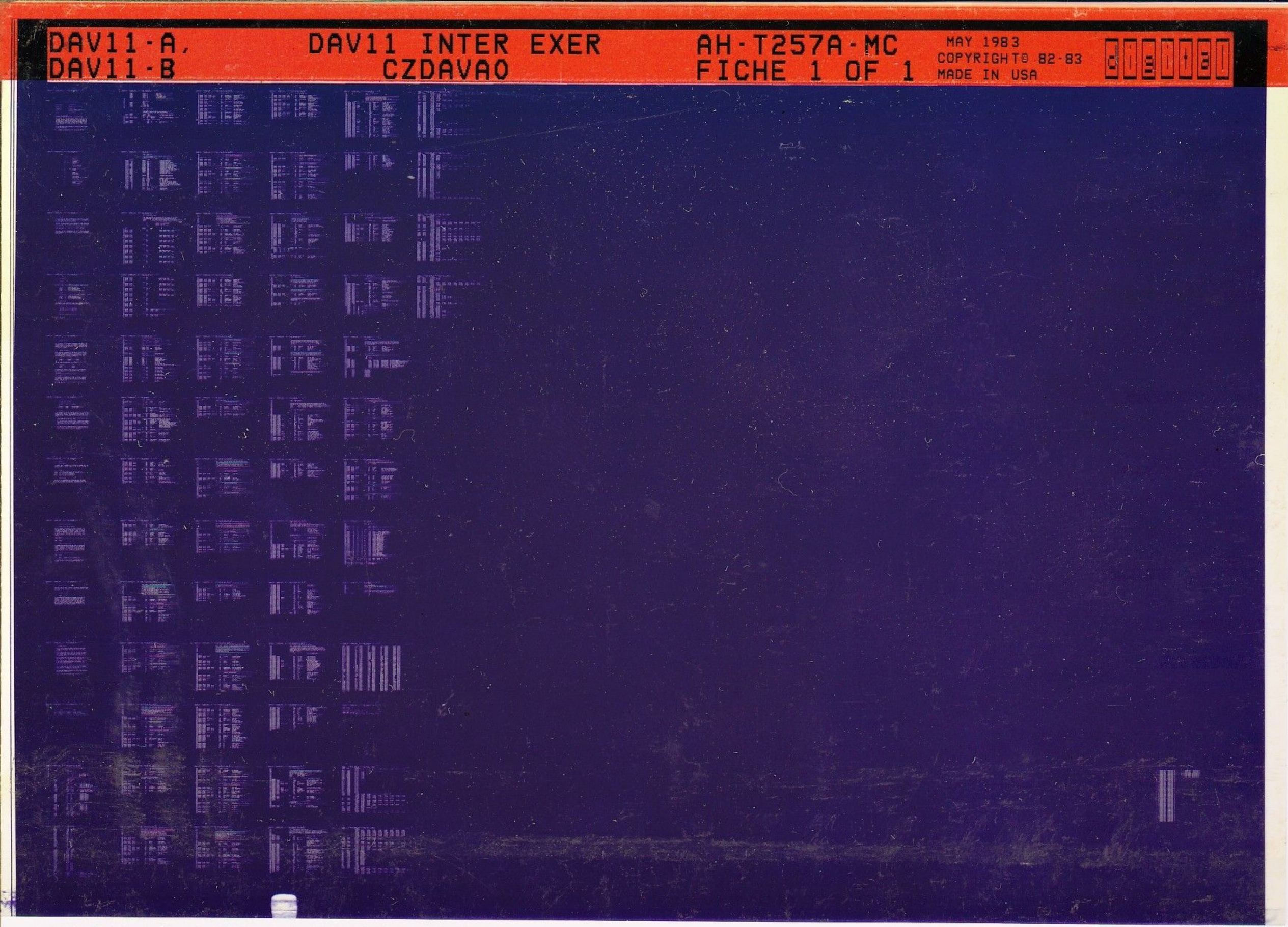
DAV11-A,
DAV11-B

DAV11 INTER EXER
CZDAVA0

AH-T257A-MC
FICHE 1 OF 1



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I D E N T I F I C A T I O N

PRODUCT CODE: AC-T256A-MC

PRODUCT NAME: CZDAVAO DAV11 INTERPROC EXER

PRODUCT DATE: NOVEMBER 1982

MAINTAINER: CSS WEST DIAGNOSTIC ENGINEERING
COSTA MESA, CALIFORNIA

AUTHOR: JOHN M. MARTIN

T A B L E O F C O N T E N T S

1.0 ABSTRACT

THE FUNCTION OF THE DAV11 INTERPROCESSOR EXERCISER IS TO VERIFY THE OPTION OPERATES ACCORDING TO SPECIFICATIONS. THE DIAGNOSTIC WILL ALSO VERIFY THAT THE DAV11 OPERATES IN ITS ENVIRONMENT SUCH AS THE SYSTEM IN WHICH IT IS INSTALLED.

THE DAV11 OPTION PROVIDES A LINK BETWEEN TWO Q-BUS PROCESSORS (DAV11-A) OR BETWEEN ONE Q-BUS AND ONE PDP-11 (UNIBUS) PROCESSOR (DAV11-B), USING THE FOLLOWING PROCESSOR/DAV11 CONFIGURATIONS:

Q-BUS PROCESSOR--------(DAV11-A)--------UNIBUS PROCESSOR

Q-BUS PROCESSOR--------(DAV11-B)--------Q-BUS PROCESSOR

CZDAV WILL TEST ALL COMPONENTS OF THE DAV11 OPTION, INCLUDING BOTH DR11B/DRV11B AND M7230/M5927 MODULES, AND THE INTERCONNECT CABLES (BC08R-25). THE DIAGNOSTIC WILL RUN IN BOTH PROCESSORS CONCURRENTLY.

2.0 REQUIREMENTS

2.1 EQUIPMENT

2.1.1 DAV11-A

ANY PDP-11 FAMILY CPU (WITH MINIMUM 16K MEMORY W/CONSOLE DEVICE)
PDP-11/03 OR ANY LSI-11 CPU (WITH MINIMUM 16K MEMORY W/CONSOLE)

DR11-B		UNIBUS DMA INTERFACE
M7230		DUAL DIFFERENTIAL MODULE
DRV11-B		(M7950) DMA INTERFACE
BC08R	(2)	DRV-11 INTERCONNECT CABLE
BC08R-25	(3)	INTERPROCESSOR INTERCONNECT CABLE

2.1.2 DAV11-B

TWO PDP-11/03 OR ANY LSI-11 CPUS (WITH MINIMUM 16K MEMORY W/CONSOLE)

DRV11-B	(2)	(M7950) DMA INTERFACE
M5927	(2)	QUAD DIFFERENTIAL MODULE
BC08R	(4)	DRV-11 INTERCONNECT CABLE
BC08R-25	(3)	INTERPROCESSOR INTERCONNECT CABLE

2.2 CONFIGURATION

THIS DIAGNOSTIC WILL SUPPORT BOTH THE DAV11-A AND DAV11-B OPTIONS
ON ANY PDP-11 FAMILY AND LSI-11 FAMILY PROCESSORS AND HAS BEEN
FULLY TESTED ON THE FOLLOWING PROCESSOR CONFIGURATIONS:

2.2.1 DAV11-A

PDP-11/03 <----------> PDP-11/34
LSI-11/23 <----------> PDP-11/34
PDP-11/03 <----------> PDP-11/70
LSI-11/23 <----------> PDP-11/70

2.2.2 DAV11-B

PDP-11/03 <----------> LSI-11/23
LSI-11/23 <----------> LSI-11/23

2.3 STORAGE

THE PROGRAM USES THE LOWER 4K WORDS OF SYSTEM MEMORY.

3.0 LOADING PROCEDURE

3.1 METHOD

THIS DIAGNOSTIC IS DISTRIBUTED ON BOOTABLE XXDP+ MEDIA. THE OPERATOR SHOULD FIRST BOOT THE DIAGNOSTIC SUPERVISOR FROM THE DISTRIBUTION KIT, AND RUN THE DIAGNOSTIC USING THE XXDP+ COMMANDS. REFER TO THE APPROPRIATE DAV11 OPTION DESCRIPTION FOR DIAGNOSTIC HIERARCHY AND INTSTALLATION INSTRUCTIONS PRIOR TO USING THIS DIAGNOSTIC.

4.0 STARTING PROCEDURE

BEFORE STARTING THE DIAGNOSTIC, COMPARE THE DEVICE REGISTER BASE ADDRESS AND INTERRUPT VECTOR ADDRESS WITH THE VALUES IN LOCATIONS DAVADR AND DRVECT, AS LISTED BELOW. IF THESE VALUES ARE INCORRECT, LOAD THE DIAGNOSTIC, HALT THE PROCESSOR, AND MODIFY THE LOCATIONS TO CONTAIN THE CORRECT VALUES, USING THE APPROPRIATE TECHNIQUE FOR YOUR CPU.

ADDRESS	LOCATION	VALUE
001360	DRVADR:	172410
001362	DRVECT:	000124

LOAD AND START THE DIAGNOSTIC IN THE SLAVE PROCESSOR FIRST, USING THE START ADDRESS TABLE LISTED BELOW.

PROCESSOR	START
MASTER	000200
SLAVE	000204

THE PROGRAM WILL IDENTIFY ITSELF AND, IF THE PROCESSOR DOES NOT HAVE A SWITCH REGISTER, THE DIAGNOSTIC WILL PROMPT THE OPERATOR FOR AN INITIAL SOFTWARE SWITCH REGISTER VALUE.

```
.RUN ZDAVA0
CZDAVA0 DAV11-A/B INTERPROCESSOR EXCERISER

SWR = 000000  NEW =
```

THE PROGRAM WILL AUTOMATICALLY START AS MASTER (LOCATION 200), SO HALT THE PROCESSOR AND LOAD SLAVE START ADDRESS (LOCATION 204), AND RESTART THE CPU USING THE APPROPRIATE METHOD. SLAVE CPU WILL THEN WAIT FOR MASTER TO INITIATE PROGRAM SYNCHRONIZATION.

NEXT, LOAD AND START THE DIAGNOSTIC IN THE MASTER PROCESSOR AS DESCRIBED ABOVE.

5.0 SOFTWARE SWITCH REGISTER

5.1 CONTROL SWITCH SETTINGS

SWITCH	OCTAL	FUNCTION
BIT15=1	100000	HALT ON ERROR
BIT13=1	020000	INIHIBIT ERROR TYPEOUTS
BIT10=1	002000	BELL ON ERROR

5.2 CONTROL

IF THE DIAGNOSTIC IS RUN ON A MACHINE WITHOUT A SWITCH REGISTER, THEN A SOFTWARE SWITCH REGISTER IS USED, WHICH ALLOWS THE USER THE SAME SWITCH OPTIONS AS THE HARDWARE SWITCH REGISTER. IF THE HARDWARE SWITCH REGISTER DOES NOT EXIST, OR IF ONE DOES AND IT CONTAINS ALL ONES, THE SOFTWARE SWITCH REGISTER (LOCATION 176) IS USED.

(1) THE SOFTWARE SWITCH REGISTER "SWREG" (LOCATION 176) CAN BE CHANGED BY USING THE ODT FACILITIES.

(2) THE SOFTWARE SWITCH REGISTER CAN BE CHANGED UNDER PROGRAM CONTROL BY TYPING THE "CONTROL" AND "G" KEYS. THIS KEYBOARD OPERATION WILL PRINT OUT THE CURRENT CONTENTS AND ACCEPT NEW OCTAL SWITCH REGISTER DATA, TERMINATED WITH A CARRIAGE RETURN.

(3) ONCE THE ODT MODE HAS BEEN ENTERED DUE TO AN ERROR CONDITION WITH BIT15 SET (HALT ON ERROR), STEP (2) ABOVE IS OF NO VALUE, SO RESORT TO STEP (1), TO ALTER THE SOFTWARE SWITCH REGISTER IF DESIRED BEFORE TYPING "P" (CONTINUE).

6.0 ERRORS

6.1 ERROR COMMENT

ALL ERRORS ARE ACCOMPANIED BY A DESCRIPTIVE COMMENT AS TO THE TYPE OF FAILURE. FURTHER QUALIFICATION OF THE ERROR CAN BE OBTAINED FROM THE PROGRAM COMMENT AT THE ERROR PC OR FROM THE TEST ITSELF.

6.2 ERROR DATA

ERRPC LISTING ADDRESS WHERE THE ERROR WAS DETECTED.
BUSADR DAV11 BUS REGISTER ADDRESS OF CONCERNED OPERATION.
EXPCT DATA VALUE THAT WAS EXPECTED.
RCVD DATA VALUE THAT WAS RECEIVED.
MEMADR MEMORY ADDRESS OF DATA ERROR.

6.3 ERROR RECOVERY

BECAUSE OF THE SYNCHRONIZATION ESTABLISHED WITH THE OTHER COMPUTER, ALL ERROR CONDITIONS FORCE AN AUTOMATIC LOOP ON TEST UNTIL THE ERROR IS ELIMINATED. SOFTWARE SWITCH REGISTER CONTROL SHOULD NOT AFFECT THE ESTABLISHED SYNC.

7.0 PROCESSOR SYNCHRONIZATION

7.1 PROGRAM INITIALIZATION PROTOCOL

WHEN THE PROGRAM IS STARTED IN THE SLAVE PROCESSOR, THE SLAVE WILL FIRST TEST THE MASTER STATUS REGISTER VALUE TO DETERMINE IF THE MASTER IS WAITING. IF NOT, THE SLAVE WILL REMAIN IN AN INFINITE LOOP UNTIL A CHANGE IN MASTER STATUS HAS BEEN OBSERVED, AT WHICH TIME THE FIRST TEST WILL BEGIN. IF THE MASTER HAS BEEN STARTED FIRST, THERE WILL BE NO RESPONSE FROM THE SLAVE AND THE MASTER WILL TIME-OUT, PRINTING THE FOLLOWING MESSAGE, AND REENTER THE WAIT LOOP.

STATUS: MASTER
MASTER CANNOT START COMMUNICATION WITH SLAVE-WAITING FOR DSTATC

ERRPC STATUS
002166 002200

7.2 PROGRAM SYNCHRONIZATION

ALL COMMUNICATION BETWEEN MASTER AND SLAVE IS INTERLOCKED THROUGH DRVCSR STATUS BITS. DURING EACH TEST, THE MASTER CPU WILL INITIATE THE INTERLOCK AND WAIT FOR THE SLAVE TO RESPOND. CONVERSELY, THE SLAVE WILL FIRST WAIT FOR THE MASTER TO SET/RESET THE STATUS BITS, BEFORE RESPONDING. IF SYNCHRONIZATION IS LOST DURING ANY INTERLOCK, EITHER CPU MAY TIME-OUT, AND THE RESULTING MESSAGE WILL BE DISPLAYED:

STUCK WAITING FOR COMPANION INTERLOCK

ERRPC STATUS
XXXXXX XXXXXX

WHERE: ERRPC = LOCATION IN TEST FOLLOWING CALL TO WAIT
        STATUS = CURRENT VALUE OF DRVCSR REGISTER

AT THIS POINT THE CPU WILL ATTEMPT TO RESYNCHRONIZE WITH THE OTHER, AND WILL DISPLAY THE FOLLOWING MESSAGE BEFORE RETURNING TO THE INITIALIZATION PROTOCOL SECTION.

*RESYNC...

8.0 EXECUTION TIME

EXECUTION TIME IS ABOUT 1 MINUTE, AND MAY BE FASTER FOR SOME PDP-11 PROCESSORS. NOTE THAT THE "END OF PASS" MESSAGE IS ONLY REPORTED AT THE COMPUTER WHICH WAS STARTED AS THE INITIAL MASTER (START 200).

9.0 PROGRAM DESCRIPTION

9.1 GENERAL

THIS INTERPROCESSOR EXERCISER WAS DESIGNED TO TEST THE I/O ABILITY OF THE DAV11 INTERFACE TO COMMUNICATE BETWEEN TWO COMPUTERS. THE TWO COMPUTERS ARE STARTED AT DIFFERENT ADDRESSES TO ESTABLISH INITIAL SYNCHRONIZATION. THE SLAVE COMPUTER IS STARTED FIRST (START 204), AND THE MASTER COMPUTER IS STARTED SECOND (START 200). THE TERMS "MASTER" AND "SLAVE" SHOULD BE USED LOOSELY AS THE MASTER WILL BECOME THE SLAVE AND THE SLAVE WILL BECOME THE MASTER AS THE PROGRAM ADVANCES. THE COMPUTER STARTED AT ADDRESS 200 WILL ALWAYS REPORT THE "END OF PASS" MESSAGE.

9.2 PROGRAM SEGMENTS

(1) MTST1 - MASTER SENDS OUT PROGRAM CONTROLLED SINGLE WORDS THROUGH THE DATA BUFFER REGISTER AND EXPECTS THE SLAVE TO ECHO EACH WORD BACK TO THE MASTER VIA THE DATA BUFFER REGISTER.

(2) MTST2 - MASTER SENDS OUT A "FNCT" BIT CODE IN THE COMMAND STATUS REGISTER AND EXPECTS THE SLAVE TO ECHO EACH CODE IN ITS "FNCT" BITS. THE MASTER WILL READ THE "STAT" BIT CODE FROM THE COMMAND/STATUS REGISTER AND COMPARE IT TO THE CODE WRITTEN.

(3) MTST3 - MASTER SENDS OUT A 32-WORD DATA BLOCK TO THE SLAVE AND CHECKS FOR PROPER INTERRUPT STATUS, WORD COUNT AND BUFFER ADDRESS AT THE COMPLETION OF THE TRANSFER.

(4) MTST4 - MASTER SENDS A DATA BLOCK TO THE SLAVE. THE SLAVE IS SET FOR A LARGER BLOCK AND DOES NOT COMPLETE. THE MASTER SETS ATTENTION INTERRUPT. THE SLAVE CHECKS THAT IT GOT THE ATTENTION INTERRUPT.

(5) STST1 - SLAVE ECHOS ALL CHANGES IN THE DATA BUFFER REGISTER.

(6) STST2 - SLAVE READS THE "STAT" BIT CODE FROM ITS COMMAND/ STATUS REGISTER, CONVERTS THIS CODE AND WRITES IT INTO ITS "FNCT" BITS IN THE COMMAND/STATUS REGISTER.

(7) STST3 - SLAVE RECEIVES A 32-WORD DATA BLOCK FROM THE MASTER AND CHECKS FOR PROPER INTERRUPT STATUS, WORD COUNT BUFFER ADDRESS AND DATA CONTENT.

(8) STST4 - SLAVE HAS LARGER WORD COUNT THAN MASTER SENDS. EXPECTS AN ATTENTION INTERRUPT FROM MASTER.

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                10.0            MAINTENANCE HISTORY

                DATE    REVISION                    REASON
                ------------------------------------------------------------

                FEB 79  YW-Z0171-A.0  J. MARTIN     INITIAL VERSION
                MAR 81  YW-Z0171-B.0  J. MARTIN     DR11-B REV T COMPATABILITY

                NOV 82  CZDAV-A.0     P. HOLSINGER  FIRST RELEASE OF DIAGNOSTIC


                &
    424                         .LIST SEQ,BIN,LOC
```

```
                                .SBTTL  OPERATIONAL SWITCH SETTINGS

                                ;*
                        000001  $TN=1
                        122000  $SWR=122000
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          ------------------
                                ;*        15            HALT ON ERROR
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        10            BELL ON ERROR
                                .SBTTL  BASIC DEFINITIONS

                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
                        001100  STACK=  1100
                        104000  ERROR=  EMT
                        000004  SCOPE=  IOT

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

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

                                ;*PRIORITY LEVEL DEFINITIONS
                        000000  PR0=    0               ;;PRIORITY LEVEL 0
                        000040  PR1=    40              ;;PRIORITY LEVEL 1
                        000100  PR2=    100             ;;PRIORITY LEVEL 2
                        000140  PR3=    140             ;;PRIORITY LEVEL 3
                        000200  PR4=    200             ;;PRIORITY LEVEL 4
                        000240  PR5=    240             ;;PRIORITY LEVEL 5
                        0003C0  PR6=    300             ;;PRIORITY LEVEL 6
                        000340  PR7=    340             ;;PRIORITY LEVEL 7

                                ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
                        100000  SW15=   100000
                        040000  SW14=   40000
                        020000  SW13=   20000
                        010000  SW12=   10000
```

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

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

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

```
                000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
                000024                  PWRVEC= 24              ;;POWER FAIL
                000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
                000034                  TRAPVEC=34              ;;"TRAP" TRAP
                000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
                000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
                000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
    438
    439         106427                  MTPS=106427             ;;INSTR EQUATE THAT MOVES BYTE TO PSW
    440
    441                                 ;REGISTER BITS
    442         000002                  FNCT1=  2
    443         000004                  FNCT2=  4
    444         000010                  FNCT3=  10
    445         004000                  DSTATA= 4000
    446         002000                  DSTATB= 2000
    447         001000                  DSTATC= 1000
    448
    449                                 .SBTTL  TRAP CATCHER

                000000                          .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                000174                  .=174
    000174      000000      DISPREG:    .WORD   0               ;;SOFTWARE DISPLAY REGISTER
    000176      000000      SWREG:      .WORD   0               ;;SOFTWARE SWITCH REGISTER
    450                                 .SBTTL  STARTING ADDRESS(ES)
    451 000200  000137  001460          JMP     @#START1        ;;JUMP TO STARTING ADDRESS OF PROGRAM
    452 000204  000137  001466          JMP     @#START2        ;GO START AS SLAVE COMPUTER
    453
    454                             ;Q-BUS 'B-EVENT' INTERRUPT HANDLER
    455         000100                  .=100
    456 000100  000104                  .WORD   104             ;VECTOR TO LOC 104
    457 000102  000340                  .WORD   340             ;AT PRIORITY 7
    458 000104  000002                  .WORD   2               ;RTI
    459
```

```
    460                                 .SBTTL  COMMON TAGS

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

            001100                              .=1100
    001100                              $CMTAG:                         ;;START OF COMMON TAGS
    001100  000000                      $PASS:  .WORD   0               ;;CONTAINS PASS COUNT
    001102     000                      $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
    001103     000                      $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
    001104  000000                      $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
    001106  000000                      $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
    001110  000000                      $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
    001112  000000                      $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
    001114     000                      $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
    001115     001                      $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
    001116  000000                      $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
    001120  000000                      $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
    001122  000000                      $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
    001124  000000                      $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
    001126  000000                      $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
    001130  000000                              .WORD   0               ;;RESERVED--NOT TO BE USED
    001132  000000                              .WORD   0
    001134     000                      $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
    001135     000                      $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
    001136  000000                              .WORD   0
    001140  177570                      SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
    001142  177570                      DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
    001144  177560                      $TKS:   177560                  ;;TTY KBD STATUS
    001146  177562                      $TKB:   177562                  ;;TTY KBD BUFFER
    001150  177564                      $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
    001152  177566                      $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
    001154     000                      $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
    001155     002                      $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
    001156     012                      $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
    001157     000                      $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
    001160     207     377     377      $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
    001163     000
    001164     077                      $QUES:  .ASCII  /?/             ;;QUESTION MARK
    001165     015                      $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
    001166     012     000              $LF:    .ASCIZ  <12>            ;;LINE FEED
                                        ;;*****************************************************************
```

```
                                .SBTTL  ERROR POINTER TABLE

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

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


    001170                      $ERRTB:
461                             ;ERROR  1
462 001170  010234                      EM1                     ;SLAVE DRV11B FAILED TO ECHO DBR CONTENTS
463 001172  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
464 001174  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
465 001176  000000                      0
466
467                             ;ERROR  2
468 001200  010327                      EM2                     ;SLAVE DRV11B FAILED TO ECHO 'STAT'BITS
469 001202  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
470 001204  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
471 001206  000000                      0
472
473                             ;ERROR  3
474 001210  010421                      EM3                     ;FAILED TO INTR ON A 'DATI'
475 001212  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
476 001214  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
477 001216  000000                      0
478
479                             ;ERROR  4
480 001220  010473                      EM4                     ;STATUS ER ON 'DATI'
481 001222  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
482 001224  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
483 001226  000000                      0
484
485                             ;ERROR  5
486 001230  010541                      EM5                     ;WORD COUNT ER ON 'DATI'
487 001232  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
488 001234  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
489 001236  000000                      0
490
491                             ;ERROR  6
492 001240  010613                      EM6                     ;BUFFER ADRS ER ON 'DATI'
493 001242  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
494 001244  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
495 001246  000000                      0
496
497                             ;ERROR  7
498 001250  010666                      EM7                     ;FAILED TO INTR ON A 'DATO'
499 001252  011443                      DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
500 001254  011554                      DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
501 001256  000000                      0
502
```

```
                                ;ERROR  10
001260  010735                          EM10                    ;STATUS ER ON 'DATO'
001262  011443                          DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
001264  011554                          DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
001266  000000                          0

                                ;ERROR  11
001270  011002                          EM11                    ;WORD COUNT ER ON 'DATO'
001272  011443                          DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
001274  011554                          DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
001276  000000                          0

                                ;ERROR  12
001300  011053                          EM12                    ;BUFFER ADRS ER ON 'DATO'
001302  011443                          DH1                     ;ERRPC  BUSADR  EXPCT   RCVD
001304  011554                          DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
001306  000000                          0

                                ;ERROR  13
001310  011125                          EM13                    ;DATA ER ON 'DATO'
001312  011500                          DH2                     ;ERRPC  MEMADR  EXPCT   RCVD
001314  011554                          DT1                     ;$ERRPC $BDADR  $GDDAT  $BDDAT
001316  000000                          0

                                ;ERROR  14
001320  011170                          EM14                    ;NO ATTN INTR
001322  011443                          DH1
001324  011554                          DT1
001326  000000                          0

                                ;ERROR  15
001330  011223                          EM15                            ;ATTN STATUS ER
001332  011443                          DH1
001334  011554                          DT1
001336  000000                          0

                                ;ERROR  16
001340  011263                          EM16    ;PROTOCOL INITIALIZATION ERROR -MASTER AND SLAVE
001342  011535                          DH3     ;ERRPC   STATUS
001344  011566                          DT2     ;$ERRPC  $ERRST
001346  000000                          0

                                ;ERROR  17
001350  011374                          EM17    ;STUCK WAITING FOR COMPANION INTERLOCK
001352  011535                          DH3     ;ERRPC   STATUS
001354  011574                          DT3     ;$ERRPC  $ERRST
001356  000000                          0
```

```
                        ;DAV11 BASE REGISTER ADDRESS ASSIGNMENT

001360  172410          DRVADR: 172410          ;MODIFY THIS LOC IF DIFFERENT

                        ;DAV11 VECTOR ADDRESS ASSIGNMENT

001362  000124          DRVECT: 124             ;MODIFY THIS LOC IF DIFFERENT

                        ;DAV11 BUS REGISTER ADDRESS POINTERS

001364  172410          DRVWCR: 172410          ;WORD COUNT
001366  172412          DRVBAR: 172412          ;BUFFER ADDRESS
001370  172414          DRVCSR: 172414          ;COMMAND/STATUS
001372  172416          DRVDBR: 172416          ;DATA BUFFER

                        ;DAV11 VECTOR ADDRESS POINTERS

001374  000124          DRVCT0: 124             ;READY & NEX VECTOR
001376  000126          DRVCT2: 126             ;NEW PSW ON INTR

                        ;COMMON PROGRAM LOCATION(S)

001400  000000          STAT:   0               ;STATUS BIT(S) TO TEST
001402  000000          INTFLG: 0               ;INTERRUPT FLAG
001404  000000          TIME:   0               ;GENERAL PURPOSE COUNTER
001406  000000          ABORT:  0               ;PROGRAM ABORT TIMER
001410  000000          TEMP:   0               ;TEMPORARY STORAGE
001412  000000          $TSTPC: 0               ;PC STORAGE
001414  000000          $ERRST: 0               ;CSR STATUS
001416  000000          SAVE:   0               ;REG DATA SAVED HERE
001420  000000          MSTER:  0               ;0=MASTER START - NON-ZERO=SLAVE START
001422  000001          ICOUNT: 1               ;# OF TIMES TO REPEAT ALL TESTS BEFORE END PASS MSG

001424  177740          XPRAM:  -32.            ;XMIT WORD COUNT
001426  011632                  DBUF            ;XMIT BUFFER ADRS
001430  000103                  103             ;XMIT STATUS/CONTROL:  INTR ENABLE,FNCT1,GO

001432  177740          RPRAM:  -32.            ;RCV WORD COUNT
001434  011632                  DBUF            ;RCV BUFFER ADRS
001436  000105                  105             ;RCV STATUS/CONTROL:  INTR ENABLE,FNCT2,GO

001440  177740          XPRAM4: -32.            ;XMIT WORD COUNT
001442  011632                  DBUF            ;XMIT BUFFER ADDRESS
001444  000103                  103             ;XMIT STATUS/CONTROL:  INTR ENABLE,FNCT1,GO

001446  177730          RPRAM4: -40.            ;RCV WORD COUNT
001450  011632                  DBUF            ;RCV BUFFER ADDRESS
001452  000105                  105             ;RCV STATUS/CONTROL:  INTR ENABLE,FNCT2,GO

001454  000000          LSI:    0               ;LSI FLAG
001456  000000          ERRFLG: 0               ;ERROR FLAG
```

```
                                        .SBTTL  PROGRAM START

001460  005037  001420          START1: CLR     MSTER           ;THIS IS MASTER START
001464  000403                          BR      START           ;SKIP NEXT

001466  012737  177777  001420  START2: MOV     #-1,MSTER       ;SLAVE START

001474                          START:

                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
001474  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
001500  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
001502  022706  001140                  CMP     #SWR,R6 ;;DONE?
001506  001374                          BNE     .-6             ;;LOOP BACK IF NO
001510  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER

                                ;;INITIALIZE A FEW VECTORS
001514  012737  006566  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
001522  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
001530  012737  007622  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
001536  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL7

                                ;;SIZE FOR A HARDWARE SWITCH REGISTER, IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER,
001544  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
001550  012737  001604  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
001556  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWITCH REGISTER
001564  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
001572  022777  177777  177340          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
001600  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND THE HARDWARE SWR IS NOT = -1
001602  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
001604  012716  001612          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
001610  000002                          RTI
001612  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
001620  012737  000174  001142          MOV     #DISPREG,DISPLAY

                                ;CHECK IF 11/03(LSI11)
001626  012737  001654  000004  66$:    MOV     #70$,@#ERRVEC   ;SET UP ERROR VECTOR
001634  012737  000001  001454          MOV     #1,LSI          ;ASSUME IT'S AN LSI
001642  005737  177776                  TST     PS              ;TRY TO ACCESS PSW
001646  005037  001454                  CLR     LSI             ;NOT AN LSI
001652  000403                          BR      75$
001654  012716  001662          70$:    MOV     #75$,(SP)       ;SET UP RETURN
001660  000002                          RTI

001662  012637  000004          75$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
001666  012700  001364                  MOV     #DRVWCR,R0      ;SET UP REG ADRS POINTERS
001672  013701  001360                  MOV     DRVADR,R1       ;GET BASE ADRS
```

```
                                ;
001676  010120                  SETUP2: MOV     R1,(R0)+        ;LOAD EM
001700  062701  000002                  ADD     #2,R1           ;
001704  022700  001374                  CMP     #DRVDBR+2,R0    ;ALL DONE?
001710  001372                          BNE     SETUP2          ;BR IF NOT
001712  012700  001374                  MOV     #DRVCT0,R0      ;SET UP DAV11 VECTOR ADRS POINTER
001716  013701  001362                  MOV     DRVECT,R1       ;GET BASE VECTOR ADRS
                                ;
001722  010120                  SETUP3: MOV     R1,(R0)+        ;
001724  062701  000002                  ADD     #2,R1           ;
001730  022700  001400                  CMP     #DRVCT2+2,R0    ;ALL DONE?
001734  001372                          BNE     SETUP3          ;BR IF NOT
                                ;
                                ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
001736  005227  177777                  INC     #-1             ;;FIRST TIME?
001742  001007                          BNE     67$             ;;BRANCH IF NO
001744  104400  010142                  TYPE    ,TITLE          ;;TYPE PROGRAM TITLE
                                ;
                                ;;GET VALUE FOR SOFTWARE SWITCH REGISTER
001750  023727  001140  000176          CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
001756  001001                          BNE     67$             ;;BRANCH IF NO
001760  104405                          GTSWR                   ;;GET SOFT-SWR SETTINGS
                                ;
001762  012706  001100          67$:    MOV     #STACK,SP       ;ALWAYS RESET STACK PTR
001766  000005                          RESET                   ;INITIALIZE DAV11 BEFORE TESTING
001770  012737  000001  001422          MOV     #1,ICOUNT       ;1ST TIME DO ALL TEST ONCE - THEN 3000(8)
                                ;
```

```
                                        .SBTTL  MASTER TESTS

001776  004737  010072         SYNCST: JSR     PC,CPUHI        ;NO INTERRUPTS
002002  005737  001420                 TST     MSTER           ;STARTED AS MASTER?
002006  001402                         BEQ     MINIT1          ;YES:  INITIALIZE FOR MASTER TESTS
002010  000137  003656                 JMP     SINIT1          ;NO:  INITIALIZE FOR SLAVE

                                        ;;**************************************************************************
                                        ;MASTER PROTOCOL INIT-TEST 1
                                        ;;**************************************************************************

002014  004737  010072         MINIT1: JSR     PC,CPUHI        ;NO INTERRUPTS
002020  012706  001100                 MOV     #STACK,SP       ;RESET STACK POINTER
002024  005077  177340                 CLR     @DRVCSR         ;CLEAR CSR
002030  012737  000010  001406         MOV     #10,ABORT       ;INITIALIZE LOOP COUNT
002036  005037  001404         1$:     CLR     TIME            ;INITIALIZE SUBLOOP COUNT

002042  032777  001000  177320 2$:     BIT     #DSTATC,@DRVCSR ;TEST FOR SLAVE SYNC
002050  001013                         BNE     MTST1           ;YES:  START TEST 1
002052  005337  001404                 DEC     TIME            ;DECR SUBLOOP COUNT
002056  001371                         BNE     2$              ;CONTINUE SUBLOOP UNTIL ZERO
002060  005337  001406                 DEC     ABORT           ;DEC LOOP COUNT
002064  001364                         BNE     1$              ;CONTINUE LOOP INTIL ZERO

002066  017737  177276  001414         MOV     @DRVCSR,$ERRST  ;SAVE STATUS
002074  104016                         ERROR+16                ;NOTIFY OPERATOR OF SYNC ERROR
002076  104411                         RSYNC                   ;AND RESYNC
```

```
                        .SBTTL  MTST1   TEST THAT SLAVE CAN ECHO THE DBR CORRECTLY
                        ;;*****************************************************************
                        ;;*****************************************************************
                        ;MASTER COMPUTER STARTS HERE FROM PROGRAM START
                        ;IT SENDS OUT SINGLE WORDS (FLOATING I/O PTRN) THRU THE
                        ;DBR TO THE SLAVE COMPUTER
                        ;IT LOOKS FOR THE SLAVE TO ECHO THE DBR WORD CORRECTLY
                        ;WITHIN A CERTAIN AMOUNT OF TIME
                        ;IF IT FAILS TO RETURN THE WORD AN ERROR IS REPORTED
                        ;THIS TEST IS NOT EXITED UNTIL ALL DATA PATTERNS HAVE
                        ;BEEN SENT AND RECEIVED CORRECTLY
                        ;;*****************************************************************
                        ;;*****************************************************************

002100  005001          MTST1:  CLR     R1              ;R1 SAYS FLOAT 0 LEFT WHEN ZERO
002102  012700  177776          MOV     #-2,R0          ;START WITH #177776 IN R0

002106  010077  177260  1$:     MOV     R0,@DRVDBR      ;SEND PATTERN OUT
002112  010037  001124          MOV     R0,$GDDAT       ;SAVE IN EXPECTED
002116  013737  001372  001122  MOV     DRVDBR,$BDADR   ;SET UP DBR ADRS

                        ;*****************************************************************
                                        ;START TEST SYNCHRONIZATION
                        ;*****************************************************************

002124  012777  000002  177236  2$:     MOV     #FNCT1,@DRVCSR  ;TELL SLAVE DATA READY

002132  012704  001000          MOV     #DSTATC,R4      ;LOAD MASK
002136  004737  007670          JSR     PC,WTNE         ;WAIT FOR SLAVE TO ECHO DATA

002142  004737  005574  3$:     JSR     PC,DELAY        ;WAIT FOR SLAVE
002146  017737  177220  001126  MOV     @DRVDBR,$BDDAT  ;READ IT BACK
002154  023737  001124  001126  CMP     $GDDAT,$BDDAT   ;CORRECT?
002162  001402                  BEQ     4$              ;BR IF SO

002164  104001                  ERROR+1                 ;SLAVE FAILED TO ECHO THE DBR WORD
002166  000406                  BR      5$              ;LOOP ON ERROR ALWAYS

002170  005100          4$:     COM     R0              ;CONVERT PTRN TO FLOATING 1
002172  005101                  COM     R1              ;TIME TO FLOAT LEFT?
002174  001003                  BNE     5$              ;BR IF NOT
002176  006300                  ASL     R0              ;YES - FLOAT LEFT
002200  005200                  INC     R0              ;KEEP LSB SET
002202  103010                  BCC     6$              ;BR IF ZERO TO CARRY
```

```
                                ;*****************************************************************
                                ;CLEAR STATUS SYNCHRONIZATION
                                ;*****************************************************************

002204  042777  000002  177156  5$:     BIC     #FNCT1,@DRVCSR  ;TELL SLAVE DATA HAS BEEN READ

002212  012704  001000                   MOV     #DSTATC,R4      ;LOAD MASK
002216  004737  007726                   JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR

002222  000731                           BR      1$              ;CONTINUE WITH NEXT DATA PATTERN

                                ;*****************************************************************
                                ;END OF TEST SYNCHRONIZATION
                                ;*****************************************************************

002224  042777  000002  177136  6$:     BIC     #FNCT1,@DRVCSR  ;CLEAR STATUS

002232  012704  001000                   MOV     #DSTATC,R4      ;LOAD MASK
002236  004737  007726                   JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR

                                ;*****************************************************************
                                ;READ TERMINATOR SYNCHRONIZATION
                                ;*****************************************************************

002242  012777  177001  177122           MOV     #177001,@DRVDBR ;SET TERMINATOR
002250  052777  000002  177112  7$:     BIS     #FNCT1,@DRVCSR  ;TELL SLAVE TO READ DATA

002256  012704  001000                   MOV     #DSTATC,R4      ;LOAD MASK
002262  004737  007670                   JSR     PC,WTNE         ;WAIT FOR SLAVE TO ECHO DATA READ

002266  000240                  8$:     NOP
002270  000240                          NOP
```

```
                                .SBTTL  MTST2   TEST THAT SLAVE CAN ECHO THE 'STAT' BITS CORRECTLY
                                ;;**************************************************************
                                ;;**************************************************************
                                ;MASTER SENDS OUT A 'FNCT' CODE (1-7) TO THE SLAVE COMPUTER
                                ;THE MASTER THEN LOOKS FOR THE SLAVE TO ECHO THE CODE VIA THE
                                ;'STAT' BITS WITHIN A CERTAIN AMOUNT OF TIME
                                ;IF IT FAILS TO RETURN THE CORRECT CODE AN ERROR IS REPORTED
                                ;THIS TEST IS NOT EXITED UNTIL ALL 'FCNT' CODES HAVE BEEN
                                ;SENT AND RECEIVED CORRECTLY
                                ;;**************************************************************
                                ;;**************************************************************

002272                          MTST2:
002272  013737  001370  001122          MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
002300  012700  000002                  MOV     #2,R0           ;SET UP INITIAL FCNT BIT COUNT
002304  012737  001202  001124          MOV     #1202,$GDDAT    ;LOAD EXPECTED

                                ;*************************************************************************
                                        ;START TEST SYNCHRONIZE
                                ;*************************************************************************

002312  005077  177052          1$:     CLR     @DRVCSR         ;CLEAR STATUS

002316  012704  007000                  MOV     #7000,R4        ;LOAD MASK
002322  004737  007726                  JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR

                                ;*************************************************************************
                                        ;TRANSFER FUNCTION/STATUS SYNCHRONIZE
                                ;*************************************************************************

002326  010077  177036          2$:     MOV     R0,@DRVCSR      ;SEND FNCT BITS TO SLAVE

002332  012704  007000                  MOV     #7000,R4        ;LOAD MASK
002336  004737  007670                  JSR     PC,WTNE         ;WAIT FOR SLAVE TO ECHO FNCT BITS

                                ;       PROCESS STATUS

002342  017737  177022  001126  3$:     MOV     @DRVCSR,$BDDAT  ;READ THE CSR
002350  023737  001124  001126          CMP     $GDDAT,$BDDAT   ;CORRECT?
002356  001402                          BEQ     4$              ;BR IF SO

002360  104002                          ERROR+2                 ;SLAVE FAILED TO ECHO 'STAT' BITS
002362  000743                          BR      MTST2           ;LOOP ON ERROR ALWAYS

002364  062737  001002  001124  4$:     ADD     #1002,$GDDAT    ;ADVANCE EXPECTED
002372  062700  000002                  ADD     #2,R0           ;ADVANCE PTRN
002376  032700  000020                  BIT     #20,R0          ;ALL BEEN DONE?
002402  001743                          BEQ     1$              ;BR IF NOT
```

```
                        ;*****************************************************************************
                        ;END OF TEST SYNCHRONIZATION
                        ;*****************************************************************************

002404  012777  177002  176760  5$:     MOV     #177002,@DRVDBR ;SET TERMINATOR
002412  005077  176752          CLR     @DRVCSR         ;CLEAR STATUS

002416  012704  007000          MOV     #7000,R4        ;LOAD MASK
002422  004737  007726          JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR

                        ;*****************************************************************************
                        ;SET INTERRUPT TO CLEAR INTERRUUPT
                        ;AND ERROR LATCHED BY THIS TEST.  (DR11-B)
                        ;*****************************************************************************

002426  005737  001454  6$:     TST     LSI             ;AN LSI?
002432  001021          BNE     8$              ;IF YES

002434  004537  005534          JSR     R5,SETVEC       ;SET VECTOR FOR
002440  005666          DRVISR                  ;SERVICE ROUTINE

002442  004737  010116  7$:     JSR     PC,CPULO        ;ALLOW INTERRUPTS
002446  012777  177777  176710  MOV     #-1,@DRVWCR     ;LOAD WORD COUNT
002454  012777  000501  176706  MOV     #501,@DRVCSR    ;CAUSE INTERRUPT AT SLAVE
002462  004737  005574          JSR     PC,DELAY        ;WAIT FOR POSSIBLE INTERRUPT

002466  004737  010072          JSR     PC,CPUHI        ;DISABLE INTERRUPTS
002472  004737  005554          JSR     PC,RSTVEC       ;RESTORE VECTOR

002476  000240  8$:     NOP
002500  000240          NOP
```

```
                        .SBTTL  MTST3   TEST THAT MASTER CAN XMIT A 32 WORD DATA BLOCK TO SLAVE
                        ;;**************************************************************
                        ;;**************************************************************
                        ;MASTER XMITS A 32 WORD BLOCK OF DATA TO SLAVE
                        ;THEN CHECKS FOR PROPER INTERRUPT STATUS, WC & BA
                        ;THE SLAVE CHECKS THE SAME PLUS THE DATA RECEIVED
                        ;THE TEST DOES NOT ADVANCE UNTIL A SUCCESSFUL XFER
                        ;;**************************************************************
                        ;;**************************************************************

002502  004737  010072          M3INI:  JSR     PC,CPUHI        ;NO INTERRUPTS
002506  004537  005534                  JSR     R5,SETVEC       ;SET VECTOR FOR
002512  005666                          DRVISR                  ;SERVICE ROUTINE

002514  005037  001456          MTST3:  CLR     ERRFLG          ;CLEAR ERRORS
002520  005077  176644                  CLR     @DRVCSR         ;CLEAR STATUS
002524  005037  001402                  CLR     INTFLG          ;CLEAR INTR FLAG
002530  004737  005574                  JSR     PC,DELAY        ;DELAY FOR SLAVE

002534  004537  005624          1$:     JSR     R5,LDBUF        ;GO LOAD 'DBUF' WITH DATA PTRM
002540  177740                          -32.                    ;DO 32. LOCATIONS
002542  012737  100000  001404          MOV     #100000,TIME    ;SET UP A TIMER VALUE
002550  013777  001424  176606          MOV     XPRAM,@DRVWCR   ;SET UP WORD COUNT
002556  013777  001426  176602          MOV     XPRAM+2,@DRVBAR ;SET UP BUFFER ADRS
002564  004737  010116                  JSR     PC,CPULO        ;ALLOW INTERRUPTS
002570  013777  001430  176572          MOV     XPRAM+4,@DRVCSR ;SET UP CONTROL:  IE,FNCT1 & GO(CLRS CYCLE)

002576  005737  001402          2$:     TST     INTFLG          ;TEST FOR INTERRUPT
002602  001023                          BNE     3$              ;IF NE YES
002604  005337  001404                  DEC     TIME            ;WAIT FOR INTR
002610  001372                          BNE     2$              ;UNTIL 0

                        ;       PPOCESS TRANSFER ERROR

002612  004737  010072          20$:    JSR     PC,CPUHI        ;DISABLE INTERRUPTS
002616  017737  176546  001126          MOV     @DRVCSR,$BDDAT  ;READ CSR
002624  042777  000100  176536          BIC     #100,@DRVCSR    ;DISABLE IE
002632  012737  002702  001124          MOV     #2702,$GDDAT    ;LOAD EXPECTED STATUS:
                                                                ;STAT B,CYCLE,RDY,IE.FNCT1
002640  013737  001370  001122          MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
002646  104003                          ERROR+3                 ;DATI FAILED TO CAUSE A WC INTR
002650  000466                          BR      6$              ;GO RESYNC ON ERROR
```

```
                                    ;       PROCESS TRANSFER

002652  004737  010072          3$:       JSR     PC,CPUHI          ;DISABLE INTERRUPTS
002656  017737  176506  001126            MOV     @DRVCSR,$BDDAT    ;READ STATUS
002664  042777  000100  176476            BIC     #100,@DRVCSR      ;DISABLE IE
002672  012737  002702  001124            MOV     #2702,$GDDAT      ;LOAD EXPECTED STATUS:
                                                                    ;STAT B,,YCLE,RDY,IE,FNCT1
002700  023737  001124  001126            CMP     $GDDAT,$BDDAT     ;CORRECT?
002706  001405                            BEQ     4$                ;BR IF SO

002710  013737  001370  001122            MOV     DRVCSR,$BDADR     ;SET UP CSR ADRS
002716  104004                            ERROR+4                   ;DATI STATUS ERROR
002720  000442                            BR      6$                ;GO RESYNC ON ERROR

002722  005037  001124          4$:       CLR     $GDDAT            ;LOAD EXPECTED WC
002726  017737  176432  001126            MOV     @DRVWCR,$BDDAT    ;READ WORD COUNT
002734  001405                            BEQ     5$                ;BR IF ZERO

002736  013737  001364  001122            MOV     DRVWCR,$BDADR     ;SET UP WCR ADRS
002744  104005                            ERROR+5                   ;DATI WORD COUNT ERROR
002746  000427                            P       6$                ;GO RESYNC ON ERROR

002750  013737  001426  001124  5$:       MOV     XPRAM+2,$GDDAT    ;GET STARTING ADRS OF XFER
002756  013700  001424                    MOV     XPRAM,R0          ;GET WC
002762  005400                            NEG     R0                ;GET ACTUAL #
002764  006300                            ASL     R0                ;CONVERT TO WORD
002766  060037  001124                    ADD     R0,$GDDAT         ;ADD TO BASE ADRS
002772  017737  176370  001126            MOV     @DRVBAR,$BDDAT    ;READ BAR ADRS
003000  042737  000001  001126            BIC     #BIT00,$BDDAT     ;ELIMINATE LSB
003006  023737  001124  001126            CMP     $GDDAT,$BDDAT     ;CORRECT?
003014  001406                            BEQ     7$                ;BR IF SO

003016  013737  001366  001122            MOV     DRVBAR,$BDADR     ;SET UP BAR ADRS
003024  104006                            ERROR+6                   ;DATI BUFFER ADRS ERROR

003026  005237  001456          6$:       INC     ERRFLG            ;SET ERROR FLAG
003032  004737  005574          7$:       JSR     PC,DELAY          ;WAIT FOR POSSIBLE LSI REFRESH
```

```
                                ;*****************************************************************************
                                ;END OF TRANSFER SYNCHRONIZATION
                                ;*****************************************************************************

003036  005077  176326          10$:    CLR     @DRVCSR         ;CLEAR CSR STATUS

003042  012704  007000                  MOV     #7000,R4        ;LOAD MASK
003046  004737  007726                  JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR

003052  005737  001456                  TST     ERRFLG          ;ERROR?
003056  001404                          BEQ     11$             ;IF EQ NO ERROR
003060  012777  000004  176302          MOV     #FNCT2,@DRVCSR  ;ERROR:  SET FNCT2
003066  000403                          BR      12$
003070  012777  000002  176272  11$:    MOV     #FNCT1,@DRVCSR  ;NO ERROR:  SET FNCT1

                                ;*****************************************************************************
                                ;TRANSFER STATUS SYNCHRONIZATION
                                ;*****************************************************************************

003076  012704  007000          12$:    MOV     #7000,R4        ;LOAD MASK
003102  004737  007670                  JSR     PC,WTNE         ;WAIT FOR SLAVE TO ECHO TRANSFER STATUS

003106  017737  176256  001416          MOV     @DRVCSR,SAVE    ;GET CSR VALUE
003114  032737  002000  001416          BIT     #DSTATB,SAVE    ;ERROR?
003122  001402                          BEQ     13$             ;IF EQ NO
003124  005237  001456                  INC     ERRFLG          ;SET ERROR FLAG

                                ;*****************************************************************************
                                ;CLEAR STATUS SYNCHRONIZATION
                                ;*****************************************************************************

003130  005077  176234          13$:    CLR     @DRVCSR         ;CLEAT STATUS

003134  012704  007000                  MOV     #7000,R4        ;LOAD MASK
003140  004737  007726                  JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR

                                ;       LOOP ON TEST IF ERROR DETECTED

003144  005737  001456                  TST     ERRFLG          ;ANY ERRORS?
003150  001402                          BEQ     14$             ;IF NOT

003152  000137  002514                  JMP     MTST3           ;RESTART TEST

003156  004737  005554          14$:    JSR     PC,RSTVEC       ;GO RESTORE VECTOR
003162  000240                          NOP
003164  000240                          NOP
```

```
                        .SBTTL  MTST4   SET SLAVE ATTN INTERRUPT
                        ;;*****************************************************************
                        ;;*****************************************************************
                        ;MASTER XMITS A 32 WORD BLOCK TO SLAVE.
                        ;SLAVE SET FOR LARGER TRANSFER.
                        ;       MASTER CHECKS NORMAL COMPLETION.
                        ;MASTER SETS ATTN INTR WITH FNCT3.
                        ;       SLAVE CHECKS FOR TERMINATION.
                        ;;*****************************************************************
                        ;;*****************************************************************

003166  004737  010072          M4INI:  JSR     PC,CPUHI        ;DISABLE INTERRUPTS
003172  004537  005534                  JSR     R5,SETVEC       ;SET VECTOR FOR
003176  005666                          DRVISR                  ;SERVICE ROUTINE

003200  005037  001456          MTST4:  CLR     ERRFLG          ;CLEAR ERRORS
003204  005077  176160                  CLR     @DRVCSR         ;CLEAR STATUS
003210  005037  001402                  CLR     INTFLG          ;CLEAR INTR FLAG
003214  004737  005574                  JSR     PC,DELAY        ;DELAY FOR SLAVE

003220  012737  100000  001404  1$:     MOV     #100000,TIME    ;SET TIMER
003226  013777  001440  176130          MOV     XPRAM4,@DRVWCR  ;SET WORD COUNT
003234  013777  001442  176124          MOV     XPRAM4+2,@DRVBAR  ;SET BUFFER ADDRESS

                        ;       INITIATE TRANSFER AND WAIT FOR INTERRUPT

003242  004737  010116                  JSR     PC,CPULO        ;ALLOW INTERRUPTS
003246  013777  001444  176114          MOV     XPRAM4+4,@DRVCSR  ;SET IE,FNCT1,GO

003254  005737  001402          2$:     TST     INTFLG          ;TEST FOR INTERRUPT
003260  001023                          BNE     3$              ;IF NE YES
003262  005337  001404                  DEC     TIME            ;WAIT FOR INTR
003266  001372                          BNE     2$              ;UNTIL 0

                        ;       PROCESS INTERRUPT ERROR

003270  004737  010072          20$:    JSR     PC,CPUHI        ;DISABLE INTERRUPTS
003274  017737  176070  001126          MOV     @DRVCSR,$BDDAT  ;READ CSR
003302  042777  000100  176060          BIC     #100,@DRVCSR    ;DISABLE IE
003310  012737  002702  001124          MOV     #2702,$GDDAT    ;LOAD EXPECTED STATUS:
                                                                ;STAT B,CYCLE,RDY,IE,FNCT1
003316  013737  001370  001122          MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
003324  104003                          ERROR+3                 ;DATI FAILED TO CAUSE A WC INTR
003326  000466                          BR      6$              ;GO RESYNC ON ERROR
```

```
1044                                    ;       PROCESS DATA TRANSFER
1045
1046 003330  004737  010072            3$:     JSR     PC,CPUHI        ;DISABLE INTERRUPTS
1047 003334  017737  176030  001126            MOV     @DRVCSR,$BDDAT  ;READ STATUS
1048 003342  042777  000100  176020            BIC     #100,@DRVCSR    ;DISABLE IE
1049 003350  012737  002702  001124            MOV     #2702,$GDDAT    ;LOAD EXPECTED STATUS:
1050                                                                    ;STAT B,CYCLE,RDY,IE,FNCT1
1051 003356  023737  001124  001126            CMP     $GDDAT,$BDDAT   ;CORRECT?
1052 003364  001405                            BEQ     4$              ;BR IF SO
1053 003366  013737  001370  001122            MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
1054 003374  104004                            ERROR+4                 ;DATI STATUS ERROR
1055 003376  000442                            BR      6$              ;GO RESYNC ON ERROR
1056
1057 003400  005037  001124            4$:     CLR     $GDDAT          ;LOAD EXPECTED WC
1058 003404  017737  175754  001126            MOV     @DRVWCR,$BDDAT  ;READ WORD COUNT
1059 003412  001405                            BEQ     5$              ;BR IF ZERO
1060 003414  013737  001364  001122            MOV     DRVWCR,$BDADR   ;SET UP WCR ADRS
1061 003422  104005                            ERROR+5                 ;DATI WORD COUNT ERROR
1062 003424  000427                            BR      6$              ;GO RESYNC ON ER
1063
1064 003426  013737  001426  001124  5$:     MOV     XPRAM+2,$GDDAT  ;GET STARTING ADRS OF XFER
1065 003434  013700  001424                    MOV     XPRAM,R0        ;GET WC
1066 003440  005400                            NEG     R0              ;GET ACTUAL #
1067 003442  006300                            ASL     R0              ;CONVERT TO WORD
1068 003444  060037  001124                    ADD     R0,$GDDAT       ;ADD TO BASE ADRS
1069 003450  017737  175712  001126            MOV     @DRVBAR,$BDDAT  ;READ BAR ADRS
1070 003456  042737  000001  001126            BIC     #BIT00,$BDDAT   ;ELIMINATE LSB
1071 003464  023737  001124  001126            CMP     $GDDAT,$BDDAT   ;CORRECT?
1072 003472  001406                            BEQ     7$              ;BR IF SO
1073 003474  013737  001366  001122            MOV     DRVBAR,$BDADR   ;SET UP BAR ADRS
1074 003502  104006                            ERROR+6                 ;DATI BUFFER ADRS ERROR
1075
1076 003504  005237  001456            6$:     INC     ERRFLG          ;SET ERROR FLAG
1077 003510  052777  000010  175652    7$:     BIS     #FNCT3,@DRVCSR  ;SET ATTENTION
1078
```

```
1080                                    ;*****************************************************************************
1081                                    ;END OF TRANSFER SYNCHRONIZATION
1082                                    ;*****************************************************************************
1083
1084 003516  004737  005574        10$:  JSR     PC,DELAY        ;DELAY FOR SLAVE
1085 003522  005077  175642              CLR     @DRVCSR         ;CLEAR CSR STATUS
1086
1087 003526  012704  007000              MOV     #7000,R4        ;LOAD MASK
1088 003532  004737  007726              JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR
1089
1090 003536  005737  001456              TST     ERRFLG          ;ERROR?
1091 003542  001404                      BEQ     11$             ;IF EQ NO ERROR
1092 003544  012777  000004  175616      MOV     #FNCT2,@DRVCSR  ;ERROR:  SET FNCT2
1093 003552  000403                      BR      12$
1094 003554  012777  000002  175606  11$:  MOV     #FNCT1,@DRVCSR  ;NO ERROR:  SET FNCT1
1095
1096                                    ;*****************************************************************************
1097                                    ;TRANSFER STATUS SYNCHRONIZATION
1098                                    ;*****************************************************************************
1099
1100 003562  012704  007000        12$:  MOV     #7000,R4        ;LOAD MASK
1101 003566  004737  007670              JSR     PC,WTNE         ;WAIT FOR SLAVE TO ECHO TRANSFER STATUS
1102
1103 003572  017737  175572  001416      MOV     @DRVCSR,SAVE    ;GET CSR VALUE
1104 003600  032737  002000  001416      BIT     #DSTATB,SAVE    ;ERROR?
1105 003606  001402                      BEQ     13$             ;IF EQ NO
1106 003610  005237  001456              INC     ERRFLG          ;SET ERROR FLAG
1107
1108                                    ;*****************************************************************************
1109                                    ;CLEAR STATUS SYNCHRONIZATION
1110                                    ;*****************************************************************************
1111
1112 003614  005077  175550        13$:  CLR     @DRVCSR         ;CLEAT STATUS
1113
1114 003620  012704  007000              MOV     #7000,R4        ;LOAD MASK
1115 003624  004737  007726              JSR     PC,WTEQ         ;WAIT FOR SLAVE TO ECHO STATUS CLEAR
1116
1117                                    ;       LOOP ON TEST IF ERROR DETECTED
1118
1119 003630  005737  001456              TST     ERRFLG          ;ANY ERRORS?
1120 003634  001402                      BEQ     14$             ;IF NOT
1121
1122 003636  000137  003200              JMP     MTST4           ;RESTART TEST
1123
1124 003642  004737  005554        14$:  JSR     PC,RSTVEC       ;GO RESTORE VECTOR
1125 003646  000137  003734              JMP     STST1           ;PROCEED TO SLAVE TEST 1
1126 003652  000240                      NOP
1127 003654  000240                      NOP
1128
```

```
                                        .SBTTL  SLAVE TESTS
                                        ;;*************************************************************************
                                                        ;SLAVE PROTOCOL INIT-TEST 1
                                        ;;*************************************************************************

                                        ;*      NOTE:   THIS SEGMENT EXECUTED ONLY SLAVE START OR RESYNC

003656  004737  010072          SINIT1: JSR     PC,CPUH1        ;NO INTERRUPTS
003662  012706  001100                  MOV     #STACK,SP       ;INITIALIZE STACK POINTER
003666  005077  175476                  CLR     @DRVCSR         ;CLEAR CSR
003672  032777  001000  175470          BIT     #DSTATC,@DRVCSR ;TEST DSTATC
003700  001404                          BEQ     2$              ;CLEAR:  WAIT FOR MASTER

003702  032777  001000  175460  1$:     BIT     #DSTATC,@DRVCSR ;WAIT FOR CLEAR
003710  001374                          BNE     1$              ;

003712  012777  000002  175450  2$:     MOV     #FNCT1,@DRVCSR  ;TELL MASTER TO GO AHEAD
003720  032777  001000  175442  3$:     BIT     #DSTATC,@DRVCSR ;DID MASTER SET DSTATC?
003726  001774                          BEQ     3$              ;NO:  WAIT

003730  000137  003750                  JMP     SL1STR          ;DBR DATA IS READY
```

```
                        .SBTTL  STST1   RECEIVED MASTER'S DBR DATA/SEND BACK VIA DBR
                        ;;*****************************************************************
                        ;;*****************************************************************
                        ;NOW THIS COMPUTER BECOMES THE SLAVE AND ECHOS MASTER'S DBR DATA
                        ;SLAVE COMPUTER STARTS HERE FROM PROGRAM START 204
                        ;;*****************************************************************
                        ;;*****************************************************************

003734  005077  175430  STST1:  CLR     @DRVCSR         ;CLEAR FNCT BIT

                        ;*************************************************************************
                                        ;DBR TRANSFER SYNCHRONIZE
                        ;*************************************************************************

003740  012704  001000  2$:     MOV     #DSTATC,R4      ;LOAD MASK
003744  004737  007670          JSR     PC,WTNE         ;WAIT FOR MASTER TO LOAD DBR

                        ;       READ AND PROCESS DBR DATA

003750  017737  175416  001416  SL1STR: MOV     @DRVDBR,SAVE    ;GET DATA
003756  013777  001416  175406          MOV     SAVE,@DRVDBR    ;SEND IT BACK
003764  022737  177001  001416          CMP     #177001,SAVE    ;TEST TERMINATOR?
003772  001410                        BEQ     4$              ;IF EQ YES

                        ;*************************************************************************
                                        ;DBR ECHO SYNCHRONIZATION
                        ;*************************************************************************

003774  052777  000002  175366  3$:     BIS     #FNCT1,@DRVCSR  ;TELL MASTER DONE

004002  012704  001000                  MOV     #DSTATC,R4      ;LOAD MASK
004006  004737  007726                  JSR     PC,WTEQ         ;WAIT FOR MASTER TO RED DBR

004012  000750                  BR      STST1           ;GO LOOK FOR MORE DATA

                        ;*************************************************************************
                                        ;END OF TEST SYNCHRONIZATION
                        ;*************************************************************************

004014  052777  000002  175346  4$:     BIS     #FNCT1,@DRVCSR  ;TELL MASTER DONE
004022  000240                  NOP             ;
004024  000240                  NOP
```

```
                                .SBTTL  STST2   RECEIVE MASTER'S 'STAT' BITS/SEND BACK VIA 'FNCT' BITS
                                ;;*****************************************************************
                                ;;*****************************************************************
                                ;RECEIVE 'STAT' BITS AND CONVERT TO 'FNCT' BITS AND WRITE TO CSR
                                ;;*****************************************************************
                                ;;*****************************************************************

004026  004737  010072          STST2:  JSR     PC,CPUHI        ;DISABLE INTERRUPTS

                                ;*************************************************************************
                                        ;TEST START SYNCHRONIZE
                                ;*************************************************************************

004032  012704  007000          1$:     MOV     #7000,R4        ;LOAD MASK
004036  004737  007726                  JSR     PC,WTEQ         ;WAIT FOR MASTER TO START TEST

004042  005077  175322                  CLR     @DRVCSR         ;ECHO MASTER TEST START

                                ;       CHECK FOR END OF TEST FLAG

004046  022777  177002  175316  2$:     CMP     #177002,@DRVDBR ;TERMINATOR?
004054  001416                  BEQ     5$              ;IF EQ YES

                                ;*************************************************************************
                                        ;TRANSMIT STATUS SYNCHRONIZATION
                                ;*************************************************************************

004056  012704  007000          3$:     MOV     #7000,R4        ;LOAD MASK
004062  004737  007670                  JSR     PC,WTNE         ;WAIT FOR MASTER TO SEND STATUS

004066  017737  175276  001416          MOV     @DRVCSR,SAVE    ;READ THE CSR
004074  042737  170777  001416          BIC     #170777,SAVE    ;SAVE ONLY THE STAT BITS

004102  113777  001417  175260          MOVB    SAVE+1,@DRVCSR  ;ECHO WITH FNCT BITS
004110  000750                  BR      1$
```

```
                                        ;*************************************************************************
                                        ;SET INTERRUPT TO CLEAR INTERRUUPT
                                        ;AND ERROR LATCHED BY THIS TEST.  (DR11-B)
                                        ;*************************************************************************

004112  005737  001454          5$:   TST     LSI             ;AN LSI?
004116  001021                        BNE     7$              ;IF YES
004120  004537  005534                JSR     R5,SETVEC       ;SET VECTOR FOR
004124  005666                        DRVISR                  ;SERVICE ROUTINE

004126  004737  010116          6$:   JSR     PC,CPULO        ;ALLOW INTERRUPTS
004132  012777  177777  175224        MOV     #-1,@DRVWCR     ;LOAD WORD COUNT
004140  012777  000501  175222        MOV     #501,@DRVCSR    ;CAUSE INTERRUPT IN MASTER
004146  004737  005574                JSR     PC,DELAY        ;WAIT FOR POSSIBLE INTERRUPT

004152  004737  010072                JSR     PC,CPUHI        ;DISABLE INTERRUPTS
004156  004737  005554                JSR     PC,RSTVEC       ;RESTORE VECTOR

004162  000240                  7$:   NOP
004164  000240                        NOP
```

```
                        .SBTTL  STST3   RECEIVE A 32 WORD BLOCK/MAKE STATUS & DATA CHECKS
                        ;;**************************************************************
                        ;;**************************************************************
                        ;THIS TEST SETS UP TO RECEIVE A 32 WORD BLOCK OF DATA FROM THE MASTER
                        ;THEN CHECKS FOR PROPER INTERRUPT STATUS,WC,BA & DATA
                        ;IF AN ERROR IS DETECTED THE SLAVE TELLS THE MASTER, REPORTS THE
                        ;ERROR,AND RESYNCS ON TEST
                        ;;**************************************************************
                        ;;**************************************************************

                        ;       INITIALIZE TRAP VECTOR
004166                  S3INI:
004166  004737  010072          JSR     PC,CPUHI        ;DISABLE INTERRUPTS
004172  004537  005534          JSR     R5,SETVEC       ;SET VECTOR FOR
004176  005666                  DRVISR                  ;SERVICE ROUTINE

                        ;       CLEAR/INITIALIZE TEST PARAMETERS
004200                  STST3:
004200  005037  001456          CLR     ERRFLG          ;CLEAR ERRORS
004204  005077  175160          CLR     @DRVCSR         ;CLEAR STATUS
004210  005037  001402          CLR     INTFLG          ;CLEAR INTR FLAG

004214  004537  005606          JSR     R5,CLRBUF       ;GO CLR 'DBUF'
004220  177740                  -32.                    ;DO 32. LOCATIONS

004222  012737  100000  001404  MOV     #100000,TIME    ;SET UP A TIMER VALUE
004230  013777  001432  175126  MOV     RPRAM,@DRVWCR   ;SET UP WORD COUNT
004236  013777  001434  175122  MOV     RPRAM+2,@DRVBAR ;SET UP BUFFER ADRS
004244  004737  010116          JSR     PC,CPULO        ;ALLOW INTERRUPTS

                        ;**************************************************************************
                                        ;TRANSFER SYNCHRONIZATION
                        ;**************************************************************************

004250  012704  001000  1$:     MOV     #DSTATC,R4      ;LOAD MASK
004254  004737  007670          JSR     PC,WTNE         ;WAIT FOR MASTER TO INITIATE TRANSFER
004260  013777  001436  175102  MOV     RPRAM+4,@DRVCSR ;SET UP CONTROL- IE,FNCT2,GO

004266  005737  001402  2$:     TST     INTFLG          ;TEST FOR INTERRUPT
004272  001023                  BNE     3$              ;IF NE YES
004274  005337  001404          DEC     TIME            ;WAIT FOR INTERRUPT
004300  001372                  BNE     2$              ;UNTIL ZERO

                        ;       PROCESS INTERRUPT ERROR

004302  004737  010072  20$:    JSR     PC,CPUHI        ;DISABLE INTERRUPTS
004306  017737  175056  001126  MOV     @DRVCSR,$BDDAT  ;READ CSR
004314  042777  000100  175046  BIC     #100,@DRVCSR    ;DISABLE IE
004322  012737  001304  001124  MOV     #1304,$GDDAT    ;LOAD EXPECTED STATUS:
                                                        ;STATC,RDY,IE & FNCT 2
004330  013737  001370  001122  MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
004336  104007                  ERROR+7                 ;DATO FAILED TO CAUSE A WC INTR
004340  000520                  BR      10$             ;GO RESYNC ON ERROR
```

```
                                        ;       PROCESS TRANSFER
                                        ;
004342  004737  010072          3$:    JSR     PC,CPUHI        ;DISABLE INTERRUPTS
004346  017737  175016  001126         MOV     @DRVCSR,$BDDAT  ;READ STATUS
004354  042777  000100  175006         BIC     #100,@DRVCSR    ;DISABLE IE
004362  012737  001304  001124         MOV     #1304,$GDDAT    ;LOAD EXPECTED STATUS:
                                                                ;STATC,RDY,IE & FNCT 2
004370  023737  001124  001126         CMP     $GDDAT,$BDDAT   ;CORRECT?
004376  001405                         BEQ     4$              ;BR IF SO
004400  013737  001370  001122         MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
004406  104010                         ERROR+10                ;DATO STATUS ERROR
004410  000474                         BR      10$             ;GO RESYNC ON ERROR
                                        ;
004412  005037  001124          4$:    CLR     $GDDAT          ;LOAD EXPECTED WC
004416  017737  174742  001126         MOV     @DRVWCR,$BDDAT  ;READ WCR
004424  001405                         BEQ     5$              ;BR IF SO
004426  013737  001364  001122         MOV     DRVWCR,$BDADR   ;SET UP WCR ADRS
004434  104011                         ERROR+11                ;DATO WORD COUNT ERROR
004436  000461                         BR      10$             ;GO RESYNC ON ERROR
                                        ;
004440  013737  001434  001124  5$:    MOV     RPRAM+2,$GDDAT  ;GET STARTING ADRS OF XFER
004446  013700  001432                 MOV     RPRAM,R0        ;GET WC
004452  005400                         NEG     R0              ;GET ACTUAL #
004454  006300                         ASL     R0              ;CONVERT TO WORD
004456  060037  001124                 ADD     R0,$GDDAT       ;ADD TO BASE ADRS
004462  017737  174700  001126         MOV     @DRVBAR,$BDDAT  ;READ BAR ADRS
004470  042737  000001  001126         BIC     #BIT00,$BDDAT   ;ELIMINATE LSB
004476  023737  001124  001126         CMP     $GDDAT,$BDDAT   ;CORRECT?
004504  001405                         BEQ     6$              ;BR IF SO
004506  013737  001366  001122         MOV     DRVBAR,$BDADR   ;SET UP BAR ADRS
004514  104012                         ERROR+12                ;DATO BUFFER ADRS ERROR
004516  000431                         BR      10$             ;GO RESYNC ON ERROR
                                        ;
004520  013700  001434          6$:    MOV     RPRAM+2,R0      ;GET BUFFER ADRS
004524  013701  001432                 MOV     RPRAM,R1        ;GET WORD COUNT
004530  012702  177776          7$:    MOV     #177776,R2      ;GET 1ST DATA PTRN(FLOATING 0)
004534  005003                         CLR     R3              ;R3 SAYS WHEN TO SHIFT PTRN
004536  020220                  8$:    CMP     R2,(R0)+        ;COMPARE DATA IN DBUF TO EXPECTED
004540  001011                         BNE     9$              ;BR IF DATA ERROR
004542  005201                         INC     R1              ;COUNT THE WORD COUNT
004544  001420                         BEQ     110$            ;BR IF DATA CHECKS DONE
                                        ;
004546  005102                         COM     R2              ;CONVERT PTRN TO FLOATING 1
004550  005103                         COM     R3              ;TIME TO SHIFT?
004552  001371                         BNE     8$              ;BR IF NOT - GO CK NEXT
004554  006302                         ASL     R2              ;FLOAT PTRN LEFT
004556  005202                         INC     R2              ;KEEP LSB SET
004560  103363                         BCC     7$              ;GO RESET FLOATING PTRN
004562  000765                         BR      8$              ;GO CHECK NEXT
                                        ;
```

```
                        ;       PROCESS DATA ERROR

004564  014037  001126  9$:     MOV     -(R0),$BDDAT    ;GET BAD DATA
004570  010037  001122          MOV     R0,$BDADR       ;GET MEM ADRS OF DATA ER
004574  010237  001124          MOV     R2,$GDDAT       ;LOAD EXPECTED DATA
004600  104013                  ERROR+13                ;DATO DATA ERROR

004602  005237  001456  10$:    INC     ERRFLG          ;SET ERROR FLAG

                        ;*******************************************************************************
                                ;END OF TRANSFER SYNCHRONIZATION
                        ;*******************************************************************************

004606  012704  007000  110$:   MOV     #7000,R4        ;LOAD MASK
004612  004737  007726          JSR     PC,WTEQ         ;WAIT FOR MASTER TO CLEAR CSR

004616  005077  174546          CLR     @DRVCSR         ;ECHO CSR CLEAR TO MASTER

                        ;*******************************************************************************
                                ;TRANSFER STATUS SYNCHRONIZATION
                        ;*******************************************************************************

004622  012704  007000  11$:    MOV     #7000,R4        ;LOAD MASK
004626  004737  007670          JSR     PC,WTNE         ;WAIT FOR MASTER TO POST STATUS
004632  017737  174532  001416  MOV     @DRVCSR,SAVE    ;READ MASTER STATUS

004640  005737  001456          TST     ERRFLG          ;TEST LOCAL ERROR
004644  001404                  BEQ     111$            ;IF EQ NO ERROR
004646  012777  000004  174514  MOV     #FNCT2,@DRVCSR  ;ERROR:  SET FNCT2
004654  000411                  BR      12$             ;CONTINUE

004656  012777  000002  174504  111$:   MOV     #FNCT1,@DRVCSR  ;NO ERROR:  SET FNCT1
004664  032737  002000  001416  BIT     #DSTATB,SAVE    ;CHECK FOR MASTER ERROR
004672  001402                  BEQ     12$             ;IF EQ NO ERROR
004674  005237  001456          INC     ERRFLG          ;YES, FLAG ERROR

                        ;*******************************************************************************
                                ;CLEAR STATUS SYNCHRONIZATION
                        ;*******************************************************************************

004700  012704  007000  12$:    MOV     #7000,R4        ;LOAD MASK
004704  004737  007726          JSR     PC,WTEQ         ;WAIT FOR MASTER TO CLEAR TRANSFER STATUS

004710  005077  174454          CLR     @DRVCSR         ;ECHO MASTER CLEAR TRANSFER STATUS

004714  005737  001456  16$:    TST     ERRFLG          ;ANY ERRORS?
004720  001402                  BEQ     17$             ;IF NOT

004722  000137  004200          JMP     STST3           ;RESTART TEST

004726  004737  005554  17$:    JSR     PC,RSTVEC       ;GO RESTORE VECTOR
004732  000240                  NOP
004734  000240                  NOP
```

```
                        .SBTTL  STST4   GET ATTN INTERRUPT

                        ;;*****************************************************************
                        ;;*****************************************************************
                        ;SETS UP TO RECEIVE A LARGER BUFFER THAN THE MASTER SENDS.
                        ;MASTER ENDS XFER AND SENDS ATTN INTERRUPT.
                        ;SLAVE CHECKS FOR ATTN TERMINATION.
                        ;IF AN ERROR IS DETECTED THE SLAVE TELLS THEMASTER
                        ;AND RESYNCHS ON TEST.
                        ;IF ALL OK THEN THIS COMPUTER BECOMES MASTER
                        ;AND GOES TO MTST1.
                        ;;*****************************************************************
                        ;;*****************************************************************

                        ;       INITIALIZE TRAP VECTOR
004736                  S4INI:
004736  004737  010072          JSR     PC,CPUHI        ;DISABLE INTERRUPTS
004742  004537  005534          JSR     R5,SETVEC       ;SET VECTOR FOR
004746  005666                  DRVISR                  ;SERVICE ROUTINE

                        ;       CLEAR/INITIALIZE TEST PARAMETERS
004750                  STST4:
004750  005037  001456          CLR     ERRFLG          ;CLEAR ERRORS
004754  005037  001402          CLR     INTFLG          ;CLEAR INTERRUPT FLAG
004760  005077  174404          CLR     @DRVCSR         ;CLEAR STATUS

004764  004537  005606          JSR     R5,CLRBUF       ;CLEAR BUFFER
004770  177730                  -40.

004772  012737  140000  001404  MOV     #140000,TIME    ;SET TIMER
005000  013777  001446  174356  MOV     RPRAM4,@DRVWCR  ;SET WORD COUNT
005006  013777  001450  174352  MOV     RPRAM4+2,@DRVBAR  ;SET BUFFER ADDRESS
005014  004737  010116          JSR     PC,CPULO        ;ALLOW INTERRUPTS

                        ;*****************************************************************
                                        ;TRANSFER SYNCHRONIZATION
                        ;*****************************************************************

005020  012704  007000  1$:     MOV     #7000,R4        ;LOAD MASK
005024  004737  007670          JSR     PC,WTNE         ;WAIT FOR MASTER TO INITIATE TRANSFER
005030  013777  001452  174332  MOV     RPRAM4+4,@DRVCSR  ;SET IE,FNCT2,GO

005036  005737  001402  2$:     TST     INTFLG          ;TEST FOR INTERRUPT
005042  001023                  BNE     3$              ;IF NE YES
005044  005337  001404          DEC     TIME            ;WAIT FOR INTERRUUPT
005050  001372                  BNE     2$              ;UNTIL ZERO
```

```
1458                                    ;       PROCESS INTERRUPT ERROR
1459
1460 005052  004737  010072            20$:    JSR     PC,CPUHI        ;DISABLE INTERRUPTS
1461 005056  017737  174306  001126            MOV     @DRVCSR,$BDDAT  ;READ CSR
1462 005064  042777  000100  174276            BIC     #^O00,@DRVCSR   ;DISABLE IE
1463 005072  012737  005304  001124            MOV     #5304,$GDDAT    ;LOAD EXPECTED STATUS:
1464                                                                    ;STATA,STATC,RDY,IE & FNCT2
1465 005100  013737  001370  001122            MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
1466 005106  104014                            ERROR+14                ;NO ATTN INTR
1467 005110  000442                            BR      6$              ;GO RESYNC ON ERROR
1468
1469 005112  004737  010072            3$:     JSR     PC,CPUHI        ;DISABLE INTERRUPTS
1470 005116  017737  174246  001126            MOV     @DRVCSR,$BDDAT  ;READ STATUS
1471 005124  042777  000100  174236            BIC     #100,@DRVCSR    ;DISABLE IE
1472 005132  012737  005304  001124            MOV     #5304,$GDDAT    ;LOAD EXPECTED STATUS:
1473                                                                    ;STATA,STATC,RDY,IE & FNCT2
1474 005140  023737  001124  001126            CMP     $GDDAT,$BDDAT   ;CORRECT?
1475 005146  001405                            BEQ     4$              ;BR IF SO
1476 005150  013737  001370  001122            MOV     DRVCSR,$BDADR   ;SET UP CSR ADRS
1477 005156  104015                            ERROR+15                ;ATTN STATUS ERROR
1478 005160  000416                            BR      6$              ;GO RESYNC ON ERROR
1479
1480 005162  012737  177770  001124    4$:     MOV     #-8.,$GDDAT     ;LOAD EXPECTED WORD COUNT
1481 005170  017737  174170  001126            MOV     @DRVWCR,$BDDAT  ;READ WCR
1482 005176  023737  001124  001126            CMP     $GDDAT,$BDDAT   ;CHECK WORD COUNT
1483 005204  001406                            BEQ     10$             ;BR IF SO
1484 005206  013737  001364  001122            MOV     DRVWCR,$BDADR   ;SET UP WCR ADRS
1485 005214  104011                            ERROR+11                ;DATO WORD COUNT ERROR
1486
1487 005216  005237  001456            6$:     INC     ERRFLG          ;SET ERROR FLAG
1488
```

```
                        ;*****************************************************************************
                        ;END OF TRANSFER SYNCHRONIZATION
                        ;*****************************************************************************

005222  012704  007000  10$:    MOV     #7000,R4        ;LOAD MASK
005226  004737  007726          JSR     PC,WTEQ         ;WAIT FOR MASTER TO CLEAR CSR

005232  005077  174132          CLR     @DRVCSR         ;ECHO CSR CLEAR TO MASTER

                        ;*****************************************************************************
                        ;TRANSFER STATUS SYNCHRONIZATION
                        ;*****************************************************************************

005236  012704  007000  11$:    MOV     #7000,R4        ;LOAD MASK
005242  004737  007670          JSR     PC,WTNE         ;WAIT FOR MASTER TO POST STATUS
005246  017737  174116  001416  MOV     @DRVCSR,SAVE    ;READ MASTER STATUS

005254  005737  001456          TST     ERRFLG          ;TEST LOCAL ERROR
005260  001404                  BEQ     111$            ;IF EQ NO ERROR
005262  012777  000004  174100  MOV     #FNCT2,@DRVCSR  ;ERROR:  SET FNCT2
005270  000411                  BR      12$             ;CONTINUE

005272  012777  000002  174070  111$:   MOV     #FNCT1,@DRVCSR  ;NO ERROR:  SET FNCT1
005300  032737  002000  001416  BIT     #DSTATB,SAVE    ;CHECK FOR MASTER ERROR
005306  001402                  BEQ     12$             ;IF EQ NO ERROR
005310  005237  001456          INC     ERRFLG          ;YES, FLAG ERROR

                        ;*****************************************************************************
                        ;CLEAR STATUS SYNCHRONIZATION
                        ;*****************************************************************************

005314  012704  007000  12$:    MOV     #7000,R4        ;LOAD MASK
005320  004737  007726          JSR     PC,WTEQ         ;WAIT FOR MASTER TO CLEAR TRANSFER STATUS

005324  005077  174040          CLR     @DRVCSR         ;ECHO MASTER CLEAR TRANSFER STATUS

                        ;       IF ERROR DETECTED, LOOP ON TEST
005330  005737  001456  13$:    TST     ERRFLG          ;ANY ERRORS?
005334  001402                  BEQ     14$             ;IF EQ NO ERROR

005336  000137  004750          JMP     STST4           ;RESTART TEST 4

005342  004737  005554  14$:    JSR     PC,RSTVEC       ;GO RESTORE VECTOR
005346  000240                  NOP
005350  000240                  NOP

005352  104406  EOPT:   CKSWR                          ;GO CHECK SWR
005354  005737  001420          TST     MSTER           ;WERE WE STARTED AS MASTER?
005360  001055                  BNE     EOPTA           ;BR IF NOT
005362  005337  001422          DEC     ICOUNT          ;COUNT TEST PASS
005366  001052                  BNE     EOPTA           ;BR IF NOT DUE FOR 'END PASS' MSG
005370  012737  000370  001422  MOV     #370,ICOUNT     ;RESET PASS COUNT
```

```
                                .SBTTL  END OF PASS ROUTINE

                                ;;*****************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERE'S A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO EOPTA
                                ;;*****************************************************************

005376  000240                $EOP:   NOP
005400  005037  001102                CLR     $TSTNM          ;;ZERO THE TEST NUMBER
005404  005237  001100                INC     $PASS           ;;INCREMENT THE PASS NUMBER
005410  042737  100000  001100        BIC     #100000,$PASS   ;;DON'T ALLOW A NEGATIVE NUMBER
005416  005327                        DEC     (PC)+           ;;LOOP?
005420  000001                $EOPCT: .WORD   1
005422  003022                        BGT     $DOAGN          ;;YES
005424  012737                        MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
005426  000001                $ENDCT: .WORD   1
005430  005420                        $EOPCT
005432  104400                        TYPE                    ;;TYPE "END PASS #"
005434  005477                        $ENDNG
005436  013746  001100                MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
005442  104404                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
005444  104400                        TYPE                    ;;TYPE A NULL CHARACTER
005446  005474                        $ENULL

005450  013700  000042        $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
005454  001405                        BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
005456  000005                        RESET                   ;;CLEAR THE WORLD
005460  004710                $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
005462  000240                        NOP                     ;;SAVE ROOM
005464  000240                        NOP                     ;;FOR
005466  000240                        NOP                     ;;ACT11
005470                          $DOAGN:
005470  000137                        JMP     @(PC)+          ;;RETURN

005472  005514                $RTNAD: .WORD   EOPTA
005474     377     377     000 $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
005477     015     012     105 $ENDNG: .ASCIZ  <15><12>/END PASS #/
005502     116     104     040
005505     120     101     123
005510     123     040     043
005513     000
                                .EVEN

005514  012737  001000  001404  EOPTA:  MOV     #1000,TIME      ;SET UP A COUNT
005522  005337  001404          EOPTB:  DEC     TIME            ;STALL FOR OTHER CPU TO BECOME SLAVE
005526  001375                          BNE     EOPTB           ;UNTIL TIME=0
005530  000137  002100                  JMP     MTST1           ;NOW BECOME MASTER
```

```
                                        .SBTTL  PROGRAM SUBROUTINES

                                        ;;*****************************************************************
                                        ;THIS ROUTINE SETS THE PRIORITY LEVEL FOR NO INTERRUPT -
                                        ;SETS UP THE DRV11B INTERRUPT TO RETURN O. INTERRUPT
                                        ;TO THE ADDRESS INDICATED ((R5)) BY THE CALL +2
                                        ;;*****************************************************************

005534  004737  010072          SETVEC: JSR     PC,CPUHI        ;DISABLE INTERRUPTS
005540  012577  173630                  MOV     (R5)+,@DRVCTO   ;LOAD ISR ADDRESS
005544  012777  000340  173624          MOV     #340,@DRVCT2    ;LOAD ISR PRIORITY
005552  000205                          RTS     R5              ;EXIT

                                        ;;*****************************************************************
                                        ;THIS ROUTINE RESTORES THE DRV11B INTERRUPT VECTOR TO A HALT
                                        ;AND RAISES THE PRIORITY LEVEL
                                        ;;*****************************************************************

005554  004737  010072          RSTVEC: JSR     PC,CPUHI        ;DISABLE INTERRUPTS
005560  013777  001376  173606          MOV     DRVCT2,@DRVCTO  ;POINT VECTOR TO HALT
005566  005077  173604                  CLR     @DRVCT2         ;SET UP HALT
005572  000207                          RTS     PC              ;RETURN

                                        ;;*****************************************************************
                                        ;THIS ROUTINE DELAYS THE PROGRAM TO ALLOW POSSIBLE MEMORY
                                        ;REFRESH PERIODS TO OCCUR IN THE OTHER PROCESSOR WITHOUT LOOSING
                                        ;PROGRAM SYNC.
                                        ;;*****************************************************************

005574  012702  001000          DELAY:  MOV     #1000,R2
005600  005302                  1$:     DEC     R2
005602  001376                          BNE     1$
005604  000207                          RTS     PC
```

```
                        ;;*****************************************************************
                        ;THIS ROUTINE CLEARS THE 'DBUF' BEFORE A 'DATI' XFER
                        ;THE # OF LCOATIONS IN 'DBUF' TO BE CLEARED IS SPECIFIED BY
                        ;THE VALUE IN THE CALL +2 - WHEN ALL CLEARED THE RETURN IS TO
                        ;THE CALL +4
                        ;;*****************************************************************

005606  012500          CLRBUF: MOV     (R5)+,R0        ;GET THE LOC COUNT
005610  012701  011632          MOV     #DBUF,R1        ;GET 1ST ADRS
005614  005021          1$:     CLR     (R1)+           ;CLR MEM LOC
005616  005200                  INC     R0              ;COUNT LOC
005620  001375                  BNE     1$              ;UNTIL ALL DONE
005622  000205                  RTS     R5              ;EXIT

                        ;;*****************************************************************
                        ;THIS ROUTINE LOADS 'DBUF' WITH A FLOATING ZERO/ONE PATTERN
                        ;THE # OF LOCATIONS IN 'DBUF' TO BE LOADED IS SPECIFIED BY
                        ;THE VALUE IN THE CALL +2 - WHEN ALL LOADED THE RETURN IS TO CALL +4
                        ;;*****************************************************************

005624  012500          LDBUF:  MOV     (R5)+,R0        ;GET LOC COUNT
005626  012701  011632          MOV     #DBUF,R1        ;GET 1ST ADRS
005632  012702  177776  1$:     MOV     #177776,R2      ;SET UP FLOATING ZERO PTRN
005636  005003                  CLR     R3              ;R3 SAYS WHEN TO SHIFT PTRN
005640  010221          2$:     MOV     R2,(R1)+        ;LOAD MEM WITH PTRN
005642  005200                  INC     R0              ;COUNT LOC
005644  001001                  BNE     3$              ;BR IF MORE
005646  000205                  RTS     R5              ;EXIT
005650  005102          3$:     COM     R2              ;CONVERT PTRN TO FLOATING 1
005652  005103                  COM     R3              ;SHOULD WE SHIFT?
005654  001371                  BNE     2$              ;BR IF NOT - THIS WILL BE A FLOATING 1
005656  006302                  ASL     R2              ;FLOAT ZERO LEFT
005660  005202                  INC     R2              ;KEEP LSB SET
005662  103363                  BCC     1$              ;GO RESET FLOATING PATRN
005664  000765                  BR      2$              ;GO LOAD NEXT PATRN

                        ;;*****************************************************************
                        ;THIS ROUTINE WILL INDICATE THAT AN INTERRUPT HAS OCCURED.
                        ;;*****************************************************************

005666  005237  001402  DRVISR: INC     INTFLG          ;BUMP FLAG
005672  000002                  RTI                     ;AND RETURN
```

```
                                .SBTTL  SYSMAC ROUTINES
                                .SBTTL  TYPE ROUTINE

                                ;;******************************************************************
                                ;ROUTINE TO TYPE ASCIZ MESSAGE, MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;NOTE1:          $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;NOTE2:          $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;NOTE3:          $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;
                                ;CALL:
                                ;1)  USING A TRAP INSTRUCTION
                                ;       TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;OR
                                ;       TYPE
                                ;       MESADR
                                ;
005674  105737  001157  $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
005700  100002                  BPL     1$              ;;BR IF YES
005702  000000                  HALT                    ;;HALT HERE IF NO TERMINAL
005704  000407                  BR      3$              ;;LEAVE
005706  010046          1$:     MOV     R0,-(SP)        ;;SAVE R0
005710  017600  000002          MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
005714  112046          2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
005716  001005                  BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
005720  005726                  TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
005722  012600          60$:    MOV     (SP)+,R0        ;;RESTORE R0
005724  062716  000002  3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
005730  000002                  RTI                     ;;RETURN
005732  122716  000011  4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
005736  001430                  BEQ     8$
005740  122716  000200          CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
005744  001006                  BNE     5$
005746  005726                  TST     (SP)+           ;;POP  <CR><LF> EQUIV
005750  104400                  TYPE                    ;;TYPE A CR AND LF
005752  001165                  $CRLF
005754  105037  006110          CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
005760  000755                  BR      2$              ;;GET NEXT CHARACTER
005762  004737  006044  5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
005766  123726  001156  6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS?
005772  001350                  BNE     2$              ;;IF NO GO GET NEXT CHAR.
005774  013746  001154          MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                        ;;AND THE NULL CHAR.
006000  105366  000001  7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
006004  002770                  BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
006006  004737  006044          JSR     PC,$TYPEC       ;;GO TYPE A NULL
006012  105337  006110          DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
006016  000770                  BR      7$              ;;LOOP
```

```
1721                                    ;HORIZONTAL TAB PROCESSOR
1722
1723 006020  112716  000040            8$:     MOVB    #' ,(SP)        ;REPLACE TAB WITH SPACE
1724 006024  004737  006044            9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
1725 006030  132737  000007  006110            BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
1726 006036  001372                            BNE     9$              ;;TAB STOP
1727 006040  005726                            TST     (SP)+           ;;POP SPACE OFF STACK
1728 006042  000724                            BR      2$              ;;GEET NEXT CHARACTER
1729 006044  105777  173100            $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
1730 006050  100375                            BPL     $TYPEC
1731 006052  116677  000002  173072            MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
1732 006060  122766  000015  000002            CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
1733 006066  001003                            BNE     1$              ;;BRANCH IF NO
1734 006070  105037  006110                    CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
1735 006074  000406                            BR      $TYPEX          ;;EXIT
1736 006076  122766  000012  000002  1$:      CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
1737 006104  001402                            BEQ     $TYPEX          ;;BRANCH IF YES
1738 006106  105227                            INCB    (PC)+           ;;COUNT THE CHARACTER
1739 006110  000000            $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
1740 006112  000207            $TYPEX: RTS     PC
1741
```

```
                        .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
                        ;;*****************************************************************
                        ;THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                        ;OCTAL (ASCII) NUMBER AND TYPE IT.
                        ;$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                        ;CALL:
                        ;       MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                        ;       TYPOS                   ;;CALL FOR TYPEOUT
                        ;       .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                        ;       .BYTE   M               ;;M=1 OR 0
                        ;                               ;;1=TYPE LEADING ZEROS
                        ;                               ;;0=SUPPRESS LEADING ZEROS
                        ;
                        ;$TYPEON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                        ;$TYPOS OR $TYPOC
                        ;CALL:
                        ;       MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                        ;       TYPON                   ;;CALL FOR TYPEOUT
                        ;
                        ;$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                        ;       CALL:
                        ;       MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                        ;       TYPOC                   ;;CALL FOR TYPEOUT
                        
006114  017646  000000  $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
006120  116637  000001  006337 MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
006126  112637  006341         MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
006132  062716  000002         ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
006136  000406                 BR      $TYPON
006140  112737  000001  006337 $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
006146  112737  000006  006341         MOVB    #6,$OMODE+1     ;;SET FOR SIZ(6) DIGITS
006154  112737  000005  006336 $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
006162  010346                 MOV     R3,-(SP)        ;;SAVE R3
006164  010446                 MOV     R4,-(SP)        ;;SAVE R4
006166  010546                 MOV     R5,-(SP)        ;;SAVE R5
006170  113704  006341         MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
006174  005404                 NEG     R4
006176  062704  000006         ADD     #6,R4           ;;SUBTRACT IT FOR MAX, ALLOWED
006202  110437  006340         MOVB    R4,$OMODE       ;;SAVE IT FOR USE
006206  113704  006337         MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
006212  016605  000012         MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
006216  005003                 CLR     R3              ;;CLEAR THE OUTPUT WORD
```

```
1787 006220  006105                  1$:   ROL   R5              ;;ROTATE MSB INTO "C"
1788 006222  000404                        BR    3$              ;;GO DO MSB
1789 006224  006105                  2$:   ROL   R5              ;;FORM THIS DIGIT
1790 006226  006105                        ROL   R5
1791 006230  006105                        ROL   R5
1792 006232  010503                        MOV   R5,R3
1793 006234  006103                  3$:   ROL   R3              ;;GET LSB OF THIS DIGIT
1794 006236  105337  006340               DECB  $OMODE          ;;TYPE THIS DIGIT?
1795 006242  100016                        BPL   7$              ;;BR IF NO
1796 006244  042703  177770               BIC   #177770,R3      ;;GET RID OF JUNK
1797 006250  001002                        BNE   4$              ;;TEST FOR 0
1798 006252  005704                        TST   R4              ;;SUPPRESS THIS 0?
1799 006254  001403                        BEQ   5$              ;;BR IF YES
1800 006256  005204                  4$:   INC   R4              ;;DON'T SUPPRESS ANYMORE 0'S
1801 006260  052703  000060               BIS   #'0,R3          ;;MAKE THIS DIGIT ASCII
1802 006264  052703  000040         5$:   BIS   #' ,R3          ;;MAKE ASCII IF NOT ALREADY
1803 006270  110337  006334               MOVB  R3,8$           ;;SAVE FOR TYPING
1804 006274  104400                        TYPE                  ;;GO TYPE THIS DIGIT
1805 006276  006334                        8$
1806 006300  105337  006336          7$:   DECB  $OCNT           ;;COUNT BY 1
1807 006304  003347                        BGT   2$              ;;BR IF MORE TO DO
1808 006306  002402                        BLT   6$              ;;BR IF DONE
1809 006310  005204                        INC   R4              ;;INSURE LAST DIGIT ISN'T A BLANK
1810 006312  000744                        BR    2$              ;;GO DO THE LAST DIGIT
1811 006314  012605                  6$:   MOV   (SP)+,R5        ;;RESTORE R5
1812 006316  012604                        MOV   (SP)+,R4        ;;RESTORE R4
1813 006320  012603                        MOV   (SP)+,R3        ;;RESTORE R3
1814 006322  016666  000002  000004       MOV   2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
1815 006330  012616                        MOV   (SP)+,(SP)
1816 006332  000002                        RTI                   ;;RETURN
1817 006334     000               8$:     .BYTE 0               ;;STORAGE FOR ASCII DIGIT
1818 006335     000                       .BYTE 0               ;;TERMINATOR FOR TYPE ROUTINE
1819 006336     000               $OCNT:  .BYTE 0               ;;OCTAL DIGIT COUNTER
1820 006337     000               $OFILL: .BYTE                 ;;ZERO FILL SWITCH
1821 006340  000000               $OMODE: .WORD 0               ;;NUMBER OF DIGITS TO TYPE
1822
```

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

006342                          $TYPDS:
006342  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
006344  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
006346  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
006350  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
006352  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
006354  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
006360  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
006364  100004                         BPL     1$              ;;BR IF INPUT IS POS.
006366  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
006370  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
006376  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
006400  012703  006556                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
006404  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
006410  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
006412  016001  006546                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
006416  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
006420  002402                         BLT     4$              ;;BR IF DONE
006422  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
006424  000774                         BR      3$
006426  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
006430  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
006432  001002                         BNE     5$              ;;FALL THROUGH IF 0
006434  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
006436  100407                         BMI     7$              ;;BR IF YES
006440  106316                 5$:     ASLB    (SP)            ;;MSD?
006442  103003                         BCC     6$              ;;BR IF NO
006444  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
006452  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
```

```
1866 006456  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
1867 006462  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
1868 006464  005720                          TST     (R0)+           ;;JUST INCREMENTING
1869 006466  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
1870 006472  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
1871 006474  003002                          BGT     8$              ;;GO TO EXIT
1872 006476  010502                          MOV     R5,R2           ;;GET THE LSD
1873 006500  000764                          BR      6$              ;;GO CHANGE TO ASCII
1874 006502  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
1875 006504  100003                          BPL     9$              ;;BR IF NO
1876 006506  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
1877 006514  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
1878 006516  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
1879 006520  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
1880 006522  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
1881 006524  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
1882 006526  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
1883 006530  104400                          TYPE                    ;;NOW TYPE THE NUMBER
1884 006532  006556                          $DBLK
1885 006534  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
1886 006542  012616                          MOV     (SP)+,(SP)
1887 006544  000002                          RTI                     ;;RETURN TO USER
1888 006546  023420                  $DTBL:  10000.
1889 006550  001750                          1000.
1890 006552  000144                          100.
1891 006554  000012                          10.
1892 006556                          $DBLK:  .BLKW   4
1893
```

```
                                .SBTTL  ERROR HANDLER ROUTINE

                                ;;**********************************************************************
                                ;THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                ;AND GO TO SWRCK ON ERROR
                                ;THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;SW15=1          HALT ON ERROR
                                ;SW13=1          INHIBIT ERROR TYPEOUTS
                                ;SW10=1          BELL ON ERROR
                                ;CALL
                                ;       ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
006566                          $ERROR:
006566  104406                        CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
006570  104406                        CKSWR                   ;;GO LOOK FOR SWR CHANGE
006572  105237  001103        7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
006576  001775                        BEQ     7$              ;;DON'T LET THE FLAG TO TO ZERO
006600  013777  001102  172334        MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
006606  032777  002000  172324        BIT     #BIT10,@SWR     ;;BELL ON ERROR?
006614  001402                        BEQ     1$              ;;NO - SKIP
006616  104400                        TYPE                    ;;RING BELL
006620  001160                        $BELL
006622  005237  001112        1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
006626  011637  001116                MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
006632  162737  000002  001116        SUB     #2,$ERRPC
006640  117737  172252  001114        MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
006646  032777  020000  172264        BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
006654  001004                        BNE     20$             ;;SKIP TYPEOUTS
006656  004737  006702                JSR     PC,SWRCK        ;;GO TO USER ERROR ROUTINE
006662  104400                        TYPE
006664  001165                        $CRLF
006666                          20$:
006666  005777  172246        2$:     TST     @SWR            ;;HALT ON ERROR
006672  100002                        BPL     3$              ;;SKIP IF CONTINUE
006674  000000                        HALT                    ;;HALT ON ERROR!
006676  104406                        CKSWR                   ;;TEST FOR CHANGE IN SOFT/SWR
006700                          3$:
006700  000002                        RTI                     ;;RETURN
                                ;;**********************************************************************
                                ;GO TYPE ERROR
                                ;GO UPDATE SOFTWARE SWR IF 'CNTRL/G'
                                ;;**********************************************************************

006702  004737  006712        SWRCK:  JSR     PC,$ERRTYP      ;GO TYPE ERROR
006706  104406                        CKSWR                   ;GO LOOK FOR SWR CHANGE
006710  000207                        RTS     PC              ;RETURN TO ERROR HANDLER
```

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

006712                  $ERRTYP:
006712  104400                  TYPE                    ;;"CARRIAGE RETURN" & "LINE FEED"
006714  001165                  $CRLF
006716  010046                  MOV     R0,-(SP)        ;;SAVE R0
006720  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
006722  153700  001114          BISB    @#$ITEMB,R0
006726  001004                  BNE     1$              ;;IT ITEM NUMBER IS ZERO, JUST
                                                        ;;TYPE THE PC OF THE ERROR
006730  013746  001116          MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                        ;;ERROR ADDRESS
006734  104401                  TYPOC                   ;;GO TYPE--OCTAL ASCII (ALL DIGITS)
006736  000426                  BR      6$              ;;GET OUT
006740  005300          1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
006742  006300                  ASL     R0              ;;WORK FOR THE ERROR TABLE
006744  006300                  ASL     R0
006746  006300                  ASL     R0
006750  062700  001170          ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
006754  012037  006764          MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
006760  001404                  BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
006762  104400                  TYPE                    ;;TYPE THE "ERROR MESSAGE"
006764  000000          2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
006766  104400                  TYPE                    ;;"CARRIAGE RETURN" & "LINE FEED"
006770  001165                  $CRLF
006772  012037  007002  3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
006776  001404                  BEQ     5$              ;;SKIP TYPEOUT IF 0
007000  104400                  TYPE                    ;;TYPE THE "DATA HEADER"
007002  000000          4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
007004  104400                  TYPE                    ;;"CARRIAGE RETURN" & "LINE FEED"
007006  001165                  $CRLF
007010  011000          5$:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
007012  001004                  BNE     7$              ;;GO TYPE THE DATA
007014  012600          6$:     MOV     (SP)+,R0        ;;RESTORE R0
007016  104400                  TYPE                    ;;"CARRIAGE RETURN" & "LINE FEED"
007020  001165                  $CRLF
007022  000207                  RTS     PC              ;;RETURN
007024                  7$:
007024  013046                  MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
007026  104401                  TYPOC                   ;;GO TYPE--OCTAL ASCII (ALL DIGITS)
007030  005710                  TST     (R0)            ;;IS THERE ANOTHER NUMBER?
007032  001770                  BEQ     6$              ;;BR IF NO
007034  104400                  TYPE                    ;;TYPE TWO(2) SPACES
007036  007042                  8$
007040  000771                  BR      7$              ;;LOOP
007042    040     040     000   8$:     .ASCIZ  /  /            ;;TWO (2) SPACES
                                .EVEN
```

```
                                .SBTTL  TTY INPUT ROUTINE
                                .ENABL LSB

                                ;;**********************************************************************
                                ;;**********************************************************************
                                ;SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                ;ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                ;SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                ;WHEN OPERATING IN TTY FLAG MODE.

007046  022737  000176  001140  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
007054  001074                          BNE     15$             ;;BRANCH IF NO
007056  105777  172062                  TSTB    @$TKS           ;;CHAR THERE?
007062  100071                          BPL     15$             ;;IF NO, DON'T WAIT AROUND
007064  117746  172056                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
007070  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
007074  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
007100  001062                          BNE     15$             ;;NO, RETURN TO USER
007102  123727  001134  000001          CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
007110  001456                          BEQ     15$             ;;BRANCH IF YES
007112  104400                          TYPE                    ;;ECHO THE CONTROL-G (-G)
007114  007573                          $CNTLG
007116  104400                  $GTSWR: TYPE                    ;;TYPE CURRENT CONTENTS
007120  007600                          $MSWR
007122  013746  000176                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
007126  104401                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
007130  104400                          TYPE                    ;;PROMPT FOR NEW SWR
007132  007611                          $MNEW
007134  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
007136  005046                          CLR     -(SP)   ;;THE NEW SWR
007140  105777  172000          7$:     TSTB    @$TKS           ;;CHAR THERE?
007144  100375                          BPL     7$              ;;IF NOT TRY AGAIN
007146  117746  171774                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
007152  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
007156  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
007162  001005                          BNE     10$             ;;BRANCH IF NOT
007164  104400                          TYPE                    ;;YES,ECHO CONTROL-U (^U)
007166  007566                          $CNTLU
007170  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
007174  000757                          BR      19$             ;;LET'S TRY IT AGAIN
007176  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
007202  001022                          BNE     16$             ;;BRANCH IF NO
007204  005766  000004                  TST     4(SP)           ;;YES,IS IT THE FIRST CHAR?
007210  001403                          BEQ     11$             ;;BRANCH IF YES
007212  016677  000002  171720          MOV     2(SP),@SWR      ;;SAVE NEW SWR
007220  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
007224  104400                  14$:    TYPE                    ;;ECHO <CR> AND <LF>
007226  001165                          $CRLF
007230  123727  001135  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
007236  001003                          BNE     15$             ;;BRANCH IF NOT
007240  012777  000100  171676          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
007246  000002                  15$:    RTI                     ;;RETURN
```

```
2050 007250  004737  006044          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
2051 007254  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
2052 007260  002420                          BLT     18$             ;;BRANCH IF YES
2053 007262  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
2054 007266  003015                          BGT     18$             ;;BRANCH IF YES
2055 007270  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
2056 007274  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
2057 007300  001403                          BEQ     17$             ;;BRANCH IF YES
2058 007302  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
2059 007304  006316                          ASL     (SP)            ;;      CHAR OVER TO MAKE
2060 007306  006316                          ASL     (SP)            ;;      ROOM FOR NEW ONE.
2061 007310  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
2062 007314  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
2063 007320  000707                          BR      7$              ;;GET THE NEXT ONE
2064 007322  104400                  18$:    TYPE                    ;;TYPE ?<CR><LF>
2065 007324  001164                          $QUES
2066 007326  000720                          BR      20$             ;;SIMULATE CONTROL^U
2067                                 .DSABL  LSB
2068
```

```
                        ;;*****************************************************************
                        ;THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                        ;CALL:
                        ;       RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
                        ;       RETURN HERE             ;;CHARACTER IS ON THE STACK
                        ;                               ;;WITH PARITY BIT STRIPPED OFF
                        ;
007330  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
007332  016666  000004  000002  MOV     4(SP),2(SP)     ;;SAVE THE PS
007340  105777  171600  1$:     TSTB    @$TKS           ;;WAIT FOR
007344  100375                  BPL     1$              ;;A CHARACTER
007346  117766  171574  000004  MOVB    @$TKB,4(SP)     ;;READ THE TTY
007354  042766  177600  000004  BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
007362  026627  000004  000023  CMP     4(SP),#23       ;;IS IT A CONTROL-S?
007370  001013                  BNE     3$              ;;BRANCH IF NO
007372  105777  171550  2$:     TSTB    @$TKB           ;;WAIT FOR A CHARACTER
007376  100375                  BPL     2$              ;;LOOP UNTIL ITS THERE
007400  117746  171542          MOVB    @$TKB,-(SP)     ;;GET CHARACTER
007404  042716  177600          BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
007410  022627  000021          CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
007414  001366                  BNE     2$              ;;IF NOT DISCARD IT
007416  000750                  BR      1$              ;;YES, RESUME
007420  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
007426  002407                  BLT     4$              ;;BRANCH IF YES
007430  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
007436  003003                  BGT     4$              ;;BRANCH IF YES
007440  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
007446  000002          4$:     RTI                     ;;GU BACK TO USER
2100
```

```
                        ;;*****************************************************************
                        ;THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                        ;CALL:
                        ;       RDLIN                   ;;INPUT A STRING FROM THE TTY
                        ;       RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                        ;                               ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
007450  010346          $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
007452  012703  007556  1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
007456  022703  007566  2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
007462  101405                  BLOS    4$              ;;BR IF YES
007464  104407                  RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
007466  112613                  MOVB    (SP)+,(R3)      ;;GET CHARACTER
007470  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
007474  001003                  BNE     3$              ;;SKIP IF NOT
007476  104400                  4$:     TYPE                    ;;TYPE A '?'
007500  001164                          $QUES
007502  000763                  BR      1$              ;;CLEAR THE BUFFER AND LOOP
007504  111337  007554          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
007510  104400                  TYPE
007512  007554                  9$
007514  122723  000015          CMPB    #15,(R3)+       ;;CHECK FOR RETURN
007520  001356                  BNE     2$              ;;LOOP IF NOT RETURN
007522  105063  177777          CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
007526  104400                  TYPE                    ;;TYPE A LINE FEED
007530  001166                  $LF
007532  012603                  MOV     (SP)+,R3        ;;RESTORE R3
007534  011646                  MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
007536  016666  000004  000002  MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
007544  012766  007556  000004  MOV     #$TTYIN,4(SP)
007552  000002                  RTI                     ;;RETURN
007554     000                  9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR, TO TYPE
007555     000                          .BYTE   0               ;;TERMINATOR
007556                          $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
007566     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U'
007571     012     000
007573     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL ''G''
007576     012     000
007600     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
007603     127     122     040
007606     075     040     000
007611     040     040     116  $MNEW:  .ASCIZ  /  NEW = /
007614     105     127     040
007617     075     040     000

                        .EVEN
```

```
                        .SBTTL  TRAP DECODER

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

007622  010046          $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
007624  016600  000002          MOV     2(SP),R0        ;;GET TRAP ADDRESS
007630  005740                  TST     -(R0)           ;;BACKUP BY 2
007632  111000                  MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRP
007634  006300                  ASL     R0              ;;POSITION FOR INDEXING
007636  016000  007644          MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
007642  000200                  RTS     R0              ;;GO TO ROUTINE

                        .SBTTL  TRAP TABLE

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

                        ;       ROUTINE
                        ;       -------
007644                  $TRPAD:
005674                          $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
006140                          $TYPOC  ;;CALL=TYPOC    TRAP+1(104401)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
006114                          $TYPOS  ;;CALL=TYPOS    TRAP+2(104402)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
006154                          $TYPON  ;;CALL=TYPON    TRAP+3(104403)  TYPE OCTAL NUMBER (AS PER LAST CALL)
006342                          $TYPDS  ;;CALL=TYPDS    TRAP+4(104404)  TYPE DECIMAL NUMBER (WITH SIGN)
007116                          $GTSWR  ;;CALL=GTSWR    TRAP+5(104405)  GET SOFT-SWR SETTING
007046                          $CKSWR  ;;CALL=CKSWR    TRAP+6(104406)  TEST FOR CHANGE IN SOFT-SWR
007330                          $RDCHR  ;;CALL=RDCHR    TRAP+7(104407)  TTY TYPEIN CHARACTER ROUTINE
007450                          $RDLIN  ;;CALL=RDLIN    TRAP+10(104410) TTY TYPEIN STRING ROUTINE
010004                          RESYNC  ;;CALL=RESYNC   TRAP+11(104411) PROGRAM RESYNC

                        104400  TYPE=TRAP+0
                        104401  TYPOC=TRAP+1
                        104402  TYPOS=TRAP+2
                        104403  TYPON=TRAP+3
                        104404  TYPDS=TRAP+4
                        104405  GTSWR=TRAP+5
                        104406  CKSWR=TRAP+6
                        104407  RDCHR=TRAP+7
                        104410  RDLIN=TRAP+10
                        104411  RSYNC=TRAP+11
```

```
                        .SBTTL  INTERBOARD COMMUNICATION SUBROUTINES
                        ;;*************************************************************************
                        ;;                      ;WTNE
                        ;;*************************************************************************
007670                  WTNE:                           ;WAIT FOR BITS SET
007670  012737  000004  001406          MOV     #4,ABORT        ;SETUP ABORT TIMER
007676  005037  001404  10$:     CLR     TIME            ;CLEAR SUB LOOP COUNTER
                                                        ;INNER LOOP
007702  030477  171462  15$:     BIT     R4,@DRVCSR      ;WAIT FOR BITS SET
007706  001035                  BNE     WTEXI           ;YES:  CONTINUE
007710  005337  001404          DEC     TIME            ;DECR SUB LOOP COUNTER
007714  001372                  BNE     15$             ;CONTINUE UNTIL ZERO
                                                        ;OUTER LOOP
007716  005337  001406          DEC     ABORT           ;DECR MAIN LOOP COUNTER
007722  00136                   BNE     10$             ;CONTINUE UNTIL ZERO
007724  00041                   BR      WTABO           ;TIMEOUT:  ABORT PROGRAM
                        ;;*************************************************************************
                        ;;                      ;WTEQ
                        ;;*************************************************************************
007726                  WTEQ:                           ;WAIT FOR BITS CLEAR
007726  012737  000004  001406          MOV     #4,ABORT        ;SETUP ABORT TIMER
                                                        ;INNER LOOP
007734  005037  001404  10$:     CLR     TIME            ;CLEAR SUB LOOP COUNTER
007740  030477  171424  15$:     BIT     R4,@DRVCSR      ;WAIT FOR BITS CLEAR
007744  001416                  BEQ     WTEXI           ;YES:  CONTINUE
007746  005337  001404          DEC     TIME            ;DECR SUB LOOP COUNTER
007752  001372                  BNE     15$             ;CONTINUE UNTIL ZERO
                                                        ;OUTER LOOP
007754  005337  001406          DEC     ABORT           ;DECR MAIN LOOP COUNTER
007760  001365                  BNE     10$             ;CONTINUE UNTIL ZERO
007762  000400                  BR      WTABO           ;TIMEOUT:  ABORT PROGRAM
                                                        ;SYNC LOST, RESTART
007764  011637  001412  WTABO:  MOV     (SP),$TSTPC     ;SAVE PC
007770  017737  171374  001414  MOV     @DRVCSR,$ERRST  ;SAVE CSR
007776  104017                  ERROR+17                ;ALERT OPERATOR THAT WE'RE STUCK
010000  104411                  RSYNC                   ;AND RESYNC
                                                        ;PROGRAM SYNCHRONIZED
010002  000207          WTEXI:  RTS     PC              ;RETURN
```

```
                        .SBTTL  INTERPROCESSOR PROGRAM RESYNCHRONIZATION ROUTINE
                        ;;*****************************************************************
                        ;RESYNC
                        ;;*****************************************************************

010004                  RESYNC:
010004  004737  010072          JSR     PC,CPUHI        ;
010010  012706  001100          MOV     #STACK,SP       ;;INITIALIZE STACK POINTER
010014  005737  001420          TST     MSTER           ;;WAS THIS CPU STARTED AS MASTER?
010020  001404                  BEQ     20$             ;;YES:  SETUP DELAY FOR MASTER
010022  012737  000014  001406  10$:    MOV     #14,ABORT       ;;SLAVE CPU:  WAIT FOR MASTER TO
010030  000403                  BR      WTSYNC          ;;REACH ITS RESYNC ROUTINE

010032  012737  000030  001406  20$:    MOV     #30,ABORT       ;;MASTER CPU:  WAIT FOR SLAVE

010040                  WTSYNC:
010040  005037  001404          10$:    CLR     TIME            ;;CLEAR SUB LOOP COUNTER
010044  005337  001404          15$:    DEC     TIME            ;;DECR SUB LOOP COUNTER
010050  001375                  BNE     15$             ;;CONTINUE UNTIL ZERO
010052  005337  001406          DEC     ABORT           ;;DECR MAIN LOOP COUNTER
010056  001370                  BNE     10$             ;;CONTINUE UNTIL ZERO

010060  000005                  RESET                   ;;RESET PROCESSOR
010062  104400  010217          TYPE    ,SYNMSG         ;;TYPE THE MESSAGE
010066  000137  001776          JMP     SYNCST          ;;AND RESTART

                        ;;*****************************************************************
                        ;CPUHI
                        ;;*****************************************************************
010072  005737  001454  CPUHI:  TST     LSI             ;IS THIS CPU AN LSI?
010076  001403                  BEQ     1$              ;NO:  UNIBUS
010100  106427  000340          MTPS    #340            ;SET HIGHEST PRIORTY (LSI)
010104  000207                  RTS     PC
010106  012737  000340  177776  1$:     MOV     #340,PS         ;SET PRI07, IN UNIBUS
010114  000207                  RTS     PC

                        ;;*****************************************************************
                        ;CPULO
                        ;;*****************************************************************
010116  005737  001454  CPULO:  TST     LSI             ;IS THIS CPU AN LSI?
010122  001403                  BEQ     1$              ;NO:  UNIBUS
010124  106427  000000          MTPS    #0              ;SET LOWEST PRIORITY (LSI)
010130  000207                  RTS     PC
010132  012737  000000  177776  1$:     MOV     #0,PS           ;SET PRI00, IN UNIBUS
010140  000207                  RTS     PC
```

```
                                .SBTTL  ASCII MESSAGES
                                .NLIST  BEX

010142  200                     TITLE:  .ASCII  <CRLF>
010143  103  132  104                   .ASCII  \CZDAVA0 DAV11-A/B INTERPROCESSOR EXERCISER\
010215  200  000                        .ASCIZ  <CRLF>

010217  200  052  122           SYNMSG: .ASCIZ  <CRLF>/*RESYNC.../<CRLF>

010234  124  105  123           EM1:    .ASCII  /TEST 1    STATUS: MASTER/<CRLF>
010265  123  114  101                   .ASCIZ  /SLAVE FAILED TO ECHO DBR CONTENTS/
010327  124  105  123           EM2:    .ASCII  /TEST 2    STATUS: MASTER/<CRLF>
010360  123  114  101                   .ASCIZ  /SLAVE FAILED TO ECHO 'STAT' BITS/
010421  123  124  101           EM3:    .ASCII  /STATUS: MASTER/<CRLF>
010440  106  101  111                   .ASCIZ  /FAILED TO INTR ON A 'DATI'/
010473  123  124  101           EM4:    .ASCII  /STATUS: MASTER/<CRLF>
010512  123  124  101                   .ASCIZ  /STATUS ERROR ON 'DATI'/
010541  123  124  101           EM5:    .ASCII  /STATUS: MASTER/<CRLF>
010560  127  117  122                   .ASCIZ  /WORD COUNT ERROR ON 'DATI'/
010613  123  124  101           EM6:    .ASCII  /STATUS: MASTER/<CRLF>
010632  102  125  106                   .ASCIZ  /BUFFER ADRS ERROR ON 'DATI'/
010666  123  124  101           EM7:    .ASCII  /STATUS: SLAVE/<CRLF>
010704  106  101  111                   .ASCIZ  /FAILED TO INTR ON 'DATO'/
010735  123  124  101           EM10:   .ASCII  /STATUS: SLAVE/<CRLF>
010753  123  124  101                   .ASCIZ  /STATUS ERROR ON 'DATO'/
011002  123  124  101           EM11:   .ASCII  /STATUS: SLAVE/<CRLF>
011020  127  117  122                   .ASCIZ  /WORD COUNT ERROR ON 'DATO'/
011053  123  124  101           EM12:   .ASCII  /STATUS: SLAVE/<CRLF>
011071  102  125  106                   .ASCIZ  /BUFFER ADRS ERROR ON 'DATO'/
011125  123  124  101           EM13:   .ASCII  /STATUS: SLAVE/<CRLF>
011143  104  101  124                   .ASCIZ  /DATA ERROR ON 'DATO'/
011170  123  124  101           EM14:   .ASCII  /STATUS: SLAVE/<CRLF>
011206  116  117  040                   .ASCIZ  /NO ATTN INTR/
011223  123  124  101           EM15:   .ASCII  /STATUS: SLAVE/<CRLF>
011241  101  124  124                   .ASCIZ  /ATTN STATUS ERROR/
011263  123  124  101           EM16:   .ASCII  /STATUS: MASTER/<CRLF>
011302  103  101  116                   .ASCII    ANNOT START COMMUNICATION WITH SLAVE-/
011350  127  101  111                   .ASCIZ  , \ITING FOR DSTATC/<CRLF>
011374  123  124  125           EM17:   .ASCIZ  ,  UCK WAITING FOR COMPANION INTERLOCK/<CRLF>

011443  105  122  122           DH1:    .ASCIZ  /ERRPC   BUSADR  EXPCT   RCVD/
011500  105  122  122           DH2:    .ASCIZ  /ERRPC   MEMADR  EXPCT   RCVD/
011535  105  122  122           DH3:    .ASCIZ  /ERRPC   DRVCSR/
                                .EVEN

011554  001116  001122  001124  DT1:    $ERRPC,$BDADR,$GDDAT,$BDDAT,0
011566  001116  001414  000000  DT2:    $ERRPC,$ERRST,0
011574  001412  001414  000000  DT3:    $TSTPC,$ERRST,0
```

```
                                .SBTTL  PROGRAM AREAS
                                ;;*****************************************************************
                                ;'PATCH' IS A PATCH AREA FOR TEMPORARY CODE.
                                ;;*****************************************************************
011602                          PATCH:  .BLKW   12.

                                ;;*****************************************************************
                                ;'DBUF' IS THE WORKING AREA IN MEM FOR ALL NPR OPERATIONS.
                                ;;*****************************************************************
011632  000000                  DBUF:   0               ;1ST ADRS OF DATA BUFFER
        000001                          .END
```

```
ABORT   001406          DSTATC= 001000          PR3   = 000140          SW13  = 020000          $EOP    005376
BIT0  = 000001          DSWR  = 177570          PR4   = 000200          SW14  = 040000          $EOPCT  005420
BIT00 = 000001          DT1     011554          PR5   = 000240          SW15  = 100000          $ERFLG  001103
BIT01 = 000002          DT2     011566          PR6   = 000300          SW2   = 000004          $ERMAX  001115
BIT02 = 000004          DT3     011574          PR7   = 000340          SW3   = 000010          $ERROR  006566
BIT03 = 000010          EMTVEC= 000030          PS    = 177776          SW4   = 000020          $ERRPC  001116
BIT04 = 000020          EM1     010234          PSW   = 177776          SW5   = 000040          $ERRST  001414
BIT05 = 000040          EM10    010735          PWRVEC= 000024          SW6   = 000100          $ERRTB  001170
BIT06 = 000100          EM11    011002          RDCHR = 104407          SW7   = 000200          $ERRTY  006712
BIT07 = 000200          EM12    011053          RDLIN = 104410          SW8   = 000400          $ERTTL  001112
BIT08 = 000400          EM13    011125          RESVEC= 000010          SW9   = 001000          $FILLC  001156
BIT09 = 001000          EM14    011170          RESYNC  010004          SYNCST  001776          $FILLS  001155
BIT1  = 000002          EM15    011223          RPRAM   001432          SYNMSG  010217          $GDADR  001120
BIT10 = 002000          EM16    011263          RPRAM4  001446          S3INI   004166          $GDDAT  001124
BIT11 = 004000          EM17    011374          RSTVEC  005554          S4INI   004736          $GET42  005450
BIT12 = 010000          EM2     010327          RSYNC = 104411          TBITVE= 000014          $GTSWR  007116
BIT13 = 020000          EM3     010421          R6    =%000006          TEMP    001410          $ICNT   001104
BIT14 = 040000          EM4     010473          R7    =%000007          TIME    001404          $INTAG  001135
BIT15 = 100000          EM5     010541          SAVE    001416          TITLE   010142          $ITEMB  001114
BIT2  = 000004          EM6     010613          SCOPE = 000004          TKVEC = 000060          $LF     001166
BIT3  = 000010          EM7     010666          SETUP2  001676          TPVEC = 000064          $LPADR  001106
BIT4  = 000020          EOPT    005352          SETUP3  001722          TRAPVE= 000034          $LPERR  001110
BIT5  = 000040          EOPTA   005514          SETVEC  005534          TRTVEC= 000014          $MNEW   007611
BIT6  = 000100          EOPTB   005522          SINIT1  003656          TYPDS = 104404          $MSWR   007600
BIT7  = 000200          ERRFLG  001456          SL1STR  003750          TYPE  = 104400          $NULL   001154
BIT8  = 000400          ERROR = 104000          STACK = 001100          TYPOC = 104401          $OCNT   006336
BIT9  = 001000          ERRVEC= 000004          START   001474          TYPON = 104403          $OFILL  006337
BPTVEC= 000014          FNCT1 = 000002          START1  001460          TYPOS = 104402          $OMODE  006340
CKSWR = 104406          FNCT2 = 000004          START2  001466          WTABO   007764          $PASS   001100
CLRBUF  005606          FNCT3 = 000010          STAT    001400          WTEQ    007726          $QUES   001164
CPUHI   010072          GTSWR = 104405          STKLMT= 177774          WTEXI   010002          $RDCHR  007330
CPULO   010116          HT    = 000011          STST1   003734          WTINE   007670          $RDLIN  007450
CR    = 000015          ICOUNT  001422          STST2   004026          WTSYNC  010040          $RTNAD  005472
CRLF  = 000200          INTFLG  001402          STST3   004200          XPRAM   001424          $SWR  = 122000
DBUF    011632          IOTVEC= 000020          STST4   004750          XPRAM4  001440          $TKB    001146
DDISP = 177570          LDBUF   005624          SWR     001140          $AUTOB  001134          $TKS    001144
DELAY   005574          LF    = 000012          SWRCK   006702          $BDADR  001122          $TN   = 000001
DH1     011443          LSI     001454          SWREG   000176          $BDDAT  001126          $TPB    001152
DH2     011500          MINIT1  002014          SW0   = 000001          $BELL   001160          $TPFLG  001157
DH3     011535          MSTER   001420          SW00  = 000001          $CHARC  006110          $TPS    001150
DISPLA  001142          MTPS  = 106427          SW01  = 000002          $CKSWR  007046          $TRAP   007622
DISPRE  000174          MTST1   002100          SW02  = 000004          $CMTAG  001100          $TRPAD  007644
DRVADR  001360          MTST2   002272          SW03  = 000010          $CM3  = 000000          $TSTNM  001102
DRVBAR  001366          MTST3   002514          SW04  = 000020          $CNTLG  007573          $TSTPC  001412
DRVCSR  001370          MTST4   003200          SW05  = 000040          $CNTLU  007566          $TTYIN  007556
DRVCT0  001374          M3INI   002502          SW06  = 000100          $CRLF   001165          $TYPDS  006342
DRVCT2  001376          M4INI   003166          SW07  = 000200          $DBLK   006556          $TYPE   005674
DRVDBR  001372          PATCH   011602          SW08  = 000400          $DOAGN  005470          $TYPEC  006044
DRVECT  001362          PIRQ  = 177772          SW09  = 001000          $DTBL   006546          $TYPEX  006112
DRVISR  005666          PIRQVE= 000240          SW1   = 000002          $ENDAD  005460          $TYPOC  006140
DRVWCR  001364          PR0   = 000000          SW10  = 002000          $ENDCT  005426          $TYPON  006154
DSTATA= 004000          PR1   = 000040          SW11  = 004000          $ENDNG  005477          $TYPOS  006114
DSTATB= 002000          PR2   = 000100          SW12  = 010000          $ENULL  005474
```

```
. ABS.  011634  000
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  12735 WORDS  ( 50 PAGES)

DYNAMIC MEMORY:  14114 WORDS  ( 54 PAGES)
ELAPSED TIME:  00:00:38
ZDAVA0.BIN/DS:GBL/EN:ABS:AMA,ZDAVA0/CR:SYM/-SP=[6,1]SYSDGN,[6,4]ZDAVA0.P11
```

ZDAVA0 CREATED BY MACRO ON 6-DEC-82 AT 12:16 PAGE 1
CZDAVA.P11 06-DEC-82 12:20 SYMBOL CROSS REFERENCE CREF V01 SEQ 0064

SYMBOL	VALUE	REFERENCES
ABORT	001406	#24-577 *27-698 *27-705 *64-2195 *64-2204 *64-2214 *64-2222 *65-2247 *65-2250 *65-2256
BIT0	= 000001	#21-437
BIT00	= 000001	#21-437 21-437 33-942 36-1070 43-1332
BIT01	= 000002	#21-437 21-437
BIT02	= 000004	#21-437 21-437
BIT03	= 000010	#21-437 21-437
BIT04	= 000020	#21-437 21-437
BIT05	= 000040	#21-437 21-437
BIT06	= 000100	#21-437 21-437
BIT07	= 000200	#21-437 21-437
BIT08	= 000400	#21-437 21-437
BIT09	= 001000	#21-437 21-437
BIT1	= 000002	#21-437
BIT10	= 002000	#21-437 57-1913
BIT11	= 004000	#21-437
BIT12	= 010000	#21-437
BIT13	= 020000	#21-437 57-1921
BIT14	= 040000	#21-437
BIT15	= 100000	#21-437
BIT2	= 000004	#21-437
BIT3	= 000010	#21-437
BIT4	= 000020	#21-437
BIT5	= 000040	#21-437
BIT6	= 000100	#21-437
BIT7	= 000200	#21-437
BIT8	= 000400	#21-437
BIT9	= 001000	#21-437
BPTVEC	= 000014	#21-437
CKSWR	= 104406	47-1536 57-1908 57-1909 57-1930 57-1939 #63-2183
CLRBUF	005606	42-1273 45-1436 #50-1634
CPUHI	010072	27-686 27-695 31-865 32-880 32-904 33-916 35-1010 35-1035 36-1046 38-1137 40-1201 41-1246 42-1263 42-1296 43-1308 45-1426 46-1460 46-1469 49-1599 49-1609 65-2243 #65-2266
CPULO	010116	31-860 32-894 35-1025 41-1241 42-1279 45-1442 #65-2276
CR	= 000015	#21-437 52-1732
CRLF	= 000200	#21-437 51-1702 66-2287 66-2289 66-2291 66-2291 66-2293 66-2295 66-2297 66-2299 66-2301 66-2303 66-2305 66-2307 66-2309 66-2311 66-2313 66-2315 66-2317 66-2319 66-2321 66-2322
DBUF	011632	24-586 24-590 24-594 24-598 50-1635 50-1648 #67-2343
DDISP	= 177570	#21-437 22-460 25-632
DELAY	005574	28-741 31-863 32-887 33-950 35-1017 37-1084 41-1244 #49-1620
DH1	011443	23-463 23-469 23-475 23-481 23-487 23-493 23-499 23-505 23-511 23-517 23-529 23-535 #66-2324
DH2	011500	23-523 #66-2325
DH3	011535	23-541 23-547 #66-2326
DISPLA	001142	#22-460 *25-632 *25-640 57-1912
DISPRE	000174	#21-449 25-640
DRVADR	001360	#24-554 25-653
DRVBAR	001366	#24-563 32-893 33-941 33-946 35-1021 36-1069 36-1073 42-1278 43-1331 43-1335 45-1441
DRVCSR	001370	#24-564 27-697 27-701 27-708 28-736 29-761 29-772 29-782 30-802

SYMBOL		VALUE	REFERENCES								
			30-810	30-819	30-826	31-844	31-862	32-885	32-895	32-905	32-906
			32-909	33-917	33-918	33-924	34-957	34-964	34-966	34-975	34-984
			35-1015	35-1026	35-1036	35-1037	35-1040	36-1047	36-1048	36-1053	36-1077
			37-1085	37-1092	37-1094	37-1103	37-1112	38-1139	38-1140	38-1143	38-1146
			38-1147	39-1159	39-1179	39-1190	40-1210	40-1224	40-1227	41-1243	42-1270
			42-1287	42-1297	42-1298	42-1301	43-1309	43-1310	43-1315	44-1373	44-1381
			44-1385	44-1388	44-1400	45-1434	45-1450	46-1461	46-1462	46-1465	46-1470
			46-1471	46-1476	47-1497	47-1505	47-1509	47-1512	47-1524	64-2199	64-2217
			64-2229								
DRVCT0		001374	#24-569	26-661	49-1600	49-1610					
DRVCT2		001376	#24-570	26-666	49-1601	49-1610	49-1611				
DRVDBR		001372	#24-565	26-659	28-728	28-730	28-742	29-781	31-843	39-1170	39-1171
			40-1214								
DRVECT		001362	#24-558	26-662							
DRVISR		005666	31-858	32-882	35-1012	41-1239	42-1265	45-1428	#50-1667		
DRVWCR		001364	#24-562	25-652	31-861	32-892	33-929	33-932	35-1020	36-1058	36-1060
			41-1242	42-1277	43-1320	43-1322	45-1440	46-1481	46-1484		
DSTATA	=	004000	#21-445								
DSTATB	=	002000	#21-446	34-976	37-1104	44-1389	47-1513				
DSTATC	=	001000	#21-447	27-701	28-738	29-763	29-774	29-784	38-1140	38-1143	38-1147
			39-1165	39-1181	42-1285						
DSWR	=	177570	#21-437	22-460	25-631						
DT1		011554	23-464	23-470	23-476	23-482	23-488	23-494	23-500	23-506	23-512
			23-518	23-524	23-530	23-536	#66-2329				
DT2		011566	23-542	#66-2330							
DT3		011574	23-548	#66-2331							
EMTVEC	=	000030	#21-437	*25-628	*25-623						
EM1		010234	23-462	#66-2293							
EM10		010735	23-504	#66-2307							
EM11		011002	23-510	#66-2309							
EM12		011053	23-516	#66-2311							
EM13		011125	23-522	#66-2313							
EM14		011170	23-528	#66-2315							
EM15		011223	23-534	#66-2317							
EM16		011263	23-540	#66-2319							
EM17		011374	23-546	#66-2322							
EM2		010327	23-468	#66-2295							
EM3		010421	23-474	#66-2297							
EM4		010473	23-480	#66-2299							
EM5		010541	23-486	#66-2301							
EM6		010613	23-492	#66-2303							
EM7		010666	23-498	#66-2305							
EOPT		005352	#47-1536								
EOPTA		005514	47-1538	47-1540	48-1580	#48-1585					
EOPTB		005522	#48-1586	48-1587							
ERRFLG		001456	#24-602	*32-884	*33-949	34-962	*34-978	34-991	*35-1014	*36-1076	37-1090
			*37-1106	37-1119	*42-1269	*44-1364	44-1383	*44-1391	44-1402	*45-1432	*46-1487
			47-1507	*47-1515	47-1527						
ERROR	=	104000	#21-437	27-709	28-746	30-830	32-910	33-925	33-933	33-947	35-1041
			36-1054	36-1061	36-1074	42-1302	43-1316	43-1323	43-1336	44-1362	46-1466
			46-1477	46-1485	64-2230						
ERRVEC	=	000004	#21-437	25-629	*25-630	*25-643	*25-651				

SYMBOL VALUE REFERENCES

```
FNCT1   = 000002  #21-442  28-736  29-761  29-772  29-782  34-966  37-1094  38-1146  39-1179
                  39-1190  44-1388  47-1512
FNCT2   = 000004  #21-443  34-964  37-1092  44-1385  47-1509
FNCT3   = 000010  #21-444  36-1077
GNS     = ******   21-449   21-449
GTSWR   = 104405   26-677  #63-2182
HT      = 000011  #21-437   51-1700
ICOUNT    001422  #24-583  *26-681  *47-1539  *47-1541
INTFLG    001402  #24-575  *32-886   32-897  *35-1016  35-1028  *42-1271  42-1289  *45-1433  45-1452
                  *50-1667
IOTVEC  = 000020  #21-437
LDBUF     005624   32-889  #50-1647
LH      = 000012  #21-437   52-1736
LSI       001454  #24-601  *25-644  *25-646   31-854   41-1236  65-2266  65-2276
MINIT1    002014   27-688  #27-695
MSTER     001420  #24-582  *25-607  *25-610   27-687   47-1537  65-2245
MTPS    = 106427  #21-439
MTST1     002100   27-702  #28-725   48-1588
MTST2     002272  #30-801   30-831
MTST3     002514  #32-884   34-994
MTST4     003200  #35-1014  37-1122
M3INI     002502  #32-880
M4INI     003166  #35-1010
PATCH     011602  #67-2338
PIRQ    = 177772  #21-437
PIRQVE  = 000240  #21-437
PR0     = 000000  #21-437
PR1     = 000040  #21-437
PR2     = 000100  #21-437
PR3     = 000140  #21-437
PR4     = 000200  #21-437
PR5     = 000240  #21-437
PR6     = 000300  #21-437
PR7     = 000340  #21-437
PS      = 177776  #21-437   21-437   25-645  *65-2270  *65-2280
PSW     = 177776  #21-437
PWRVEC  = 000024  #21-437
RDCHR   = 104407   62-2112  #63-2184
RDLIN   = 104410  #63-2185
RESVEC  = 000010  #21-437
RESYNC    010004   63-2175  #65-2242
RPRAM     001432  #24-589   42-1277  42-1278  42-1287  43-1326  43-1327  43-1339  43-1340
RPRAM4    001446  #24-597   45-1440  45-1441  45-1450
RSTVEC    005554   31-866   34-996   37-1124  41-1247  44-1407  47-1532  #49-1609
RSYNC   = 104411   27-710  #63-2186  64-2231
R6      =%000006  #21-437   21-437  *25-615  *25-616   25-617
R7      =%000007  #21-437   21-437
SAVE      001416  #24-581  *34-975   34-976  *37-1103  37-1104  *39-1170  39-1171  39-1172  *40-1224
                  *40-1225  40-1227  *44-1381  44-1389  *47-1505  47-1513
SCOPE   = 000004  #21-437
SETUP2    001676  #26-657   26-660
SETUP3    001722  #26-664   26-667
```

```
SYMBOL  VALUE          REFERENCES
SETVEC    005534        31-857     32-881     35-1011    41-1238    42-1264    45-1427    #49-1599
SINIT1    003656        27-689    #38-1137
SL1STR    003750        38-1150   #39-1170
STACK   = 001100       #21-437     25-619     26-679     27-696     38-1138    65-2244
START     001474        25-608    #25-612
START1    001460        21-451    #25-607
START2    001466        21-452    #25-610
STAT      001400       #24-574
STKLMT  = 177774       #21-437
STST1     003734        37-1125   #39-1159    39-1184
STST2     004026       #40-1201
STST3     004200       #42-1268    44-1405
STST4     004750       #45-1431    47-1530
SWR       001140       #22-460     25-617    *25-631     25-633    *25-639     26-675     57-1913    57-1921    57-1927
                        59-2006    59-2040
SWRCK     006702        57-1923   #57-1938
SWREG     000176       #21-449     25-639     26-675     59-2006    59-2020
SW0     = 000001       #21-437
SW00    = 000001       #21-437    21-437
SW01    = 000002       #21-437    21-437
SW02    = 000004       #21-437    21-437
SW03    = 000010       #21-437    21-437
SW04    = 000020       #21-437    21-437
SW05    = 000040       #21-437    21-437
SW06    = 000100       #21-437    21-437
SW07    = 000200       #21-437    21-437
SW08    = 000400       #21-437    21-437
SW09    = 001000       #21-437    21-437
SW1     = 000002       #21-437
SW10    = 002000       #21-437
SW11    = 004000       #21-437
SW12    = 010000       #21-437
SW13    = 020000       #21-437
SW14    = 040000       #21-437
SW15    = 100000       #21-437
SW2     = 000004       #21-437
SW3     = 000010       #21-437
SW4     = 000020       #21-437
SW5     = 000040       #21-437
SW6     = 000100       #21-437
SW7     = 000200       #21-437
SW8     = 000400       #21-437
SW9     = 001000       #21-437
SYNCST    001776       #27-686     65-2261
SYNMSG    010217        65-2260   #66-2291
S3INI     004166       #42-1262
S4INI     004736       #45-1425
TBITVE  = 000014       #21-437
TEMP      001410       #24-578
TIME      001404       #24-576    *27-699    *27-703    *32-891    *32-899    *35-1019   *35-1030   *42-1276   *42-1291
                       *45-1439   *45-1454   *48-1585   *48-1586   *64-2197   *64-2201   *64-2216   *64-2215   *65-2253
                       *65-2254
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SYMBOL  VALUE          REFERENCES
TITLE     010142        26-672    #66-2287
TKVEC   = 000060       #21-437
TPVEC   = 000064       #21-437
TRAPVE  = 000034       #21-437    *25-624    *25-625
TRTVEC  = 000014       #21-437
TYPDS   = 104404        48-1566   #63-2181
TYPE    = 104400        26-672     48-1563    48-1567    51-1705    54-1804    56-1883    57-1915    57-1924    58-1950
                        58-1968    58-1970    58-1974    58-1976    58-1981    58-1989    59-2016    59-2018    59-2022
                        59-2032    59-2042    60-2064    62-2116    62-2120    62-2125   #63-2177    65-2260
TYPOC   = 104401        58-1959    58-1986    59-2021   #63-2178
TYPON   = 104403       #63-2180
TYPOS   = 104402       #63-2179
WTABO     007764        64-2207    64-2225   #64-2228
WTEQ      007726        29-764     29-775     30-813     31-847     34-960     34-987     37-1088    37-1115    39-1182
                        40-1208    44-1371    44-1398    47-1495    47-1522   #64-2213
WTEXI     010002        64-2200    64-2218   #64-2234
WTNE      007670        28-739     29-785     30-822     34-973     37-1101    39-1166    40-1222    42-1286    44-1380
                        45-1449    47-1504   #64-2194
WTSYNC    010040        65-2248   #65-2252
XPRAM     001424       #24-585     32-892     32-893     32-895     33-936     33-937     36-1064    36-1065
XPRAM4    001440       #24-593     35-1020    35-1021    35-1026
$AUTOB    001134       #22-460     59-2014
$BDADR    001122       #22-460    *28-730    *30-802    *32-909    *33-924    *33-932    *33-946    *35-1040   *36-1053
                       *36-1060   *36-1073   *42-1301   *43-1315   *43-1322   *43-1335   *44-1360   *46-1465   *46-1476
                       *46-1484    66-2329
$BDDAT    001126       #22-460    *28-742     28-743    *30-826     30-827    *32-905    *33-917     33-921    *33-929
                       *33-941    *33-942     33-943    *35-1036   *36-1047    36-1051   *36-1058   *36-1069   *36-1070
                        36-1071   *42-1297   *43-1309    43-1313   *43-1320   *43-1331   *43-1332    43-1333   *44-1359
                       *46-1461   *46-1470    46-1474   *46-1481    46-1482    66-2329
$BELL     001160       #22-460     57-1916
$CHARC    006110       *51-1707   *51-1717    52-1725   *52-1734   #52-1739
$CKSWR    007046       #59-2006    63-2172
$CMTAG    001100       #22-460     25-615
$CM3    = 000000       #22-460     22-460
$CNTLG    007573        59-2017   #62-2136
$CNTLU    007566        59-2033   #62-2135
$CRLF     001165       #22-460     51-1706    57-1925    58-1951    58-1971    58-1977    58-1982    59-2043
$DBLK     006556        55-1847    56-1884   #56-1892
$DOAGN    005470        48-1559    48-1571   #48-1577
$DTBL     006546        55-1850   #56-1888
$ENDAD    005460       #48-1573
$ENDCT    005426       #48-1561
$ENDNG    005477        48-1564   #48-1582
$ENULL    005474        48-1568   #48-1581
$EOP      005376       #48-1553
$EOPCT    005420       #48-1558    48-1562
$ERFLG    001103       #22-460    *57-1910
$ERMAX    001115       #22-460
$ERROR    006566        25-622    #57-1907
$ERRPC    001116       #22-460    *57-1918   *57-1919    57-1920    58-1957    66-2329    66-2330
$ERRST    001414       #24-580    *27-708    *64-2229    66-2330    66-2331
$ERRTB    001170       #23-460     58-1965
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SYMBOL	VALUE	REFERENCES
$ERRTY	006712	57-1938 #58-1949
$ERTTL	001112	#22-460 *57-1917
$FILLC	001156	#22-460 51-1710
$FILLS	001155	#22-460
$GDADR	001120	#22-460
$GDDAT	001124	#22-460 *28-729 28-743 *30-804 30-827 *30-833 *32-907 *33-919 33-921 *33-928 *33-936 *33-940 33-943 *35-1038 *36-1049 36-1051 *36-1057 *36-1064 *36-1068 36-1071 *42-1299 *43-1311 43-1313 *43-1319 *43-1326 *43-1330 43-1333 *44-1361 *46-1463 *46-1472 46-1474 *46-1480 46-1482 66-2329
$GET42	005450	#48-1570
$GTSWR	007116	#59-2018 63-2171
$ICNT	001104	#22-460
$INTAG	001135	#22-460 59-2044
$ITEMB	001114	#22-460 *57-1920 58-1954
$LF	001166	#22-460 62-2126
$LPADR	001106	#22-460
$LPERR	001110	#22-460
$MNEW	007611	59-2023 #62-2138
$MSWR	007600	59-2019 #62-2137
$NULL	001154	#22-460 51-1712
$OCNT	006336	*53-1774 *54-1806 #54-1819
$OFILL	006337	*53-1768 *53-1772 53-1782 #54-1820
$OMODE	006340	*53-1769 *53-1773 53-1778 *53-1781 *54-1794 #54-1821
$PASS	001100	#22-460 *48-1555 *48-1556 48-1565
$QUES	001164	#22-460 60-2065 62-2117
$RDCHR	007330	#61-2079 63-2173
$RDLIN	007450	#62-2108 63-2174
$RTNAD	005472	#48-1580
$SWR	= 122000	#21-430 22-460 22-460 22-460
$TKB	001146	#22-460 59-2010 59-2028 61-2083 61-2087 61-2089
$TKS	001144	#22-460 59-2008 59-2026 59-2046 61-2081
$TN	= 000001	#21-429
$TPB	001152	#22-460 52-1731
$TPFLG	001157	#22-460 51-1688
$TPS	001150	#22-460 52-1729
$TRAP	007622	25-624 #63-2150
$TRPAD	007644	63-2155 #63-2165
$TSTNM	001102	#22-460 *48-1554 57-1912
$TSTPC	001412	#24-579 *64-2228 66-2331
$TTYIN	007556	62-2109 62-2110 62-2130 #62-2134
$TYPDS	006342	#55-1835 63-2170
$TYPE	005674	#51-1688 63-2166
$TYPEC	006044	51-1709 51-1716 52-1724 #52-1729 52-1730 60-2050
$TYPEX	006112	52-1735 52-1737 #52-1740
$TYPOC	006140	#53-1772 63-2167
$TYPON	006154	53-1771 #53-1774 63-2169
$TYPOS	006114	#53-1767 63-2168