR.
1060
1061 006310                             50$:
1062 006310  032703  070000                    BIT     #OVERRUN.ERROR!FRAMING.ERROR!PARITY.ERROR,R3    ;  IS IT MODEM STATUS,
1063                                                                                                    ;  SELF-TEST ERROR CODE,
1064                                                                                                    ;  OR DATA?
1065 006314  001736                            BEQ     40$             ;  IF NONE SET THEN IT IS DATA.  IT DOESN'T COUNT.
1066 006316  062703  010000                    ADD     #BIT12,R3       ;  MAKE SURE ALL THE BITS WERE SET!
1067 006322  100026                            BPL     60$             ;  THEY WERE.  THAT'S GOOD.
1068
1069
1070                                    ;  OVERRUN, PARITY OR FRAMING ERROR!!  FATAL ERROR!!  DROP THIS UNIT!!
1071
1072                                                                    ;  IF OVERFLOW TO BIT 15 DID NOT OCCUR,
1073                                                                    ;  THEN WE KNOW ALL 3 BITS WERE NOT SET!
1074                                                                    ;  REPORT AN ERROR.
1075 006324  016767  171720  171546            MOV     DHVCSR,CSRA     ;  REPORT CSR.
1076 006332  016267  000000  171542            MOV     CSR(R2),ACSR    ;  REPORT CSR CONTENTS.
1077 006340  010367  171540                    MOV     R3,ASTAT        ;  REPORT RBUF CONTENTS.
1078 006344  012767  000034  171534            MOV     #34,ERRTYP      ;  REPORT ERROR TYPE.
1079
1080 006352  104401  000000' 003410'          MSG$,BEGIN,ERR.F        ;ASCII MESSAGE CALL
```

```
1081                                    ;*****************************************************************
     006360  104405  000000' 000000      HRDER$,BEGIN,NULL       ;
                                        ;*****************************************************************
1082
1083 006366  046767  171660  171650      BIC     POINT,DHV.LIVE  ;  REMOVE THIS FAULTY DHV FROM TESTING.
1084 006374  000167  000100              JMP     DHV.N1          ;  GO GET NEXT DHV.
1085
1086
1087                                ;  THE "ALL ONES" CODE FOR BITS 12-14 IN RBUF INDICATES THAT MODEM
1088                                ;  STATUS OR SELF TEST DIAGNOSTIC INFO.  IS BEING HELD IN RBUF BITS 0-7.
1089                                ;  WE WANT TO LOOK AT THE SELF-TEST CODE TO ASSURE THAT THE SELF-TEST
1090                                ;  COMPLETED O.K.
1091
1092 006400                        60$:
1093 006400  032703  000001              BIT     #BIT0,R3        ;  IS THIS MODEM STATUS OR SELF-TEST ERROR CODE?
1094 006404  001702                      BEQ     40$             ;  IGNOR THE MODEM STATUS. WE JUST WANT
1095                                                             ;  SELF-TEST ERROR CODES.
1096
1097 006406  105703                      TSTB    R3              ;  LOOK TO SEE IF ROM VERSION OR SELF-TEST ERROR CODE.
1098 006410  100031                      BPL     70$             ;  IF BIT7=0 THEN ROM VERSION. READ AND IGNOR.
1099 006412  120327  000201              CMPB    R3,#201         ;  DID WE GET SUCCESSFUL COMPLETION CODE?
1100 006416  001426                      BEQ     70$             ;  IF SO, CODE 201 RETURNED.  ANY OTHER CODE IS
1101                                                             ;  AN ERROR!
1102
1103
1104                                    ;  SELF-TEST ERROR CODE INDICATES AN ERROR!!  FATAL ERROR!!  DROP THIS DHV11!!
1105
1106                                                             ;  REPORT AN ERROR.
1107 006420  016767  171624  171452      MOV     DHVCSR,CSRA     ;  REPORT CSR.
1108 006426  016267  000000  171446      MOV     CSR(R2),ACSR    ;  REPORT CSR CONTENTS.
1109 006434  010367  171444              MOV     R3,ASTAT        ;  REPORT RBUF CONTENTS.
1110 006440  012767  000034  171440      MOV     #34,ERRTYP      ;  REPORT ERROR TYPE.
1111
1112 006446  104401  000000' 003515'     MSG$,BEGIN,ERR.G        ;ASCII MESSAGE CALL
1113                                    ;*****************************************************************
     006454  104405  000000' 000000      HRDER$,BEGIN,NULL       ;
                                        ;*****************************************************************
1114
1115 006462  046767  171564  171554      BIC     POINT,DHV.LIVE  ;  REMOVE THIS FAULTY DHV FROM TESTING.
1116 006470  000167  000004              JMP     DHV.N1          ;  GO GET NEXT DHV.
1117
1118
1119                                ;  THESE ARE THE SELF-TEST ERROR CODES
1120
1121                                    ; CODE          MEANING
1122
1123                                    ; 201   SELF TEST NULL CODE (OK)
1124                                    ; 203   SELF TEST CODE SKIPPED
1125                                    ; 211   BASIC DATA PATH ERROR FRO PROC2
1126                                    ; 213   UNDEFINED UART ERROR
1127                                    ; 225   PROC1 TO EXTERNAL RAM ERROR
1128                                    ; 227   PROC2 TO EXTERNAL RAM ERROR
1129                                    ; 231   PROC1 TO INTERNAL RAM ERROR
1130                                    ; 233   PROC2 TO INTERNAL RAM ERROR
1131                                    ; 235   PROC1 ROM ERROR
```

```
                                        ; 237   PROC2 ROM ERROR
                                        ; 241-277 UART ACCESS OR FUNCTION
                                        ; BIT 7=0 AND BIT0-1 ROM VERSION
                                        ; ALL OTHER CODES ARE UNDEFINED ERRORS.

006474                          70$:
006474  005304                        DEC     R4              ;  NEXT CHARACTER.
006476  001245                        BNE     40$             ;  HAVE WE DONE ALL 8 CHARACTERS?
                                                                ;  IF NOT, GO BACK & DO THEM.


                                ;  LET'S LOOK AT THE NEXT DHV11

006500                          DHV.N1:

006500  005767  171540                TST     DHV.LIVE        ;  ANY DHVS TO TEST?
006504  001002                        BNE     10$
006506  000167  175642                JMP     DROP
006512                          10$:
006512  106367  171534                ASLB    POINT           ;  LOOK AT NEXT DHV.
006516  032767  000020  171526        BIT     #20,POINT       ;  HAVE WE TESTED ALL DHV'S.
006524  001005                        BNE     DHVT02          ;  YES, GOTO NEXT TEST SECTION.
006526  062767  000020  171514        ADD     #20,DHVCSR      ;  NO, GET NEXT DHV ADDRESS.
006534  000167  177222                JMP     DHV.L1          ;  GO BACK AND TEST.
```

```
                                        .sbttl  MODE SET-UP
                                ;) **
                                ;)
                                ;)  NAME: DHVT02
                                ;)
                                ;)  FUNCTIONAL DESCRIPTION:     THIS SECTION SETS UP THE DHV11 TO PASS DATA IN
                                ;)                              INTERNAL LOOPBACK MODE OR TO LOOPBACK DATA
                                ;)                              EXTERNALLY IN NORMAL MODE.
                                ;)
                                ;)
                                ;)  CALLING SEQUENCE:           IN LINE.
                                ;)
                                ;)  INPUTS REQUIRED:            NONE
                                ;)
                                ;)  OUTPUTS GIVEN:              NONE.
                                ;)
                                ;)  REGISTERS USED, UNRESTORED: ALL
                                ;)
                                ;)  SUBROUTINES USED:           NONE.
                                ;)
                                ;)  RESTRICTIONS:
                                ;)
                                ;) --

006540                          DHVT02:

006540  005067  171516                  CLR     LCKOUT          ;  INIT. LOCKOUT.
006544  005067  174146                  CLR     XOFF            ;  INIT. XOFF INDICATOR.
006550  005067  171452                  CLR     LINESDONE       ;  INIT. LINE DONE INDICATOR.
006554  005067  171450                  CLR     LINESDONE+2     ;  INIT. LINE DONE INDICATOR.
006560  005067  171446                  CLR     LINESDONE+4     ;  INIT. LINE DONE INDICATOR.
006564  005067  171444                  CLR     LINESDONE+6     ;  INIT. LINE DONE INDICATOR.

006570  005067  171452                  CLR     DHVNOW          ;  START WITH DEVICE #0.
006574  016767  171206  171446          MOV     ADDR,DHVCSR     ;  GET ADDRESS OF FIRST DHV11.
006602  016767  171202  174060          MOV     VECTOR,DHVVECT  ;  GET VECTOR OF FIRST DHV11.

006610  012767  000001  171434          MOV     #1,POINT        ;  RECORD WORKING ON 1ST DHV11.
006616  005067  171416                  CLR     DHVSDONE        ;  CLEAR THE INDICATOR OF HOW MANY DHVS
                                                                ;  ARE DONE,
006622  005067  171414                  CLR     DHVSLEFT        ;  AND HOW MANY ARE LEFT TO DO.

006626                          DHV.L2:

006626  036767  171420  171410          BIT     POINT,DHV.LIVE  ;  DOES OPERATOR WANT THIS DHV11 TESTED?
006634  001503                          BEQ     DHV.N2          ;  NO, GO LOOK AT THE NEXT DHV.

006636  016702  171406                  MOV     DHVCSR,R2       ;  SAVE DHV ADDRESS FOR SUBROUTINES.


                                ;  SETUP THE COUNT PATTERN TO SEND VIA THE TRANSMITTER.
                                ;  THE COUNT PATTERN IS 224-377 (148-255 DECIMAL).

006642                          DHV.BUF:
```

MODE SET-UP

```
1213 006642  012700  000270'          MOV     #TXBUF,R0          ;  NOW WRITE COUNT PATTERN INTO XMIT BUFFER.
1214 006646  012701  000224          MOV     #224,R1            ;  START WITH 224 UP TO 377 (148-255 DECIMAL).
1215 006652                    10$:
1216 006652  110120                  MOVB    R1,(R0)+           ;  STORE PATTERN.
1217 006654  105201                  INCB    R1                 ;  UPDATE PATTERN UNTIL PATTERN 377 IS
1218                                                            ;  STORED.
1219 006656  001375                  BNE     10$                ;  HAVE WE STORED UP TO 377 YET?
1220
1221 006660                    20$:
1222 006660  012700  000670'          MOV     #DHR0BUF,R0        ;  GET RECEIVER BUFFER ADDRESS.
1223 006664  016701  171356          MOV     DHVNOW,R1
1224 006670                    30$:
1225 006670  005301                  DEC     R1                     ;  IS THIS DHV #0?
1226 006672  100403                  BMI     40$
1227 006674  062700  000400          ADD     #DHR1BUF-DHR0BUF,R0    ;  NOT DHV# 0, UPDATE FOR REAL BUFFER ADDRESS
1228 006700  000773                  BR      30$                    ;  DO MORE UNTIL CORRECT BUFFER ADDRESS OBTAINED.
1229
1230 006702                    40$:
1231 006702  005267  171334          INC     DHVSLEFT           ;  KEEP TRACK OF HOW MANY DHV'S HAVE TO BE DONE.
1232
1233 006706  012701  000010          MOV     #8.,R1             ;  SETUP COUNT FOR 8 LINES.
1234 006712                    45$:
1235 006712  112720  000224          MOVB    #224,(R0)+         ;  DEPOSIT 1ST EXPECTED DATA VALUE INTO RECEIVER BIT
1236                                                            ;  MAP FOR THIS UNIT.
1237 006716  005301                  DEC     R1                 ;  NEXT LINE.
1238 006720  001374                  BNE     45$                ;  HAVE WE FINISHED 8 LINES YET?
1239
1240 006722  012701  000170          MOV     #120.,R1           ;  SETUP COUNT FOR 240 LOCATIONS.
1241 006726                    47$:
1242 006726  005020                  CLR     (R0)+              ;  CLEAR REMAINDER OF RECEIVER BIT MAP FOR THIS UNIT.
1243 006730  005301                  DEC     R1                 ;  HAVE WE FINISHED 240 LOCATIONS YET?
1244 006732  001375                  BNE     47$
1245
1246
1247                           ;  LINE PARAMETER ROUTINE.
1248
1249 006734  005000                  CLR     R0                 ;  START WITH LINE ZERO.
1250 006736  012701  000001          MOV     #1,R1              ;  POINT TO IT.
1251 006742                    50$:
1252 006742  030167  171256          BIT     R1,LINESELECT      ;  IS THIS LINE ON THE DHV SELECTED FOR TESTING?
1253 006746  001433                  BEQ     70$                ;  NO, DON'T SET IT UP.
1254
1255 006750  010062  000000          MOV     R0,CSR(R2)         ;  SELECT LINE NUMBER IN CSR.
1256                                                            ;  NOTE THE INITAL RESET SELECTED A
1257                                                            ;  XMIT AND RECEIVE BAUD OF 9600, NO PARITY,
1258                                                            ;  1 STOP BIT, NORMAL OPERATION.  WE'RE
1259                                                            ;  NOT GOING TO CHANGE THAT HERE.
1260
1261 006754  030167  171042          BIT     R1,SR3             ;  DOES THE OPERATOR WANT TO TEST IN LOCAL LOOPBACK?
1262 006760  001404                  BEQ     52$                ;  YES, SET-UP FOR LOCAL LOOPBACK.
1263
1264                                                            ;  NO, SET-UP IN NORMAL OPERATION.
1265
1266 006762  012762  000026  000010  MOV     #RX.ENABLE!AUTO1!AUTO0,LNCTRL(R2)    ;  SET RX ENABLE & NORMAL
1267                                                                                ;  OPERATION IN LNCTRL.
```

MODE SET-UP

```
1268 006770  000403                          BR      54$
1269
1270 006772                          52$:
1271 006772  012762  000226  000010          MOV     #LOCAL.LOOP!RX.ENABLE!AUTO1!AUTO0,LNCTRL(R2)   ;  SET RX ENABLE & LOCAL
1272                                                                                                 ;  LOOPBACK IN LNCTRL.
1273
1274 007000                          54$:
1275 007000  016762  173674  000012          MOV     PA22,TX1BUFADR(R2)      ;  PUT XMIT BUF ADDRESS IN TBUFFAD1.
1276                                                                         ;  IF EXTENEDED ADDRESS, MUST SET UP +14.
1277 007006  116762  173670  000014          MOVB    EA22,TX2BUFADR(R2)
1278 007014  012762  000154  000016          MOV     #108.,TXBUFCNTR(R2)     ;  SET UP BYTE COUNT.
1279
1280
1281                                 ;  SETUP THE BAUD RATES.
1282
1283 007022  016762  173674  000004          MOV     LPRSELECT,LPR(R2)       ;  SETUP THE BAUD RATES.
1284
1285
1286                                 ;  TURN ON THE TRANSMITTER & LET HER SEND THOSE CHARACTERS!
1287
1288 007030  052762  100200  000014          BIS     #TX.ENABLE!DMA.START,TX2BUFADR(R2)   ;  ENABLE DMA START AND TXMIT ENABLE.
1289 007036                          70$:
1290 007036  005200                          INC     R0                      ;  UPDATE LINE NUMBER FOR CSR.
1291 007040  106301                          ASLB    R1                      ;  POINT TO NEXT LINE.
1292 007042  001337                          BNE     50$                     ;  HAVE WE DONE 8 LINES?
1293
1294
1295                                 ;  LET'S LOOK AT THE NEXT DHV11
1296
1297 007044                          DHV.N2:
1298
1299 007044  062767  000020  171176          ADD     #20,DHVCSR      ;  NEXT DHV ADDRESS.
1300 007052  062767  000010  173610          ADD     #10,DHVVECT     ;  NEXT VECTOR ADDRESS.
1301 007060  005267  171162                  INC     DHVNOW          ;  UPDATE FOR ERROR TYPECOUNT IF ANY.
1302
1303 007064  106367  171162                  ASLB    POINT           ;  LOOK TO NEXT DHV BITMASK POSITION.
1304 007070  032767  000020  171154          BIT     #20,POINT       ;  HAVE WE TESTED ALL DHV'S.
1305 007076  001653                          BEQ     DHV.L2          ;  GO BACK AND TEST IF ANY.
1306
1307                                 ;  YES ALL BOARDS SET SO TURN ON THE TRANSMITTER
1308                                 ;  AND RECEIVER INTERRUPT ENABLES AND LET HER FLY!!
1309
1310 007100  032767  000001  171136          BIT     #1,DHV.LIVE     ;CHECK FOR DHV
1311 007106  001405                          BEQ     10$
1312 007110  016702  173570                  MOV     ADDR0,R2        ; SET UP R2 FOR FIRST CSR
1313 007114  012762  040100  000000          MOV     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  SET XMIT INTERPT-ENABLE AND
1314                                                                                         ;  RECEIVE DATA INTERRUPT ENABLE.
1315 007122                          10$:
1316 007122  032767  000002  171114          BIT     #2,DHV.LIVE     ;CHECK FOR DHV
1317 007130  001405                          BEQ     20$
1318 007132  016702  173550                  MOV     ADDR1,R2        ; SET UP R2 FOR SECOUND CSR
1319 007136  012762  040100  000000          MOV     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  SET XMIT-INTERPT-ENABLE AND
1320                                                                                         ;  RECEIVE DATA INTERRLPT ENABLE.
1321 007144                          20$:
1322 007144  032767  000004  171072          BIT     #4,DHV.LIVE     ;CHECK FOR DHV
```

MODE SET-UP

```
1323 007152  001405                          BEQ     30$
1324 007154  016702  173530                  MOV     ADDR2,R2        ; SET UP R2 FOR THIRD CSR
1325 007160  012762  040100  000000          MOV     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  SET XMIT-INTERPT-ENABLE AND
1326                                                                                          ;  RECEIVE DATA INTERRUPT ENABLE.
1327 007166                          30$:
1328 007166  032767  000010  171050          BIT     #10,DHV.LIVE    ;CHECK FOR DHV
1329 007174  001405                          BEQ     40$
1330 007176  016702  173510                  MOV     ADDR3,R2        ; SET UP R2 FOR FORTH CSR
1331 007202  012762  040100  000000          MOV     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  SET XMIT-INTERPT-ENABLE AND
1332                                                                                          ;  RECEIVE DATA INTERRUPT ENABLE.
1333 007210                          40$:
1334 007210  104400  000000'                EXIT$,BEGIN                     ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
1335
```

DHV11 XMITTER INTERRUPT SERVICE ROUTINES.

```
                                        .sbttl  DHV11 XMITTER INTERRUPT SERVICE ROUTINES.
                                ;) **
                                ;)
                                ;)   NAME:                       DHX0-X3,DHXSRV
                                ;)
                                ;)   FUNCTIONAL DESCRIPTION:    PROCESS THE INTERRUPTS OF XMITTERS.
                                ;)
                                ;)   CALLING SEQUENCE:          THESE ROUTINES ARE INTERRUPTED INTO.
                                ;)
                                ;)   INPUTS REQUIRED:          ADDRESS OF ROUTINES MUST BE SET UP.
                                ;)
                                ;)   OUTPUTS GIVEN:
                                ;)
                                ;)   REGISTERS USED, UNRESTORED:
                                ;)
                                ;)   SUBROUTINE ROUTINES USED:
                                ;)
                                ;)   RESTRICTIONS:
                                ;)
                                ;) --
                                ;  ENTRANCE POINT FOR DHV'S DURING TRANSMITTER INTERRUPTS.
                                DHX0:
                                        MOV     R2,-(SP)            ;  SAVE THE REGISTERS.
                                        MOV     R1,-(SP)
                                        MOV     #DHR0BUF+100,R1     ;  SAVE BUFFER AREA FOR ERROR REPORTS.
                                        MOV     ADDR0,R2            ;  CSR ADDRESS FOR DHV #1.
                                        JMP     TXSERV              ;  GOTO COMMON TX INTERRUPT ROUTINE.
                                DHX1:
                                        MOV     R2,-(SP)            ;  SAVE THE REGISTERS.
                                        MOV     R1,-(SP)
                                        MOV     #DHR1BUF+100,R1     ;  SAVE BUFFER AREA FOR ERROR REPORTS.
                                        MOV     ADDR1,R2            ;  CSR ADDRESS FOR DHV #2.
                                        JMP     TXSERV              ;  GOTO COMMON TX INTERRUPT ROUTINE.
                                DHX2:
                                        MOV     R2,-(SP)            ;  SAVE REGISTERS.
                                        MOV     R1,-(SP)
                                        MOV     #DHR2BUF+100,R1     ;  SAVE BUFFER AREA FOR ERROR REPORTS.
                                        MOV     ADDR2,R2            ;  CSR ADDRESS FOR DHV #3.
                                        JMP     TXSERV              ;  GOTO COMMON TX INTERRUPT ROUTINE.
                                DHX3:
                                        MOV     R2,-(SP)            ;  SAVE REGISTERS.
                                        MOV     R1,-(SP)
                                        MOV     #DHR3BUF+100,R1     ;  SAVE BUFFER AREA FOR ERROR REPORTS.
```

DHV11 XMITTER INTERRUPT SERVICE ROUTINES.

```
1392
1393 007304  016702  173402                MOV     ADDR3,R2          ;  CSR ADDRESS FOR DHV #4.
1394 007310  000167  000000                JMP     TXSERV            ;  GOTO COMMON TX INTERRUPT ROUTINE.
1395
1396
1397                                 ;  COMMON TRANSMITTER SERVICE ROUTINE.
1398
1399 007314                          TXSERV:
1400
1401 007314  016267  000000  170736          MOV     CSR(R2),CDHVCSR   ;  GET CSR.
1402 007322  100474                          BMI     100$              ;  REPORT ERROR IF TRANSMITTER ACTION BIT (15) NOT SET.
1403
1404
1405                                 ;  ILLEGAL TRANSMIT INTERRUPT!!  ERROR!!
1406
1407                                                                   ;  REPORT "ILLEGAL TRANSMIT INTERRUPT ERROR."
1408 007324  010221                          MOV     R2,(R1)+          ;  STORE CSR REPORT.
1409 007326  016221  000000                  MOV     CSR(R2),(R1)+     ;  STORE CSR CONTENTS.
1410 007332  016221  000002                  MOV     RBUF(R2),(R1)+    ;  STORE RBUF CONTENTS.
1411
1412 007336  042762  040100  000000          BIC     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  DISABLE TRANSMIT &
1413                                                                                           ;  RECEIVER INTERRUPTS.
1414
1415 007344  012601                          MOV     (SP)+,R1          ;  RESTORE REGISTERS.
1416 007346  012602                          MOV     (SP)+,R2
1417                                         ;------------------------------------ - - - ------ -------- ---
     007350  000004  000000' 007356'         PIRQ$,BEGIN,10$           ; QUEUE UP TO CONTINUE AT 10$ AND RTI
                                             ;------------------------------------------- -------- -   --
1418
1419 007356                                  10$:
1420 007356  005767  170700                  TST     LCKOUT                ;  DO NOT TYPEOUT ERROR REPORT IF ANOTHER REPORT
1421 007362  001405                          BEQ     15$                   ;  IS IN PROGRESS.
1422 007364  104407  000000'                BREAK$,BEGIN                ;TEMPORARY RETURN TO MONITOR....
     007370  104407  000000'                BREAK$,BEGIN                ;THEN CONTINUE AT NEXT INSTRUCTION.
1423 007374  000770                        BR      10$
1424 007376                                  15$:
1425 007376  005267  170660                  INC     LCKOUT                ;  DURING ERROR TYPEOUT, WE MUST NOT ALLOW ANY OTHER
1426 007402  012704  000770'                MOV     #DHROBUF+100,R4       ;  SECTION TO REPORT AN ERROR.
1427 007406                                  20$:
1428 007406  005714                          TST     (R4)                  ;  DOES THIS LINE HAVE A SAVED ERROR?  (R4<>0).
1429 007410  001003                          BNE     30$                   ;  YES, REPORT IT.
1430 007412  062704  000400                  ADD     #DHR1BUF-DHROBUF,R4   ;  NO, THEN LOOK AT NEXT LINE FOR ERROR.
1431 007416  000773                          BR      20$
1432
1433 007420                                  30$:
1434 007420  011467  170454                  MOV     (R4),CSRA             ;  REPORT CSR ADDRESS.
1435 007424  005024                          CLR     (R4)+                 ;  CLEAR ERROR INDICATION.
1436
1437 007426  012467  170450                  MOV     (R4)+,ACSR            ;  REPORT CSR CONTENTS.
1438 007432  012467  170446                  MOV     (R4)+,ASTAT           ;  REPORT RBUF CONTENTS.
1439 007436  012767  000025  170442          MOV     #25,ERRTYP            ;  REPORT ERROR TYPE.
1440
1441 007444  104401  000000' 003631'         MSG$,BEGIN,ERR.H            ;ASCII MESSAGE CALL
1442                                         ;*************************************************************
     007452  104405  000000' 000000         HRDER$,BEGIN,NULL           ;
```

DHV11 XMITTER INTERRUPT SERVICE ROUTINES.

```
                                        ;*****************************************************************
1443
1444 007460  005067  170576                   CLR     LCKOUT              ;  ALLOW ANOTHER DHV TO RUN THIS DIAGNOSTIC.
1445 007464  005267  170550                   INC     DHVSDONE            ;  ANOTHER DHV IS DONE.
1446 007470  026767  170544  170544           CMP     DHVSDONE,DHVSLEFT   ;  ANY DHVS LEFT TO TEST?
1447 007476  001402                           BEQ     35$                 ;  YES,  GO DO THEM.
1448
1449 007500  104400  000000'                  EXIT$,BEGIN                     ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
1450
1451 007504                           35$:
1452 007504  104413  000000'                  ENDIT$,BEGIN            ;SIGNAL END OF ITERATION.
                                                                       ;MONITOR SHALL TEST END OF PASS
1453 007510  000167  174644                   JMP     RESTRT          ;  GO START TESTING ANOTHER DHV.
1454
1455 007514                           100$:
1456 007514  012601                           MOV     (SP)+,R1        ;  RESTORE REGISTERS.
1457 007516  012602                           MOV     (SP)+,R2
1458 007520  000002                           RTI
1459
```

```
                                        .sbttl  DHV11 RECEIVER INTERRUPT SERVICE ROUTINES.
                                ;) ++
                                ;)
                                ;)   NAME:                       DHR0-R3,DHRSRV
                                ;)
                                ;)   FUNCTIONAL DESCRIPTION:    PROCESS THE INTERRUPTS OF RECEIVERS.
                                ;)
                                ;)   CALLING SEQUENCE:          THESE ROUTINES ARE INTERRUPTED INTO.
                                ;)
                                ;)   INPUTS REQUIRED:          ADDRESS OF ROUTINES MUST BE SET UP.
                                ;)
                                ;)   OUTPUTS GIVEN:
                                ;)
                                ;)   REGISTERS USED, UNRESTORED:
                                ;)
                                ;)   SUBROUTINE ROUTINES USED:
                                ;)
                                ;)   RESTRICTIONS:
                                ;)
                                ;) --
                                ;  ENTRANCE POINT FOR DHV'S DURING RECEIVER INTERRUPTS.
007522                          DHR0:
007522  010146                          MOV     R1,-(SP)        ;  SAVE REGISTERS ON STACK.
007524  010246                          MOV     R2,-(SP)
007526  010346                          MOV     R3,-(SP)
007530  010446                          MOV     R4,-(SP)
007532  012767  000000  170514          MOV     #0,OFFSET       ;  INDICATE THIS IS DEVICE #1.
007540  012767  000670' 170510          MOV     #DHR0BUF,BUFADR ;  GET BUFFER TO RECEIVE CHARACTERS.
007546  016702  173132                  MOV     ADDR0,R2        ;  CSR ADDRESS FOR DHV #1.
007552  000167  000124                  JMP     RXSERV          ;  GOTO COMMON RECEIVER INTERRUPT SERVICE ROUTINE.
007556                          DHR1:
007556  010146                          MOV     R1,-(SP)        ;  SAVE REGISTERS ON STACK.
007560  010246                          MOV     R2,-(SP)
007562  010346                          MOV     R3,-(SP)
007564  010446                          MOV     R4,-(SP)
007566  012767  000002  170460          MOV     #2,OFFSET       ;  INDICATE THIS IS DEVICE #2.
007574  012767  001270' 170454          MOV     #DHR1BUF,BUFADR ;  GET BUFFER TO RECEIVE CHARACTERS.
007602  016702  173100                  MOV     ADDR1,R2        ;  CSR ADDRESS FOR DHV #2.
007606  000167  000070                  JMP     RXSERV          ;  GOTO COMMON RECEIVER INTERRUPT SERVICE ROUTINE.
007612                          DHR2:
007612  010146                          MOV     R1,-(SP)        ;  SAVE REGISTERS ON STACK.
007614  010246                          MOV     R2,-(SP)
007616  010346                          MOV     R3,-(SP)
007620  010446                          MOV     R4,-(SP)
007622  012767  000004  170424          MOV     #4,OFFSET       ;  INDICATE THIS IS DEVICE #3.
```

DHV11 RECEIVER INTERRUPT SERVICE ROUTINES.

```
1516 007630  012767  001670' 170420          MOV     #DHR2BUF,BUFADR   ;  GET BUFFER TO RECEIVE CHARACTERS.
1517 007636  016702  173046                  MOV     ADDR2,R2          ;  CSR ADDRESS FOR DHV #3.
1518 007642  000167  000034                  JMP     RXSERV            ;  GOTO COMMON RECEIVER INTERRUPT SERVICE ROUTINE.
1519
1520 007646                          DHR3:
1521
1522 007646  010146                          MOV     R1,-(SP)          ;  SAVE REGISTERS ON STACK.
1523 007650  010246                          MOV     R2,-(SP)
1524 007652  010346                          MOV     R3,-(SP)
1525 007654  010446                          MOV     R4,-(SP)
1526
1527 007656  012767  000006  170370          MOV     #6,OFFSET         ;  INDICATE THIS IS DEVICE #4.
1528 007664  012767  002270' 170364          MOV     #DHR3BUF,BUFADR   ;  GET BUFFER TO RECEIVE CHARACTERS.
1529 007672  016702  173014                  MOV     ADDR3,R2          ;  CSR ADDRESS FOR DHV #4.
1530 007676  000167  000000                  JMP     RXSERV            ;  GOTO COMMON RECEIVER INTERRUPT SERVICE ROUTINE.
1531
1532
1533                                  ;  COMMON RECEIVER INTERRUPT SERVICE ROUTINE.
1534
1535 007702                          RXSERV:
1536
1537 007702                          20$:
1538 007702  016201  000002                  MOV     RBUF(R2),R1       ;  PULL OUT RECEIVED CHARACTER.
1539 007706  100402                          BMI     25$               ;  ARE THERE ANY CHARACTERS?
1540 007710  000167  000576                  JMP     100$              ;  THERE ARE NO MORE CHARACTERS TO PROCESS.
1541 007714                          25$:
1542 007714  032701  070000                  BIT     #OVERRUN.ERROR!FRAMING.ERROR!PARITY.ERROR,R1    ;  YES.  ARE THERE
1543                                                                                                  ;  ANY ERRORS?
1544 007720  001510                          BEQ     40$                       ;  NO.
1545
1546 007722  010103                          MOV     R1,R3             ;  THERE COULD BE AN ERROR.
1547 007724  062703  010000                  ADD     #BIT12,R3         ;  ARE BITS 12,13, & 14 SET?  WE HOPE SO.
1548 007730  103764                          BCS     20$               ;  YES THEY ARE.  NO PROBLEM.
1549
1550
1551                                  ;  ERROR!!  OVERRUN,PARITY, OR FRAMING ERROR!!
1552
1553 007732  016704  170320                  MOV     BUFADR,R4         ;  GET BUFFER TO STORE ERROR REPORT.
1554 007736  062704  000040                  ADD     #40,R4
1555
1556 007742  010224                          MOV     R2,(R4)+          ;  STORE THE CSR.
1557 007744  016224  000000                  MOV     CSR(R2),(R4)+     ;  STORE THE CSR CONTENTS.
1558 007750  010124                          MOV     R1,(R4)+          ;  STORE THE RECEIVE BUFFER CONTENTS.
1559
1560 007752  042762  040100  000000          BIC     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  DISABLE TX & RECEIVE
1561                                                                                          ;  INTERRUPTS.
1562
1563 007760  012604                          MOV     (SP)+,R4          ;  RESTORE THE REGISTERS.
1564 007762  012603                          MOV     (SP)+,R3
1565 007764  012602                          MOV     (SP)+,R2
1566 007766  012601                          MOV     (SP)+,R1
1567
1568
     007770  000004  000000' 007776'         PIRQ$,BEGIN,26$           ; QUEUE UP TO CONTINUE AT 26$ AND RTI
```

DHV11 RECEIVER INTERRUPT SERVICE ROUTINES.

```
1569
1570 007776                                  26$:
1571 007776  005767  170260                      TST     LCKOUT                  ;  DO NOT TYPEOUT ERROR REPORT IF ANOTHER ERROR
1572 010002  001405                              BEQ     27$                     ;  REPORT IS IN PROGRESS.
1573 010004  104407  000000'                     BREAK$,BEGIN            ;TEMPORARY RETURN TO MONITOR....
     010010  104407  000000'                     BREAK$,BEGIN            ;THEN CONTINUE AT NEXT INSTRUCTION.
1574 010014  000770                              BR      26$
1575 010016                                  27$:
1576 010016  005267  170240                      INC     LCKOUT                  ;  DURING ERROR TYPEOUT, WE MUST NOT ALLOW ANY OTHER
1577 010022  012704  000730'                     MOV     #DHR0BUF+40,R4          ;  SECTION TO REPORT AN ERROR.
1578 010026                                  28$:
1579 010026  005714                              TST     (R4)                    ;  DOES THIS LINE HAVE A SAVED ERROR?  (R1<>0).
1580 010030  001003                              BNE     29$                     ;  YES, REPORT IT.
1581 010032  062704  000400                      ADD     #DHR1BUF-DHR0BUF,R4     ;  NO, THEN LOOK AT NEXT LINE FOR ERROR.
1582 010036  000773                              BR      28$
1583
1584 010040                                  29$:
1585 010040  011467  170034                      MOV     (R4),CSRA       ;  REPORT THE CSR ADDRESS.
1586 010044  005024                              CLR     (R4)+           ;  CLEAR ERROR INDICATION.
1587
1588 010046  012467  170030                      MOV     (R4)+,ACSR      ;  REPORT THE CSR CONTENTS.
1589 010052  012467  170026                      MOV     (R4)+,ASTAT     ;  REPORT THE CONTENTS OF RBUF.
1590
1591 010056  012767  000034  170022              MOV     #34,ERRTYP      ;  REPORT ERROR TYPE.
1592 010064  104401  000000' 003701'             MSG$,BEGIN,ERR.I        ;ASCII MESSAGE CALL
1593 010072                                  30$:                        ;  ERROR OCCURRED.
1594                                          ;*****************************************************************
     010072  104405  000000' 000000             HRDER$,BEGIN,NULL       ;
                                                ;*****************************************************************
1595
1596 010100                                  32$:
1597 010100  005067  170156                      CLR     LCKOUT
1598 010104  005267  170130                      INC     DHVSDONE                ;  THIS DHV IS DONE!
1599 010110  026767  170124  170124              CMP     DHVSDONE,DHVSLEFT       ;  ANY MORE DHVS TO DO?
1600 010116  001405                              BEQ     36$
1601
1602 010120                                  33$:
1603 010120  104400  000000'                     EXIT$,BEGIN                     ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
1604
1605 010124                                  35$:
1606                                          ;-------------------------------------------------------------- - ------
     010124  000004  000000' 010132'             PIRQ$,BEGIN,36$         ; QUEUE UP TO CONTINUE AT 36$ AND RTI
                                                ;------------------ ------------- -  -- - ---------  - ---- ---
1607 010132                                  36$:
1608 010132  104413  000000'                     ENDIT$,BEGIN            ;SIGNAL END OF ITERATION.
                                                                         ;MONITOR SHALL TEST END OF PASS
1609
1610 010136  000167  174216                      JMP     RESTRT
1611
1612 010142                                  40$:
1613 010142  010103                              MOV     R1,R3           ;  GET LINE #.
1614 010144  000303                              SWAB    R3              ;  PLACE LINE # IN 1ST FOUR BITS.
1615 010146  042703  177760                      BIC     #^C<17>,R3      ;  CLEAR OUT EVERYTHING BUT THE LINE #.
1616
1617 010152  066703  170100                      ADD     BUFADR,R3       ;  SET-UP LOCATION FOR LINE #.
```

DHV11 RECEIVER INTERRUPT SERVICE ROUTINES.

```
1618
1619 010156                                60$:
1620 010156  042701  177400                    BIC     #^C<377>,R1     ;  CLEAR OUT EVERYTHING BUT THE CHARACTER RECEIVED.
1621 010162  120113                            CMPB    R1,(R3)         ;  DOES THE EXPECTED (R3) MATCH THE RECEIVED R1.
1622 010164  001504                            BEQ     70$             ;  BRANCH IF EQUAL.  THIS IS WHAT WE WANT.
1623
1624 010166  020127  000021                    CMP     R1,#21          ;  XON?  IF SO, WE MUST IGNORE.
1625 010172  001643                            BEQ     20$
1626
1627 010174  020127  000023                    CMP     R1,#23          ;  XOFF?  IF SO, WE MUST IGNORE.  IF NOT, REPORT
1628 010200  001640                            BEQ     20$             ;  A DATA ERROR.  IF CHARACTER DOES NOT MATCH
1629                                                                   ;  EXPECTED, IT MUST BE EITHER XOFF OR XON.
1630
1631                                       ;  ERROR!!  DATA ERROR!!
1632
1633 010202                                62$:
1634 010202  016704  170050                    MOV     BUFADR,R4
1635 010206  062704  000010                    ADD     #10,R4
1636
1637 010212  010124                            MOV     R1,(R4)+                ;  ACTUAL DATA.
1638 010214  011324                            MOV     (R3),(R4)+              ;  EXPECTED DATA.
1639 010216  010224                            MOV     R2,(R4)+                ;  CSR ADDRESS.
1640 010220  010314                            MOV     R3,(R4)                 ;  LINE # * BUFADR.
1641 010222  166724  170030                    SUB     BUFADR,(R4)+            ;  LINE #.
1642
1643 010226  042762  040100  000000            BIC     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  DISABLE TX & RECEIVE
1644                                                                                            ;  INTERRUPTS.
1645
1646 010234  012604                            MOV     (SP)+,R4                ;  RESTORE REGISTERS.
1647 010236  012603                            MOV     (SP)+,R3
1648 010240  012602                            MOV     (SP)+,R2
1649 010242  012601                            MOV     (SP)+,R1
1650
1651                                           ;------------------------------------------------------  -- -- --
     010244  000004  000000' 010252'           PIRQ$,BEGIN,66$         ; QUEUE UP TO CONTINUE AT 66$ AND RTI
                                               ;------------------------- ------------------- - -    --------
1652 010252                                66$:
1653 010252  005767  170004                    TST     LCKOUT                  ;  DON'T TYPEOUT ERROR REPORT IF ANOTHER ERROR
1654 010256  001405                            BEQ     67$                     ;  REPORT IS IN PROGRESS.
1655 010260  104407  000000'                    BREAK$,BEGIN            ;TEMPORARY RETURN TO MONITOR....
     010264  104407  000000'                    BREAK$,BEGIN            ;THEN CONTINUE AT NEXT INSTRUCTION.
1656 010270  000770                            BR      66$
1657
1658 010272                                67$:
1659 010272  005267  167764                    INC     LCKOUT                  ;  DURING ERROR TYPEOUT, WE MUST NOT ALLOW ANY OTHER
1660 010276  012701  000700'                    MOV     #DHROBUF+10,R1          ;  SECTION TO REPORT AN ERROR.
1661
1662 010302                                68$:
1663 010302  005711                            TST     (R1)                    ;  DOES THIS LINE HAVE A SAVED ERROR?  (R1<>0)
1664 010304  001003                            BNE     69$                     ;  YES, REPORT IT.
1665 010306  062701  000400                    ADD     #DHR1BUF-DHROBUF,R1     ;  NO, THEN LOOK AT NEXT LINE FOR ERROR.
1666 010312  000773                            BR      68$
1667
1668 010314                                69$:
1669 010314  011167  167570                    MOV     (R1),AWAS               ;  REPORT ACTUAL DATA.
```

DHV11 RECEIVER INTERRUPT SERVICE ROUTINES.

```
1670 010320  005021                          CLR     (R1)+                   ;  CLEAR ERROR INDICATION.
1671
1672 010322  112167  167560                 MOVB    (R1)+,ASB               ;  REPORT EXPECTED DATA.
1673 010326  105021                          CLRB    (R1)+
1674 010330  012167  167544                 MOV     (R1)+,CSRA              ;  REPORT CSR ADDRESS.
1675 010334  012167  167542                 MOV     (R1)+,SBADR             ;  REPORT LINE #.
1676
1677 010340  104401  000000' 003757'        MSG$,BEGIN,ERR.J        ;ASCII MESSAGE CALL
1678
1679                                         ;*************************************************************************
     010346  104404  000000'                DATER$,BEGIN            ;DATA ERROR!!!
                                             ;*************************************************************************
1680
1681 010352  005067  167704                 CLR     LCKOUT                  ;  DONE REPORTING THIS ERROR?
1682 010356  005267  167656                 INC     DHVSDONE                ;  MARK THIS DHV AS BEING DONE.
1683 010362  026767  167652  167652         CMP     DHVSDONE,DHVSLEFT       ;  ARE ALL THE DHVS DONE?
1684 010370  001660                         BEQ     36$                     ;  YES, THEN END PASS.  ELSE NORMAL EXIT.
1685
1686 010372  104400  000000'                EXIT$,BEGIN                         ;EXIT TO MONITOR. MODULE WAIT FOR INTERRUPT.
1687
1688 010376                          70$:
1689 010376  105213                         INCB    (R3)                    ;  INCREMENT CHARACTER.
1690 010400  001402                         BEQ     75$                     ;  SEE IF DID LAST CHARACTER (377), BR IF NOT.
1691 010402  000167  177274                 JMP     20$                     ;  NOT THE LAST CHARACTER.  GO SEE IF ANOTHER
1692 010406                          75$:                                   ;  CHARACTER IS AVAILABLE.
1693 010406  166703  167644                 SUB     BUFADR,R3               ;  R3 = LINE# + BUFFER ADDRESS.  GET LINE#.
1694 010412  012704  000001                 MOV     #1,R4                   ;  MAKE BITMASK OF LINE NUMBER.
1695 010416                          80$:
1696 010416  005303                         DEC     R3                      ;  DECREMENT UNTIL 0.
1697 010420  100402                         BMI     90$
1698 010422  006304                         ASL     R4                      ;  SHIFT UNTIL # GOES TO ZERO FOR BITMASK.
1699 010424  000774                         BR      80$                     ;  BITMASK IN R4.
1700 010426                          90$:
1701 010426  016701  167622                 MOV     OFFSET,R1
1702 010432  050461  000226'                BIS     R4,LINESDONE(R1)            ;  RECORD THIS LINE DONE.
1703
1704 010436  026761  167562  000226'        CMP     LINESELECT,LINESDONE(R1)    ;  SEE IF ALL LINES DONE ON THIS UNIT.
1705 010444  001402                         BEQ     95$
1706 010446  000167  177230                 JMP     20$                         ;  BR IF ALL LINES NOT DONE.
1707
1708 010452                          95$:
1709 010452  042762  040100  000000         BIC     #TXINTR.ENABLE!RCVINTR.ENABLE,CSR(R2)   ;  DISABLE TX & RECEIVE
1710                                                                             ;  INTERRUPTS.
1711
1712 010460  012604                         MOV     (SP)+,R4                ;  RESTORE REGISTERS.
1713 010462  012603                         MOV     (SP)+,R3
1714 010464  012602                         MOV     (SP)+,R2
1715 010466  012601                         MOV     (SP)+,R1
1716
1717 010470  005267  167544                 INC     DHVSDONE                ;  RECORD THIS DHV AS BEING DONE.
1718 010474  026767  167540  167540         CMP     DHVSDONE,DHVSLEFT       ;  ARE ALL DHVS DONE?
1719 010502  001002                         BNE     97$                     ;  NO, EXIT.
1720 010504  000167  177414                 JMP     35$                     ;  YES, REPORT END OF PASS.
1721 010510                          97$:
1722 010510  000002                         RTI                             ;  EXIT, JUST THIS DHV IS DONE.
```

```
010512                              100$:
010512  012604                              MOV     (SP)+,R4                        ;  RESTORE REGISTERS.
010514  012603                              MOV     (SP)+,R3
010516  012602                              MOV     (SP)+,R2
010520  012601                              MOV     (SP)+,R1
010522  000002                              RTI


                                    ;)@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
                                    ;)@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
                                    ;)@@@                                       @@@
                                    ;)@@@  SUBROUTINE TO SET-UP THE BAUD RATE   @@@
                                    ;)@@@                                       @@@
                                    ;)@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
                                    ;)@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@


010524                              BAUDRATE:

010524  016767  167266  167532              MOV     SR1,TXSPEED             ;  GET SELECTED TRANSMIT SPEED.
010532  016767  167260  167526              MOV     SR1,RCVSPEED            ;  GET SELECTED RECEIVE SPEED.

010540  012700  000004                      MOV     #4,R0                   ;  SET UP SHIFT COUNTER.
010544                              10$:

010544  006367  167514                      ASL     TXSPEED                 ;  LINE-UP TRANSMIT SPEED SELECTOR W/LPR.
010550  077003                              SOB     R0,10$

010552  056767  167506  167506              BIS     TXSPEED,RCVSPEED          ;  PUT TRANSMIT & SPEED SELECTION TOGETHER.
010560  000367  167502                      SWAB    RCVSPEED


010564  016767  172130  172130              MOV     DHVLPR,LPRSELECT          ;  INITIALIZE THE LINE PARAMETER SELECTION.
010572  056767  167470  172122              BIS     RCVSPEED,LPRSELECT        ;  SAVE THE TRANSMIT & RECEIVE SPEEDS.

010600  000207                              RTS     PC                        ;  RETURN TO MAIN PROGRAM.

        000001                              .END
```

Symbol table

```
ACSR     000102R        DATA.V= 100000        ERR.J   003757R        PARITY= 010000        SBADR   000102R
ADDR     000006R        DATCK$= 104411        ERR.K   004007R        PARPRE= 002000        SELFTE  005746R
ADDR0    002704R        DATER$= 104404        ERR.L   004046R        PASCNT  000034R       SETUP1  004456R
ADDR1    002706R        DHR0    007522R       ERR.M   004154R        PA22    002700R       SETUP2  004522R
ADDR2    002710R        DHR0BU  000670R       EX      005260R        PDPF11= 000002        SOFCNT  000042R
ADDR22= 001000          DHR1    007556R       EXIT$ = 104400         PDPLSI= 020000        SOFER$= 104406
ADDR3    002712R        DHR1BU  001270R       FLAG    002714R        PDP44 = 100000        SOFPAS  000046R
APTPRE= 000200          DHR2    007612R       FRAMIN= 020000         PDP60 = 004000        SPOINT  000032R
ASB      000106R        DHR2BU  001670R       GETPA$= 104415         PDP70 = 010000        SPSIZ = 000040
ASTAT    000104R        DHR3    007646R       GWBUF$= 104414         PIRQ$ = 000004        SR1     000016R
AUTO  = 000010          DHR3BU  002270R       HRDCNT  000044R        POINT   000252R       SR2     000020R
AUTO0 = 000020          DHVCSR  000250R       HRDER$= 104405         POPSP = 005726        SR3     000022R
AUTO1 = 000002          DHVLPR  002720R       HRDPAS  000050R        POPSP2= 022626        SR4     000024R
AWAS     000110R        DHVNOW  000246R       ICONT   000036R        PRHMS$= 000002        START   004344R
BAUDRA   010524R        DHVSDO  000240R       ICOUNT  000040R        PRTY  = 000000        STAT    000026R
BEGIN    000000R        DHVSLE  000242R       IDNUM   000122R        PRTY0 = 000000        SVR0    000062R
BIT0  = 000001          DHVT02  006540R       INDPAR= 000040         PRTY1 = 000040        SVR1    000064R
BIT1  = 000002          DHVVEC  002670R       INIT    000030R        PRTY2 = 000100        SVR2    000066R
BIT10 = 002000          DHV.BU  006642R       INITIA  004554R        PRTY3 = 000140        SVR3    000070R
BIT11 = 004000          DHV.LI  000244R       INTR    000120R        PRTY4 = 000200        SVR4    000072R
BIT12 = 010000          DHV.L1  005762R       KTPRES= 000400         PRTY5 = 000240        SVR5    000074R
BIT13 = 020000          DHV.L2  006626R       KTXTND= 040000         PRTY6 = 000300        SVR6    000076R
BIT14 = 040000          DHV.N1  006500R       LCKOUT  000262R        PRTY7 = 000340        SYSCNT  000052R
BIT15 = 100000          DHV.N2  007044R       LINECO  000236R        PS    = 177776        TRPDFD= 000023
BIT2  = 000004          DHX0    007214R       LINESD  000226R        PSW   = 177776        TX      005220R
BIT3  = 000010          DHX1    007234R       LINESE  000224R        PUSH  = 005746        TXBUF   000270R
BIT4  = 000020          DHX2    007254R       LNCTRL= 000010         PUSH2 = 024646        TXBUFC= 000016
BIT5  = 000040          DHX3    007274R       LOCAL.= 000200         PWRFLG= 000002        TXCHAR= 000002
BIT6  = 000100          DIAG.F= 020000        LPR   = 000004         QMON22= 000010        TXDATA= 100000
BIT7  = 000200          DMA.ST= 000200        LPRSEL  002722R        RAND$ = 104417        TXDMA.= 010000
BIT8  = 000400          DROP    004354R       MAP22$= 104416         RANNUM  000054R       TXINTR= 040000
BIT9  = 001000          DVID1   000014R       MASTER= 000040         RBUF  = 000002        TXSERV  007314R
BREAK$= 104407          EA      002676R       MODNAM  000000R        RCV     005240R       TXSPEE  000264R
BR1      000012R        EA22    002702R       MODSP   000224R        RCVDAT= 000200        TX.ACT= 100000
BR2      000013R        ECCMEM= 000100        MSGN$ = 104403         RCVINT= 000100        TX.ENA= 100000
BTOD$ = 104421          ENDIT$= 104413        MSGS$ = 104402         RCVSPE  000266R       TX1BUF= 000012
BUFADR   000256R        END$  = 104410        MSG$  = 104401         RESTRT  004360R       TX2BUF= 000014
CAPRES= 000004          ERRTYP  000106R       NCPUOP= 000020         RES1    000056R       USTACK= 000001
CDATA$= 104412          ERR.A   002724R       NEXTDH  005676R        RES2    000060R       VA      002672R
CDHVCS   000260R        ERR.B   003024R       NOAPTY= 000002         RH70  = 001000        VECT    005646R
CHECKL   005330R        ERR.C   003124R       NULL  = 000000         ROUTIN  004702R       VECTOR  000010R
CKHNG$= 000001          ERR.D   003214R       OFFSET  000254R        RSTRT   000112R       WASADR  000104R
CLKPRE= 000001          ERR.E   003315R       OPEN  = 000000         RXSERV  007702R       WDFR    000116R
CLKSP$= 104422          ERR.F   003410R       OTOA$ = 104420         RX.ENA= 000004        WDTO    000114R
CONFIG   000056R        ERR.G   003515R       OVERRU= 040000         R6    =%000006        XFLAG   000005R
CSR   = 000000          ERR.H   003631R       PA      002674R        R7    =%000007        XOFF    002716R
CSRA     000100R        ERR.I   003701R

. ABS.   000000    000   (RW,I,GBL,ABS,OVR)
         010602    001   (RW,I,LCL,REL,CON)
Errors detected:  0

*** Assembler statistics
```

Symbol table

Work file reads: 0
Work file writes: 0
Size of work file: 13467 Words (53 Pages)
Size of core pool: 19402 Words (74 Pages)
Operating system: RSX-11M/PLUS (Under VAX/VMS)

Elapsed time: 00:00:47.21
DHVD.OBJ,DHVD.LST/CR/-SP=DDXCOM,DHVD

DHVD CREATED BY MACRO ON 27-FEB-85 AT 09:12 PAGE 1

SEQ 0040

SYMBOL CROSS REFERENCE CREF V02

SYMBOL	VALUE	REFERENCES								
ACSR	000102 R	#11-459	*12-704	*12-788	*12-866	*12-901	*12-918	*12-997	*12-1018	*12-1048
		*12-1076	*12-1108	*14-1437	*15-1588					
ADDR	000006 R	#11-459	12-655	12-967	13-1192					
ADDR0	002704 R	#11-579	12-660	13-1312	14-1366	15-1493				
ADDR1	002706 R	#11-580	13-1318	14-1375	15-1505					
ADDR2	002710 R	#11-581	13-1324	14-1384	15-1517					
ADDR22	= 001000	#11-459	12-637							
ADDR3	002712 R	#11-582	13-1330	14-1393	15-1529					
APTPRE	= 000200	#11-459								
ASB	000106 R	#11-459	*15-1672							
ASTAT	000104 R	#11-459	*12-705	*12-789	*12-867	*12-902	*12-919	*12-998	*12-1019	*12-1049
		*12-1077	*12-1109	*14-1438	*15-1589					
AUTO	= 000010	#11-459								
AUTO0	= 000020	#11-534	12-758	12-763	13-1266	13-1271				
AUTO1	= 000002	#11-535	12-758	12-763	13-1266	13-1271				
AWAS	000110 R	#11-459	*15-1669							
BAUDRA	010524 R	12-930	#15-1741							
BEGIN	000000 R	#11-459	12-622	12-633	12-640	12-692	12-692	12-708	12-709	12-781
		12-781	12-795	12-798	12-800	12-827	12-830	12-833	12-836	12-845
		12-845	12-869	12-870	12-904	12-906	12-921	12-924	12-988	12-988
		12-1001	12-1002	12-1022	12-1023	12-1038	12-1038	12-1052	12-1053	12-1080
		12-1081	12-1112	12-1113	13-1334	14-1417	14-1422	14-1422	14-1441	14-1442
		14-1449	14-1452	15-1568	15-1573	15-1573	15-1592	15-1594	15-1603	15-1606
		15-1608	15-1651	15-1655	15-1655	15-1677	15-1679	15-1686		
BIT0	= 000001	#11-459	#11-479	12-1093						
BIT1	= 000002	#11-459	#11-478	11-535	12-791	12-829				
BIT10	= 002000	#11-459	#11-469							
BIT11	= 004000	#11-459	#11-468							
BIT12	= 010000	#11-459	#11-467	11-511	11-522	12-1066	15-1547			
BIT13	= 020000	#11-459	#11-466	11-510	11-521					
BIT14	= 040000	#11-459	#11-465	11-509	11-520					
BIT15	= 100000	#11-459	#11-464	11-508	11-519	11-527	11-540			
BIT2	= 000004	#11-459	#11-477	11-533	12-835					
BIT3	= 000010	#11-459	#11-476							
BIT4	= 000020	#11-459	#11-475	11-534						
BIT5	= 000040	#11-459	#11-474	11-514						
BIT6	= 000100	#11-459	#11-473	11-513						
BIT7	= 000200	#11-459	#11-472	11-512	11-532	11-541				
BIT8	= 000400	#11-459	#11-471							
BIT9	= 001000	#11-459	#11-470							
BREAK$	= 104407	#11-459	12-692	12-692	12-781	12-781	12 845	12-845	12-988	12-988
		12-1038	12-1038	14-1422	14-1422	15-1573	15-1573	15-1655	15-1655	
BR1	000012 R	#11-459	12-734	12-737	12-940	12-944				
BR2	000013 R	#11-459								
BTOD$	= 104421	#11-459								
BUFADR	000256 R	#11-559	*15-1492	*15-1504	*15-1516	*15-1528	15-1553	15-1617	15-1634	15-1641
		15-1693								
CAPRES	= 000004	#11-459								
CDATA$	= 104412	#11-459								
CDHVCS	000260 R	#11-560	*14-1401							
CHECKL	005330 R	#12-860								
CKHNG$	= 000001	#11-459								

SYMBOL CROSS REFERENCE CREF V02

SYMBOL	VALUE	REFERENCES
CLKPRE	= 000001	#11-459
CLKSP$	= 104422	#11-459
CONFIG	000056 R	#11-459 12-637
CSR	= 000000	#11-484 *12-687 12-689 12-704 *12-747 *12-771 12-788 *12-816 *12-840 12-842 12-866 12-901 12-918 *12-983 12-985 12-997 12-1018 12-1048 12-1076 12-1108 *13-1255 *13-1313 *13-1319 *13-1325 *13-1331 14-1401 14-1409 *14-1412 15-1557 *15-1560 *15-1643 *15-1709
CSRA	000100 R	#11-459 *12-703 *12-786 *12-865 *12-900 *12-917 *12-996 *12-1017 *12-1047 *12-1075 *12-1107 *14-1434 *15-1585 *15-1674
DATA.V	= 100000	#11-519
DATCK$	= 104411	#11-459
DATER$	= 104404	#11-459 15-1679
DHR0	007522 R	12-658 12-951 #15-1484
DHR0BU	000670 R	#11-567 13-1222 13-1227 14-1364 14-1426 14-1430 15-1492 15-1577 15-1581 15-1660 15-1665
DHR1	007556 R	12-951 #15-1496
DHR1BU	001270 R	#11-568 13-1227 14-1373 14-1430 15-1504 15-1581 15-1665
DHR2	007612 R	#15-1508
DHR2BU	001670 R	#11-569 14-1382 15-1516
DHR3	007646 R	#15-1520
DHR3BU	002270 R	#11-570 14-1391 15-1528
DHVCSR	000250 R	#11-555 *12-655 12-672 12-703 12-786 12-865 12-900 12-917 12-937 *12-957 *12-967 12-975 12-996 12-1011 12-1017 12-1047 12-1075 12-1107 *12-1154 *13-1192 13-1205 *13-1299
DHVLPR	002720 R	#11-586 15-1756
DHVNOW	000246 R	#11-554 *13-1191 13-1223 *13-1301
DHVSDO	000240 R	#11-551 *13-1196 *14-1445 14-1446 *15-1598 15-1599 *15-1682 15-1683 *15-1717 15-1718
DHVSLE	000242 R	#11-552 *13-1198 *13-1231 14-1446 15-1599 15-1683 15-1718
DHVT02	006540 R	12-1153 #13-1182
DHVVEC	002670 R	#11-571 *12-656 12-731 12-936 *12-958 *13-1193 *13-1300
DHV.BU	006642 R	#13-1211
DHV.LI	000244 R	#11-553 *12-617 *12-626 12-651 12-667 *12-711 *12-802 *12-872 *12-908 *12-926 12-971 *12-1004 *12-1025 *12-1055 *12-1083 *12-1115 12-1147 13-1202 13-1310 13-1316 13-1322 13-1328
DHV.L1	005762 R	#12-969 12-1155
DHV.L2	006626 R	#13-1200 13-1305
DHV.N1	006500 R	12-973 12-1005 12-1026 12-1056 12-1084 12-1116 #12-1145
DHV.N2	007044 R	13-1203 #13-1297
DHX0	007214 R	12-659 12-952 #14-1360
DHX1	007234 R	12-952 #14-1369
DHX2	007254 R	#14-1378
DHX3	007274 R	#14-1387
DIAG.F	= 020000	#11-510 12-1011
DMA.ST	= 000200	#11-541 13-1288
DROP	004354 R	#12-620 12-652 12-1149
DVID1	000014 R	#11-459 12-617
EA	002676 R	#11-575 12-635
EA22	002702 R	#11-577 *12-635 *12-644 *12-645 *12-646 *12-647 13-1277
ECCMEM	= 000100	#11-459
ENDIT$	= 104413	#11-459 14-1452 15-1608
END$	= 104410	#11-459 12-622

SYMBOL CROSS REFERENCE CREF V02

SYMBOL	VALUE	REFERENCES								
ERRTYP	000106 R	#11-459	*12-706	*12-999	*12-1020	*12-1050	*12-1078	*12-1110	*14-1439	*15-1591
ERR.A	002724 R	#11-593	12-904							
ERR.B	003024 R	#11-594	12-921							
ERR.C	003124 R	#11-595	12-708	12-1001						
ERR.D	003214 R	#11-596	12-1022							
ERR.E	003315 R	#11-597	12-1052							
ERR.F	003410 R	#11-598	12-1080							
ERR.G	003515 R	#11-599	12-1112							
ERR.H	003631 R	#11-600	14-1441							
ERR.I	003701 R	#11-601	15-1592							
ERR.J	003757 R	#11-602	15-1677							
ERR.K	004007 R	#11-603	12-869							
ERR.L	004046 R	#11-604	12-798							
ERR.M	004154 R	#11-605	12-795							
EX	005260 R	12-824	#12-838							
EXIT$	= 104400	#11-459	12-830	12-836	13-1334	14-1449	15-1603	15-1686		
FLAG	002714 R	#11-584	*12-743	12-791	12-813	*12-829	*12-835			
FRAMIN	= 020000	#11-521	12-1062	15-1542						
GETPA$	= 104415	#11-459	12-633							
GWBUF$	= 104414	#11-459								
HRDCNT	000044 R	#11-459								
HRDER$	= 104405	#11-459	12-709	12-800	12-870	12-906	12-924	12 1002	12-1023	12-1053
		12-1081	12-1113	14-1442	15-1594					
HRDPAS	000050 R	#11-459								
ICONT	000036 R	#11-459								
ICOUNT	000040 R	#11-459								
IDNUM	000122 R	#11-459								
INDPAR	= 000040	#11-459								
INIT	000030 R	#11-459								
INITIA	004554 R	#12-684								
INTR	000120 R	#11-459								
KTPRES	= 000400	#11-459								
KTXTND	= 040000	#11-459								
LCKOUT	000262 R	#11-561	*13-1184	14-1420	*14-1425	*14-1444	15-1571	*15-1576	*15-1597	15-1653
		*15-1659	*15-1681							
LINECO	000236 R	#11-549	*12-877	*12-889	12-897	12-914				
LINESD	000226 R	#11-548	*13-1186	*13-1187	*13-1188	*13-1189	*15-1702	15-1704		
LINESE	000224 R	#11-546	12-744	12-862	*12-887	*12-894	13-1252	15-1704		
LNCTRL	= 000010	#11-488	*12-758	*12-763	*13-1266	*13-1271				
LOCAL.	= 000200	#11-532	12-763	13-1271						
LPR	= 000004	#11-487	*13-1283							
LPRSEL	002722 R	#11-587	13-1283	*15-1756	*15-1757					
MAP22$	= 104416	#11-459	12-640							
MASTER	= 000040	#11-514	12-687	12-689	12-840	12-842	12-983	12-985		
MODNAM	000000 R	#11-459								
MODSP	000224 R	11-459	#11-459							
MSGN$	= 104403	#11-459								
MSGS$	= 104402	#11-459								
MSG$	= 104401	#11-459	12-708	12-795	12-798	12-869	12-904	12-921	12-1001	12-1022
		12-1052	12-1080	12-1112	14-1441	15-1592	15-1677			
NCPUOP	= 000020	#11 459								
NEXTDH	005676 R	12-669	12-719	12-810	12 873	12-909	12-927	#12-947		

SYMBOL CROSS REFERENCE CREF V02

SYMBOL	VALUE	REFERENCES
NOAPTY	= 000002	#11-459
NULL	= 000000	#11-459 12-709 12-800 12 870 12-906 12-924 12-1002 12-1023 12-1053 12-1081 12-1113 14-1442 15-1594
OFFSET	000254 R	#11-558 *15-1491 *15-1503 *15-1515 *15-1527 15-1701
OPEN	= 000000	11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11-459 11 459 11-459 11-459 11-459 11-459 11-459 #11-459
OTOA$	= 104420	#11-459
OVERRU	= 040000	#11-520 12-1062 15-1542
PA	002674 R	#11-574 12-634 12-640
PARITY	= 010000	#11-522 12-1062 15-1542
PARPRE	= 002000	#11-459
PASCNT	000034 R	#11-459
PA22	002700 R	#11-576 *12-634 13-1275
PDPF11	= 000002	#11-459
PDPLSI	= 020000	#11-459
PDP44	= 100000	#11-459
PDP60	= 004000	#11-459
PDP70	= 010000	#11-459
PIRQ$	= 000004	#11-459 12-827 12-833 14-1417 15-1568 15-1606 15-1651
POINT	000252 R	#11-557 *12-654 12-667 12-711 12-802 12-872 12-908 12-926 *12-949 12-954 *12-966 12-971 12-1004 12-1025 12-1055 12-1083 12-1115 *12-1151 12-1152 *13-1195 13-1202 *13-1303 13-1304
POPSP	= 005726	#11-459
POPSP2	= 022626	#11-459
PRHMS$	= 000002	#11-459
PRTY	= 000000	#11-459
PRTY0	= 000000	#11-459
PRTY1	= 000040	#11-459
PRTY2	= 000100	#11-459
PRTY3	= 000140	#11-459
PRTY4	= 000200	#11-459
PRTY5	= 000240	11-459 11-459 #11-459
PRTY6	= 000300	#11-459
PRTY7	= 000340	#11-459
PS	= 177776	#11-459
PSW	= 177776	#11-459
PUSH	= 005746	#11-459
PUSH2	= 024646	#11-459
PWRFLG	= 000002	#11-459
QMON22	= 000010	#11-459
RAND$	= 104417	#11-459
RANNUM	000054 R	#11-459
RBUF	= 000002	#11-485 12-705 12-726 12-789 12-867 12-902 12-919 12-998 12-1035 14-1410 15-1538
RCV	005240 R	12-733 #12-832
RCVDAT	= 000200	#11-512
RCVINT	= 000100	#11-513 12-769 13-1313 13-1319 13-1325 13-1331 14-1412 15-1560 15-1643 15-1709
RCVSPE	000266 R	#11-564 *15-1744 *15-1752 *15-1753 15-1757
RESTRT	004360 R	11-459 12-618 #12-624 14-1453 15-1610
RES1	000056 R	#11-459

SYMBOL CROSS REFERENCE CREF V02

SYMBOL	VALUE	REFERENCES							
RES2	000060 R	#11-459							
RH70	= 001000	#11-459							
ROUTIN	004702 R	#12-723							
RSTRT	000112 R	#11-459							
RXSERV	007702 R	15-1494	15-1506	15-1518	15-1530	#15-1535			
RX.ENA	= 000004	#11-533	12-758	12-763	13-1266	13-1271			
R6	=%000006	#11-459							
R7	=%000007	#11-459							
SBADR	000102 R	#11-459	*15-1675						
SELFTE	005746 R	12-955	#12-964						
SETUP1	004456 R	12-641	#12-649						
SETUP2	004522 R	#12-665	12-959						
SOFCNT	000042 R	#11-459							
SOFER%	= 104406	#11-459							
SOFPAS	000046 R	#11-459							
SPOINT	000032 R	#11-459							
SPSIZ	= 000040	#1-29	11-459						
SR1	000016 R	#11-459	*12-881	12-895	12-912	15-1743	15-1744		
SR2	000020 R	#11-459	12-878						
SR3	000022 R	#11-459	12-753	12-793	13-1261				
SR4	000024 R	#11-459							
START	004344 R	11-459	#12-615						
STAT	000026 R	#11-459							
SVR0	000062 R	#11-459							
SVR1	000064 R	#11-459							
SVR2	000066 R	#11-459							
SVR3	000070 R	#11-459							
SVR4	000072 R	#11-459							
SVR5	000074 R	#11-459							
SVR6	000076 R	#11-459							
SYSCNT	000052 R	#11-459							
TRPDFD	= 000023	#11-459	11-459	11-459	#11-459	11-459	11-459	#11-459	11-459	11-459
		#11-459	11-459	11-459	#11-459	11-459	11-459	#11-459	11-459	11-459
		#11-459	11-459	11-459	#11-459	11-459	11-459	#11-459	11-459	11-459
		#11-459	11-459	11-459	#11-459	11-459	11 459	#11-459	11-459	11-459
		#11-459	11-459	11-459	#11-459	11-459	11-459	#11-459	11-459	11-459
		#11-459	11-459	11-459	#11-459	11-459	11-459	#11-459	11-459	11-459
		#11-459	11-459	11-459	#11-459					
TX	005220 R	12-736	#12-826							
TXBUF	000270 R	#11-566	12-632	13-1213						
TXBUFC	= 000016	#11-491	*13-1278							
TXCHAR	= 000002	#11-486	*12-773	*12-817						
TXDATA	= 100000	#11-527	12-773	12-817						
TXDMA.	= 010000	#11-511								
TXINTR	= 040000	#11-509	12-769	13-1313	13-1319	13-1325	13-1331	14 1412	15-1560	15-1643
		15-1709								
TXSERV	007314 R	14-1367	14-1376	14-1385	14-1394	#14-1399				
TXSPEE	000264 R	#11-563	*15-1743	*15-1749	15-1752					
TX.ACT	= 100000	#11-508								
TX.ENA	= 100000	#11-540	13-1288							
TX1BUF	= 000012	#11-489	*13-1275							
TX2BUF	= 000014	#11-490	*13-1277	*13-1288						

SYMBOL CROSS REFERENCE CREF V02

SYMBOL	VALUE	REFERENCES		
USTACK	* 000001	#11-459		
VA	002672 R	#11-573	*12-632	12-633
VECT	005646 R	#12-935		
VECTOR	000010 R	#11-459	12-656	13-1193
WASADR	000104 R	#11-459		
WDFR	000116 R	#11-459		
WDTO	000114 R	#11-459		
XFLAG	000005 R	#11-459		
XOFF	002716 R	#11-585	*13-1185	

MACRO CROSS REFERENCE CREF V02

MACRO NAME	REFERENCES									
BKMOD	#1-125									
BREAK	#1-223	12-692	12-781	12-845	12-988	12-1038	14-1422	15-1573	15-1655	
BTOD	#1-247									
CKDATA	#1-283									
CLKSP	#1-150									
DATACK	#1-292									
DATERR	#1-176	15-1679								
DFSEVN	#1-315	11-459	11-459	11-459	11-459	11-459	11-459	11-459	11-459	11-459
	11-459	11-459	11-459							
DSEVNT	#1-325	11-459	11-459	11-459	11-459	11-459	11-459	11-459		
END	#1-213	12-622								
ENDIT	#1-204	14-1452	15-1608							
ENDMOD	#1-209									
EQUATS	#1-331	11-459								
EXIT	#1-158	12-830	12-836	13-1334	14-1449	15-1603	15-1686			
GETPA	#1-274	12-633								
GWBUFF	#1-262									
HLFBRK	#1-228									
HRDER	#1-166	12-709	12 800	12-870	12-906	12-924	12-1002	12-1023	12-1053	12-1081
	12-1113	14-1442	15-1594							
IOMOD	#1-121	11-459								
IOMODP	#1-145									
IOMODR	#1-141									
IOMODX	#1-137									
MAP22	#1-278	12-640								
MODULE	#1-30	11-459								
MSG	#1-192	12-708	12-795	12-798	12-869	12-904	12-921	12-1001	12-1022	12-1052
	12-1080	12-1112	14-1441	15-1592	15-1677					
MSGN	#1-196									
MSGS	#1-200									
NBKMOD	#1-133									
OTOA	#1-233									
PIRQ	#1-217	12-827	12-833	14-1417	15-1568	15-1606	15-1651			
RAND	#1-162									
SBKMOD	#1-129									
SOFER	#1-182									