PDP11

UNIBUS SYSTEMS EXERCISER

CZKUAD0

DIAGNOSTIC

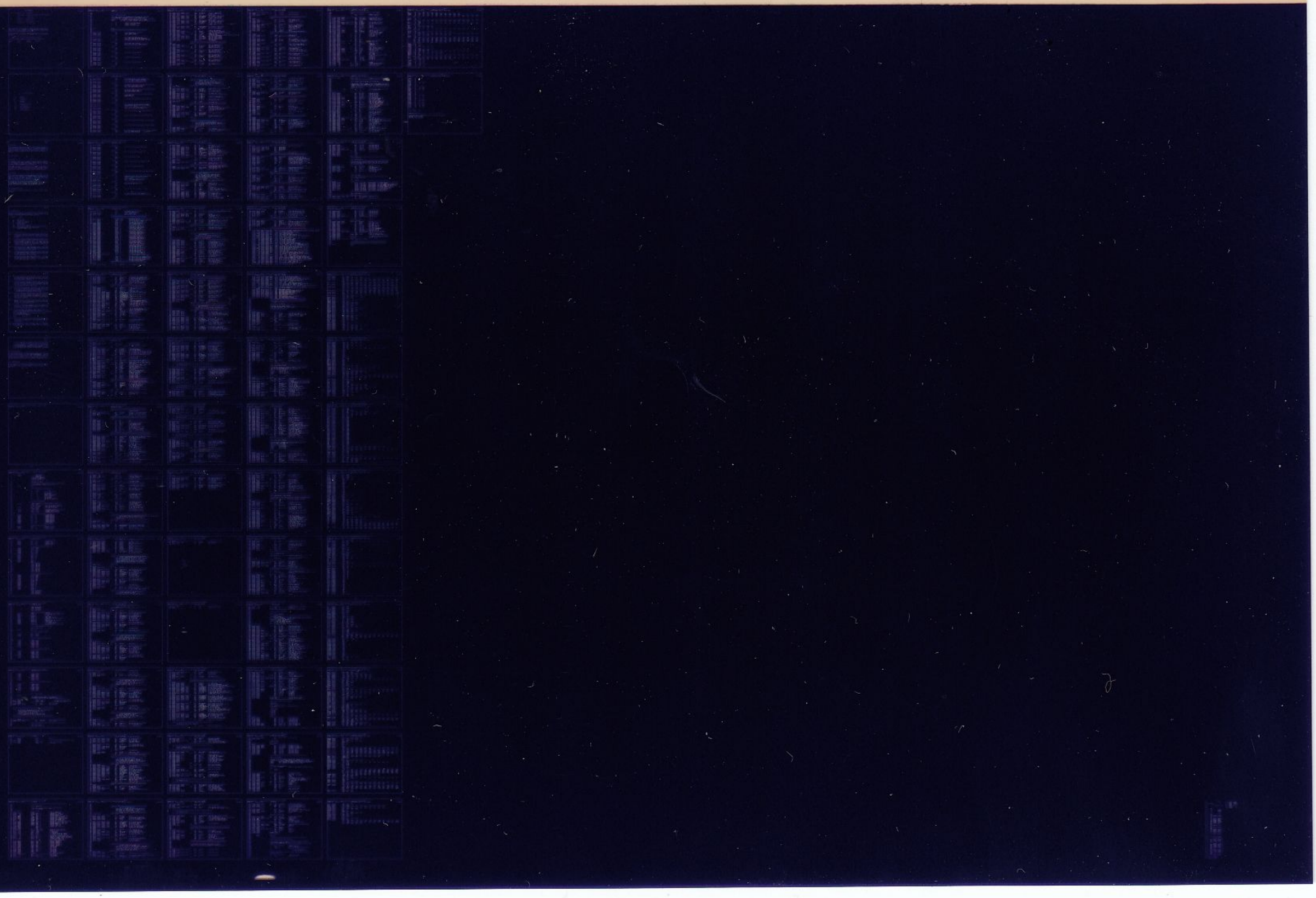
AH-8856D-MC

FICHE 1 OF 1

JUL 1978

digital

MADE IN USA



Identification

Product Code: AC-8855D-MC

Product Name: CZKUADO Unibus Systems Exerciser Diagnostic

Date : 1-APRIL-78

Maintainer: Diagnostic Group

Author: Manuel Soares

MODIFIED BY: BILL SCHLITZKUS

SEQ 0002

Table of Contents

1.0 ABSTRACT

This program was created to test PDP-11's CPU interface circuitry. It uses the Unibus Exerciser(s) (UBE) to insure proper operation by simulating peripherals which would require the 11-CPU to produce the necessary signals. It should be noted that the UBE is a powerful tool and if it is not programmed correctly could cause various problems on the Bus.

2.0 REQUIREMENTS

2.1 Hardware

This program assumes the following in proper working condition: 1. The Unibus, 2. Memory (8K minimum), and 3. UBE(s) (4 maximum). If a fourth UBE is being used, its time delay should be set at 100us to prevent latency problems in one of the tests.

With two or more UBE(s), all should have W1 jumpers except the one furthest electrically from the CPU. If there are more than 4 UBE(s) on the Unibus the program is not responsible for any problems which might occur , since it is programmed to handle a maximum of only 4.

2.2 Software

After loading the program the starting address must be 200, so that the first time through, the available UBE(s) are determined. In addition if one or more UBE(s) are added or removed, the program again must be started at 200. Otherwise, to avoid duplicating some printouts, the program can be restarted at address 220.

****
A SOFTWARE HALT CAN BE CAUSED BY DEPRESSING CONTROL-H ON THE CONSOLE.
IF THE PROGRAM IS HALTED THIS WAY, AND THE PROGRAM IS RESTARTED,
DEPRESS ANY CONSOLE KEY TO REMOVE THE SOFTWARE HALT CONDITION.
****

3.0 PROGRAM DESCRIPTION

This program was assembled with MACY11 using PDP-11 Maindec Sysmac package .

3.1 Switch Options

The use of thes program on processors having a software switch register necessitates operator interaction: the operator must set up location 176 with the switch register values desired .

Switch	Use
15	Halt on Error
14	Loop on test
13	Inhibit error typeouts
11	Inhibit iterations
10	Bell on error
9	Loop on error
8	Loop on test in SWR<5:0>

NOTE: If you wish to inhibit all typing except "end of pass" you must put down switch 7, after loading 200.

6 WHEN SET, INHIBIT TEST 14

3.2 Test 1 through Test 16

TEST 1 - No Bus grants issued with processor at higher priority than bus request. This test is to insure that any request is not honored as long as the processor is at the same or higher priority.

TEST 2 - Issuing of non-processor grants and arbitration tests. This test will request on NPR through BR4 levels with the processor status initially at level 7 and make sure the device exercises an NPG to do a fun 1-dati, then the requests will be repeated while sequentially lowering the processor status from 7 to 0 to allow arbitration of all requests and the issuing of NPG.

TEST 3 - Issuing of Bus grant 7 and arbitration tests. This test will arbitrate for a BG7. The requests will be on levels BR7 thru BR4, doing fun 1-dati transfers, and the processor status lowered sequentially from 7 to 0.

TEST 4 - Issuing of Bus grant 6 and arbitration tests. This test will arbitrate for a BG6, the requests will be on levels BR6 thru BR4, doing fun 1-dati transfers, and the processor status lowered sequentially from 6 to 0.

TEST 5 - Issuing of Bus grant 5 and arbitration tests. This test will arbitrate for a BG5, the requests will be on levels BR5 thru BR4, doing fun 1-dati transfers, and the processor status lowered sequentially from 5 to 0.

SEQ 0005

TEST 6 - Issuing of Bus grant 4 and arbitration tests. This test will arbitrate for a BG4, the requests will be on level BR4, doing func 1-dati transfers, and the processor status lowered sequentially from 4 to 0.

TEST 7 - CPU test for no sack time out. This test will check that the CPU times out and drops a grant if no sack signal is received. If the CPU time out is inoperative, the Bus exerciser will time out and send the sack signal to prevent a Bus hang and set an error flag in CR2.

TEST 10 - CPU test for receiving sack. This test is to insure that the CPU can receive the sack signal; The time delay will be set on device 1 and several dati transfers made. If there is not bus late error, the CPU received sack correctly. It is assumed that dev 1 time delay is set for 10us.

TEST 11 - Passing of grants and interrupt test. This test will set off all available devices simultaneously whose only functions will be to interrupt, the requests will all be at level 7 so that the device closest to tha CPU should receive BG7 first and interrupt first, the next closest should interrupt next and so on.

TEST 12 - Address lines (14 - 17) check. This test will check Bus address lines 14 thru 17 by doing a fun 1-dati-npr to those addresses. If the addresses don't exist the interrupt routine will ignore any no ssyn error.

TEST 13 - CPU test for ACLO/DCLO sequence. This test checks the assertion of ACLO and DCLO and that the CPU traps to the correct service routine. If this program is running under ACT11 this test will be skipped.

TEST 14 - Parity error test. This test will cause parity error and checks that the CPU traps to the correct vector.
THIS TEST IS SKIPPED ON MACHINES THAT DON'T HAVE THE SXT INSTRUCTION (EG., 11/05 AND 11/20).
THIS TEST SHOULD BE DESELECTED IF THE MEMORY PARITY OPTION IS NOT PRESENT OR NOT ENABLED.

SW06=1 INHIBIT TEST 14

TEST 15 - Multitransfers I. This test will cause any Bus exercisers, up to 4, to create a lot of traffic on the Bus and check that the CPU can handle it; all devices are set off simultaneously.

TEST 16 - Multitransfers II. This test will have the available exercisers doing various transfers and/or interrupts at different request levels to further check CPU handling capabilities.

TEST 17 - DUMMY END OF PROGRAM. This portion of the program is just to see if "H" has been typed on the console to cause a program halt. If there is no "H" the program continues by jumping to $EOP (end-of-pass routine).
IF THE PROGRAM IS HALTED THIS WAY, AND THE PROGRAM IS RESTARTED, DEPRESS ANY CONSOLE KEY TO REMOVE THE SOFTWARE HALT CONDITION.

3.3 Sysmac Routines

The 'END OF PASS ROUTINE' thru 'Power Down and Up Routines', as listed in the program listing, are the Sysmac package macros. They are called out in the source program, some with arguments and some without, and are expanded in the listing. Some macros are necessary for the operation of others, so for a complete explanation of all available Sysmac Macros see PDP-11 Maindec Sysmac Package (DZQAC-B-D).

4.0 ERROR REPORTING

The minimum amount of information given when an error occurs is the PC of the error call and the Test number in which it occurred. Other pertinent data will by typed out depending on the test being run at that time.

```
     1
```

```
                        $SWR=167400
                        $SWRMK=300
                .TITLE  UNIBUS EXERCISER
                ;*COPYRIGHT (C) MARCH, 75
                ;*DIGITAL EQUIPMENT CORP.
                ;*MAYNARD, MASS. 01754
                ;*
                ;*PROGRAM BY M.SOARES
                ;*
                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                ;*PACKAGE (MAINDEC-11-DZQAC-B1),AUG 29,1975.
                ;*
                $TN=1

                .SBTTL  OPERATIONAL SWITCH SETTINGS
                ;*
                ;*      SWITCH                  USE
                ;*      ------          --------------------
                ;*        15            HALT ON ERROR
                ;*        14            LOOP ON TEST
                ;*        13            INHIBIT ERROR TYPEOUTS
                ;*        11            INHIBIT ITERATIONS
                ;*        10            BELL ON ERROR
                ;*         9            LOOP ON ERROR
                ;*         8            LOOP ON TEST IN SWR<5:0>
                ;*          6           WHEN SET, INHIBIT TEST 14

                .SBTTL  BASIC DEFINITIONS

                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100          STACK=  1100
                .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL
177776          PS=     177776          ;;PROCESSOR STATUS WORD
                .EQUIV  PS,PSW
177774          STKLMT= 177774          ;;STACK LIMIT REGISTER
177772          PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570          DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570          DDISP=  177570          ;;HARDWARE DISPLAY REGISTER

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

                ;*PRIORITY LEVEL DEFINITIONS
000000          PR0=    0               ;;PRIORITY LEVEL 0
000040          PR1=    40              ;;PRIORITY LEVEL 1
000100          PR2=    100             ;;PRIORITY LEVEL 2
```

```
                        PR3=    140             ;;PRIORITY LEVEL 3
                        PR4=    200             ;;PRIORITY LEVEL 4
                        PR5=    240             ;;PRIORITY LEVEL 5
                        PR6=    300             ;;PRIORITY LEVEL 6
                        PR7=    340             ;;PRIORITY LEVEL 7

                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
                        SW15=   100000
                        SW14=   40000
                        SW13=   20000
                        SW12=   10000
                        SW11=   4000
                        SW10=   2000
                        SW09=   1000
                        SW08=   400
                        SW07=   200
                        SW06=   100
                        SW05=   40
                        SW04=   20
                        SW03=   10
                        SW02=   4
                        SW01=   2
                        SW00=   1
                        .EQUIV  SW09,SW9
                        .EQUIV  SW08,SW8
                        .EQUIV  SW07,SW7
                        .EQUIV  SW06,SW6
                        .EQUIV  SW05,SW5
                        .EQUIV  SW04,SW4
                        .EQUIV  SW03,SW3
                        .EQUIV  SW02,SW2
                        .EQUIV  SW01,SW1
                        .EQUIV  SW00,SW0

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

```
                        .EQUIV  BIT04,BIT4
                        .EQUIV  BIT03,BIT3
                        .EQUIV  BIT02,BIT2
                        .EQUIV  BIT01,BIT1
                        .EQUIV  BIT00,BIT0

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

                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*KT11 VECTOR ADDRESS

000250                  MMVEC=  250

                        ;*KT11 STATUS REGISTER ADDRESSES

177572                  SR0=    177572
177574                  SR1=    177574
177576                  SR2=    177576
172516                  SR3=    172516

                        ;*USER "I" PAGE DESCRIPTOR REGISTERS

177600                  UIPDR0= 177600
177602                  UIPDR1= 177602
177604                  UIPDR2= 177604
177606                  UIPDR3= 177606
177610                  UIPDR4= 177610
177612                  UIPDR5= 177612
177614                  UIPDR6= 177614
177616                  UIPDR7= 177616

                        ;*USER "I" PAGE ADDRESS REGISTERS

177640                  UIPAR0= 177640
177642                  UIPAR1= 177642
177644                  UIPAR2= 177644
177646                  UIPAR3= 177646
177650                  UIPAR4= 177650
177652                  UIPAR5= 177652
177654                  UIPAR6= 177654
177656                  UIPAR7= 177656

                        ;*KERNAL "I" PAGE DESCRIPTOR REGISTERS
```

```
                        172300                  KIPDR0= 172300
                        172302                  KIPDR1= 172302
                        172304                  KIPDR2= 172304
                        172306                  KIPDR3= 172306
                        172310                  KIPDR4= 172310
                        172312                  KIPDR5= 172312
                        172314                  KIPDR6= 172314
                        172316                  KIPDR7= 172316

                                                ;*KERNAL "I" PAGE ADDRESS REGISTERS

                        172340                  KIPAR0= 172340
                        172342                  KIPAR1= 172342
                        172344                  KIPAR2= 172344
                        172346                  KIPAR3= 172346
                        172350                  KIPAR4= 172350
                        172352                  KIPAR5= 172352
                        172354                  KIPAR6= 172354
                        172356                  KIPAR7= 172356


                                                .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
                        000200                  .=200
000200  005037  001174                          CLR     $TMP0           ;MAKE SURE TMP0=0
000204  000137  001756                          JMP     @#START         ;JUMP TO START


        ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
        ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
        ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
                ;*WHEN LOADING THE PROGRAM FOR THE FIRST TIME, OR ANY TIME
                ;*AFTER ALTERING THE # OF EXERCISERS ON THE BUS,
                ;*YOU MUST START AT LOCATION 200 AND
                ;*RESTART AT LOCATION 220 ONLY IF YOU DO NOT WISH
                ;*TO SIZE MEMORY AND TYPE OUT DEV ADDRESSES AGAIN
        ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
        ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
        ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

                        000220                  .=220
000220  012737  000777  001174                  MOV     #777,$TMP0      ;TMP0 IS INDICATOR FOR RESTART
000226  000137  001756                          JMP     @#START         ;JUMP TO START


                                                ;*****************************************************************


                                                .SBTTL  ACT11 HOOKS
                                                ;HOOKS REQUIRED BY ACT11
```

```
                    000232                  $SVPC=.                 ;SAVE PC
                    000046                  .=46
000046  015636                              $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                    000052                  .=52
000052  040000                              .WORD   40000           ;;2)SET LOC.52 TO 40000
                    000232                  .=$SVPC                 ;; RESTORE PC
```

```
                                ;*****************************************************************

                                .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  000000                  .WORD   0
001136  177570          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001140  177570          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001142  177560          $TKS:   177560                  ;;TTY KBD STATUS
001144  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001146  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001150  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001152     000          $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001153     002          $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001154     012          $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001155     000          $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001156  000000          $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                        ;;WHICH  ($REG0) WAS OBTAINED
001160  000000          $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001162  000000          $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
001164  000000          $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
001166  000000          $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
001170  000000          $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
001172  000000          $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
001174  000000          $TMP0:  .WORD   0               ;;USER DEFINED
001176  000000          $TMP1:  .WORD   0               ;;USER DEFINED
001200  000000          $TMP2:  .WORD   0               ;;USER DEFINED
001202  000000          $TMP3:  .WORD   0               ;;USER DEFINED
001204  000000          $TMP4:  .WORD   0               ;;USER DEFINED
001206  000000          $TMP5:  .WORD   0               ;;USER DEFINED
001210  000000          $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001212  000000          $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001214  177607  000377  $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001220     077          $QUES:  .ASCII  /?/             ;;QUESTION MARK
001221     015          $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001222  000012          $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

001224                  $ERRTB:
                        ;*****************************************************************
                        ;*****************************************************************
                        ;ITEM 1
001224  011404                  EM1             ;CPU TRAPPED THRU LOC 4 -TIME OUT
001226  011452                  DH1             ; ADDR   $ERRPC #ERR/TST#
001230  015262                  DT1             ;$REG2,$ERRPC,$TSTNM,0
001232  000000                  0
                        ;ITEM 2
001234  011503                  EM2             ;CPU ISSUED A BUS GRANT WITH PSW = 7
                                                ;DEV 1 SHOULD NOT HAVE BECOME BUS MASTER
001236  011616                  DH2             ;BE1DB BE1CC BE1BA BE1CR1 PSW $ERRPC #ERR/TST#
001240  015272                  DT2             ;$REG0,$REG1,$REG2,$REG3,$REG4,$ERRPC,$TSTNM,0
001242  000000                  0
                        ;ITEM  3
001244  011706                  EM3             ;CPU DID NOT ISSUE A BUS NPG
001246  011740                  DH3             ;BE1CR1 BE1CC FM-PS TO-PS $ERRPC #ERR/TST#
001250  015312                  DT3             ;$REG0,$REG1,$REG2,$REG3,$ERRPC,$TSTNM,0
001252  000000                  0
                        ;ITEM 4
001254  012021                  EM4             ;CPU DID NOT ISSUE BUS GRANT 7
001256  011740                  DH3
001260  015312                  DT3
001262  000000                  0
                        ;ITEM 5
001264  012057                  EM5             ;CPU DID NOT ISSUE BUS GRANT 6
001266  011740                  DH3
001270  015312                  DT3
001272  000000                  0
                        ;ITEM 6
001274  012115                  EM6             ;CPU DID NOT ISSUE BUS GRANT 5
001276  011740                  DH3
001300  015312                  DT3
001302  000000                  0
                        ;ITEM 7
001304  012153                  EM7             ;CPU DID NOT ISSUE BUS GRANT 4
001306  011740                  DH3
001310  015312                  DT3
001312  000000                  0
                        ;ITEM 10
```

```
  345  001314  012211                        EM10          ;ONE OR MORE DEVICES DID NOT INTERRUPT
  346  001316  012257                        DH10          ;THIS IS THE ORDER IN WHICH THEY INTERRUPTED
  347                                                      ;   1ST  2ND  3RD  4TH $ERRPC #ERR/TST#
  348  001320  015330                        DT10          ;$REG1,$REG2,$REG3,$REG4,$ERRPC,$TSTNM,0
  349  001322  000000                        0
  350                                 ;ITEM 11
  351  001324  012415                        EM11          ;BUS ADDRESS LINES <A17:A14> DID NOT FUNCTION PROPERLY
  352  001326  012503                        DH11          ;BE1CR1 BE1CR2 BE1BA $ERRPC #ERR/TST#
  353  001330  015346                        DT11          ;$REG1,$REG2,$REG3,$ERRPC,$TSTNM,0
  354  001332  000000                        0
  355                                 ;ITEM 12
  356  001334  012554                        EM12          ;CPU NO SACK TIME OUT LOGIC FAILED(TO NEGATE BUS GRANT)
  357  001336  012642                        DH12          ;BE1CR1 BE1CR2 $ERRPC #ERR/TST#
  358  001340  015362                        DT12          ;$REG0,$REG1,$ERRPC,$TSTNM,0
  359  001342  000000                        0
  360                                 ;ITEM 13
  361  001344  012703                        EM13          ;CPU DID NOT PROPERLY EXECUTE AN ACLO/DCLO SEQUENCE
  362  001346  012766                        DH13          ;$ERRPC #ERR/TST#
  363  001350  015374                        DT13          ;$ERRPC,$TSTNM,0
  364  001352  000000                        0
  365                                 ;ITEM 14
  366  001354  013007                        EM14          ;CPU DID NOT TRAP FROM BUS PARITY ERR PA/PB = 0/1
  367  001356  012766                        DH13
  368  001360  015374                        DT13
  369  001362  000000                        0
  370                                 ;ITEM 15
  371  001364  013072                        EM15          ;DEV 1 DID DATIP WITH ROL ON DATOB TO MEMORY
  372                                                      ;THE TRANSFER TO THE FOLLOWING LOC WAS INCORRECT
  373  001366  013235                        DH15          ;MEMORY  ACTUAL CORRECT
  374                                                      ; LOC    DATA   DATA  $ERRPC #ERR/TST# $ICNT #
  375  001370  015402                        DT15          ;$REG0,$REG1,$REG3,$ERRPC,$TSTNM,$ICNT,0
  376  001372  000000                        0
  377                                 ;ITEM 16
  378  001374  013347                        EM16          ;DEV 3'S DATO TO MEMORY DID NOT EQUAL PATTERN IN R3
  379  001376  013235                        DH15
  380  001400  015402                        DT15
  381  001402  000000                        0
  382                                 ;ITEM 17
  383  001404  013435                        EM17          ;DEV 4'S DATO TO MEMORY DID NOT EQUAL PATERN IN R4
  384  001406  013235                        DH15
  385  001410  015402                        DT15
  386  001412  000000                        0
  387                                 ;ITEM 20
  388  001414  013523                        EM20          ;DEV 1 DID FUN 1-NPR-DATIP;INCORRECT PATTERN IN MEMORY
  389  001416  013235                        DH15
  390  001420  015402                        DT15
  391  001422  000000                        0
  392                                 ;ITEM 21
  393  001424  013617                        EM21          ;DEV 2 DID FUN 2-NPR-DATOB;INCORRECT PATTERN IN MEMORY
  394  001426  013235                        DH15
  395  001430  015402                        DT15
  396  001432  000000                        0
  397                                 ;ITEM 22
  398  001434  013713                        EM22          ;BIT 7 OF CR2 SET-CPU DID NOT TIME OUT WITH SACK INHIBITED
  399  001436  014005                        DH22          ;DEV #  PC  $ERRPC #ERR/TST#
  400  001440  015420                        DT22          ;$TMP4,$REG5,$ERRPC,$TSTNM,0
```

```
   401  001442  000000                    0
   402                            ;ITEM 23
   403  001444  014047                    EM23          ;BIT 11 OF CR2 SET-NO SSYN ON INTR SIGNAL
   404  001446  014005                    DH22
   405  001450  015420                    DT22
   406  001452  000000                    0
   407                            ;ITEM 24
   408  001454  014120                    EM24          ;BIT 5 OF CR2 SET-RECEIVED WRONG GRANT
   409  001456  014005                    DH22
   410  001460  015420                    DT22
   411  001462  000000                    0
   412                            ;ITEM 25
   413  001464  014166                    EM25          ;BIT 6 OF CR2 SET-BUS LATE
   414  001466  014005                    DH22
   415  001470  015420                    DT22
   416  001472  000000                    0
   417                            ;ITEM 26
   418  001474  014220                    EM26          ;BIT 8 OF CR2 SET-DEV DID NOT RECEIVE SSYN
   419  001476  014005                    DH22
   420  001500  015420                    DT22
   421  001502  000000                    0
   422                            ;ITEM 27
   423  001504  014262                    EM27          ;BIT 9 OF CR2 SET-WRONG ADDR ON BUS
   424  001506  014005                    DH22
   425  001510  015420                    DT22
   426  001512  000000                    0
   427                            ;ITEM 30
   428  001514  014331                    EM30          ;BIT 10 OF CR2 SET-DEV RECEIVED OTHER THAN ONE GRANT
   429  001516  014005                    DH22
   430  001520  015420                    DT22
   431  001522  000000                    0
   432                            ;ITEM31
   433  001524  014420                    EM31          ;BKGRND RTN INSTRUCTIONS OF NEGB'S WERE NOT DONE
   434                                                  ;CORRECTLY TO $REG1 DURING MULTITRANFERS II
   435  001526  014560                    DH31          ;ACTUAL CORRECT
   436                                                  ;DATA    DATA $ERRPC #ERR/TST# $ICNT #
   437  001530  015432                    DT31          ;$REG1,146463,$ERRPC,$TSTNM,$ICNT,0
   438  001532  000000                    0
   439                            ;ITEM 32
   440  001534  014653                    EM32          ;DEV 3 DID DATI BUT HAS INCORRECT
   441                                                  ;VALUES IN DATA REGISTER
   442  001536  014560                    DH31
   443  001540  015432                    DT31
   444  001542  000000                    0
   445                            ;ITEM 33
   446  001544  014737                    EM33          ;DEV 4 DID NOT INTR THE CORRECT # OF TIMES
   447  001546  014560                    DH31
   448  001550  015432                    DT31
   449  001552  000000                    0
   450                            ;ITEM 34
   451  001554  015011                    EM34          ;LAST DATI XFER BY DEV 1 WAS INCORRECT-
   452                                                  ;EITHER DEV DID NOT WORK OR WRONG DATA WASSET UP
   453  001556  014560                    DH31
   454  001560  015432                    DT31
   455  001562  000000                    0
   456                            ;ITEM 35
```

```
                                        EM35            ;CPU TRAPPED THRU LOC 0 TO CATCH
                                                        ;IMPROPERLY LOADED VECTORS
                                        DH1             ; ADDR   $ERRPC #ERR/TST#
                                        DT1             ;$REG2,$ERRPC,$TSTNM,0
                                        0
                                ;***************************************************************
                                ;***************************************************************
                                ;***************************************************************
                                        ALLERR  :7740           ;ALL ERR BITS OF CR2
                                        SIMLGO  :170014         ;ADDR TO SET OFF ALL DEVICES SIMOLTANEOUSLY
                                        PBVEC   =114            ;TRAP VEC FOR PARITY ERROR
                                        PBPSW   =116            ;PSW ADDR FOR TRAP ON PARITY ERR
                                        BE1DB   :0              ;DATA REG ADDR FOR DEVICE 1
                                        BE1CC   :0              ;CYCLE COUNT REG ADDR FOR DEV 1
                                        BE1BA   :0              ;ADDR REG ADDR FOR DEV 1
                                        BE1CR1  :0              ;CONTROL REG 1 ADDR FOR DEV 1
                                        BE1CLR  :0              ;CLEAR ERRS REG ADDR FOR DEV 1
                                        BE1CR2  :0              ;CONTROL REG 2 ADDR FOR DEV 1
                                        BE2DB   :0              ;DATA REG ADDR FOR DEV 2
                                        BE2CC   :0              ;CYCLE COUNT REG ADDR FOR DEV 2
                                        BE2BA   :0              ;ADDR REG ADDR FOR DEV 2
                                        BE2CR1  :0              ;CONTROL REG 1 ADDR FOR DEV 2
                                        BE2CLR  :0              ;CLEAR ERRS REG ADDR FOR DEV 2
                                        BE2CR2  :0              ;CONTROL REG 2 ADDR FOR DEV 2
                                        BE3DB   :0              ;DATA REG ADDR FOR DEV 3
                                        BE3CC   :0              ;CYCLE COUNT REG ADDR FOR DEV 3
                                        BE3BA   :0              ;ADDR REG ADDR FOR DEV 3
                                        BE3CR1  :0              ;CONTROL REG 1 ADDR FOR DEV 3
                                        BE3CLR  :0              ;CLEAR ERRS REG ADDR FOR DEV 3
                                        BE3CR2  :0              ;CONTROL REG 2 ADDR FOR DEV 3
                                        BE4DB   :0              ;DATA REG ADDR FOR DEV 4
                                        BE4CC   :0              ;CYCLE COUNT REG ADDR FOR DEV 4
                                        BE4BA   :0              ;ADDR REG ADDR FOR DEV 4
                                        BE4CR1  :0              ;CONTROL REG 1 ADDR FOR DEV 4
                                        BE4CLR  :0              ;CLEAR ERRS REG ADDR FOR DEV 4
                                        BE4CR2  :0              ;CONTROL REG 2 ADDR FOR DEV 4
                                        BE1VEC  :0              ;TRAP VEC ADDR FOR DEV 1
                                        BE1PSW  :0              ;PSW ADDR FOR TRAP THRU BE1VEC
                                        BE2VEC  :0              ;TRAP VEC ADDR FOR DEV 2
                                        BE2PSW  :0              ;PSW ADDR FOR TRAP THRU BE2VEC
                                        BE3VEC  :0              ;TRAP VEC ADDR FOR DEV 3
                                        BE3PSW  :0              ;PSW ADDR FOR TRAP THRU BE3VEC
                                        BE4VEC  :0              ;TRAP VEC ADDR FOR DEV 4
                                        BE4PSW  :0              ;PSW ADDR FOR TRAP THRU BE4VEC
                                        DEVCNT  :0              ;CONTAINS # OF DEVICES ON BUS
000000  000000                          DEVS    :0,0,0,0        ;WILL CONTAIN ADDR(S) OF INTR'G DEVS
                                        DATA1   :0              ;MAX ADDR TO WHICH DATA XFERRED BY DEV 1
                                        DATA2   :0              ;MAX ADDR TO WHICH DATA XFERRED BY DEV 2
                                        DATA3   :0              ;MAX ADDR TO WHICH DATA XFERRED BY DEV 3
                                        DATA4   :0              ;MAX ADDR TO WHICH DATA XFERRED BY DEV 4
                                        ENDMEM  :0              ;TAG ENDING DEFINED LABELS
                                ;***************************************************************
                                ;***************************************************************
001724                          CLRRTN:
012703  001600                          MOV     #BE1DB,R3       ;R3 IS POINTER TO BUFFER AREAS
```

```
                                1$:     CLR     (R3)+           ;CLEAR BUFFER THEN INCREMENT ADDR
                                        CMP     #ENDMEM, R3     ;IF POINTER AT LAST BUFFER, EXIT
                                        BPL     1$              ;IF PLUS, GO BACK AND CLEAR NEXT ADDR
                                        MOV     #$REG0,R3       ;NOW START TO CLEAR TEMP REGISTERS
                                2$:     CLR     (R3)+           ;CLEAR CURRENT ADDR
                                        CMP     #$TMP5,R3       ;CHECK FOR LAST TEMP REG ADDR
                                        BHI     2$              ;IF NOT, CLEAR NEXT TEMP REG
                                        RTS     PC              ;EXIT
                                ;*****************************************************************
                                ;*****************************************************************
001756                          START:
001756  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
001762  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
001764  022706  001126                  CMP     #$BDDAT,R6      ;;DONE?
001770  001374                          BNE     .-6             ;;LOOP BACK IF NO
001772  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
001776  012737  015656  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
002004  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
002012  012737  016134  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
002020  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
002026  012737  020136  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
002034  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
002042  012737  020202  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
002050  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
002056  013737  015502  015474          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
002064  005037  001210                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
002070  005037  001212                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
002074  112737  000001  001115          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
002102  012737  002102  001106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
002110  012737  002110  001110          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
002116  013746  000004                  MOV     @#4,-(SP)       ;;SAVE ERROR VECTOR
002122  013746  000006                  MOV     @#6,-(SP)
002126  012737  002142  000004          MOV     #64$,4          ;;SET UP TIME OUT VECTOR
002134  005777  176776                  TST     @SWR            ;;TRY TO REFERENCE HARDWARE SWR
002140  000407                          BR      65$             ;;BRANCH IF NO TIMEOUT TRAP OCCURS
002142  012737  000176  001136  64$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
002150  012737  000174  001140          MOV     #DISPREG,DISPLAY ;;POINT TO SOFTWARE DISPLAY REG
002156  022626                          CMP     (SP)+,(SP)+     ;;RESTORE STACK
002160  012637  000006          65$:    MOV     (SP)+,@#6       ;;RESTORE ERROR VECTOR
002164  012637  000004                  MOV     (SP)+,@#4
002170  032777  000200  176740          BIT     #BIT07,@SWR     ;IS SWITCH 7 UP?
002176  001402                          BEQ     3$              ;IF NOT, SKIP TYPEOUT
002200  104400  011174                  TYPE    ,QNO
002204                          3$:
002204  022737  000777  001174          CMP     #777,$TMP0      ;IS THIS RESTART FROM LOC 220?
002212  001002                          BNE     5$              ;IF NOT,SKIP THE JMP INSTR
002214  000137  003506                  JMP     @#TST1          ;ELSE JUMP TO TEST 1
                                
002220                          5$:
002220  012737  010562  000000          MOV     #THRU0,0        ;SET UP FOR TRAP THRU LOC 0
002226  012737  000340  000002          MOV     #PR7,2          ;SET UP PSW FOR TRAP THRU 0
002234  032777  000200  176674          BIT     #BIT07,@SWR     ;IS SWITCH 7 UP?
002242  001452                          BEQ     33$             ;IF NOT, SKIP TYPEOUT
002244  104400  002252                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
002250  000422                          BR      66$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ        <15><12>/IF BUS HANGS WHILE SIZING MEMORY/
```

```
                                66$:
002316                                  TYPE    ,.+4            ;;TYPE ASCIZ STRING
002316  104400  002324                    BR      67$             ;;GET OVER THE ASCIZ
002322  000422                            ;;.ASCIZ      <15><12>/IT IS DUE TO NO CPU SSYN TIME OUT/
                                67$:
002370                          33$:
002370  004737  001724                    JSR     PC,CLRRTN       ;CLEAR BUFFER AREAS
002374  004737  016616                    JSR     PC,$SIZE        ;FIND AVAILABLE MEMORY
002400  012737  000340  000006            MOV     #PR7,ERRVEC+2   ;PS=7 FOR TRAP THRU LOC 4
002406  012700  170000                    MOV     #170000,R0      ;SET UP POINTER FOR 1ST POSSIBLE DEV ADDR
002412  012702  000510                    MOV     #510,R2         ;SET UP POINTER FOR 1ST POSSIBLE VEC ADDR
002416  012701  001600                    MOV     #BE1DB,R1       ;SET UP POINTER FOR DEVICE ADDR LOCATION
002422  012703  001660                    MOV     #BE1VEC,R3      ;SET UP POINTER FOR INTR ADDR LOCATION
002426                          LODDEV:
002426  022700  170060                    CMP     #170060,R0      ;IS R0 > LAST POSSIBLE DEV ADDR?
002432  002002                            BGE     10$             ;IF NOT,GO TO 10$
002434  000137  002736                    JMP     BGIN            ;ELSE GO TO BGIN
002440                          10$:
002440  012737  002544  000004            MOV     #NODEV,ERRVEC   ;SET UP TRAP VECTOR FOR TIME OUT
002446  005710                            TST     (R0)            ;SEE IF ACTUAL DEVICE ADDRESS EXISTS
002450  012737  002662  000004            MOV     #TYMOUT,ERRVEC  ;CHANGE TRAP VECTOR FOR ERROR CONDITION
002456  005237  001700                    INC     DEVCNT          ;COUNT DEVICES
002462  010021                  MOVREG:   MOV     R0,(R1)+        ;MOVE ACTUAL DEVICE ADDR TO DEVICE NAME
002464  010037  001172                    MOV     R0,$REG5        ;REG5 CONTAINS LAST DEVICE ADDR
002470  062700  000002                    ADD     #2,R0           ;INCREMENT POINTER BY 2
002474  105237  001174                    INCB    $TMP0           ;COUNT # OF REGISTERS PER DEVICE
002500  122737  000005  001174            CMPB    #5,$TMP0        ;AFTER 5 REGISTERS
002506  001365                            BNE     MOVREG          ;ARE RECORDED
002510  105037  001174                    CLRB    $TMP0           ;CLEAR THE COUNTING REGISTER
002514  062700  000004                    ADD     #4,R0           ;ADD 4 TO THE POINTER THEN
002520  010021                            MOV     R0,(R1)+        ;RECORD THE LAST REGISTER ADDRESS
002522  062700  000002                    ADD     #2,R0           ;INCREMENT POINTER BY 2
002526                          MOVVEC:                           ;NOW START RECORDING
002526  010223                            MOV     R2,(R3)+        ;THE INTR VECTORS
002530  062702  000002                    ADD     #2,R2           ;INCREMENT POINTER BY 2
002534  010223                            MOV     R2,(R3)+        ;THE INTR VECTORS
002536  062702  000002                    ADD     #2,R2           ;INCREMENT POINTER BY 2
002542  000731                            BR      LODDEV          ;AND GO SEE IF THER'S ANOTHER DEVICE
                                ;*****************************************************************
                                ;*****************************************************************
002544                          NODEV:                            ;TIME OUT ROUTINE FOR DEVICE CHECK
002544  022700  170060                    CMP     #170060,R0      ;IF ALL POSSIBLE ADDR'S HAVE NOT BEEN CHECKED
002550  003035                            BGT     ADD20           ;OUT-GO BACK AND CHECK FOR MORE,
002552  012716  002736                    MOV     #BGIN,(SP)      ;ELSE CHANGE STACK POINTER
002556  022737  000000  001700            CMP     #0,DEVCNT       ;CHECK FOR NO EXERCISERS
002564  001035                            BNE     EXNO            ;IF ONE OR MORE EXERCISERS, EXIT
002566  104400  002574                    TYPE    ,.+4            ;;TYPE ASCIZ STRING
002572  000423                            BR      64$             ;;GET OVER THE ASCIZ
                                        ;;.ASCIZ      <15><12>/THERE ARE NO EXERCISERS ON THE BUS/
002642                          64$:
002642  000000                            HALT
002644  062700  000020          ADD20:    ADD     #20,R0          ;ADD 20 TO POINTER
002650  062702  000004                    ADD     #4,R2           ;POINTER=NEXT DEV'S VEC LOCATIONS
002654  012716  002426                    MOV     #LODDEV,(SP)    ;GO BACK TO LODDEV
002660                          EXNO:
002660  000002                            RTI                     ;EXIT
```

```
                        ;*****************************************************************
                        ;*****************************************************************
002662                  TYMOUT:                         ;TIME OUT ROUTINE

002662  011637  001164          MOV     (SP),$REG2      ;THE MOVE IS FOR TYPEOUT REASONS
002666  162737  000002  001164  SUB     #2,$REG2        ;SUBTRACT 2 TO FIND ACTUAL ADDR
002674  104001                  ERROR   1               ;ERR MESSG FOR ILLEGAL TIME OUT
002676  000002                  RTI
                        ;*****************************************************************
                        ;*****************************************************************
                        ;*****************************************************************
002700                  CLRREG:
002700  005000                  CLR     R0              ;R0=0
002702  005002                  CLR     R2              ;R2=0
002704  012701  001600          MOV     #BE1DB,R1       ;R1 WILL POINT TO ADDR OF 1ST DEVICE
002710  005200          1$:     INC     R0              ;R0 IS REGISTER COUNTER
002712  005031                  CLR     @(R1)+          ;CLEAR CONTENTS OF REG
002714  022700  000006          CMP     #6,R0           ;IF COUNT IS NOT 6
002720  001373                  BNE     1$              ;GO BACK AND INCREMENT COUNT
002722  005000                  CLR     R0              ;ELSE CLEAR R0
002724  005202                  INC     R2              ;ADD 1 TO R2(DEVICE COUNTER)
002726  020237  001700          CMP     R2,DEVCNT       ;SEE IF IT = PREVIOUS COUNT
002732  101766                  BLOS    1$              ;IF NOT, CLEAR NEXT DEV REGS
002734  000207                  RTS     PC              ;EXIT
                        ;//////////////////////////////////////////////////////////////////
                        ;//////////////////////////////////////////////////////////////////
                        ;//////////////////////////////////////////////////////////////////
002736                  BGIN:
002736  012737  010342  000024          MOV     #PWRFAL,PWRVEC  ;TAKE CARE OF BIT 4(S) BEING SET RANDOMLY IN CR2(S)
002744  004737  010240                  JSR     PC,STVEC        ;SET UP VEC(S) FOR RANDOM ERRS
002750  004737  002700                  JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
002754  005037  001174                  CLR     $TMP0           ;CLEAR TEMPORARY REG
002760  005037  001160                  CLR     $REG0           ;CLEAR COUNTER
002764  013737  017152  001174          MOV     $LSTBK,$TMP0    ;*************************
002772  032777  000200  176136          BIT     #BIT07,@SWR     ;IS SWITCH 7 UP?
003000  001002                  BNE     2$              ;IF UP, GO TO 2$
003002  000137  003506          JMP     5$              ;ELSE SKIP THE TYPEOUTS
003006  005237  001160  2$:     INC     $REG0           ;ADD 1 TO REG0
003012  006237  001174          ASR     $TMP0           ;SHIFT TO DIVIDE
003016  022737  000005  001160  CMP     #5,$REG0        ;IS TMP0 DIVIDED BY 40(5 ASR'S)
003024  001370                  BNE     2$              ;IF NOT, SHIFT AGAIN
003026  005237  001174          INC     $TMP0           ;ADD 1 FOR FUDGE FACTOR
003032  104400  001221          TYPE    ,$CRLF
003036  013746  001174          MOV     $TMP0,-(SP)     ;;SAVE $TMP0 FOR TYPEOUT
                                                        ;;THIS IS THE # OF K OF MEMORY
003042  104404                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
003044  104400  003052          TYPE    ,.+4            ;;TYPE ASCIZ STRING
003050  000424                  BR      64$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ      /K OF MEMORY IS AVAILABLE IN THIS SYSTEM/
003122                  64$:
003122  104400  003130          TYPE    ,.+4            ;;TYPE ASCIZ STRING
003126  000431                  BR      65$             ;;GET OVER THE ASCIZ
                                ;;.ASCIZ      <15><12>/THE FOLLOWING # OF EXERCISERS ARE ON THE BUS:  /
003212                  65$:
003212  013746  001700          MOV     DEVCNT,-(SP)    ;;SAVE DEVCNT FOR TYPEOUT
003216  104402                  TYPOS                   ;;GO TYPE--OCTAL ASCII
```

```
                                                .BYTE   1               ;;TYPE 1 DIGIT(S)
                                                .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                TYPE    ,.+4            ;;TYPE ASCIZ STRING
                                                BR      66$             ;;GET OVER THE ASCIZ
                                                ;;.ASCIZ        <15><12>/THE LOWEST ELECT. PRIORITY UBE SHOULD NOT HAVE W1 JUMPER/
                                        66$:
                                                TYPE    ,.+4            ;;TYPE ASCIZ STRING
                                                BR      67$             ;;GET OVER THE ASCIZ
                                                ;;.ASCIZ        <15><12>/DEVICE ADDRESS(ES): /<15><12>
                                        67$:
                                                CLR     $TMP0           ;CLEAR TMP0(USED AS COUNTER)
                                                MOV     #BE1DB,R0       ;USE R0 AS POINTER TO ADDRESSES
                                        4$:
                                                INC     $TMP0           ;ADD 1 TO TMP0
                                                MOV     (R0),$REG0      ;MOVE FOR TYPEOUT REASONS
                                                TYPE    ,.+4            ;;TYPE ASCIZ STRING
                                                BR      68$             ;;GET OVER THE ASCIZ
                                                ;;.ASCIZ        / DEV/
                                        68$:
                                                MOV     $TMP0,-(SP)     ;;SAVE $TMP0 FOR TYPEOUT
                                                TYPOS                   ;;GO TYPE--OCTAL ASCII
                                                .BYTE   2               ;;TYPE 2 DIGIT(S)
                                                .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                TYPE    ,.+4            ;;TYPE ASCIZ STRING
                                                BR      69$             ;;GET OVER THE ASCIZ
                                                ;;.ASCIZ        / = /
                                        69$:
                                                MOV     $REG0,-(SP)     ;;SAVE $REG0 FOR TYPEOUT
                                                TYPOS                   ;;GO TYPE--OCTAL ASCII
                                                .BYTE   6               ;;TYPE 6 DIGIT(S)
                                                .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                ADD     #14,R0          ;ADD 14 FOR NEXT ADDR
                                                CMP     $TMP0,DEVCNT    ;SEE IF TMP0 = # OF DEVICES
                                                BNE     4$              ;IF NOT, GO TYPE NEXT ADDR
                                                TYPE    ,$CRLF          ;TYPE <CR><LF>
                                                CMP     #4,DEVCNT       ;SEE IF THERE ARE 4 DEVICES
                                                BNE     5$              ;IF NOT,SKIP THE TYPE OUT
                                                TYPE    ,FOR4           ;ELSE TYPE MSSG FOR 4TH DEV
                                        5$:


                                        ;*********************************************************************
                                        ;*TEST 1        NO BUS GRANTS ISSUED WITH PROCESSOR AT HIGHER PRIORITY THAN BUS REQUEST
                                                ;*THIS TEST IS TO INSURE THAT ANY REQUEST IS NOT
                                                ;*HONORED AS LONG AS THE PROCESSOR IS AT THE SAME OR
                                                ;*HIGHER PRIORITY
                                        ;*********************************************************************
                                        TST1:   SCOPE
                                                JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
                                        NG:

                                                MOV     #ERRCHK,@BE1VEC ;SET UP DEVICE 1 INTR VECTOR
                                                MOV     #PR7,@BE1PSW    ;SET UP DEVICE 1 PSW VECTOR
                                                MOV     #TYMOUT,ERRVEC  ;SET UP TRAP THRU LOC 4(TIME OUT VEC)
                                                MOV     #PR7,R0         ;MOVE PS=7 TO R0
                                                MOV     #2021,R1        ;MOVE FUN 1-DATI-BR7 TO R1
```

```
  737  003546  004737  010636              JSR     PC,NOG          ;DO  NOG
  738  003552  012700  000300              MOV     #PR6,R0         ;MOVE PS=6 TO R0
  739  003556  012701  002011              MOV     #2011,R1        ;MOVE FUN 1-DATI-BR6 TO R1
  740  003562  004737  010636              JSR     PC,NOG          ;DO NOG
  741  003566  012700  000240              MOV     #PR5,R0         ;MOVE PS=5 TO R0
  742  003572  012701  002005              MOV     #2005,R1        ;MOVE FUN 1-DATI-BR5 TO R1
  743  003576  004737  010636              JSR     PC,NOG          ;DO NOG
  744  003602  012700  000200              MOV     #PR4,R0         ;MOVE PS=4 TO R0
  745  003606  012701  002003              MOV     #2003,R1        ;MOVE FUN 1-DATI-BR4 TO R1
  746  003612  004737  010636              JSR     PC,NOG          ;DO NOG
  747  003616  052777  004000  175762      BIS     #BIT11,@BE1CR1  ;SET BIT 11 TO DO FUN 3
  748  003624  052777  000040  175754      BIS     #BIT05,@BE1CR1  ;SET OFF DEV AT NPR LEVEL
  749  003632  000240                      NOP                     ;ALLOW TIME FOR XFER
  750
  751
  752                          ;*****************************************************************
  753                          ;*TEST 2        ISSUING OF NON-PROCESSOR GRANTS AND ARBITRATION TESTS
  754                                  ;*THIS TEST WILL REQUEST ON NPR THRU BR4 LEVELS
  755                                  ;*WITH THE PROCESSOR STATUS INITIALLY AT LEVEL 7 AND MAKE
  756                                  ;*SURE THE DEVICE EXERCISES AN NPG TO DO A FUN 1-DATI,
  757                                  ;*THEN THE REQUESTS WILL BE REPEATED WHILE SEQUENTIALLY
  758                                  ;*LOWERING THE PROCESSOR STATUS FROM 7 TO 0 TO ALLOW
  759                                  ;*ARBITRATION OF ALL REQUESTS AND THE ISSUING OF NPG
  760                          ;*****************************************************************
  761  003634  000004          TST2:   SCOPE
  762
  763  003636                  NPRTST:
  764  003636  012700  000340              MOV     #PR7,R0
  765  003642                  2$:
  766  003642  123737  001115  001103      CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
  767  003650  100451                      BMI     TST3            ;;BR IF YES TO NEXT TEST
  768  003652  012737  000340  177776      MOV     #PR7,PSW                ;INITIAL PS
  769  003660  012777  004730  175772      MOV     #ERRCHK,@BE1VEC ;SET UP VECTOR LOCATION
  770  003666  012777  000340  175766      MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
  771  003674  012777  020342  175702      MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
  772  003702  012777  177777  175672      MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1
  773  003710  012777  002077  175670      MOV     #2077,@BE1CR1   ;LOAD #2077 FUNTIONS
  774  003716  010037  177776              MOV     R0,PSW          ;LOWER PROC STATUS
  775
  776  003722  022777  177777  175652      CMP     #-1,@BE1CC      ;SEE IF DEVICE WENT OFF
  777  003730  001014                      BNE     5$              ;IF IT DID,SKIP ERR TYPEOUT
  778  003732  017737  175650  001160      MOV     @BE1CR1,$REG0   ;NEXT MOVES ARE FOR TYPEOUTS
  779  003740  017737  175636  001162      MOV     @BE1CC,$REG1
  780  003746  012737  000340  001164      MOV     #PR7,$REG2
  781  003754  010037  001166              MOV     R0,$REG3
  782  003760  104003                      ERROR   3               ;TYPE ERROR MESSG
  783  003762                  5$:
  784  003762  162700  000040              SUB     #40,R0          ;LOWER PS BY 1 LEVEL
  785  003766  020027  000000              CMP     R0,#PR0 ;SEE IF R0 IS LESS THAN 0
  786  003772  100323                      BPL     2$              ;IF PLUS ,GO BACK AND DO ANOTHER CYCLE
  787
  788                          ;*****************************************************************
  789                          ;*TEST 3        ISSUING OF BUS GRANT 7 AND ARBITRATION TESTS
  790                                  ;*THIS TEST WILL ARBITRATE FOR A BG7,
  791                                  ;*THE REQUESTS WILL BE ON LEVELS BR7 THRU BR4, DOING
  792                                  ;*FUN 1-DATI TRANSFERS, AND THE PROCESSOR STATUS
```

```
                                        ;*LOWERED SEQUENTIALLY FROM 7 TO 0.
                                ;*****************************************************************
003774  000004                 TST3:   SCOPE
003776                         BR7TST:
003776  012700  000300                 MOV     #PR6,R0         ;2ND PS WILL = 6
004002                         2$:
004002  123737  001115  001103         CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
004010  100451                         BMI     TST4            ;;BR IF YES TO NEXT TEST
004012  012737  000340  177776         MOV     #PR7,PSW                ;INITIAL PS
004020  012777  004730  175632         MOV     #ERRCHK,@BE1VEC ;SET UP VECTOR LOCATION
004026  012777  000340  175626         MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
004034  012777  020342  175542         MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
004042  012777  177777  175532         MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1
004050  012777  002037  175530         MOV     #2037,@BE1CR1   ;LOAD #2037 FUNTIONS
004056  010037  177776                 MOV     R0,PSW          ;LOWER PROC STATUS

004062  022777  177777  175512         CMP     #-1,@BE1CC      ;SEE IF DEVICE WENT OFF
004070  001014                         BNE     5$              ;IF IT DID,SKIP ERR TYPEOUT
004072  017737  175510  001160         MOV     @BE1CR1,$REG0   ;NEXT MOVES ARE FOR TYPEOUTS
004100  017737  175476  001162         MOV     @BE1CC,$REG1
004106  012737  000340  001164         MOV     #PR7,$REG2
004114  010037  001166                 MOV     R0,$REG3
004120  104004                         ERROR   4               ;TYPE ERROR MESSG
004122                         5$:
004122  162700  000040                 SUB     #40,R0          ;LOWER PS BY 1 LEVEL
004126  020027  000000                 CMP     R0,#PR0 ;SEE IF R0 IS LESS THAN 0
004132  100323                         BPL     2$              ;IF PLUS ,GO BACK AND DO ANOTHER CYCLE


                                ;*****************************************************************
                                ;*TEST 4         ISSUING OF BUS GRANT 6 AND ARBITRATION TESTS
                                        ;*THIS TEST WILL ARBITRATE FOR A BG6,
                                        ;*THE REQUESTS WILL BE ON LEVELS BR6 THRU BR4, DOING
                                        ;*FUN 1-DATI TRANSFERS, AND THE PROCESSOR STATUS
                                        ;*LOWERED SEQUENTIALLY FROM 6 TO 0.
                                ;*****************************************************************
004134  000004                 TST4:   SCOPE
004136                         BR6TST:
004136  012700  000240                 MOV     #PR5,R0         ;2ND PS WILL = 5
004142                         2$:
004142  123737  001115  001103         CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
004150  100451                         BMI     TST5            ;;BR IF YES TO NEXT TEST
004152  012737  000300  177776         MOV     #PR6,PSW                ;INITIAL PS
004160  012777  004730  175472         MOV     #ERRCHK,@BE1VEC ;SET UP VECTOR LOCATION
004166  012777  000340  175466         MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
004174  012777  020342  175402         MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
004202  012777  177777  175372         MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1
004210  012777  002017  175370         MOV     #2017,@BE1CR1   ;LOAD #2017 FUNTIONS
004216  010037  177776                 MOV     R0,PSW          ;LOWER PROC STATUS

004222  022777  177777  175352         CMP     #-1,@BE1CC      ;SEE IF DEVICE WENT OFF
004230  001014                         BNE     5$              ;IF IT DID,SKIP ERR TYPEOUT
004232  017737  175350  001160         MOV     @BE1CR1,$REG0   ;NEXT MOVES ARE FOR TYPEOUTS
004240  017737  175336  001162         MOV     @BE1CC,$REG1
004246  012737  000300  001164         MOV     #PR6,$REG2
004254  010037  001166                 MOV     R0,$REG3
```

```
                        ERROR   5               ;TYPE ERROR MESSG
                5$:
                        SUB     #40,R0          ;LOWER PS BY 1 LEVEL
                        CMP     R0,#PR0 ;SEE IF R0 IS LESS THAN 0
                        BPL     2$              ;IF PLUS ,GO BACK AND DO ANOTHER CYCLE


                ;*********************************************************************
                ;*TEST 5         ISSUING OF BUS GRANT 5 AND ARBITRATION TESTS
                        ;*THIS TEST WILL ARBITRATE FOR A BG5,
                        ;*THE REQUESTS WILL BE ON LEVELS BR5 THRU BR4, DOING
                        ;*FUN 1-DATI TRANSFERS, AND THE PROCESSOR STATUS
                        ;*LOWERED SEQUENTIALLY FROM 5 TO 0.
                ;*********************************************************************
                TST5:   SCOPE
                BR5TST:
                        MOV     #PR4,R0         ;2ND PS WILL = 4
                2$:
                        CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
                        BMI     TST6            ;;BR IF YES TO NEXT TEST
                        MOV     #PR5,PSW                ;INITIAL PS
                        MOV     #ERRCHK,@BE1VEC ;SET UP VECTOR LOCATION
                        MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
                        MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
                        MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1
                        MOV     #2007,@BE1CR1   ;LOAD #2007 FUNTIONS
                        MOV     R0,PSW          ;LOWER PROC STATUS

                        CMP     #-1,@BE1CC      ;SEE IF DEVICE WENT OFF
                        BNE     5$              ;IF IT DID,SKIP ERR TYPEOUT
                        MOV     @BE1CR1,$REG0   ;NEXT MOVES ARE FOR TYPEOUTS
                        MOV     @BE1CC,$REG1
                        MOV     #PR5,$REG2
                        MOV     R0,$REG3
                        ERROR   6               ;TYPE ERROR MESSG
                5$:
                        SUB     #40,R0          ;LOWER PS BY 1 LEVEL
                        CMP     R0,#PR0 ;SEE IF R0 IS LESS THAN 0
                        BPL     2$              ;IF PLUS ,GO BACK AND DO ANOTHER CYCLE


                ;*********************************************************************
                :*TEST 6         ISSUING OF BUS GRANT 4 AND ARBITRATION TESTS
                        ;*THIS TEST WILL ARBITRATE FOR A BG4,
                        ;*THE REQUESTS WILL BE ON LEVEL BR4, DOING
                        ;*FUNC 1-DATI TRANSFERS, AND THE PROCESSOR STATUS
                        ;*LOWERED SEQUENTIALLY FROM 4 TO 0.
                ;*********************************************************************
                TST6:   SCOPE
                BR4TST:
                        MOV     #PR3,R0         ;2ND PS WILL = 3
                2$:
                        CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
                        BMI     TST7            ;;BR IF YES TO NEXT TEST
                        MOV     #PR4,PSW                ;INITIAL PS
                        MOV     #ERRCHK,@BE1VEC ;SET UP VECTOR LOCATION
```

```
   905  004466  012777  000340  175166          MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
   906  004474  012777  020342  175102          MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
   907  004502  012777  177777  175072          MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1
   908  004510  012777  002003  175070          MOV     #2003,@BE1CR1   ;LOAD #2003 FUNTIONS
   909  004516  010037  177776                  MOV     R0,PSW          ;LOWER PROC STATUS
   910
   911  004522  022777  177777  175052          CMP     #-1,@BE1CC      ;SEE IF DEVICE WENT OFF
   912  004530  001014                          BNE     5$              ;IF IT DID,SKIP ERR TYPEOUT
   913  004532  017737  175050  001160          MOV     @BE1CR1,$REG0   ;NEXT MOVES ARE FOR TYPEOUTS
   914  004540  017737  175036  001162          MOV     @BE1CC,$REG1
   915  004546  012737  000200  001164          MOV     #PR4,$REG2
   916  004554  010037  001166                  MOV     R0,$REG3
   917  004560  104007                          ERROR   7               ;TYPE ERROR MESSG
   918  004562                          5$:
   919  004562  162700  000040                  SUB     #40,R0          ;LOWER PS BY 1 LEVEL
   920  004566  020027  000000                  CMP     R0,#PR0 ;SEE IF R0 IS LESS THAN 0
   921  004572  100323                          BPL     2$              ;IF PLUS ,GO BACK AND DO ANOTHER CYCLE
   922                          ;*****************************************************************
   923
   924                          ;*****************************************************************
   925                          ;*TEST 7        CPU TEST FOR NO SACK TIME OUT
   926                                  ;*THIS TEST WILL CHECK THAT THE CPU TIMES OUT AND
   927                                  ;*DROPS A GRANT IF NO SACK SIGNAL IS RECEIVED
   928                                  ;*IF THE CPU TIME OUT IS INOPERATIVE, THE BUS EXERCISER
   929                                  ;*WILL TIME OUT AND SEND THE SACK SIGNAL TO PREVENT
   930                                  ;*A BUS HANG AND SET AN ERROR FLAG IN CR2
   931                          ;*****************************************************************
   932  004574  000004          TST7:   SCOPE
   933  004576  004737  002700          JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
   934  004602  012777  177777  174772  MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1
   935  004610  012777  020342  174766  MOV     #ATEND,@BE1BA   ;SET UP DEVICE REG ADDR
   936  004616  012737  000340  177776  MOV     #PR7,PSW        ;SET PS=7
   937  004624  012737  002662  000004  MOV     #TYMOUT,ERRVEC  ;SET UP TIME OUT VECTOR
   938  004632  012777  004730  175020  MOV     #ERRCHK,@BE1VEC ;SET UP DEVICE INTR VECTOR
   939  004640  012777  000340  175014  MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
   940  004646  052777  000010  174736  BIS     #BIT03,@BE1CR2  ;INHIBIT SACK RETURN
   941  004654  012777  006003  174724  MOV     #6003,@BE1CR1   ;DO FUN 3--BR4
   942  004662  012737  000140  177776  MOV     #PR3,PSW        ;LOWER PROC. STATUS TO 3
   943  004670  004737  011046          JSR     PC,CNTR         ;DELAY FOR TIMEOUT
   944  004674  042777  000010  174710  BIC     #BIT03,@BE1CR2  ;ALLOW FUTURE SACKS
   945  004702  105777  174704          TSTB    @BE1CR2         ;CHECK IF NO-NO SACK BIT IS SET
   946  004706  100024                  BPL     TST10           ;;IF NOT SET, GO TO NEXT TEST
   947  004710  017737  174672  001160  MOV     @BE1CR1,$REG0   ;MOVE FOR TYPEOUT REASONS
   948  004716  017737  174670  001162  MOV     @BE1CR2,$REG1   ;MOVE FOR TYPEOUT
   949  004724  104012                  ERROR   12              ;ERROR IF SET-DEVICE FORCED TO SEND SACK
   950  004726  000414                  BR      TST10           ;;GO TO NEXT TEST
   951                          ;*****************************************************************
   952                          ;*****************************************************************
   953  004730                  ERRCHK:
   954  004730  033777  001574  174654  BIT     ALLERR,@BE1CR2 ;CHECK FOR ANY ERRS IN CR2
   955  004736  001407                  BEQ     5$              ;IF NONE, EXIT
   956  004740  011637  001172          MOV     (SP),$REG5      ;FOR TYPEOUT OF PC
   957  004744  012737  000001  001204  MOV     #1,$TMP4        ;INDICATOR FOR DEVICE 1
   958  004752  004737  010406          JSR     PC,ERRTN        ;CHECK TO SEE IF ANY ERRORS OCCURED
   959  004756                  5$:
   960  004756  000002                  RTI                     ;EXIT TRAP
```

```
                        ;*********************************************************************
                        ;*TEST 10        CPU TEST FOR RECEIVING SACK
                                ;*THIS TEST IS TO INSURE THAT THE CPU CAN RECEIVE THE
                                ;*SACK SIGNAL; THE TIME DELAY WILL BE SET ON DEVICE 1
                                ;*AND SEVERAL DATI TRANSFERS MADE, IF THERE IS NO BUS
                                ;*LATE ERROR, THE CPU RECEIVED SACK CORRECTLY
                                ;*IT IS ASSUMED THAT DEV 1 TIME DELAY IS SET FOR 10 US
                        ;*********************************************************************
004760  000004          TST10:  SCOPE

004762  012737  000340  177776          MOV     #PR7,PSW        ;PS = 7
004770  004737  002700                  JSR     PC,CLRREG       ;CLEAR ALL DEVICE REGISTERS
004774  012702  020342                  MOV     #ATEND,R2       ;R2 WILL POINT TO END OF PROG
005000  012705  000010                  MOV     #10,R5          ;R5 = # OF TEST WORDS TO CREATE
005004  004737  011030                  JSR     PC,DOUP         ;CREATE THOSE TEST WORDS

005010  012777  004730  174642          MOV     #ERRCHK,@BE1VEC ;SET UP VECTOR LOCATION
005016  012777  000340  174636          MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
005024  012777  177770  174550          MOV     #-10,@BE1CC     ;SET UP CYCLE COUNT
005032  012777  020342  174544          MOV     #ATEND,@BE1BA   ;SET UP ADDR REGISTER
005040  052777  040000  174544          BIS     #BIT14,@BE1CR2  ;SET BIT 14 OF CR2 FOR TIME DELAY
005046  012777  024441  174532          MOV     #24441,@BE1CR1  ;DO FUN 2-DATIP/NO ROL-NPR
005054  012737  000000  177776          MOV     #PR0,PSW        ;LOWER PS TO ALLOW INTERRUPTS
005062                          5$:
005062  105777  174520                  TSTB    @BE1CR1         ;SEE IF DONE BIT SET
005066  100375                          BPL     5$              ;IF NOT, GO BACK AND WAIT
005070  042777  040000  174514          BIC     #BIT14,@BE1CR2  ;ELSE CLEAR BIT 14 OF CR2
005076  022777  000010  174474          CMP     #10,@BE1DB      ;DID LAST XFER MOVE 10 INTO DB
005104  001407                          BEQ     10$             ;IF IT DID,GO TO 10$
005106  017737  174466  001162          MOV     @BE1DB,$REG1    ;ELSE MOVE FOR ERR TYPE OUT
005114  012737  000010  001164          MOV     #10,$REG2
005122  104034                          ERROR   34              ;TYPE ERR MSSG
005124                          10$:
005124  032777  004000  174460          BIT     #BIT11,@BE1CR2  ;SEE IF NO SSYN ON INTR ERR SET
005132  001402                          BEQ     TST11           ;;IF NOT SET, GO TO NEXT TEST
005134  104023                          ERROR   23              ;ELSE TYPE ERR MSSG
005136  000400                          BR      TST11           ;;THEN GO TO NEXT TEST


                        ;*********************************************************************
                        ;*TEST 11        PASSING OF GRANTS AND INTERRUPT TEST
                                ;*THIS TEST WILL SET OFF ALL AVAILABLE DEVICES SIMULTANEOUSLY
                                ;*WHOSE ONLY FUNCTIONS WILL BE TO INTERRUPT, THE REQUESTS
                                ;*WILL ALL BE AT LEVEL 7 SO THAT THE DEVICE CLOSEST TO THE CPU
                                ;*SHOULD RECEIVE BG7 FIRST AND INTERRUPT FIRST, THE NEXT
                                ;*CLOSEST SHOULD INTERRUPT NEXT AND SO ON.
                        ;*********************************************************************
005140  000004          TST11:  SCOPE
005142  012737  000340  177776          MOV     #PR7,PSW        ;PS=7
005150  004737  002700                  JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
005154                          LOAD1:
005154  012704  001702                  MOV     #DEVS,R4        ;DEVS CONTAINS SEQUENCE OF INTR'G DEVICE ADDRS
005160  012777  005402  174472          MOV     #INTR1,@BE1VEC  ;SET UP DEVICE 1 INTR VECTOR
005166  012777  000340  174466          MOV     #PR7,@BE1PSW    ;SET UP INTR PSW
```

```
1017  005174  012777  000036  174404          MOV     #36,@BE1CR1     ;DO FUN 0 - BR7 THRU BR4
1018  005202  122737  000001  001700          CMPB    #1,DEVCNT       ;IF ONLY 1 DEVICE ON BUS
1019  005210  001443                          BEQ     GO              ;BRANCH TO GO
1020  005212  012777  005420  174444  LOAD2:  MOV     #INTR2,@BE2VEC  ;SET UP DEVICE 2 INTR VECTOR
1021  005220  012777  000340  174440          MOV     #PR7,@BE2PSW    ;SET UP DEVICE 2 PSW VECTOR
1022  005226  012777  000036  174366          MOV     #36,@BE2CR1     ;DO FUN 0 - BR7 THRU BR4
1023  005234  122737  000002  001700          CMPB    #2,DEVCNT       ;IF ONLY 2 DEVICES ON BUS
1024  005242  001426                          BEQ     GO              ;BRANCH TO GO
1025  005244  012777  005436  174416  LOAD3:  MOV     #INTR3,@BE3VEC  ;SET UP DEVICE 3 INTR VECTOR
1026  005252  012777  000340  174412          MOV     #PR7,@BE3PSW    ;SET UP DEVICE 3 PSW VECTOR
1027  005260  012777  000036  174350          MOV     #36,@BE3CR1     ;DO FUN 0 - BR7 THRU BR4
1028  005266  122737  000003  001700          CMPB    #3,DEVCNT       ;IF ONLY 3 DEVICES ON BUS
1029  005274  001411                          BEQ     GO              ;BRANCH TO GO
1030  005276                          LOAD4:
1031  005276  012777  005454  174370          MOV     #INTR4,@BE4VEC  ;SET UP DEVICE 4 INTR VECTOR
1032  005304  012777  000340  174364          MOV     #PR7,@BE4PSW    ;SET UP DEVICE 4 PSW VECTOR
1033  005312  012777  000036  174332          MOV     #36,@BE4CR1     ;DO FUN 0 - BR7 THRU BR4
1034  005320                          GO:
1035  005320  005001                          CLR     R1              ;CLEAR R1 FOR COUNTING
1036  005322  005277  174250                  INC     @SIMLGO         ;SET SIMULTANEOUS GO REGISTER
1037  005326  012737  000000  177776          MOV     #PR0,PSW        ;LOWER PS TO ALLOW INTERRUPTS
1038  005334  004737  011046                  JSR     PC,CNTR         ;ALLOW TIME FOR INTERRUPTS BY COUNTING
1039  005340  020137  001700          CMPARE: CMP     R1,DEVCNT       ;COMPARE THE TWO
1040  005344  001456                          BEQ     TST12           ;;IF BUFFERS INCREMENTED IN CORRECT SEQUENCE, GO TO NEXT
1041  005346  013737  001702  001162          MOV     DEVS,$REG1      ;MOVE FOR TYPEOUT REASONS
1042  005354  013737  001704  001164          MOV     DEVS+2,$REG2    ;MOVE FOR TYPEOUT REASONS
1043  005362  013737  001706  001166          MOV     DEVS+4,$REG3    ;MOVE FOR TYPEOUT REASONS
1044  005370  013737  001710  001170          MOV     DEVS+6,$REG4    ;MOVE FOR TYPEOUT REASONS
1045  005376  104010                          ERROR   10              ;TYPE ERR MSSG
1046  005400  000440                          BR      TST12           ;;GO TO NEXT TEST
1047                          ;*****************************************************************
1048                          ;*****************************************************************
1049  005402                  INTR1:
1050  005402  005201                          INC     R1              ;ADD 1 TO COUNTER ON INTR
1051  005404  013724  001600                  MOV     BE1DB,(R4)+     ;MOVE ADDR FOR TYPEOUT
1052  005410  012737  000001  001204          MOV     #1,$TMP4        ;INDICATOR FOR DEVICE 1
1053  005416  000424                          BR      INTRTN          ;BRANCH TO REST OF INTR RTN
1054  005420                  INTR2:
1055  005420  005201                          INC     R1              ;ADD 1 TO COUNTER ON INTR
1056  005422  013724  001614                  MOV     BE2DB,(R4)+     ;MOVE ADDR FOR TYPEOUT
1057  005426  012737  000002  001204          MOV     #2,$TMP4        ;INDICATOR FOR DEVICE 2
1058  005434  000415                          BR      INTRTN          ;BRANCH TO REST OF INTR RTN
1059  005436                  INTR3:
1060  005436  005201                          INC     R1              ;ADD 1 TO COUNTER ON INTR
1061  005440  013724  001630                  MOV     BE3DB,(R4)+     ;MOVE ADDR FOR TYPEOUT
1062  005444  012737  000003  001204          MOV     #3,$TMP4        ;INDICATOR FOR DEVICE 3
1063  005452  000406                          BR      INTRTN          ;BRANCH TO REST OF INTR RTN
1064  005454                  INTR4:
1065  005454  005201                          INC     R1              ;ADD 1 TO COUNTER ON INTR
1066  005456  013724  001644                  MOV     BE4DB,(R4)+     ;MOVE ADDR FOR TYPEOUT
1067  005462  012737  000004  001204          MOV     #4,$TMP4        ;INDICATOR FOR DEVICE 4
1068  005470                  INTRTN:
1069  005470  011637  001172                  MOV     (SP),$REG5      ;FOR TYPEOUT OF PC
1070  005474  004737  010406                  JSR     PC,ERRTN        ;SEE IF ERROR CAUSED INTR
1071  005500  000002                          RTI                     ;EXIT
1072
```

```
1073
1074                                    ;*********************************************************************
1075                                    ;*TEST 12       ADDRESS LINES (14 - 17) CHECK
1076                                            ;*THIS TEST WILL CHECK BUS ADDRESS LINES 14 THRU 17
1077                                            ;*BY DOING A FUN 1-DATI-NPR TO THOSE ADDRESSES
1078                                            ;*IF THE ADDRESSES DON'T EXIST THE INTERRUPT ROUTINE
1079                                            ;*WILL IGNORE ANY NO SSYN ERROR.
1080                                    ;*********************************************************************
1081  005502  000004                    TST12:  SCOPE
1082
1083  005504  004737  002700                    JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
1084  005510  012737  000140  177776            MOV     #PR3,PSW        ;PS=3
1085  005516  012777  005604  174134            MOV     #BRK,@BE1VEC    ;SET UP DEVICE INTR VEC
1086  005524  012777  000340  174130            MOV     #PR7,@BE1PSW    ;SET UP DEVICE PSW VEC
1087  005532                            DO14:
1088  005532  004737  011074                    JSR     PC,ADLI         ;TEST ADDR LINES 14 &15
1089  005536  152777  000001  174046            BISB    #1,@BE1CR2      ;ELSE SET BIT 0 OF CR2(ADDR LINE 16)
1090  005544  004737  011074                    JSR     PC,ADLI
1091  005550  042777  000001  174034            BIC     #1,@BE1CR2      ;CLEAR BIT 0(ADDR LINE 16)
1092  005556  152777  000002  174026            BISB    #2,@BE1CR2      ;SET BIT 1 OF CR2(ADDR LINE 17)
1093  005564  004737  011074                    JSR     PC,ADLI
1094  005570  152777  000003  174014            BISB    #3,@BE1CR2      ;ELSE SET BITS 0 AND 1 OF CR2
1095                                                                    ;SETS ADDR LINES 16 & 17
1096  005576  004737  011074                    JSR     PC,ADLI
1097  005602  000431                            BR      TST13           ;;GO TO NEXT TEST
1098                                    ;*********************************************************************
1099                                    ;*********************************************************************
1100  005604                            BRK:
1101  005604  011637  001172                    MOV     (SP),$REG5      ;FOR TYPEOUT OF PC
1102  005610  012737  000001  001204            MOV     #1,$TMP4        ;INDICATOR FOR DEVICE 1
1103  005616  032777  007340  173766            BIT     #7340,@BE1CR2   ;CHECK FOR ALL ERRS EXCEPT NO SSYN ERR
1104  005624  001003                            BNE     1$              ;IF ANY ARE SET,SEE WHICH ONES
1105  005626  005077  173756                    CLR     @BE1CLR         ;ELSE CLEAR THE NO SSYN ERR
1106  005632  000414                            BR      EXBRK           ;AND EXIT
1107  005634                            1$:
1108  005634  017737  173746  001162            MOV     @BE1CR1,$REG1   ;MOVES ARE FOR TYPEOUTS
1109  005642  017737  173744  001164            MOV     @BE1CR2,$REG2
1110  005650  017737  173730  001166            MOV     @BE1BA,$REG3
1111  005656  104011                            ERROR   11              ;ERR ON ACCESSING A14 - A17
1112  005660  004737  010406                    JSR     PC,ERRTN        ;DO ERR CHECK SUB-ROUTINE
1113  005664  000002                    EXBRK:  RTI                     ;EXIT
1114
1115
1116                                    ;*********************************************************************
1117                                    ;*TEST 13       CPU TEST FOR ACLO/DCLO SEQUENCE
1118                                            ;*THIS TEST CHECKS THE ASSERTION OF ACLO AND DCLO
1119                                            ;*AND THAT THE CPU TRAPS TO THE CORRECT SERVICE ROUTINE,
1120                                            ;*IF THIS PROGRAM IS RUNNING UNDER ACT11 THIS TEST
1121                                            ;*WILL BE SKIPPED.
1122                                    ;*********************************************************************
1123  005666  000004                    TST13:  SCOPE
1124  005670  012737  000001  001210            MOV     #1,$TIMES       ;;DO 1 ITERATION
1125  005676  005737  000042                    TST     42              ;SEE IF PROGRAM IS UNDER ACT11
1126  005702  001061                            BNE     TST14           ;;IF UNDER ACT, DO NOT PERFORM THIS TEST
1127  005704  012705  000001                    MOV     #1,R5           ;INIT R5 WITH A VALUE OF 1
1128  005710                            6$:
```

```
1129  005710  005205                          INC     R5              ;ADD 1 TO R5
1130  005712  100376                          BPL     6$              ;KEEP ADDING AS LONG AS R5 POS
1131  005714  012737  000001  001204          MOV     #1,$TMP4        ;INDICATOR FOR DEVICE 1
1132  005722  012737  000340  177776          MOV     #PR7,PSW        ;SET PS=7
1133  005730  012777  004730  173722          MOV     #ERRCHK,@BE1VEC ;SET UP INTR VECTOR
1134  005736  012777  000340  173716          MOV     #PR7,@BE1PSW    ;SET UP DEVICE INTR PSW
1135  005744  005037  001176                  CLR     $TMP1           ;CLEAR TEMPORARY REGISTER(TMP1)
1136  005750  012737  006026  000024          MOV     #TMPPWR,PWRVEC  ;SET UP SPECIAL POWER RTN
1137  005756  052777  000020  173626          BIS     #BIT04,@BE1CR2  ;INDICATE PWR FAILURE BY SETTING BIT 4
1138  005764  004737  011046                  JSR     PC,CNTR         ;PAUSE FOR TIME
1139  005770  012737  010342  000024          MOV     #PWRFAL,PWRVEC  ;RESTORE PWRFAL SEQ FOR A PWR FAIL
1140  005776  042777  000020  173606          BIC     #BIT04,@BE1CR2  ;MAKE SURE BIT 4 IS CLEARED
1141  006004                          FAILCK:
1142  006004  022737  001152  020320          CMP     #$NULL,$PWRMG   ;IF THIS TEST IS CAUSE OF
1143                                                                  ;PWR FAIL --TYPE NULL CHAR
1144  006012  001401                          BEQ     XTST            ;IF EQUAL, EXIT TEST
1145  006014  104013                          ERROR   13              ;TYPE ERR MSSG IF FAILURE
1146  006016                          XTST:
1147  006016  012737  020332  020320          MOV     #$POWER,$PWRMG  ;RESTORE TYPE OUT OF 'POWER'
1148  006024  000410                          BR      TST14           ;;GO TO NEXT TEST
1149                                  ;*****************************************************************
1150                                  ;*****************************************************************
1151  006026                          TMPPWR:                         ;SPECIAL PWR RTN; OTHER THAN SYSMAC'S
1152  006026  012737  001152  020320          MOV     #$NULL,$PWRMG   ;CHANGE PWR MSSG TO NULL CHAR
1153  006034  042777  000020  173550          BIC     #BIT04,@BE1CR2  ;CLEAR POWER DOWN/UP BIT
1154  006042  000137  020202                  JMP     $PWRDN          ;GO TO THAT RTN
1155
1156
1157                                  ;*****************************************************************
1158                                  ;*TEST 14        PARITY ERROR TEST
1159                                          ;*THIS TEST WILL CAUSE PARITY ERROR AND CHECKS
1160                                          ;*THAT THE CPU TRAPS TO THE CORRECT VECTOR.
1161                                          ;*THIS TEST SHOULD BE DESELECTED IF THE MEMORY
1162                                          ;*PARITY OPTION IS NOT PRESENT, ELSE AN
1163                                          ;*ERROR WILL BE REPORTED ALTHOUGH HARDWARE IS
1164                                          ;*FUNCTIONING PROPERLY.
1165                                          ;*SW06=1         INHIBIT TEST 14 AND GO TO NEXT TEST
1166                                  ;*****************************************************************
1167  006046  000004                  TST14:  SCOPE
1168  006050  032777  000100  173060          BIT     #BIT06, @SWR    ;INHIBIT TEST 14?
1169  006056  001105                          BNE     TST15           ;GO TO NEXT TEST
1170  006060  012737  006270  000010          MOV     #NODO,10        ;SET UP RESERVED INSTR VECTOR
1171  006066  012737  000340  000012          MOV     #PR7,12         ;PSW=7
1172  006074  005037  001202                  CLR     $TMP3           ;SET $TMP3 = 0
1173  006100  000270                          SEN                     ;SET N BIT OF CC
1174  006102  006737  001202                  SXT     $TMP3           ;IF VALID INSTR, $TMP3 WILL = -1
1175  006106  005737  001202                  TST     $TMP3           ;IF INVALID, $TMP3 WILL REMAIN 0
1176  006112  100033                          BPL     NXT             ;IF CP NOT= 35,40,45,OR 70,GO TO NEXT TEST
1177  006114  012737  000140  177776          MOV     #PR3,PSW        ;PS=3
1178  006122  012777  006234  173530          MOV     #PBERR,@BE1VEC  ;SET UP DEVICE INTR
1179  006130  012737  006256  000114          MOV     #PBRTN,PBVEC    ;SET UP PARITY BIT VECTOR
1180  006136  012737  000340  000116          MOV     #340,PBPSW      ;SET UP PARITY BIT PSW
1181  006144  012777  020342  173432          MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
1182  006152  012777  177777  173422          MOV     #-1,@BE1CC      ;SET UP CYCLE COUNT
1183  006160  052777  010000  173424          BIS     #BIT12,@BE1CR2  ;SET BIT 12 FOR PARITY ERROR
1184  006166  005777  173420                  TST     @BE1CR2         ;SET OFF PARITY ERR SEQUENCE
```

```
1185  006172  012777  013161  173406          MOV     #13161,@BE1CR1  ;TRY FUN 1-DATO FROM CC-NPR-INTR ON DONE(7)
1186  006200  000240                          NOP                     ;ALLOW TIME FOR ATTEMPTED XFER
1187  006202                              NXT:
1188  006202  012737  000116  000114          MOV     #PBPSW,PBVEC    ;RESTORE
1189  006210  012737  000000  000116          MOV     #0,PBPSW        ;TRAP CATCHER HERE AND
1190  006216  012737  000012  000010          MOV     #12,10          ;AT RESERVED
1191  006224  012737  000000  000012          MOV     #0,12           ;INSTRUCTION VECTOR
1192  006232  000417                          BR      TST15           ;;BRANCH TO NEXT TEST IF PARITY TRAP OCCURRED
1193  006234                              PBERR:
1194  006234  011637  001172                  MOV     (SP),$REG5      ;FOR TYPEOUT OF PC
1195  006240  104014                          ERROR   14              ;TYPE ERR MSSG IF DEVICE INTERRUPTED
1196  006242  012737  000001  001204          MOV     #1,$TMP4        ;INDICATOR FOR DEVICE 1
1197  006250  004737  010406                  JSR     PC,ERRTN        ;CHECK TO SEE IF ANY ERRORS OCCURED
1198  006254  000002                          RTI                     ;EXIT TRAP
1199                                  ;*****************************************************************
1200                                  ;*****************************************************************
1201  006256                              PBRTN:                      ;PARITY BIT TRAP RTN
1202  006256  012777  000000  173326          MOV     #0,@BE1CR2      ;CLEAR PARITY BIT ERROR-MUST BE DONE
1203                                                                  ;BY MOVING 0(S) TO BE1CR2
1204  006264  012716  006202                  MOV     #NXT,(SP)       ;SET STACK FOR NEXT TEST
1205  006270  000002                      NODO:   RTI
1206
1207
1208                                  ;*****************************************************************
1209                                  ;*TEST 15       MULTITRANSFERS I
1210                                          ;*THIS TEST WILL CAUSE ANY BUS EXERCISERS, UP TO 4,
1211                                          ;*TO CREATE A LOT OF TRAFFIC ON THE BUS AND
1212                                          ;*CHECK THAT THE CPU CAN HANDLE IT; ALL DEVICES
1213                                          ;*ARE SET OFF SIMULTANEOUSLY
1214                                  ;*****************************************************************
1215  006272  000004                  TST15:  SCOPE
1216  006274  004737  002700                  JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
1217  006300  012703  000000                  MOV     #0,R3           ;SET DATA PATTERN = 0
1218  006304  012704  177777                  MOV     #177777,R4      ;SET DATA PATTERN = ALL 1'S
1219  006310  004737  007500                  JSR     PC,MULT1        ;LOAD & EXECUTE ALL DEVICES
1220  006314  022737  000002  001700          CMP     #2,DEVCNT       ;ARE THERE MORE THAN 2 DEVICES?
1221  006322  100115                          BPL     TST16           ;;IF 2 OR LESS, GO TO NEXT TEST
1222  006324  012703  161610                  MOV     #161610,R3      ;ELSE LOAD R3 AND R4 WITH
1223  006330  012704  016161                  MOV     #016161,R4      ;ANOTHER PATTERN
1224  006334                              5$:
1225  006334  123737  001115  001103          CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
1226  006342  100505                          BMI     TST16           ;;BR IF YES TO NEXT TEST
1227  006344  004737  010600                  JSR     PC,ROTATE       ;ROTATE DATA PATTERNS
1228  006350  004737  007500                  JSR     PC,MULT1        ;LOAD & EXECUTE ALL DEVICES
1229  006354  022703  107070                  CMP     #107070,R3      ;IS R3 = 107070?
1230  006360  001365                          BNE     5$              ;IF NOT,ROTATE AND DO AGAIN
1231  006362  012703  167777                  MOV     #167777,R3      ;ELSE MOVE NEW PATTERNS
1232  006366  012704  010000                  MOV     #010000,R4      ;INTO R3 AND R4
1233  006372                              10$:
1234  006372  123737  001115  001103          CMPB    $ERMAX,$ERFLG   ;MAX ERRS FOR THIS TEST OCCURRED?
1235  006400  100466                          BMI     TST16           ;;BR IF YES TO NEXT TEST
1236  006402  004737  010600                  JSR     PC,ROTATE       ;ROTATE DATA PATTERNS
1237  006406  004737  007500                  JSR     PC,MULT1        ;LOAD & EXECUTE ALL DEVICES
1238  006412  022703  167777                  CMP     #167777,R3      ;IS R3 = 167777 AGAIN?
1239  006416  001365                          BNE     10$             ;IF NOT,ROTATE AND DO AGAIN
1240  006420  000456                          BR      TST16           ;;GO TO NEXT TEST
```

```
1241                                    ;*****************************************************************
1242                                    ;*****************************************************************
1243                                    ;*****************************************************************
1244  006422                            SERV1:
1245  006422  017737  173156  001712            MOV     @BE1BA,DATA1    ;MOVE ADDR IN BE1BA TO DATA1 AND
1246  006430  162737  000001  001712            SUB     #1,DATA1        ;SUB 1 TO GET ACTUAL ADDR
1247  006436  012737  000001  001204            MOV     #1,$TMP4        ;INDICATOR FOR DEVICE 1
1248  006444  000435                           BR      INK             ;BRANCH TO INK
1249  006446                            SERV2:
1250  006446  017737  173146  001714            MOV     @BE2BA,DATA2    ;MOVE ADDR IN BE2BA TO DATA2 AND
1251  006454  162737  000002  001714            SUB     #2,DATA2        ;SUB 2 TO GET ACTUAL ADDR
1252  006462  012737  000002  001204            MOV     #2,$TMP4        ;INDICATOR FOR DEVICE 2
1253  006470  000423                           BR      INK             ;BRANCH TO INK
1254  006472                            SERV3:
1255  006472  017737  173136  001716            MOV     @BE3BA,DATA3    ;MOVE ADDR IN BE3BA TO DATA3 AND
1256  006500  162737  000002  001716            SUB     #2,DATA3        ;SUB 2 TO GET ACTUAL ADDR
1257  006506  012737  000003  001204            MOV     #3,$TMP4        ;INDICATOR FOR DEVICE 3
1258  006514  000411                           BR      INK             ;BRANCH TO INK
1259  006516                            SERV4:
1260  006516  017737  173126  001720            MOV     @BE4BA,DATA4    ;MOVE ADDR IN BE4BA TO DATA4 AND
1261  006524  162737  000002  001720            SUB     #2,DATA4        ;SUB 2 TO GET ACTUAL ADDR
1262  006532  012737  000004  001204            MOV     #4,$TMP4        ;INDICATOR FOR DEVICE 4
1263  006540                            INK:
1264  006540  005237  001164                    INC     $REG2           ;INCREMENT REG
1265  006544  011637  001172                    MOV     (SP),$REG5      ;FOR TYPEOUT OF PC
1266  006550  004737  010406                    JSR     PC,ERRTN        ;CHECK FOR ANY ERRS
1267  006554  000002                           RTI                     ;EXIT
1268                                    ;*****************************************************************
1269
1270                                    ;*****************************************************************
1271                                    ;*TEST 16       MULTITRANSFERS II
1272                                            ;*THIS TEST WILL HAVE THE AVAILABLE EXERCISERS DOING
1273                                            ;*VARIOUS TRANSFERS AND/OR INTERRUPTS AT DIFFERENT
1274                                            ;*REQUEST LEVELS TO FURTHER CHECK CPU HANDLING CAPABILITIES
1275                                    ;*****************************************************************
1276  006556  000004                   TST16:  SCOPE
1277  006560  012702  020342                   MOV     #ATEND,R2       ;R2 = END OF PROG
1278  006564  012705  005000                   MOV     #5000,R5        ;R5 = THE # OF DATA WORDS
1279  006570  004737  011030                   JSR     PC,DOUP         ;CREATE THOSE WORDS IN BUFFER MEMORY
1280  006574  004737  011142                   JSR     PC,TSTOVR       ;SET UP PATTERN IN MEMORY BUFFER AREA
1281  006600  004737  002700                   JSR     PC,CLRREG       ;CLEAR CONTENTS OF ALL AVAILABLE DEVS
1282
1283  006604  012737  000000  177776            MOV     #PR0,PSW        ;PS=0
1284  006612  012777  007344  173040            MOV     #S1,@BE1VEC     ;SET UP DEVICE 1 INTR VECTOR
1285  006620  012777  000340  173034            MOV     #PR7,@BE1PSW    ;SET UP DEVICE 1 PSW VECTOR
1286  006626  012777  022342  172750            MOV     #ATEND+2000,@BE1BA  ;SET UP ADDR REG
1287  006634  012777  176000  172740            MOV     #-2000,@BE1CC   ;SET UP CYCLE COUNT
1288  006642  012777  015551  172736            MOV     #15551,@BE1CR1  ;DO FUN 2-DATOB FROM CC-NPR-INTR ON DONE(6)
1289  006650  022737  000001  001700            CMP     #1,DEVCNT       ;CHECK FOR MORE THAN 1 DEVICE
1290  006656  001467                           BEQ     1$              ;IF NOT, GO CHECK RESULTS
1291
1292  006660  012777  007376  172776            MOV     #S2,@BE2VEC     ;SET UP DEVICE 2 INTR VECTOR
1293  006666  012777  000340  172772            MOV     #PR7,@BE2PSW    ;SET UP DEVICE 2 PSW VECTOR
1294  006674  012777  177000  172714            MOV     #-1000,@BE2CC   ;SET UP CYCLE COUNT FOR 1000 XFERS
1295  006702  012777  020342  172710            MOV     #ATEND,@BE2BA   ;SET UP ADDR REG=1ST LOCATION AFTER PROG
1296  006710  012777  002561  172704            MOV     #2561,@BE2CR1   ;DO FUN 1-DATIP-NPR-INTR ON DONE(7)
```

```
 1297  006716  022737  000002  001700          CMP     #2,DEVCNT       ;CHECK FOR MORE THAN 2 DEVICES
 1298  006724  001444                          BEQ     1$              ;IF NOT, GO CHECK RESULTS
 1299
 1300  006726  012777  007430  172734          MOV     #S3,@BE3VEC     ;SET UP DEVICE 3 INTR VECTOR
 1301  006734  012777  000340  172730          MOV     #PR7,@BE3PSW    ;SET UP PSW VECTOR
 1302  006742  012777  176776  172662          MOV     #-1002,@BE3CC   ;SET UP CYCLE COUNT
 1303  006750  012777  020342  172656          MOV     #ATEND,@BE3BA   ;SET UP ADDR REG
 1304  006756  012777  004005  172652          MOV     #4005,@BE3CR1   ;DO FUN 2-DATI-BR5
 1305  006764  022737  000003  001700          CMP     #3,DEVCNT       ;CHECK FOR MORE THAN 3 DEVICES
 1306  006772  001421                          BEQ     1$              ;IF NOT, GO CHECK RESULTS
 1307
 1308  006774  005037  001170                  CLR     $REG4           ;USE REG4 TO COUNT INTRS
 1309  007000  012777  007446  172666          MOV     #S4,@BE4VEC     ;SET UP DEVICE 4 INTR VECTOR
 1310  007006  012777  000340  172662          MOV     #PR7,@BE4PSW    ;SET UP PSW VECTOR
 1311  007014  012777  175000  172624          MOV     #-3000,@BE4CC   ;SET UP CYCLE COUNT
 1312  007022  052777  040000  172626          BIS     #BIT14,@BE4CR2  ;SET TIME DELAY BIT OF DEVICE 4
 1313  007030  012777  000021  172614          MOV     #21,@BE4CR1     ;DO FUN 0-BR7
 1314  007036                          1$:
 1315  007036  012700  001606                  MOV     #BE1CR1,R0      ;USE R0 TO POINT TO DEVICE 1'S CR1
 1316  007042  004737  010754                  JSR     PC,BKGD         ;PERFORM BACKGROUND ROUTINE

       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
               ;BE1 TRANSFER CHECKS
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

 1324  007046  012702  022342                  MOV     #ATEND+2000,R2  ;USE R2 TO POINT TO 2000 BYTES AFTER END OF PROGRAM
 1325  007052  012737  176000  001164          MOV     #-2000,$REG2    ;SET UP $REG2 WITH EXPECTED RESULTS
 1326  007060  023702  001712          10$:    CMP     DATA1,R2        ;CHECK FOR 4000 BYTES PAST END OF PROGRAM
 1327  007064  001417                          BEQ     14$             ;IF EQUAL, GO CHECK FOR ANOTHER DEVICE
 1328  007066  023722  001164                  CMP     $REG2,(R2)+     ;ELSE COMPARE EXPECTED RESULTS WITH THAT IN R2
 1329  007072  001004                          BNE     12$             ;IF NOT EQUAL, GO TO ERR MSSG
 1330  007074  062737  000002  001164          ADD     #2,$REG2        ;INCREMENT REG2 AS CC WOULD
 1331  007102  000766                          BR      10$             ;AND GO BACK TO CHECK NEXT LOC
 1332  007104                          12$:
 1333  007104  014237  001162                  MOV     -(R2),$REG1     ;MOVE R2 TO REG 5 FOR TYPEOUT
 1334  007110  010237  001160                  MOV     R2,$REG0
 1335  007114  013737  001164  001166          MOV     $REG2,$REG3
 1336  007122  104021                          ERROR   21              ;TYPE ERR MSSG
 1337  007124                          14$:
 1338  007124  022737  000001  001700          CMP     #1,DEVCNT       ;CHECK IF ONLY 1 DEVICE SHOULD HAVE OPERATED
 1339  007132  001470                          BEQ     TST17           ;;<IF EQUAL, GO TO NEXT TEST>

       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
               ;BE2 TRANSFER CHECKS
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

 1347  007134  012701  020342                  MOV     #ATEND,R1       ;USE R1 TO POINT TO END OF PROG
 1348  007140  023701  001714          5$:     CMP     DATA2,R1        ;CHECK FOR 2000 BYTES PAST END
 1349  007144  001413                          BEQ     6$              ;IF EQUAL, EXIT
 1350  007146  022721  052525                  CMP     #052525,(R1)+   ;ELSE COMPARE EXPECTED RESULTS WITH R1
 1351  007152  001772                          BEQ     5$              ;IF EQUAL, GO CHECK NEXT LOC
 1352  007154  014137  001162                  MOV     -(R1),$REG1     ;MOVE R1 TO REG1 FOR TYPEOUT
```

```
 1353  007160  010137  001160                 MOV     R1,$REG0
 1354  007164  012737  052525  001166         MOV     #052525,$REG3
 1355  007172  104020                         ERROR   20              ;ELSE TYPE ERR MSSG
 1356  007174                          6$:
 1357  007174  022737  000002  001700         CMP     #2,DEVCNT       ;CHECK IF ONLY 2 DEVICES OPERATED
 1358  007202  001444                         BEQ     TST17           ;;<IF EQUAL, GO TO NEXT TEST>

       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
               ;BE3 CHECK RGUTINE
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

 1366  007204  105777  172426          16$:    TSTB    @BE3CR1         ;CHECK IF DEVICE 3 DONE
 1367  007210  100401                         BMI     20$             ;IF YES, CHECK NEXT DEVICE
 1368  007212  000774                         BR      16$             ;AND GO BACK TO SEE IF DONE YET
 1369  007214                          20$:
 1370  007214  022777  176002  172406         CMP     #-1776,@BE3DB   ;CHECK FOR CORR VALUE IN BE3DB
 1371  007222  001407                         BEQ     25$             ;IF EQUAL, SKIP ERR TYPE OUT
 1372  007224  017737  172400  001162         MOV     @BE3DB,$REG1    ;MOVE FOR ERR TYPE OUT
 1373  007232  012737  176002  001164         MOV     #-1776,$REG2
 1374  007240  104032                         ERROR   32              ;TYPE ERR MSSG
 1375  007242                          25$:
 1376  007242  022737  000003  001700         CMP     #3,DEVCNT       ;CHECK IF ONLY 3 DEVICES OPERATED
 1377  007250  001421                         BEQ     TST17           ;;<IF EQUAL, GO TO NEXT TEST>

       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
               ;BE4 CHECK ROUTINE
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

 1385  007252                          22$:
 1386  007252  105777  172374                 TSTB    @BE4CR1         ;TEST IF DEVICE 4 IS DONE
 1387  007256  100375                         BPL     22$             ;IF NOT, GO BACK TO DELAY RTN
 1388  007260  022737  003000  001170         CMP     #3000,$REG4     ;CHECK IF REG4 COUNTED 3000 INTRS
 1389  007266  001407                         BEQ     26$             ;IF EQUAL SKIP ERR TYPE OUT
 1390  007270  013737  001170  001162         MOV     $REG4,$REG1     ;MOVE FOR TYPE OUT
 1391  007276  012737  003000  001164         MOV     #3000,$REG2
 1392  007304  104033                         ERROR   33              ;TYPE ERR MSSG
 1393  007306                          26$:
 1394  007306  042777  040000  172342         BIC     #BIT14,@BE4CR2  ;ELSE CLEAR TIME DELAY BIT
 1395                                  ;******************************************************************
 1396                                  ;*TEST 17        DUMMY END OF PROGRAM
 1397                                  ;******************************************************************
 1398  007314  000004                  TST17:  SCOPE
 1399  007316  012737  000001  001210         MOV     #1,$TIMES       ;;DO 1 ITERATION
 1400
 1401  007324  017700  171614                 MOV     @$TKB,R0        ;MOVE READ BUFF CONTENTS TO R0
 1402  007330  022700  000210                 CMP     #210,R0         ;DOES THE VALUE = " H" ?
 1403  007334  001001                         BNE     10$             ;IF NOT GO TO 10$
 1404  007336  000000                         HALT                    ;ELSE HALT THE PROGRAM
 1405  007340                          10$:
 1406  007340  000137  015446                 JMP     $EOP
 1407                                  ;******************************************************************
 1408                                  ;SET UP DEVICE INTR VECTOR
```

```
 1409                                   ;*****************************************************************
 1410  007344                           S1:
 1411
 1412  007344  017737  172234  001712          MOV     @BE1BA,DATA1    ;MOVE ADDR IN BE1BA TO DATA1 AND
 1413  007352  162737  000002  001712          SUB     #2,DATA1        ;SUB 2 TO GET ACTUAL ADDR
 1414  007360  012737  000001  001204          MOV     #1,$TMP4        ;SET INDICATOR FOR DEVICE 1
 1415  007366  005777  172214                  TST     @BE1CR1         ;TEST FOR ERROR
 1416  007372  100041                          BPL     EXS             ;IF PLUS, EXIT
 1417  007374  000434                          BR      CHEX            ;ELSE FIND CAUSE OF INTR
 1418  007376                           S2:
 1419  007376  017737  172216  001714          MOV     @BE2BA,DATA2    ;MOVE ADDR IN BE2BA TO DATA2 AND
 1420  007404  162737  000002  001714          SUB     #2,DATA2        ;SUB 2 TO GET ACTUAL ADDR
 1421  007412  012737  000002  001204          MOV     #2,$TMP4        ;SET INDICATOR FOR DEVICE 2
 1422  007420  005777  172176                  TST     @BE2CR1         ;TEST FOR ERROR
 1423  007424  100024                          BPL     EXS             ;IF PLUS EXIT
 1424  007426  000417                          BR      CHEX            ;ELSE FIND CAUSE OF INTR
```

```
 1425  007430                          S3:
 1426  007430  012737  000003  001204          MOV     #3,$TMP4        ;SET INDICATOR FOR DEVICE 3
 1427  007436  005777  172174                  TST     @BE3CR1         ;TEST FOR ERROR
 1428  007442  100015                          BPL     EXS             ;IF PLUS, EXIT
```

```
 1429  007444  000410                    BR      CHEX            ;ELSE FIND CAUSE OF INTR
 1430  007446                    S4:
 1431  007446  005237  001170            INC     $REG4           ;COUNT DEVICE 4'S INTRS
```

```
1432  007452  012737  000004  001204          MOV     #4,$TMP4        ;SET INDICATOR FOR DEVICE 4
1433  007460  005777  172166                  TST     @BE4CR1         ;TEST FOR ERROR
1434  007464  100004                          BPL     EXS             ;IF PLUS, EXIT
1435  007466                          CHEX:
1436  007466  011637  001172                  MOV     (SP),$REG5      ;FOR TYPEOUT OF PC
1437  007472  004737  010406                  JSR     PC,ERRTN        ;ELSE FIND CAUSE OF INTR
1438  007476                          EXS:
1439  007476  000002                          RTI
1440                                  ;*****************************************************************
1441                                  ;*****************************************************************
1442  007500                          MULT1:
1443  007500  012702  020342                  MOV     #ATEND,R2       ;R2 = END OF PROG
1444  007504  012705  005000                  MOV     #5000,R5        ;R5 = THE # OF DATA WORDS
1445  007510  004737  011030                  JSR     PC,DOUP         ;CREATE THOSE WORDS IN BUFFER MEMORY
1446  007514  004737  011142                  JSR     PC,TSTOVR       ;SET UP PATTERN IN MEMORY BUFFER AREA
1447  007520  012777  020342  172056          MOV     #ATEND,@BE1BA   ;SET REG ADDR= 1ST LOCATION AFTER END OF PROGRAM
1448  007526  012777  176000  172046          MOV     #-2000,@BE1CC   ;SET CYCLE COUNT FOR 2000 XFERS
1449  007534  012777  006422  172116          MOV     #SERV1,@BE1VEC  ;SET UP DEVICE INTR VECTOR
1450  007542  012777  000340  172112          MOV     #PR7,@BE1PSW    ;SET UP DEVICE PSW VECTOR
1451  007550  052777  040000  172034          BIS     #BIT14,@BE1CR2  ;SET BIT 14 FOR TIME DELAY ENABLE
1452  007556  012777  042560  172022          MOV     #42560,@BE1CR1  ;DO DATIP/DATOB-FUN 1-NPR-INTR ON DONE(7)
1453  007564  122737  000001  001700          CMPB    #1,DEVCNT       ;IF MORE THAN 1 DEVICE, LOAD THEIR REGISTERS
1454  007572  001474                          BEQ     6$              ;OTHERWISE BEGIN TESTING
1455  007574                          3$:
1456  007574  012777  006446  172062          MOV     #SERV2,@BE2VEC  ;SET UP DEVICE 2 INTR VECTOR
1457  007602  012777  000340  172056          MOV     #PR7,@BE2PSW    ;SET UP DEVICE 2 PSW VECTOR
1458  007610  012777  020342  172002          MOV     #ATEND,@BE2BA   ;SET UP ADDR REG FOR SAME LOCATIONS AS DEVICE 1
1459  007616  012777  177000  171772          MOV     #-1000,@BE2CC   ;SET CYCLE COUNT FOR A 1000 XFERS
1460  007624  012777  024510  171770          MOV     #24510,@BE2CR1  ;DO DATIP/NO ROTATE-FUN 2-BR6-INTR ON DONE(6)
1461  007632  122737  000002  001700          CMPB    #2,DEVCNT       ;IF MORE THAN 2 DEVICES, LOAD THER REGISTERS
1462  007640  001451                          BEQ     6$              ;OTHERWISE BEGIN TESTING
1463  007642                          4$:
1464  007642  012777  000340  172022          MOV     #PR7,@BE3PSW    ;SET UP DEVICE 3 PSW VECTOR
1465  007650  010377  171754                  MOV     R3,@BE3DB       ;MOVE PATTERN IN R3 TO DEVICE DATA REG
1466  007654  012777  006472  172006          MOV     #SERV3,@BE3VEC  ;SET UP DEVICE INTR VECTOR
1467  007662  012777  022342  171744          MOV     #ATEND+2000,@BE3BA  ;SET UP ADDR REG
1468  007670  012777  177000  171734          MOV     #-1000,@BE3CC   ;SET UP FOR 1000 XFERS
1469  007676  052777  040000  171736          BIS     #BIT14,@BE3CR2  ;SET BIT 14 FOR TIME DELAY ENABLE
1470  007704  012777  003160  171724          MOV     #3160,@BE3CR1   ;DO DATO-FUN 1-FROM DB-NPR-INTR ON DONE(7)
1471  007712  122737  000003  001700          CMPB    #3,DEVCNT       ;IF A 4TH DEVICE, GO AND LOAD REGISTERS
1472  007720  001421                          BEQ     6$              ;OTHERWISE BEGIN TESTING
1473  007722                          5$:
1474  007722  010477  171716                  MOV     R4,@BE4DB       ;MOVE PATTERN IN R4 TO DEVICE DATA REG
1475  007726  012777  000340  171742          MOV     #PR7,@BE4PSW    ;SET UP DEVICE 4 PSW VECTOR
1476  007734  012777  006516  171732          MOV     #SERV4,@BE4VEC  ;SET UP DEVICE 4 INTR VECTOR
1477  007742  012777  024342  171700          MOV     #ATEND+4000,@BE4BA  ;SET UP ADDR REG
1478  007750  012777  177000  171670          MOV     #-1000,@BE4CC   ;SET CYCLE COUNT FOR 1000 XFERS
1479  007756  012777  003104  171666          MOV     #3104,@BE4CR1   ;DO DATO-FUN 1-BR5-INTR ON DONE
1480  007764                          6$:
1481  007764  005277  171606                  INC     @SIMLGO         ;START DEVICES SIMULTANEOUSLY

      ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
      ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
              ;BACKGROUND ROUTINE FOR MULTITRANSFERS I

1487  007770  012737  000001  001162          MOV     #1,$REG1        ;MOVE 1 TO TEMPORARY REG
```

```
 1488  007776  012701  001162                 MOV     #$REG1,R1       ;SET UP R1 AS POINTER
 1489  010002  005121                  7$:    COM     (R1)+           ;COMPLEMENT TEMP REG
 1490  010004  006041                         ROR     -(R1)           ;ROTATE CONTENTS RIGHT
 1491  010006  123737  001700  001164         CMPB    DEVCNT,$REG2    ;CHECK IF ALL DEVICES ARE DONE
 1492  010014  101372                         BHI     7$              ;IF NOT, CONTINUE WITH BACKGROUND RTN
 1493                                  ;*****************************************************************

       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
               ;DEVICE 1 TRANSFER CHECKS
               ;THERE ARE NO CHECKS FOR BE2
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

 1502  010016  042777  040000  171566         BIC     #BIT14,@BE1CR2  ;CLEAR TIME DELAY BIT
 1503  010024  012700  020342                 MOV     #ATEND,R0       ;START CHECKING FOR CORRECT XFERS
 1504  010030                          8$:
 1505  010030  122720  000125                 CMPB    #125,(R0)+      ;COMPARE LOWER BYTE
 1506  010034  001012                         BNE     20$             ;IF NOT EQUAL, BR TO ERR MSSG
 1507  010036  023700  001712                 CMP     DATA1,R0        ;IS THIS LAST BYTE COMPARE?
 1508  010042  001422                         BEQ     9$              ;IF SO, BR TO 9$
 1509  010044  122720  000124                 CMPB    #124,(R0)+      ;ELSE COMPARE UPPER BYTE
 1510  010050  001006                         BNE     22$             ;IF NOT EQUAL, BR TO ERR MSSG
 1511  010052  023700  001712                 CMP     DATA1,R0        ;IS THIS LAST BYTE COMPARE?
 1512  010056  001414                         BEQ     9$              ;IF SO, BR TO 9$
 1513  010060  000763                         BR      8$              ;ELSE CHECK NEXT ADDR
 1514  010062                          20$:
 1515  010062  105740                         TSTB    -(R0)           ;SUB 1 TO GET ERR ADDR
 1516  010064  000401                         BR      24$             ;GO DO MOVES FOR ERR MSSG
 1517  010066                          22$:
 1518  010066  005740                         TST     -(R0)           ;SUB 2 TO GET ERR ADDR
 1519  010070                          24$:
 1520  010070  011037  001162                 MOV     (R0),$REG1      ;MOVES ARE FOR ERR MSSG
 1521  010074  010037  001160                 MOV     R0,$REG0
 1522  010100  012737  052125  001166         MOV     #052125,$REG3
 1523  010106  104015                         ERROR   15              ;ELSE TYPE ERR MSSG
 1524  010110                          9$:
 1525  010110  022737  000001  001700         CMP     #1,DEVCNT       ;IF ONLY ONE DEVICE
 1526  010116  001447                  25$:   BEQ     13$             ;IF NO MORE DEVICES,EXIT RTN
 1527  010120  122737  000002  001700         CMPB    #2,DEVCNT       ;CHECK FOR MORE THAN 2 DEVICES
 1528  010126  001773                         BEQ     25$             ;IF NOT, EXIT TEST

       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
       ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
               ;BE3 TRANSFER CHECKS
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
       ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

 1536  010130  042777  040000  171504         BIC     #BIT14,@BE3CR2  ;CLEAR TIME DELAY BIT OF DEVICE 3
 1537  010136  012700  022342                 MOV     #ATEND+2000,R0  ;CHECK NEXT 2000 LOCATIONS
 1538  010142  023700  001716          10$:   CMP     DATA3,R0        ;CHECK FOR 1000 XFERS
 1539  010146  001411                         BEQ     11$             ;IF SO, CHECK NEXT BLOCK
 1540  010150  020320                         CMP     R3,(R0)+        ;TEST FOR CORRECT PATTERNS
 1541  010152  001773                         BEQ     10$             ;IF NO ERR, CHECK ANOTHER LOC
 1542  010154  010337  001166                 MOV     R3,$REG3        ;THE MOVE IS FOR TYPEOUT REASONS
 1543  010160  014037  001162                 MOV     -(R0),$REG1
```

```
1544  010164  010037  001160                MOV     R0,$REG0
1545  010170  104016                        ERROR   16              ;ELSE TYPE ERR MSSG
1546  010172                        11$:
1547  010172  122737  000003  001700        CMPB    #3,DEVCNT       ;CHECK FOR MORE THAN 3 DEVICES
1548  010200  001416                        BEQ     13$             ;IF NO MORE DEVICES GO DO NEXT PATTERN

      ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
      ;/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :/* :
            ;BE4 TRANSFER CHECKS
      ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *
      ;/: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: */: *

1556  010202  012700  024342                MOV     #ATEND+4000,R0  ;CHECK NEXT BLOCK OF 2000 LOCATIONS
1557  010206  023700  001720        12$:    CMP     DATA4,R0        ;CHECK FOR 1000 XFERS
1558  010212  001411                        BEQ     13$             ;IF SO, CHANGE DATA PATTERNS & START OVER AGAIN
1559  010214  020420                        CMP     R4,(R0)+        ;ELSE CHECK FOR CORRECT PATTERNS
1560  010216  001773                        BEQ     12$             ;IF NO ERR, CHECK ANOTHER LOCATION
1561  010220  010437  001166                MOV     R4,$REG3        ;THE MOVE IS FOR TYPEOUT REASONS
1562  010224  014037  001162                MOV     -(R0),$REG1
1563  010230  010037  001160                MOV     R0,$REG0
1564  010234  104017                        ERROR   17              ;ELSE TYPE ERR MSSG
1565  010236                        13$:
1566  010236  000207                        RTS     PC
1567                                ;////////////////////////////////////////////////////////////////////////
1568                                ;////////////////////////////////////////////////////////////////////////
1569                                ;////////////////////////////////////////////////////////////////////////
1570  010240                        STVEC:
1571  010240  005000                        CLR     R0              ;R0 IS COUNTER
1572  010242  012701  010276                MOV     #Q1,R1          ;R1 IS ADDR OF INTR RTN
1573  010246  012702  000510                MOV     #510,R2         ;R2 IS DEV INTR VEC ADDR
1574  010252                        5$:
1575  010252  010122                        MOV     R1,(R2)+        ;LOAD INTR RTN INTO INTR VEC
1576  010254  012722  000340                MOV     #PR7,(R2)+      ;LOAD INTR PSW
1577  010260  062701  000006                ADD     #6,R1           ;GET NEXT INTR RTN
1578  010264  005200                        INC     R0              ;INC COUNTER
1579  010266  020037  001700                CMP     R0,DEVCNT       ;ARE ALL AVAILABLE VECS LOADED?
1580  010272  001367                        BNE     5$              ;IF NOT, GO AND LOAD NEXT ONE
1581  010274  000207                        RTS     PC              ;ELSE EXIT
1582                                ;**************************************************************************
1583                                ;**************************************************************************
1584
1585                                ; THE FOLLOWING INTR ROUTINES SHOULD HANDLE ANY ERRORS
1586                                ; WHICH MIGHT OCCUR BEFORE THE PROGRAM HAS A CHANCE TO
1587                                ; PROPERLY CHECK OUT ALL DEVICES AND SET UP THEIR INTR VECTORS
1588
1589
1590  010276                        Q1:
1591  010276  012737  000001  001204        MOV     #1,$TMP4        ;INDICATOR FOR DEV 1
1592  010304  000413                        BR      XQ
1593  010306                        Q2:
1594  010306  012737  000002  001204        MOV     #2,$TMP4        ;INDICATOR FOR DEV 2
1595  010314  000407                        BR      XQ
1596  010316                        Q3:
1597  010316  012737  000003  001204        MOV     #3,$TMP4        ;INDICATOR FOR DEV 3
1598  010324  000403                        BR      XQ
1599  010326                        Q4:
```

```
1600  010326  012737  000004  001204          MOV     #4,$TMP4        ;INDICATOR FOR DEV 4
1601  010334                              XQ:
1602  010334  004737  010406                  JSR     PC,ERRTN        ;GO TO ERR ROUTINE
1603  010340  000002                          RTI
1604                                  ;*****************************************************************
1605                                  ;*****************************************************************
1606  010342                          PWRFAL:
1607  010342  010146                          MOV     R1,-(SP)        ;SAVE CONTENTS OF R1
1608  010344  010046                          MOV     R0,-(SP)        ;SAVE CONTENTS OF R0
1609  010346  012700  001612                  MOV     #BE1CR2,R0      ;R0 POINTS TO DEV 1 CR2 ADDR
1610  010352  005001                          CLR     R1              ;CLEAR R1
1611  010354                          5$:
1612  010354  042770  000020  000000          BIC     #BIT04,@(R0)    ;CLR BIT 4 OF CURRENT CR2
1613  010362  062700  000014                  ADD     #14,R0          ;ADD 14 TO POINT TO NEXT CR2
1614  010366  005201                          INC     R1              ;COUNT THE NUMBER OF DEVS
1615  010370  020137  001700                  CMP     R1,DEVCNT       ;REACHED MAX # ON BUS?
1616  010374  103767                          BLO     5$              ;IF NOT, CLR NEXT CR2
1617  010376  012600                          MOV     (SP)+,R0        ;ELSE RESTORE R0
1618  010400  012601                          MOV     (SP)+,R1        ;AND R1
1619  010402  000137  020202                  JMP     $PWRDN          ;THEN DO REGULAR PWR DOWN RTN
1620                                  ;*****************************************************************
1621                                  ;*****************************************************************
1622  010406                          ERRTN:
1623  010406  104407                          SAVREG                  ;SAVE REGISTERS
1624  010410  012700  001576                  MOV     #BE1CR2-14,R0 ;INITIALIZE R0
1625  010414  105005                          CLRB    R5              ;CLEAR DEVICE COUNTER
1626  010416                          1$:
1627  010416  105205                          INCB    R5              ;ADD 1 TO COUNTER
1628  010420  062700  000014                  ADD     #14,R0          ;SET R0=ADDR OF CR2 OF NEXT DEVICE
1629  010424  120537  001204                  CMPB    R5,$TMP4        ;IF COUNTER NOT EQUAL TO INDICATOR
1630  010430  001372                          BNE     1$              ;ADD 1 TO COUNTER & CHECK AGAIN
1631  010432                          CHKERR:
1632  010432  105770  000000                  TSTB    @(R0)           ;CHECK FOR NO NOSACK TIMEOUT
1633  010436  100001                          BPL     1$              ;IF NOT, SEE IF THERE ARE ANY ERRS
1634  010440  104022                          ERROR   22              ;TYPE ERR MESSG FOR NO NOSACK
1635  010442                          1$:
1636  010442  032770  007540  000000          BIT     #7540,@(R0)     ;CHECK FOR OTHER ERRORS
1637  010450  001436                          BEQ     LEEV            ;IF NO ERRORS,EXIT
1638  010452  032770  004000  000000          BIT     #BIT11,@(R0)    ;CHECK FOR NO SSYN ON INTR
1639  010460  001401                          BEQ     10$             ;IF NOT SET, CHECK FOR NEXT ERR
1640  010462  104023                          ERROR   23              ;TYPE ERR MSSG FOR NO SSYN ON INTR
1641  010464                          10$:
1642  010464  132770  000040  000000          BITB    #BIT05,@(R0)    ;CHECK FOR WRONG GRANT ERR
1643  010472  001401                          BEQ     2$              ;IF NOT, CHECK BIT 6
1644  010474  104024                          ERROR   24              ;ELSE TYPE ERR MESSG FOR WRONG GRANT
1645  010476                          2$:
1646  010476  132770  000100  000000          BITB    #BIT06,@(R0)    ;CHECK FOR BUS LATE ERR
1647  010504  001401                          BEQ     3$              ;IF NOT, CHECK BIT 8
1648  010506  104025                          ERROR   25              ;TYPE ERR MSSG FOR BUS LATE
1649  010510                          3$:
1650  010510  032770  000400  000000          BIT     #BIT08,@(R0)    ;CHECK FOR NO SSYN ERR
1651  010516  001401                          BEQ     4$              ;IF NOT, CHECK BIT 9
1652  010520  104026                          ERROR   26              ;TYPE ERR MSSG FOR NO SSYN
1653  010522                          4$:
1654  010522  032770  001000  000000          BIT     #BIT09,@(R0)    ;CHECK FOR WRONG ADDR ERR
1655  010530  001401                          BEQ     5$              ;IF NOT, CHECK BIT 10
```

```
                                        ERROR   27              ;TYPE ERR MSSG FOR WRONG ADDR
                                5$:
                                        BIT     #BIT10,@(R0)    ;CHECK FOR NO GRANT ERR
                                        BEQ     LEEV            ;IF NOT, EXIT
                                        ERROR   30              ;TYPE ERR MSSG FOR NO GRANT
                                LEEV:
                                        SUB     #2,R0           ;POINT TO DEVICE CLEAR REG
                                        CLR     @(R0)           ;CLEAR ALL ERRORS
                                        RESREG                  ;RESTORE REGISTERS
                                        RTS     PC              ;EXIT
                                ;***************************************************************
                                ;***************************************************************
                                ;***************************************************************
                                THRU0:
                                        MOV     (SP),$REG2      ;MOVE FOR ERR TYPE OUT
                                        SUB     #2,$REG2        ;SUB 2 FOR ACTUAL ADDR
                                        ERROR   35              ;TYPE ERR MSSG
                                        RTI
                                ;***************************************************************
                                ;***************************************************************
                                ROTATE:
                                        BIT     #BIT00,R3       ;IS LSB A 1 OR 0 ?
                                        BEQ     5$              ;IF 0, GO TO 5$
                                        SEC                     ;ELSE SET C BIT OF COND CODES
                                        BR      10$             ;AND GO ROTATE
                                5$:
                                        CLC                     ;CLEAR C BIT OF COND CODES
                                10$:
                                        ROR     R3              ;ROTATE R3
                                        BIT     #BIT00,R4       ;IS LSB A 1 OR 0 ?
                                        BEQ     15$             ;IF 0, GO TO 15$
                                        SEC                     ;ELSE SET C BIT OF COND CODES
                                        BR      20$             ;AND GO ROTATE
                                15$:
                                        CLC                     ;CLEAR C BIT OF COND CODES
                                20$:
                                        ROR     R4              ;ROTATE R4
                                        RTS     PC
                                ;***************************************************************
                                ;***************************************************************
                                NOG:
                                2$:
                                        MOV     R0,PSW          ;SET UP PROCESSOR STATUS
                                        MOV     #ATEND,@BE1BA   ;SET UP ADDR REG
                                        MOV     #-1,@BE1CC      ;SET UP CYCLE COUNT FOR 1 CYCLE
                                        MOV     R1,@BE1CR1      ;DO FUN 1 ON BR LEVELS IN R1
                                        NOP                     ;WAIT FOR DEVICE TO ATTEMPT TO  DO XFER
                                        CMP     #-1,@BE1CC      ;SEE IF DEVICE OPERATED
                                        BNE     4$              ;IF IT DID,GO TYPE ERR MSSG
                                        ASRB    R1              ;SHIFT BYTE RIGHT TO LOWER BRRO
                                        CMPB    #1,R1           ;IF BYTE IS NOT EQUAL TO 1
                                        BNE     2$              ;GO TO 2$
                                        BR      EXNOG           ;EXIT
                                4$:
                                        JSR     PC,ERRS
                                EXNOG:  RTS     PC              ;EXIT SUB RTN
```

```
1712                                    ;*****************************************************************
1713  010714                            ERRS:
1714  010714  017737  170660  001160            MOV     @BE1DB,$REG0    ;MOVES ARE FOR TYPEOUTS
1715  010722  017737  170654  001162            MOV     @BE1CC,$REG1
1716  010730  017737  170650  001164            MOV     @BE1BA,$REG2
1717  010736  017737  170644  001166            MOV     @BE1CR1,$REG3
1718  010744  010037  001170                    MOV     R0,$REG4
1719  010750  104002                            ERROR   2
1720  010752  000207                            RTS     PC              ;EXIT ERROR RTN
1721                                    ;*****************************************************************
1722                                    ;*****************************************************************
1723  010754                            BKGD:
1724  010754  012737  031463  001162            MOV     #031463,$REG1   ;START OF BACKGROUND ROUTINE
1725  010762  012701  001163                    MOV     #$REG1+1,R1     ;USE R1 TO POINT TO TEST PATTERN
1726  010766  105441                    1$:     NEGB    -(R1)           ;DECREMENT LOC AND NEGATE BYTE=(031715)
1727  010770  105421                            NEGB    (R1)+           ;NEGATE BYTE THEN INCREMENT LOC=(031463)
1728  010772  105421                            NEGB    (R1)+           ;NEGATE BYTE THEN INCREMENT LOC=(146463)
1729  010774  105770  000000                    TSTB    @(R0)           ;TEST FOR DONE BIT OF DEVICE IN R0
1730  011000  100402                            BMI     2$              ;IF DONE, GO CHECK RESULTS
1731  011002  105441                            NEGB    -(R1)           ;ELSE DECREMENT LOC AND NEGATE BYTE=(031463)
1732  011004  000770                            BR      1$              ;CONTINUE WITH BACKGROUND
1733  011006                            2$:
1734
1735  011006  005741                            TST     -(R1)           ;BRING POINTER DOWN TO REG1
1736  011010  022711  146463                    CMP     #146463,(R1)    ;COMPARE EXPECTED PATTERN WITH THAT IN R1
1737  011014  001404                            BEQ     BKEX            ;IF EQUAL, EXIT THIS RTN
1738  011016  012737  146463  001164            MOV     #146463,$REG2   ;MOVE FOR TYPE OUT
1739  011024  104031                            ERROR   31              ;ELSE TYPE ERR MSSG
1740  011026  000207                    BKEX:   RTS     PC
1741                                    ;*****************************************************************
1742                                    ;*****************************************************************
1743  011030                            DOUP:
1744  011030  012701  000001                    MOV     #1,R1           ;INIT R1 TO 1
1745  011034                            5$:
1746  011034  010122                            MOV     R1,(R2)+        ;MOVE CONTENTS OF R1 TO AREA IN R2
1747  011036  005201                            INC     R1              ;ADD 1 TO R1
1748  011040  020105                            CMP     R1,R5           ;IS # OF MOVES = TO # IN R5?
1749  011042  101774                            BLOS    5$              ;IF NOT, DO ANOTHER MOVE
1750  011044  000207                            RTS     PC              ;ELSE EXIT
1751                                    ;*****************************************************************
1752                                    ;*****************************************************************
1753
1754  011046                            CNTR:
1755  011046  012737  000001  001170            MOV     #1,$REG4        ;INITIALIZE COUNTER REG
1756  011054  062737  000001  001170    1$:     ADD     #1,$REG4        ;ADD 1 TO IT
1757  011062  022737  000106  001170            CMP     #70.,$REG4      ;DELAY AT LEAST 41 US
1758  011070  001371                            BNE     1$              ;IF NOT, GO BACK AND ADD 1 TO REG4
1759  011072  000207                            RTS     PC              ;EXIT
1760                                    ;*****************************************************************
1761                                    ;*****************************************************************
1762  011074                            ADLI:
1763  011074  012700  040000                    MOV     #40000,R0       ;USE R0 TO SET BIT 14
1764  011100                            1$:
1765  011100  012777  177777  170474            MOV     #-1,@BE1CC      ;SET CYCLE COUNT = 1 XFER
1766  011106  010077  170472                    MOV     R0,@BE1BA       ;SET ADDR AS SPECIFIED IN R0
1767  011112  012777  002041  170466            MOV     #2041,@BE1CR1   ;DO DATI-FUN 1-NPR
```

```
 1768  011120  004737  011046              JSR     PC,CNTR         ;ALLOW TIME FOR RDY BIT TO SET
 1769  011124  022700  100000              CMP     #100000,R0      ;CHECK IF BIT 15 OF R0 IS SET
 1770  011130  001403                      BEQ     EXAD            ;IF SET, GO SET NEXT ADDR LINE
 1771  011132  012700  100000              MOV     #100000,R0      ;ELSE, NOW SET BIT 15 OF R0
 1772  011136  000760                      BR      1$              ;GO BACK AND CHECK THAT ADDR
 1773  011140                      EXAD:
 1774  011140  000207                      RTS     PC              ;EXIT SUB ROUTINE
 1775                              ;*****************************************************************
 1776                              ;*****************************************************************
 1777  011142                      TSTOVR:
 1778  011142  012737  000140  177776      MOV     #PR3,PSW        ;PS=3
 1779  011150  005037  001164              CLR     $REG2           ;CLEAR REG FOR INTR ON DONE COUNTER
 1780  011154  012700  020342              MOV     #ATEND,R0       ;SET UP R0 AS POINTER
 1781  011160  012720  125252      1$:     MOV     #125252,(R0)+   ;MOVE DATA PATTERN TO AVAILABLE MEMORY
 1782  011164  022700  022342              CMP     #ATEND+2000,R0 ;CHECK FOR A 2000 MOVES
 1783  011170  001373                      BNE     1$              ;IF NOT, GO BACK AND MOVE AGAIN
 1784  011172  000207                      RTS     PC              ;EXIT
 1785                              ;*****************************************************************
 1786                              ;*****************************************************************
 1787
 1788  011174  005015  005015  047125  QNO:    .ASCIZ  <15><12><15><12> UNIBUS SYSTEMS EXERCISER DIAGNOSTIC - CZKUA-D    BY:M.S
       011277     015  042012  053105  FOR4:   .ASCIZ  <15><12> DEV 4 MUST HAVE TIME DELAY SET @ 100 US OR LATENCY ERR MAY OCCU
       011404  050103  020125  051124  EM1:    .ASCIZ  CPU TRAPPED THRU LOCATION 4 -TIMEOUT
       011452  040440  042104  020122  DH1:    .ASCIZ   ADDR   $ERRPC #ERR/TST#
       011503     103  052520  044440  EM2:    .ASCII   CPU ISSUED A BUS GRANT WITH PSW = 7
       011546  042504  020126  020061          .ASCIZ   DEV 1 SHOULD NOT HAVE BECOME BUS MASTER
       011616  042502  042061  020102  DH2:    .ASCIZ   BE1DB   BE1CC   BE1BA   BE1CR1   PSW   $ERRPC #ERR/TST#
       011706  050103  020125  044504  EM3:    .ASCIZ  CPU DID NOT ISSUE BUS NPG
       011740  042502  041461  030522  DH3:    .ASCIZ   BE1CR1   BE1CC  FM-PS   TO-PS   $ERRPC #ERR/TST#
       012021     103  052520  042040  EM4:    .ASCIZ   CPU DID NOT ISSUE BUS GRANT 7
       012057     103  052520  042040  EM5:    .ASCIZ   CPU DID NOT ISSUE BUS GRANT 6
       012115     103  052520  042040  EM6:    .ASCIZ   CPU DID NOT ISSUE BUS GRANT 5
       012153     103  052520  042040  EM7:    .ASCIZ   CPU DID NOT ISSUE BUS GRANT 4
       012211     117  042516  047440  EM10:   .ASCIZ   ONE OR MORE DEVICES DID NOT INTERRUPT
       012257     124  044510  020123  DH10:   .ASCII   THIS IS THE ORDER IN WHICH THEY INTERRUPTED <15><12>
       012334  020040  051461  020124          .ASCIZ     1ST     2ND     3RD     4TH   $ERRPC #ERR/TST#
       012415     102  051525  040440  EM11:   .ASCIZ   BUS ADDRESS LINES <A17:A14> DID NOT FUNCTION PROPERLY
       012503     102  030505  051103  DH11:   .ASCIZ   BE1CR1  BE1CR2   BE1BA  $ERRPC #ERR/TST#
       012554  050103  020125  047516  EM12:   .ASCIZ   CPU NO SACK TIMEOUT LOGIC FAILED(TO NEGATE BUS GRANT)
       012642  042502  041461  030522  DH12:   .ASCIZ   BE1CR1  BE1CR2  $ERRPC #ERR/TST#
       012703     103  052520  042040  EM13:   .ASCIZ   CPU DID NOT PROPERLY EXECUTE AN ACLO/DCLO SEQUENCE
       012766  042444  051122  041520  DH13:   .ASCIZ   $ERRPC #ERR/TST#
       013007     103  052520  042040  EM14:   .ASCIZ   CPU DID NOT TRAP FROM BUS PARITY ERROR PA/PB = 0/1
       013072  042504  020126  020061  EM15:   .ASCII   DEV 1 DID DATIP WITH ROL ON DATOB TO MEMORY <15><12>
       013147     124  042510  052040          .ASCIZ   THE TRANSFER TO THE FOLLOWING LOCATION WAS  INCORRECT
       013235     115  046505  051117  DH15:   .ASCII   MEMORY  ACTUAL  CORRECT <15><12>
       013266  046040  041517  020040          .ASCIZ    LOC     DATA    DATA   $ERRPC #ERR/TST# $ICNT #
       013347     104  053105  041511  EM16:   .ASCIZ   DEVICE 3'S DATO TO MEMORY DID NOT EQUAL PATTERN IN R3
       013435     104  053105  041511  EM17:   .ASCIZ   DEVICE 4'S DATO TO MEMORY DID NOT EQUAL PATTERN IN R4
       013523     104  053105  041511  EM20:   .ASCIZ  DEVICE 1 DOING FUN 1-NPR-DATIP; INCORRECT PATTERN IN MEMORY
       013617     104  053105  041511  EM21:   .ASCIZ  DEVICE 2 DOING FUN 2-NPR-DATOB; INCORRECT PATTERN IN MEMORY
       013713     102  052111  033440  EM22:   .ASCIZ   BIT 7 OF CR2 SET-CPU DID NOT TIME OUT WITH SACK INHIBITED
       014005     104  053105  021440  DH22:   .ASCIZ   DEV #     PC    $ERRPC  #ERR/TST#
       014047     102  052111  030440  EM23:   .ASCIZ   BIT 11 OF CR2 SET-NO SSYN ON INTR SIGNAL
       014120  044502  020124  020065  EM24:   .ASCIZ   BIT 5 OF CR2 SET-RECEIVED WRONG GRANT
       014166  044502  020124  020066  EM25:   .ASCIZ   BIT 6 OF CR2 SET-BUS LATE
```

```
014220  044502  020124  020070  EM26:   .ASCIZ   BIT 8 OF CR2 SET-NO SSYN OCCURRED
014262  044502  020124  020071  EM27:   .ASCIZ   BIT 9 OF  CR2 SET-WRONG ADDRESS ON BUS
014331     102  052111  030440  EM30:   .ASCIZ   BIT 10 OF CR2 SET-DEVICE RECEIVED OTHER THAN ONE GRANT
014420  045502  047107  020104  EM31:   .ASCII   BKGND ROUTINE INSTRUCTIONS OF NEGB'S WERE NOT DONE <15><12>
014504  047503  051122  041505          .ASCIZ   CORRECTLY TO $REG1 DURING MULTITRANSFERS II
014560  041501  052524  046101  DH31:   .ASCII   ACTUAL  CORR'T   <15><12>
014602  040504  040524  020040          .ASCIZ   DATA    DATA    $ERRPC #ERR/TST# $ICNT #
014653     104  053105  031440  EM32:   .ASCIZ   DEV 3 DID DATI BUT HAS INCORRECT VALUES IN DATA REG
014737     104  053105  032040  EM33:   .ASCIZ   DEV 4 DID NOT INTR THE CORRECT # OF TIMES
015011     114  051501  020124  EM34:   .ASCII   LAST DATIP TO DEVICE 1 DB WAS INCORRECT- EITHER DEVICE DID <15><12>
015105     116  052117  053440          .ASCIZ   NOT WORK OR BUFFER AREA WAS NOT SET UP PROPERLY
015165     015  041412  052520  EM35:   .ASCIZ  <15><12> CPU TRAPPED THRU LOC 0 TO CATCH IMPROPERLY LOADED VECTORS
        015262                          .EVEN
015262  001164  001116  001102  DT1:    .WORD   $REG2,$ERRPC,$TSTNM,0
015272  001160  001162  001164  DT2:    .WORD   $REG0,$REG1,$REG2,$REG3,$REG4,$ERRPC,$TSTNM,0
015312  001160  001162  001164  DT3:    .WORD   $REG0,$REG1,$REG2,$REG3,$ERRPC,$TSTNM,0
015330  001162  001164  001166  DT10:   .WORD   $REG1,$REG2,$REG3,$REG4,$ERRPC,$TSTNM,0
015346  001162  001164  001166  DT11:   .WORD   $REG1,$REG2,$REG3,$ERRPC,$TSTNM,0
015362  001160  001162  001116  DT12:   .WORD   $REG0,$REG1,$ERRPC,$TSTNM,0
015374  001116  001102  000000  DT13:   .WORD   $ERRPC,$TSTNM,0
015402  001160  001162  001166  DT15:   .WORD   $REG0,$REG1,$REG3,$ERRPC,$TSTNM,$ICNT,0
015420  001204  001172  001116  DT22:   .WORD   $TMP4,$REG5,$ERRPC,$TSTNM,0
015432  001162  001164  001116  DT31:   .WORD   $REG1,$REG2,$ERRPC,$TSTNM,$ICNT,0
  (2)                           ;*****************************************************************
 1789                           ;*****************************************************************
 1790                           ;*****************************************************************
 1791                           ;*****************************************************************
 1792
 1793                           .SBTTL  END OF PASS ROUTINE
 1794
 1795                           ;*INCREMENT THE PASS NUMBER ($PASS)
 1796                           ;*TYPE "END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT YYYYY"
 1797                           ;*WHERE XXXXX AND YYYYY ARE DECIMAL NUMBERS
 1798                           ;*IF THERES A MONITOR GO TO IT
 1799                           ;*IF THERE ISN'T JUMP TO TST1
 1800
 1801  015446                   $EOP:
 1802  015446  000004                  SCOPE
 1803  015450  005037  001102           CLR     $TSTNM          ;;ZERO THE TEST NUMBER
 1804  015454  005037  001210           CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
 1805  015460  005237  001100           INC     $PASS           ;;INCREMENT THE PASS NUMBER
 1806  015464  042737  100000  001100   BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
 1807  015472  005327                   DEC     (PC)+           ;;LOOP?
 1808  015474  000001           $EOPCT: .WORD   1
 1809  015476  003063           BGT     $DOAGN                  ;;YES
 1810  015500  012737           MOV     (PC)+,@(PC)+            ;;RESTORE COUNTER
 1811  015502  000001           $ENDCT: .WORD   1
 1812  015504  015474                   $EOPCT
 1813  015506  104400  015514           TYPE    ,.+4            ;;TYPE ASCIZ STRING
 1814  015512  000407                   BR      64$             ;;GET OVER THE ASCIZ
 1815                                   ;;.ASCIZ      <12><15>/END PASS #/
 1816  015532                   64$:
 1817  015532  013746  001100           MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
 1818                                                           ;;TYPE PASS NUMBER
 1819  015536  104404                   TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
 1820  015540  104400  015546           TYPE    ,.+4            ;;TYPE ASCIZ STRING
```

```
1821  015544  000421                        BR      65$             ;;GET OVER THE ASCIZ
1822                                        ;;.ASCIZ      /  TOTAL ERRORS SINCE LAST REPORT /
1823  015610                          65$:
1824  015610  013746  001112                MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
1825                                                                ;;TOTAL NUMBER OF ERRORS
1826  015614  104404                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
1827  015616  104400  001152                TYPE    ,$NULL          ;;TYPE NULL CHAR
1828  015622  005037  001112                CLR     $ERTTL          ;;CLEAR ERROR TOTAL
1829  015626                          $GET42:
1830
1831  015626  013700  000042                MOV     @#42,R0         ;;GET MONITOR ADDRESS
1832  015632  001405                        BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
1833  015634  000005                        RESET                   ;;CLEAR THE WORLD
1834  015636  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
1835  015640  000240                        NOP                     ;;SAVE ROOM
1836  015642  000240                        NOP                     ;;FOR
1837  015644  000240                        NOP                     ;;ACT11
1838  015646                          $DOAGN:
1839  015646  000137  003506                JMP     @#TST1          ;;RETURN
1840  015652     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
1841        015656                          .EVEN
1842                                    ;*****************************************************************
1843
1844                                    .SBTTL  SCOPE HANDLER ROUTINE
1845
1846                                    ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
1847                                    ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
1848                                    ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
1849                                    ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
1850                                    ;*SW14=1        LOOP ON TEST
1851                                    ;*SW11=1        INHIBIT ITERATIONS
1852                                    ;*SW09=1        LOOP ON ERROR
1853                                    ;*SW08=1        LOOP ON TEST IN SWR<5:0>
1854                                    ;*CALL
1855                                    ;*      SCOPE           ;;SCOPE=IOT
1856
1857  015656                          $SCOPE:
1858  015656  032777  040000  163252  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
1859  015664  001114                        BNE     $OVER           ;;YES IF SW14=1
1860                                    ;#####START OF CODE FOR THE XOR TESTER#####
1861  015666  000416                  $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
1862                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
1863  015670  013746  000004                MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
1864  015674  012737  015714  000004        MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
1865  015702  005737  177060                TST     @#177060        ;;TIME OUT ON XOR?
1866  015706  012637  000004                MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
1867  015712  000466                        BR      $SVLAD          ;;GO TO THE NEXT TEST
1868  015714  022626                  5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
1869  015716  012637  000004                MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
1870  015722  000426                        BR      7$              ;;LOOP ON THE PRESENT TEST
1871  015724                          6$:;#####END OF CODE FOR THE XOR TESTER#####
1872  015724  032777  000400  163204        BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
1873  015732  001407                        BEQ     2$              ;;BR IF NO
1874  015734  017746  163176                MOV     @SWR,-(SP)      ;;SET DESIRED TEST NUM. FROM SWR
1875  015740  042716  000300                BIC     #$SWRMK,(SP)    ;;STRIP AWAY UNDESIRED BITS
1876  015744  122637  001102                CMPB    (SP)+,$TSTNM    ;;ON THE RIGHT TEST?
```

```
1877  015750  001462                          BEQ     $OVER           ;;BR IF YES
1878  015752  105737  001103          2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
1879  015756  001421                          BEQ     3$              ;;BR IF NO
1880  015760  123737  001115  001103          CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
1881  015766  101015                          BHI     3$              ;;BR IF NO
1882  015770  032777  001000  163140          BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
1883  015776  001404                          BEQ     4$              ;;BR IF NO
1884  016000  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
1885  016006  000443                          BR      $OVER
1886  016010  105037  001103          4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
1887  016014  005037  001210                  CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
1888  016020  000415                          BR      1$              ;;ESCAPE TO THE NEXT TEST
1889  016022  032777  004000  163106  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
1890  016030  001011                          BNE     1$              ;;BR IF YES
1891  016032  005737  001100                  TST     $PASS           ;;IF FIRST PASS OF PROGRAM
1892  016036  001406                          BEQ     1$              ;;      INHIBIT ITERATIONS
1893  016040  005237  001104                  INC     $ICNT           ;;INCREMENT ITERATION COUNT
1894  016044  023737  001210  001104          CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
1895  016052  002021                          BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
1896  016054  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
1897  016062  013737  016132  001210          MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
1898  016070  105237  001102          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
1899  016074  011637  001106                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
1900  016100  011637  001110                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
1901  016104  005037  001212                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
1902  016110  112737  000001  001115          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
1903  016116  013777  001102  163014  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
1904  016124  013716  001106                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
1905  016130  000002                          RTI                     ;;FIXES PS
1906  016132  000040                  $MXCNT: 40                      ;;MAX. NUMBER OF ITERATIONS
1907                                  ;*****************************************************************
1908
1909                                  .SBTTL  ERROR HANDLER ROUTINE
1910
1911                                  ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
1912                                  ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
1913                                  ;*AND GO TO $ERRTYP ON ERROR
1914                                  ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
1915                                  ;*SW15=1        HALT ON ERROR
1916                                  ;*SW13=1        INHIBIT ERROR TYPEOUTS
1917                                  ;*SW10=1        BELL ON ERROR
1918                                  ;*SW09=1        LOOP ON ERROR
1919                                  ;*CALL
1920                                  ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
1921
1922  016134                          $ERROR:
1923  016134  105237  001103          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
1924  016140  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
1925  016142  013777  001102  162770          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
1926  016150  032777  002000  162760          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
1927  016156  001402                          BEQ     1$              ;;NO - SKIP
1928  016160  104400  001214                  TYPE    ,$BELL          ;;RING BELL
1929  016164  005237  001112          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
1930  016170  011637  001116                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
1931  016174  162737  000002  001116          SUB     #2,$ERRPC
1932  016202  117737  162710  001114          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
```

```
                                ;;SKIP TYPEOUT IF SET
                                ;;SKIP TYPEOUTS
                                ;;GO TO USER ERROR ROUTINE
                                ;;HALT ON ERROR
                                ;;SKIP IF CONTINUE
                                ;;HALT ON ERROR!
                                ;;ACT-11 AUTO-ACCEPT?
                                ;;BRANCH IF NO
                                ;;YES
                                ;;LOOP ON ERROR SWITCH SET?
                                ;;BR IF NO
                                ;;FUDGE RETURN FOR LOOPING
                                ;;CHECK FOR AN ESCAPE ADDRESS
                                ;;BR IF NONE
                                ;;FUDGE RETURN ADDRESS FOR ESCAPE
                                ;;RETURN
                                ;*****************************************************************

                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

                                $ERRTYP:
                                ;;"CARRIAGE RETURN" & "LINE FEED"
                                ;;SAVE R0
                                ;;PICKUP THE ITEM INDEX
                                ;;IF ITEM NUMBER IS ZERO, JUST
                                ;;TYPE THE PC OF THE ERROR
                                ;;SAVE $ERRPC FOR TYPEOUT
                                ;;ERROR ADDRESS
                                ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                ;;GET OUT
                                ;;ADJUST THE INDEX SO THAT IT WILL
                                ;;       WORK FOR THE ERROR TABLE
                                ;;FORM TABLE POINTER
                                ;;PICKUP "ERROR MESSAGE" POINTER
                                ;;SKIP TYPEOUT IF NO POINTER
                                ;;TYPE THE "ERROR MESSAGE"
                                ;;"ERROR MESSAGE" POINTER GOES HERE
                                ;;"CARRIAGE RETURN" & "LINE FEED"
                                ;;PICKUP "DATA HEADER" POINTER
                                ;;SKIP TYPEOUT IF 0
                                ;;TYPE THE "DATA HEADER"
                                ;;"DATA HEADER" POINTER GOES HERE
                                ;;"CARRIAGE RETURN" & "LINE FEED"
                                ;;PICKUP "DATA TABLE" POINTER
                                ;;GO TYPE THE DATA
                                ;;RESTORE R0
```

```
 1989  016406  104400  001221            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
 1990  016412  000207                    RTS     PC              ;;RETURN
 1991  016414                    7$:
 1992  016414  013046                    MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
 1993  016416  104401                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
 1994  016420  005710                    TST     (R0)            ;;IS THERE ANOTHER NUMBER?
 1995  016422  001770                    BEQ     6$              ;;BR IF NO
 1996  016424  104400  016432            TYPE    ,8$             ;;TYPE TWO(2) SPACES
 1997  016430  000771                    BR      7$              ;;LOOP
 1998  016432  020040     000    8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
 1999          016436                    .EVEN
 2000                                    ;*****************************************************************
 2001
 2002                                    .SBTTL  TTY INPUT ROUTINE
 2003
 2004                                    ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 2005                                    ;*CALL:
 2006                                    ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
 2007                                    ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
 2008                                    ;
 2009
 2010  016436  011646            $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
 2011  016440  016666  000004  000002    MOV     4(SP),2(SP)     ;;SAVE THE PS
 2012  016446  105777  162470      1$:   TSTB    @$TKS           ;;WAIT FOR
 2013  016452  100375                    BPL     1$              ;;A CHARACTER
 2014  016454  117766  162464  000004    MOVB    @$TKB,4(SP)     ;;READ THE TTY
 2015  016462  042766  177600  000004    BIC     # C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
 2016  016470  000002                    RTI                     ;;GO BACK TO USER
 2017                                    ;*****************************************************************
 2018                                    ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
 2019                                    ;*CALL:
 2020                                    ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
 2021                                    ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
 2022                                    ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
 2023
 2024  016472  010346            $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
 2025  016474  012703  016600      1$:   MOV     #$TTYIN,R3      ;;GET ADDRESS
 2026  016500  022703  016616      2$:   CMP     #$TTYIN+16,R3   ;;BUFFER FULL?
 2027  016504  101405                    BLOS    4$              ;;BR IF YES
 2028  016506  104405                    RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
 2029  016510  112613                    MOVB    (SP)+,(R3)      ;;GET CHARACTER
 2030  016512  122713  000177            CMPB    #177,(R3)       ;;IS IT A RUBOUT
 2031  016516  001003                    BNE     3$              ;;SKIP IF NOT
 2032  016520  104400  001220      4$:   TYPE    ,$QUES          ;;TYPE A '?'
 2033  016524  000763                    BR      1$              ;;CLEAR THE BUFFER AND LOOP
 2034  016526  111337  016576      3$:   MOVB    (R3),9$         ;;ECHO THE CHARACTER
 2035  016532  104400  016576            TYPE    ,9$
 2036  016536  122723  000015            CMPB    #15,(R3)+       ;;CHECK FOR RETURN
 2037  016542  001356                    BNE     2$              ;;LOOP IF NOT RETURN
 2038  016544  105063  177777            CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
 2039  016550  104400  001222            TYPE    ,$LF            ;;TYPE A LINE FEED
 2040  016554  012603                    MOV     (SP)+,R3        ;;RESTORE R3
 2041  016556  011646                    MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
 2042  016560  016666  000004  000002    MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
 2043  016566  012766  016600  000004    MOV     #$TTYIN,4(SP)
 2044  016574  000002                    RTI                     ;;RETURN
```

```
2045  016576  000          9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
2046  016577  000                  .BYTE   0               ;;TERMINATOR
2047  016600  000016       $TTYIN: .BLKB   16              ;;RESERVE 16 BYTES FOR TTY INPUT
2048                       ;*****************************************************************
2049
2050                       .SBTTL  ROUTINE TO SIZE MEMORY
2051
2052                       ;*CALL:
2053                       ;*      JSR     PC,$SIZE
2054                       ;*      RETURN
2055                       ;*$LSTAD WILL CONTAIN:
2056                       ;*      WITH KT11 OPTION        -- LAST VIRTUAL ADDRESS OF THE LAST BANK
2057                       ;*      WITHOUT KT11 OPTION     -- LAST ABSOLUTE ADDRESS OF AVAILABLE MEMORY
2058                       ;*$LSTBK WILL CONTAIN THE LAST BANK AS A SAF
2059                       ;*$KT11 IS THE MEMORY MANAGEMENT KEY
2060                       ;*BIT07 = 0 DON'T USE MEMORY MANAGEMENT
2061                       ;*      MUST BE SETUP BEFORE THE CALL
2062                       ;*BIT15 = 0 DON'T HAVE MEMORY MANAGEMENT OPTION
2063                       ;*      DETERMINED BY ROUTINE
2064
2065  016616  010046       $SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
2066  016620  010146               MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
2067  016622  010246               MOV     R2,-(SP)        ;;SAVE R2 ON THE STACK
2068  016624  010346               MOV     R3,-(SP)        ;;SAVE R3 ON THE STACK
2069  016626  013746  000004       MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
2070  016632  013746  000006       MOV     @#ERRVEC+2,-(SP)
2071  016636  010600               MOV     SP,R0           ;;SAVE THE STACK POINTER
2072  016640  013746  000034       MOV     @#34,-(SP)      ;;SETUP THE TRAP VECTOR
2073  016644  012737  016654  000034  MOV  #1$,@#34        ;; TO GET THE PS
2074  016652  104400               TRAP
2075  016654  016637  000002  000006  1$:  MOV  2(SP),@#ERRVEC+2 ;;SET ERRVEC PS
2076  016662  012716  016670       MOV     #$SIZE1,(SP)    ;; TO PRESENT PS
2077  016666  000002               RTI
2078  016670  012637  000034  $SIZE1: MOV  (SP)+,@#34      ;;RESTORE TRAP VECTOR
2079  016674  012701  003776       MOV     #3776,R1        ;;SETUP ADDRESS
2080  016700  105727               TSTB    (PC)+           ;;USE MEMORY MANAGEMENT?
2081  016702  000200       $KT11:  .WORD   200             ;;SET TO USE MEMORY MANAGEMENT
2082  016704  100063               BPL     $CORE           ;;BR IF NO
2083  016706  012737  017046  000004  MOV  #$KTNEX,@#ERRVEC ;;SET FOR TIMEOUT
2084  016714  005737  177572       TST     @#SR0           ;;KT11 ARE YOU THERE?
2085  016720  052737  100000  016702  BIS  #100000,$KT11   ;;YES--SET KT11 KEY
2086  016726  005046               CLR     -(SP)           ;;INITIALIZE FOR "PAR" LOADING
2087  016730  012702  172340       MOV     #KIPAR0,R2      ;;ADDRESS OF FIRST "PAR"
2088  016734  012703  000010       MOV     # D8,R3         ;;LOAD EIGHT "PAR.'S" AND EIGHT "PDR.'S"
2089  016740  012762  077406  177740  1$:  MOV  #77406,-40(R2) ;;PDR = 4K, UP, READ/WRITE
2090  016746  011622               MOV     (SP),(R2)+      ;;LOAD "PAR"
2091  016750  062716  000200       ADD     #200,(SP)       ;;UPDATE FOR NEXT "PAR"
2092  016754  077307               SOB     R3,1$           ;;LOOP UNTIL ALL EIGHT ARE LOADED
2093  016756  012742  177600       MOV     #177600,-(R2)   ;;SETUP KIPAR7 FOR I/O
2094  016762  005042               CLR     -(R2)           ;;SETUP KIPAR6 FOR TESTING
2095  016764  012737  000006  000004  MOV  #6,     @#4      ;;SET FOR TIMEOUT
2096  016772  012737  000002  000006  MOV  #2,     @#6      ;;IF SR3 DOESNT EXIST
2097  017000  012737  000020  172516  MOV  #20,@#SR3        ;;ENABLE 22 BIT MODE
2098  017006  005237  177572       INC     @#SR0           ;;TURN ON MEMORY MANAGEMENT
2099  017012  012737  017036  000004  MOV  #$KTOUT,@#ERRVEC ;;SET FOR TIME OUT
2100  017020  005737  143776       2$:  TST     @#143776    ;;TRAP ON NON-EX-MEM
```

```
2101  017024  062712  000040                ADD     #40,(R2)          ;;MAKE A 1K STEP
2102  017030  023712  172356                CMP     @#KIPAR7,(R2)     ;;LAST ONE?
2103  017034  101371                        BHI     2$                ;;NO--TRY IT
2104  017036  011202                $KTOUT: MOV     (R2),R2           ;;GET LAST BANK+1
2105  017040  005037  177572                CLR     @#SR0             ;;TURN OFF MEMORY MANAGEMENT
2106  017044  000421                        BR      $SIZEX
2107  017046  042737  100000  016702  $KTNEX: BIC     #100000,$KT11     ;;KT11 NON-EXISTENT
2108  017054  012737  017104  000004  $CORE:  MOV     #$CROUT,@#ERRVEC  ;;SET FOR TIMEOUT
2109  017062  005002                        CLR     R2                ;;SET UP BANK
2110  017064  062701  004000          1$:   ADD     #4000,R1          ;;INCREMENT BY 1K
2111  017070  062702  000040                ADD     #40,R2            ;;1K STEP
2112  017074  005711                        TST     (R1)              ;;TRAP ON TIME OUT
2113  017076  022701  177776                CMP     #177776,R1        ;;LAST ONE
2114  017102  001370                        BNE     1$                ;;NO--TRY AGAIN
2115  017104  162701  004000          $CROUT: SUB     #4000,R1
2116  017110  162702  000040          $SIZEX: SUB     #40,R2            ;;DROP BACK
2117  017114  010006                        MOV     R0,SP             ;;RESTORE THE STACK
2118  017116  012637  000006                MOV     (SP)+,@#ERRVEC+2  ;;RESTORE ERROR VECTOR
2119  017122  012637  000004                MOV     (SP)+,@#ERRVEC
2120  017126  010137  017150                MOV     R1,$LSTAD         ;;LAST ADDRESS
2121  017132  010237  017152                MOV     R2,$LSTBK         ;;LAST BANK
2122  017136  012603                        MOV     (SP)+,R3          ;;RESTORE R3
2123  017140  012602                        MOV     (SP)+,R2          ;;RESTORE R2
2124  017142  012601                        MOV     (SP)+,R1          ;;RESTORE R1
2125  017144  012600                        MOV     (SP)+,R0          ;;RESTORE R0
2126  017146  000207                        RTS     PC
2127  017150  000000          $LSTAD: .WORD   0                 ;;CONTAINS THE LAST ADDRESS
2128  017152  000000          $LSTBK: .WORD   0                 ;;CONTAINS THE LAST BANK
2129                          ;*****************************************************************
2130
2131                          .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
2132
2133                          ;*SAVE R0-R5
2134                          ;*CALL:
2135                          ;*      SAVREG
2136                          ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
2137                          ;*
2138                          ;*TOP---(+16)
2139                          ;* +2---(+18)
2140                          ;* +4---R5
2141                          ;* +6---R4
2142                          ;* +8---R3
2143                          ;*+10---R2
2144                          ;*+12---R1
2145                          ;*+14---R0
2146
2147  017154                  $SAVREG:
2148  017154  010046                MOV     R0,-(SP)          ;;PUSH R0 ON STACK
2149  017156  010146                MOV     R1,-(SP)          ;;PUSH R1 ON STACK
2150  017160  010246                MOV     R2,-(SP)          ;;PUSH R2 ON STACK
2151  017162  010346                MOV     R3,-(SP)          ;;PUSH R3 ON STACK
2152  017164  010446                MOV     R4,-(SP)          ;;PUSH R4 ON STACK
2153  017166  010546                MOV     R5,-(SP)          ;;PUSH R5 ON STACK
2154  017170  016646  000022        MOV     22(SP),-(SP)      ;;SAVE PS OF MAIN FLOW
2155  017174  016646  000022        MOV     22(SP),-(SP)      ;;SAVE PC OF MAIN FLOW
2156  017200  016646  000022        MOV     22(SP),-(SP)      ;;SAVE PS OF CALL
```

```
                                        MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
                                        RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
017212                          $RESREG:
017212  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
017216  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
017222  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
017226  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
017232  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
017234  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
017236  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
017240  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
017242  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
017244  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
017246  000002                          RTI
                                ;*****************************************************************

                                .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
                                ;*

017250  105737  001155          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
017254  100002                          BPL     1$              ;;BR IF YES
017256  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
017260  000407                          BR      3$              ;;LEAVE
017262  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
017264  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
017270  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
017272  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
017274  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
017276  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
017300  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
017304  000002                          RTI                     ;;RETURN
017306  122716  000011          4$:     CMPB    #THT,(SP)       ;;BRANCH IF <HT>
017312  001426                          BEQ     8$
017314  122716  000200                  CMPB    #TCRLF,(SP)     ;;BRANCH IF NOT <CRLF>
017320  001004                          BNE     5$
017322  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
017324  104400                          TYPE                    ;;TYPE A CR AND LF
017326  001221                          $CRLF
017330  000757                          BR      2$              ;;GET NEXT CHARACTER
```

```
2213  017332  004737  017414          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
2214  017336  123726  001154          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
2215  017342  001352                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
2216  017344  013746  001152                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
2217                                                                  ;;AND THE NULL CHAR.
2218  017350  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
2219  017354  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
2220  017356  004737  017414                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
2221  017362  105337  017460                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
2222  017366  000770                          BR      7$              ;;LOOP
2223
2224                                  ;HORIZONTAL TAB PROCESSOR
2225
2226  017370  112716  000040          8$:     MOVB    #40,(SP)        ;;REPLACE TAB WITH SPACE
2227  017374  004737  017414          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
2228  017400  132737  000007  017460          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
2229  017406  001372                          BNE     9$              ;;TAB STOP
2230  017410  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
2231  017412  000726                          BR      2$              ;;GET NEXT CHARACTER
2232  017414  105777  161526          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
2233  017420  100375                          BPL     $TYPEC
2234  017422  116677  000002  161520          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
2235  017430  122766  000015  000002          CMPB    #15,2(SP)       ;;BRANCH IF
2236  017436  001003                          BNE     1$              ;;NOT <CR>
2237  017440  105037  017460                  CLRB    $CHARCNT        ;;
2238  017444  000406                          BR      $TYPEX          ;;EXIT
2239  017446  122766  000012  000002  1$:     CMPB    #12,2(SP)       ;;BRANCH IF
2240  017454  002002                          BGE     $TYPEX          ;;<LF>
2241  017456  105227                          INCB    (PC)+           ;;INC SPACE
2242  017460  000000                  $CHARCNT:.WORD  0               ;;COUNT
2243  017462  000207                  $TYPEX: RTS     PC
2244                                  ;;      EQUATES
2245          000011                  THT=11
2246          000200                  TCRLF=200
2247
2248                                  ;*****************************************************************
2249
2250                                  .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
2251
2252                                  ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
2253                                  ;*OCTAL (ASCII) NUMBER AND TYPE IT.
2254                                  ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
2255                                  ;*CALL:
2256                                  ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
2257                                  ;*      TYPOS                   ;;CALL FOR TYPEOUT
2258                                  ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
2259                                  ;*      .BYTE   M               ;;M=1 OR 0
2260                                  ;*                                      ;;1=TYPE LEADING ZEROS
2261                                  ;*                                      ;;0=SUPPRESS LEADING ZEROS
2262                                  ;*
2263                                  ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
2264                                  ;*$TYPOS OR $TYPOC
2265                                  ;*CALL:
2266                                  ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
2267                                  ;*      TYPON                   ;;CALL FOR TYPEOUT
2268                                  ;*
```

```
2269                                    ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
2270                                    ;*CALL:
2271                                    ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
2272                                    ;*      TYPOC                   ;;CALL FOR TYPEOUT
2273
2274  017464  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
2275  017470  116637  000001  017707          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
2276  017476  112637  017711                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
2277  017502  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
2278  017506  000406                          BR      $TYPON
2279  017510  112737  000001  017707  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
2280  017516  112737  000006  017711          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
2281  017524  112737  000005  017706  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
2282  017532  010346                          MOV     R3,-(SP)        ;;SAVE R3
2283  017534  010446                          MOV     R4,-(SP)        ;;SAVE R4
2284  017536  010546                          MOV     R5,-(SP)        ;;SAVE R5
2285  017540  113704  017711                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
2286  017544  005404                          NEG     R4
2287  017546  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
2288  017552  110437  017710                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
2289  017556  113704  017707                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
2290  017562  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
2291  017566  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
2292  017570  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
2293  017572  000404                          BR      3$              ;;GO DO MSB
2294  017574  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
2295  017576  006105                          ROL     R5
2296  017600  006105                          ROL     R5
2297  017602  010503                          MOV     R5,R3
2298  017604  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
2299  017606  105337  017710                  DECB    $OMODE          ;;TYPE THIS DIGIT?
2300  017612  100016                          BPL     7$              ;;BR IF NO
2301  017614  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
2302  017620  001002                          BNE     4$              ;;TEST FOR 0
2303  017622  005704                          TST     R4              ;;SUPPRESS THIS 0?
2304  017624  001403                          BEQ     5$              ;;BR IF YES
2305  017626  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
2306  017630  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
2307  017634  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
2308  017640  110337  017704                  MOVB    R3,8$           ;;SAVE FOR TYPING
2309  017644  104400  017704                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
2310  017650  105337  017706          7$:     DECB    $OCNT           ;;COUNT BY 1
2311  017654  003347                          BGT     2$              ;;BR IF MORE TO DO
2312  017656  002402                          BLT     6$              ;;BR IF DONE
2313  017660  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
2314  017662  000744                          BR      2$              ;;GO DO THE LAST DIGIT
2315  017664  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
2316  017666  012604                          MOV     (SP)+,R4        ;;RESTORE R4
2317  017670  012603                          MOV     (SP)+,R3        ;;RESTORE R3
2318  017672  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
2319  017700  012616                          MOV     (SP)+,(SP)
2320  017702  000002                          RTI                     ;;RETURN
2321  017704     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
2322  017705     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
2323  017706     000          $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
2324  017707     000          $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
```

```
                        $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
                        ;*****************************************************************

                        .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

017712                  $TYPDS:
017712  010046                MOV     R0,-(SP)        ;;PUSH R0 ON STACK
017714  010146                MOV     R1,-(SP)        ;;PUSH R1 ON STACK
017716  010246                MOV     R2,-(SP)        ;;PUSH R2 ON STACK
017720  010346                MOV     R3,-(SP)        ;;PUSH R3 ON STACK
017722  010546                MOV     R5,-(SP)        ;;PUSH R5 ON STACK
017724  012746  020200        MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
017730  016605  000020        MOV     20(SP),R5       ;;GET THE INPUT NUMBER
017734  100004                BPL     1$              ;;BR IF INPUT IS POS.
017736  005405                NEG     R5              ;;MAKE THE BINARY NUMBER POS.
017740  112766  000055  000001        MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
017746  005000          1$:   CLR     R0              ;;ZERO THE CONSTANTS INDEX
017750  012703  020126        MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
017754  112723  000040        MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
017760  005002          2$:   CLR     R2              ;;CLEAR THE BCD NUMBER
017762  016001  020116        MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
017766  160105          3$:   SUB     R1,R5           ;;FORM THIS BCD DIGIT
017770  002402                BLT     4$              ;;BR IF DONE
017772  005202                INC     R2              ;;INCREASE THE BCD DIGIT BY 1
017774  000774                BR      3$
017776  060105          4$:   ADD     R1,R5           ;;ADD BACK THE CONSTANT
020000  005702                TST     R2              ;;CHECK IF BCD DIGIT=0
020002  001002                BNE     5$              ;;FALL THROUGH IF 0
020004  105716                TSTB    (SP)            ;;STILL DOING LEADING 0'S?
020006  100407                BMI     7$              ;;BR IF YES
020010  106316          5$:   ASLB    (SP)            ;;MSD?
020012  103003                BCC     6$              ;;BR IF NO
020014  116663  000001  177777        MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
020022  052702  000060          6$:   BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
020026  052702  000040          7$:   BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
020032  110223                MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
020034  005720                TST     (R0)+           ;;JUST INCREMENTING
020036  020027  000010        CMP     R0,#10          ;;CHECK THE TABLE INDEX
020042  002746                BLT     2$              ;;GO DO THE NEXT DIGIT
020044  003002                BGT     8$              ;;GO TO EXIT
020046  010502                MOV     R5,R2           ;;GET THE LSD
020050  000764                BR      6$              ;;GO CHANGE TO ASCII
020052  105726          8$:   TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
020054  100003                BPL     9$              ;;BR IF NO
020056  116663  177777  177776        MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
020064  105013          9$:   CLRB    (R3)            ;;SET THE TERMINATOR
020066  012605                MOV     (SP)+,R5        ;;POP STACK INTO R5
```

```
 2381  020070  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
 2382  020072  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
 2383  020074  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 2384  020076  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
 2385  020100  104400  020126                TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
 2386  020104  016666  000002  000004        MOV     2(SP),4(SP)     ;;ADJUST THE STACK
 2387  020112  012616                        MOV     (SP)+,(SP)
 2388  020114  000002                        RTI                     ;;RETURN TO USER
 2389  020116  023420                $DTBL:  10000.
 2390  020120  001750                        1000.
 2391  020122  000144                        100.
 2392  020124  000012                        10.
 2393  020126  000004                $DBLK:  .BLKW   4
 2394                                 ;*****************************************************************
 2395
 2396                                 .SBTTL  TRAP DECODER
 2397
 2398                                 ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
 2399                                 ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
 2400                                 ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
 2401                                 ;*GO TO THAT ROUTINE.
 2402
 2403  020136  010046                $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
 2404  020140  016600  000002                MOV     2(SP),R0        ;;GET TRAP ADDRESS
 2405  020144  005740                        TST     -(R0)           ;;BACKUP BY 2
 2406  020146  111000                        MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
 2407  020150  006300                        ASL     R0              ;;POSITION FOR INDEXING
 2408  020152  016000  020160                MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
 2409  020156  000200                        RTS     R0              ;;GO TO ROUTINE
 2410
 2411
 2412                                 .SBTTL  TRAP TABLE
 2413
 2414                                 ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
 2415                                 ;*BY THE "TRAP" INSTRUCTION.
 2416
 2417                                 ;       ROUTINE
 2418                                 ;       -------
 2419  020160                         $TRPAD:
 2420  020160  017250                        $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
 2421  020162  017510                        $TYPOC  ;;CALL=TYPOC    TRAP+1(104401)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
 2422  020164  017464                        $TYPOS  ;;CALL=TYPOS    TRAP+2(104402)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
 2423  020166  017524                        $TYPON  ;;CALL=TYPON    TRAP+3(104403)  TYPE OCTAL NUMBER (AS PER LAST CALL)
 2424  020170  017712                        $TYPDS  ;;CALL=TYPDS    TRAP+4(104404)  TYPE DECIMAL NUMBER (WITH SIGN)
 2425  020172  016436                        $RDCHR  ;;CALL=RDCHR    TRAP+5(104405)  TTY TYPEIN CHARACTER ROUTINE
 2426  020174  016472                        $RDLIN  ;;CALL=RDLIN    TRAP+6(104406)  TTY TYPEIN STRING ROUTINE
 2427  020176  017154                        $SAVREG ;;CALL=SAVREG   TRAP+7(104407)  SAVE R0-R5 ROUTINE
 2428  020200  017212                        $RESREG ;;CALL=RESREG   TRAP+10(104410) RESTORE R0-R5 ROUTINE
 2429                                 ;*****************************************************************
 2430
 2431                                 .SBTTL  POWER DOWN AND UP ROUTINES
 2432
 2433                                 ;POWER DOWN ROUTINE
 2434  020202  012737  020324  000024 $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
 2435  020210  012737  000340  000026         MOV     #340,@#PWRVEC+2 ;;PRIO:7
 2436  020216  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
```

```
2437  020220  010146                          MOV     R1,-(SP)          ;;PUSH R1 ON STACK
2438  020222  010246                          MOV     R2,-(SP)          ;;PUSH R2 ON STACK
2439  020224  010346                          MOV     R3,-(SP)          ;;PUSH R3 ON STACK
2440  020226  010446                          MOV     R4,-(SP)          ;;PUSH R4 ON STACK
2441  020230  010546                          MOV     R5,-(SP)          ;;PUSH R5 ON STACK
2442  020232  010637  020330                  MOV     SP,$SAVR6         ;;SAVE SP
2443  020236  012737  020250  000024          MOV     #$PWRUP,@#PWRVEC  ;;SET UP VECTOR
2444  020244  000000                          HALT
2445  020246  000776                          BR      .-2               ;;HANG UP
2446
2447                                  ;POWER UP ROUTINE
2448  020250  013706  020330          $PWRUP: MOV     $SAVR6,SP         ;;GET SP
2449  020254  005037  020330                  CLR     $SAVR6            ;;WAIT LOOP FOR THE TTY
2450  020260  005237  020330          1$:     INC     $SAVR6            ;;WAIT FOR THE INC
2451  020264  001375                          BNE     1$                ;;OF  WORD
2452  020266  012605                          MOV     (SP)+,R5          ;;POP STACK INTO R5
2453  020270  012604                          MOV     (SP)+,R4          ;;POP STACK INTO R4
2454  020272  012603                          MOV     (SP)+,R3          ;;POP STACK INTO R3
2455  020274  012602                          MOV     (SP)+,R2          ;;POP STACK INTO R2
2456  020276  012601                          MOV     (SP)+,R1          ;;POP STACK INTO R1
2457  020300  012600                          MOV     (SP)+,R0          ;;POP STACK INTO R0
2458  020302  012737  020202  000024          MOV     #$PWRDN,@#PWRVEC  ;;SET UP THE POWER DOWN VECTOR
2459  020310  012737  000340  000026          MOV     #340,@#PWRVEC+2   ;;PRIO:7
2460  020316  104400                          TYPE                      ;REPORT THE POWER FAILURE
2461  020320  020332                  $PWRMG: .WORD   $POWER            ;;POWER FAIL MESSAGE POINTER
2462  020322  000002                          RTI
2463  020324  000000                  $ILLUP: HALT                      ;;THE POWER UP SEQUENCE WAS STARTED
2464  020326  000776                          BR      .-2               ;; BEFORE THE POWER DOWN WAS COMPLETE
2465  020330  000000                  $SAVR6: 0                         ;;PUT THE SP HERE
2466  020332  005015  047520  042527  $POWER: .ASCIZ  <15><12>''POWER''
2467  020340  000122
2468                                          .EVEN
2469                                  ;*****************************************************************
2470                                  ;*****************************************************************
2471                                  ;*****************************************************************
2472  020342                          ATEND:
2473          000001                  .END
```

```
ADD20   002644          611     620#
ADLI    011074         1088    1090    1093    1096    1762#
ALLERR  001574          465#    954
ATEND   020342          771     804     838     872     906     935     975     982    1181    1277    1286    1295    1303
                       1324    1347    1443    1447    1458    1467    1477    1503    1537    1556    1699    1780    1782
                       2472#
BE1BA   001604          471#    771*    804*    838*    872*    906*    935*    982*    1110    1181*   1245    1286*   1412
                       1447*   1699*   1716    1766*
BE1CC   001602          470#    772*    776     779     805*    809     812     839*    843     846     873*    877     880
                        907*    911     914     934*    981*   1182*   1287*   1448*   1700*   1703    1715    1765*
BE1CLR  001610          473#   1105*
BE1CR1  001606          472#    747*    748*    773*    778     806*    811     840*    845     874*    879     908*    913
                        941*    947     984*    987    1017*   1108    1135*   1288*   1315    1415    1452*   1701*   1717
                       1767*
BE1CR2  001612          474#    940*    944*    945     948     954     983*    989*    996    1089*   1091*   1092*   1094*
                       1103    1109    1137*   1140*   1153*   1183*   1184    1202*   1451*   1502*   1609    1624
BE1DB   001600          469#    512     580     639     692     990     992    1051    1714
BE1PSW  001662          494#    733*    770*    803*    837*    871*    905*    939*    980*   1016*   1086*   1134*   1285*
                       1450*
BE1VEC  001660          493#    581     732*    769*    802*    836*    870*    904*    938*    979*   1015*   1085*   1133*
                       1178*   1284*   1449*
BE2BA   001620          477#   1250    1295*   1419    1458*
BE2CC   001616          476#   1294*   1459*
BE2CLR  001624          479#
BE2CR1  001622          478#   1022*   1296*   1422    1460*
BE2CR2  001626          480#
BE2DB   001614          475#   1056
BE2PSW  001666          496#   1021*   1293*   1457*
BE2VEC  001664          495#   1020*   1292*   1456*
BE3BA   001634          483#   1255    1303*   1467*
BE3CC   001632          482#   1302*   1468*
BE3CLR  001640          485#
BE3CR1  001636          484#   1027*   1304*   1366    1427    1470*
BE3CR2  001642          486#   1469*   1536*
BE3DB   001630          481#   1061    1370    1372    1465*
BE3PSW  001672          498#   1026*   1301*   1464*
BE3VEC  001670          497#   1025*   1300*   1466*
BE4BA   001650          489#   1260    1477*
BE4CC   001646          488#   1311*   1478*
BE4CLR  001654          491#
BE4CR1  001652          490#   1033*   1313*   1386    1433    1479*
BE4CR2  001656          492#   1312*   1394*
BE4DB   001644          487#   1066    1474*
BE4PSW  001676          500#   1032*   1310*   1475*
BE4VEC  001674          499#   1031*   1309*   1476*
BGIN    002736          585     612     652#
BIT0  = 000001          118#
BIT00 = 000001          108#    118    1677    1685
BIT01 = 000002          107#    117
BIT02 = 000004          106#    116
BIT03 = 000010          105#    115     940     944
BIT04 = 000020          104#    114    1137    1140    1153    1612
BIT05 = 000040          103#    113     748    1642
BIT06 = 000100          102#    112    1168    1646
BIT07 = 000200          101#    111     553     564     659
BIT08 = 000400          100#    110    1650    1872
```

```
BIT09 = 001000            99#   109   1654   1882   1944
BIT1  = 000002           117#
BIT10 = 002000            98#  1658   1926
BIT11 = 004000            97#   747    996   1638   1889
BIT12 = 010000            96#  1183
BIT13 = 020000            95#  1933
BIT14 = 040000            94#   983    989   1312   1394   1451   1469   1502   1536   1858
BIT15 = 100000            93#
BIT2  = 000004           116#
BIT3  = 000010           115#
BIT4  = 000020           114#
BIT5  = 000040           113#
BIT6  = 000100           112#
BIT7  = 000200           111#
BIT8  = 000400           110#
BIT9  = 001000           109#
BKEX    011026          1737  1740#
BKGD    010754          1316  1723#
BPTVEC= 000014           125#
BRK     005604          1085  1100#
BR4TST  004436           898#
BR5TST  004276           864#
BR6TST  004136           830#
BR7TST  003776           796#
CHEX    007466          1417  1424   1429   1435#
CHKERR  010432          1631#
CLRREG  002700           636#   655    729    933    974   1012   1083   1216   1281
CLRRTN  001724           511#   575
CMPARE  005340          1039#
CNTR    011046           943  1038   1138   1754#  1768
DATA1   001712           504# 1245* 1246* 1326  1412* 1413*  1507   1511
DATA2   001714           505# 1250* 1251* 1348  1419* 1420*
DATA3   001716           506# 1255* 1256* 1538
DATA4   001720           507# 1260* 1261* 1557
DDISP = 177570            40#   260
DEVCNT  001700           501#  590*   613    646    679    713    716   1018   1023   1028   1039   1220   1289
                        1297  1305   1338   1357   1376   1453   1461   1471   1491   1525   1527   1547   1579
                        1615
DEVS    001702           502# 1014   1041   1042   1043   1044
DH1     011452           310   459   1788#
DH10    012257           346  1788#
DH11    012503           352  1788#
DH12    012642           357  1788#
DH13    012766           362   367   1788#
DH15    013235           373   379    384    389    394   1788#
DH2     011616           316  1788#
DH22    014005           399   404    409    414    419    424    429   1788#
DH3     011740           321   326    331    336    341   1788#
DH31    014560           435   442    447    453   1788#
DISPLA  001140           260#  549* 1903* 1925*
DISPRE  000174           199#  549
DOUP    011030           977  1279   1445   1743#
DO14    005532          1087#
DSWR  = 177570            39#   259
DT1     015262           311   460   1788#
DT10    015330           348  1788#
```

```
DT11    015346            353    1788#
DT12    015362            358    1788#
DT13    015374            363     368    1788#
DT15    015402            375     380     385     390     395    1788#
DT2     015272            317    1788#
DT22    015420            400     405     410     415     420     425     430    1788#
DT3     015312            322     327     332     337     342    1788#
DT31    015432            437     443     448     454    1788#
EMTVEC= 000030            128#    531*    532*
EM1     011404            309    1788#
EM10    012211            345    1788#
EM11    012415            351    1788#
EM12    012554            356    1788#
EM13    012703            361    1788#
EM14    013007            366    1788#
EM15    013072            371    1788#
EM16    013347            378    1788#
EM17    013435            383    1788#
EM2     011503            314    1788#
EM20    013523            388    1788#
EM21    013617            393    1788#
EM22    013713            398    1788#
EM23    014047            403    1788#
EM24    014120            408    1788#
EM25    014166            413    1788#
EM26    014220            418    1788#
EM27    014262            423    1788#
EM3     011706            320    1788#
EM30    014331            428    1788#
EM31    014420            433    1788#
EM32    014653            440    1788#
EM33    014737            446    1788#
EM34    015011            451    1788#
EM35    015165            457    1788#
EM4     012021            325    1788#
EM5     012057            330    1788#
EM6     012115            335    1788#
EM7     012153            340    1788#
ENDMEM  001722            508#    514
ERRCHK  004730            732     769     802     836     870     904     938     953#    979    1133
ERRS    010714           1710    1713#
ERRTN   010406            958    1070    1112    1197    1266    1437    1602    1622#
ERRVEC= 000004            121#    577*    587*    589*    734*    937*   1863    1864*   1866*   1869*   2069    2070    2075*
                         2083*   2099*   2108*   2118*   2119*
EXAD    011140           1770    1773#
EXBRK   005664           1106    1113#
EXNO    002660            614    1623#
EXNOG   010712           1708    1711#
EXS     007476           1416    1423    1428    1434    1438#
FAILCK  006004           1141#
FOR4    011277            718    1788#
GNS   = ****** U          198     568     572     617     673     677     685     689     698     706    1815    1822    2420
                         2421    2422    2423    2424    2425    2426    2427    2428
GO      005320           1019    1024    1029    1034#
INK     006540           1248    1253    1258    1263#
INTRTN  005470           1053    1058    1063    1068#
```

```
INTR1   005402          1015    1049#
INTR2   005420          1020    1054#
INTR3   005436          1025    1059#
INTR4   005454          1031    1064#
IOTVEC= 000020           126#    529*    530*
KIPAR0= 172340           182#   2055    2087
KIPAR1= 172342           183#
KIPAR2= 172344           184#
KIPAR3= 172346           185#
KIPAR4= 172350           186#
KIPAR5= 172352           187#
KIPAR6= 172354           188#
KIPAR7= 172356           189#   2102
KIPDR0= 172300           171#
KIPDR1= 172302           172#
KIPDR2= 172304           173#
KIPDR3= 172306           174#
KIPDR4= 172310           175#
KIPDR5= 172312           176#
KIPDR6= 172314           177#
KIPDR7= 172316           178#
LEEV    010546          1637    1659    1661#
LOAD1   005154          1013#
LOAD2   005212          1020#
LOAD3   005244          1025#
LOAD4   005276          1030#
LODDEV  002426           582#    606     622
MMVEC = 000250           138#
MOVREG  002462           591#    596
MOVVEC  002526           601#
MULT1   007500          1219    1228    1237    1442#
NG      003514           730#
NODEV   002544           587     609#
NODO    006270          1170    1205#
NOG     010636           737     740     743     746    1696#
NPRTST  003636           763#
NXT     006202          1176    1187#   1204
PBERR   006234          1178    1193#
PBPSW = 000116           468#   1180*   1188    1189*
PBRTN   006256          1179    1201#
PBVEC = 000114           467#   1179*   1188*
PIRQ  = 177772            38#
PIRQVE= 000240           132#
PR0   = 000000            55#    785     818     852     886     920     985    1037    1283
PR1   = 000040            56#
PR2   = 000100            57#
PR3   = 000140            58#    899     942    1084    1177    1778
PR4   = 000200            59#    744     865     903     915
PR5   = 000240            60#    741     831     869     881
PR6   = 000300            61#    738     797     835     847
PR7   = 000340            62#    563     577     733     735     764     768     770     780     801     803     813     837
                          871    905     936     939     973     980    1011    1016    1021    1026    1032    1086    1132
                         1134   1171    1285    1293    1301    1310    1450    1457    1464    1475    1576
PS    = 177776            35#     36
PSW   = 177776            36#    768*    774*    801*    807*    835*    841*    869*    875*    903*    909*    936*    942*
                          973*   985*   1011*   1037*   1084*   1132*   1177*   1283*   1698*   1778*
```

```
PWRFAL  010342            653    1139    1606#
PWRVEC= 000024            127#    535*    536*    653*   1136*   1139*   2434*   2435*   2443*   2458*   2459*
QNO     011174            555    1788#
Q1      010276           1572    1590#
Q2      010306           1593#
Q3      010316           1596#
Q4      010326           1599#
RDCHR = 104405           2028    2425#
RDLIN = 104406           2426#
RESREG= 104410           1664    2428#
RESVEC= 000010            122#
ROTATE  010600           1227    1236    1676#
SAVREG= 104407           1623    2427#
SERV1   006422           1244#   1449
SERV2   006446           1249#   1456
SERV3   006472           1254#   1466
SERV4   006516           1259#   1476
SIMLGO  001576            466#   1036*   1481*
SR0   = 177572            142#   2084    2098*   2105*
SR1   = 177574            143#
SR2   = 177576            144#
SR3   = 172516            145#   2097*
STACK = 001100             32#    528
START   001756            203     220     523#
STKLMT= 177774             37#
STVEC   010240            654    1570#
SWR     001136            259#    546     548*    553     564     659    1168    1858    1872    1874    1882    1889    1926
                         1933    1938    1944
SWREG   000176            200#    548
SW0   = 000001             90#
SW00  = 000001             80#     90
SW01  = 000002             79#     89
SW02  = 000004             78#     88
SW03  = 000010             77#     87
SW04  = 000020             76#     86
SW05  = 000040             75#     85
SW06  = 000100             74#     84
SW07  = 000200             73#     83
SW08  = 000400             72#     82
SW09  = 001000             71#     81
SW1   = 000002             89#
SW10  = 002000             70#
SW11  = 004000             69#
SW12  = 010000             68#
SW13  = 020000             67#
SW14  = 040000             66#
SW15  = 100000             65#
SW2   = 000004             88#
SW3   = 000010             87#
SW4   = 000020             86#
SW5   = 000040             85#
SW6   = 000100             84#
SW7   = 000200             83#
SW8   = 000400             82#
SW9   = 001000             81#
S1      007344           1284    1410#
```

```
S2      007376            1292    1418#
S3      007430            1300    1425#
S4      007446            1309    1430#
TBITVE= 000014             123#
TCRLF = 000200            2207    2246#
THRUO   010562             562    1669#
THT   = 000011            2205    2245#
TKVEC = 000060             130#
TMPPWR  006026            1136    1151#
TPVEC = 000064             131#
TRAPVE= 000034             129#    533*    534*
TRTVEC= 000014             124#
TSTOVR  011142            1280    1446    1777#
TST1    003506             559     728#   1839
TST10   004760             946     950     971#
TST11   005140             997     999    1010#
TST12   005502            1040    1046    1081#
TST13   005666            1097    1123#
TST14   006046            1126    1148    1167#
TST15   006272            1169    1192    1215#
TST16   006556            1221    1226    1235    1240    1276#
TST17   007314            1339    1358    1377    1398#
TST2    003634             761#
TST3    003774             767     795#
TST4    004134             800     829#
TST5    004274             834     863#
TST6    004434             868     897#
TST7    004574             902     932#
TYMOUT  002662             589     627#    734     937
TYPDS = 104404             670    1819    1826    2424#
TYPE  = 104400             555     566     570     615     667     671     675     683     687     696     704     715     718
                          1813    1820    1827    1928    1936    1961    1978    1980    1983    1985    1989    1996    2032
                          2035    2039    2210    2309    2385    2420#   2460
TYPOC = 104401            1969    1993    2421#
TYPON = 104403            2423#
TYPOS = 104402             680     701     709    2422#
UIPAR0= 177640             160#
UIPAR1= 177642             161#
UIPAR2= 177644             162#
UIPAR3= 177646             163#
UIPAR4= 177650             164#
UIPAR5= 177652             165#
UIPAR6= 177654             166#
UIPAR7= 177656             167#
UIPDR0= 177600             149#
UIPDR1= 177602             150#
UIPDR2= 177604             151#
UIPDR3= 177606             152#
UIPDR4= 177610             153#
UIPDR5= 177612             154#
UIPDR6= 177614             155#
UIPDR7= 177616             156#
XQ      010334            1592    1595    1598    1601#
XTST    006016            1144    1146#
$BDADR  001122             253#
$BDDAT  001126             255#    526
```

```
$BELL   001214          285#   1928   1952
$CHARC  017460         2221*   2228   2237*  2242#
$CMTAG  001100          241#    524    531    537    538    539
$CM1  = 000006          271#    272#   273#   274#   275#   276#   277#
$CM2  = 000014          271#    272#   273#   274#   275#   276#   277#
$CM3  = 000006          269#    271
$CM4  = 000006          277#    278#   279#   280#   281#   282#   283#
$CORE   017054         2082    2108#
$CRLF   001221          287#    667    715    1936   1952   1961   1980   1985   1989   2048   2211   2248
$CROUT  017104         2108    2115#
$DBLK   020126         2351    2385   2393#
$DOAGN  015646         1809    1832   1838#
$DTBL   020116         2354    2389#
$ENDAD  015636          228    1834#  1941
$ENDCT  015502          537    1811#
$ENULL  015652         1840#
$EOP    015446         1406    1801#
$EOPCT  015474          537*   1808#  1812
$ERFLG  001103          244#    766    799    833    867    901    1225   1234   1848   1878   1880   1886*  1907
                       1923*   1952
$ERMAX  001115          250#    540*   766    799    833    867    901    1225   1234   1880   1902*  1907
$ERROR  016134          531    1922#
$ERRPC  001116          251#   1788   1930*  1931*  1932   1952   1967
$ERRTB  001224          305#   1975
$ERRTY  016302         1935    1960#
$ERTTL  001112          248#   1824   1828*  1929*  1952
$ESCAP  001212          284#    539*  1901*  1947   1949   1952
$FILLC  001154          267#   2214   2248
$FILLS  001153          266#   2248
$GDADR  001120          252#
$GDDAT  001124          254#
$GET42  015626         1829#
$HD   = 000001           14     15
$ICNT   001104          245#   1788   1893*  1894   1896*  1906
$ILLUP  020324         2434    2463#
$ITEMB  001114          249#   1932*  1952   1964
$KTNEX  017046         2083    2107#
$KTOUT  017036         2099    2104#
$KT11   016702         2081#   2085*  2107*
$LF     001222          288#   1952   2039   2048   2248
$LPADR  001106          246#    541*  1884*  1899*  1904   1906
$LPERR  001110          247#    542*  1884   1900*  1906   1946
$LSTAD  017150         2120*   2127#
$LSTBK  017152          658    2121*  2128#
$MAIL = ****** U        553     729    762    796    830    864    898    933    972    1011   1082   1125   1168
                       1216    1277   1400   1899   1938   2199
$MXCNT  016132         1897    1906#
$NULL   001152          265#   1142   1152   1827   2216   2248
$NWTST= 000001          722#    724    752#   754    788#   790    822#   824    856#   858    890#   892    924#
                        926    963#   965   1002#   1004   1074#  1076   1116#  1118   1157#  1159   1208#  1210
                       1270#   1272   1395#
$OCNT   017706         2281*   2310*  2323#
$OMODE  017710         2276*   2280*  2285   2288*  2299*  2325#
$OVER   016116         1859    1877   1885   1895   1903#
$PASS   001100          242#   1805*  1806*  1817   1840   1891   1907
$POWER  020332         1147    2461   2466#
```

```
$PWRDN  020202           535    1154    1619    2434#   2458
$PWRMG  020320          1142    1147*   1152*   2461#
$PWRUP  020250          2443    2448#
$QUES   001220           286#   1952    2032    2048    2248
$RDCHR  016436          2010#   2425
$RDDEC= ****** U        2427
$RDLIN  016472          2024#   2426
$RDOCT= ****** U        2427
$RDSZ = 000016          2017#
$REGAD  001156           269#
$REG0   001160           271#    516     657*    662*    664     695*    708     778*    811*    845*    879*    913*    947*
                        1334*   1353*   1521*   1544*   1563*   1714*   1788
$REG1   001162           272#    779*    812*    846*    880*    914*    948*    992*   1041*   1108*   1333*   1352*   1372*
                        1390*   1487*   1488    1520*   1543*   1562*   1715*   1724*   1725    1788
$REG2   001164           273#    629*    630*    780*    813*    847*    881*    915*    993*   1042*   1109*   1264*   1325*
                        1328    1330*   1335    1373*   1391*   1491    1670*   1671*   1716*   1738*   1779*   1788
$REG3   001166           274#    781*    814*    848*    882*    916*   1043*   1110*   1335*   1354*   1522*   1542*   1561*
                        1717*   1788
$REG4   001170           275#   1044*   1308*   1388    1390    1431*   1718*   1755*   1756*   1757    1788
$REG5   001172           276#    592*    956*   1069*   1101*   1194*   1265*   1436*   1788
$RESRE  017212          2163#   2428
$R2A  = ****** U        2429
$SAVRE  017154          2147#   2427
$SAVR6  020330          2442*   2448    2449*   2450*   2465#
$SCOPE  015656           529    1857#
$SETUP= 000037           191#    529     531     533     535     537     538     539     541    1803    1941
$SIZE   016616           576    2065#
$SIZEX  017110          2106    2116#
$SIZE1  016670          2076    2078#
$STUP = 177777           191#
$SVLAD  016070          1867    1898#
$SVPC = 000232           226#    231
$SWR  = 167400             2#     14      20      21      22      23      24      25      26     283     284     285     538
                         539     541     542     729     762     796     830     864     898     933     972    1011    1082
                        1124    1168    1216    1277    1399    1798    1804    1830    1839    1840    1849    1850    1851
                        1852    1853    1858    1870    1872    1873    1878    1879    1880    1887    1888    1889    1900
                        1903    1906    1914    1915    1916    1917    1918    1926    1933    1938    1944    1952    2462
$SWRMK= 000300             3#     26      27    1853    1854    1874    1875
$TIMES  001210           283#    538*   1124*   1399*   1804*   1887*   1894    1897*   1906
$TKB    001144           262#   1401    2004    2014
$TKS    001142           261#   2004    2012
$TMP0   001174           202*    219*    277#    557     594*    595     597*    656*    658*    663*    666*    668     691*
                         694*    700     713
$TMP1   001176           278#   1135*
$TMP2   001200           279#
$TMP3   001202           280#   1172*   1174*   1175
$TMP4   001204           281#    957*   1052*   1057*   1062*   1067*   1102*   1131*   1196*   1247*   1252*   1257*   1262*
                        1414*   1421*   1426*   1432*   1591*   1594*   1597*   1600*   1629    1788
$TMP5   001206           282#    518
$TN   = 000020            14#    722     729#    752     762#    767     788     796#    800     822     830#    834     856
                          864#    868     890     898#    902     924     933#    946     950     963     972#    997     999
                         1002    1011#   1040    1046    1074    1082#   1097    1116    1124#   1126    1148    1157    1168#
                         1192    1208    1216#   1221    1226    1235    1240    1270    1277#   1339    1358    1377    1395
                         1399#
$TPB    001150           264#   2234*   2248
$TPFLG  001155           268#   2193    2248
```

```
$TPS    001146            263#   2232   2248
$TRAP   020136            533    2403#
$TRP  = 000011           2411#   2421#  2422#  2423#  2424#  2425#  2426#  2427#  2428#  2429#
$TRPAD  020160           2408    2419#
$TSTNM  001102            243#   1788   1803*  1848   1876   1898*  1903   1907   1925   1952
$TTYIN  016600           2025    2026   2043   2047#
$TYPBN= ****** U         2425
$TYPDS  017712           2339#   2424
$TYPE   017250           2193#   2411   2420
$TYPEC  017414           2213    2220   2227   2232#  2233
$TYPEX  017462           2238    2240   2243#
$TYPOC  017510           2279#   2421
$TYPON  017524           2278    2281#  2423
$TYPOS  017464           2274#   2422
$XTSTR  015666           1861#
$OFILL  017707           2275*   2279*  2289   2324#
$40CAT= ****** U         1858    1935
.     = 020342            194#    198#   201#   218#   226    227#   229#   231#   240#   289    527    541    542
                          566     569#   570    615    618#   671    675    683    686#   687    690#   696    699#
                          704    1788#  1813   1816#  1820   1840   1841#  1906   1907   1952   1999#  2004   2047#
                         2048    2248   2393#  2445   2464
```

```
BE1       762#    765     798     832     866     900
COMMEN      1#    133#    205    1317    1340    1359    1378    1482    1494    1529    1549
ENDCOM      1#    133#    214    1321    1344    1363    1382    1486    1499    1533    1553
ERROR      33#    631     782     815     849     883     917     949     994     998    1045    1111    1145    1195    1336
          1355   1374    1392    1523    1545    1564    1634    1640    1644    1648    1652    1656    1660    1672    1719
          1739
ESCAPE      1#    133#
GETPRI      1#
MSSG      721#    724     752#    754     787#    790     821#    824     855#    858     889#    892     923#    926     962#
           965   1001#    1004   1073#    1076   1115#    1118   1156#    1159   1207#    1210   1270#    1272
MULT        1#    133#
NEWTST      1#    133#    722     752     788     822     856     890     924     963    1002    1074    1116    1157    1208
          1270   1395
NOGRNT    751#   1697
POP         1#    133#   2168    2380    2452
PUSH        1#    133#   2148    2339    2436
REPORT      1#
SCOPE      34#    728     761     795     829     863     897     932     971    1010    1081    1123    1167    1215    1276
          1398   1802
SETPRI      1#
SETTRA    2411#   2421    2422    2423    2424    2425    2426    2427    2428
SETUP       1#    133#    524
SKIP        1#    133#    767     800     834     868     902     946     950     997     999    1040    1046    1097    1126
          1148   1192    1221    1226    1235    1240    1339    1358    1377
SLASH       1#    133#    649    1567
SPACE     133#
STARS       1#    133#    222     233     289     306     462     509     521     607     625     633     722     727     752
           760    788     794     822     828     856     862     890     896     922     924     931     951     963     970
          1002   1009    1047    1074    1080    1098    1116    1122    1149    1157    1166    1199    1208    1214    1241
          1268   1270    1275    1395    1397    1407    1409    1440    1493    1582    1604    1620    1666    1674    1694
          1712   1721    1722    1741    1751    1760    1775    1785    1788    1791    1842    1907    1952    2000    2017
          2048   2129    2175    2248    2326    2394    2429    2469
SWRSU       1#    543#
TRMTRP    2411#
TYPBIN      1#    133#
TYPDEC      1#    133#    668    1817    1824
TYPNAM      1#
TYPNUM      1#    133#
TYPOCS      1#    133#    679     700     708
TYPOCT      1#    133#   1967    1991
TYPTXT      1#    133#    566     570     615     671     675     683     687     696     704    1813    1820
$$CMRE    233#    271     272     273     274     275     276
$$CMTM    233#    277     278     279     280     281     282
$$ESCA      1#    133#
$$NEWT      1#    133#    722     752     788     822     856     890     924     963    1002    1074    1116    1157    1208
          1270   1395
$$SET     2411#   2421    2422    2423    2424    2425    2426    2427    2428
$$SKIP      1#    133#    767     800     834     868     902     946     950     997     999    1040    1046    1097    1126
          1148   1192    1221    1226    1235    1240    1339    1358    1377
.EQUAT      1#     2#      28
.HEADE      1#     2#       4
.KT11       1#     2#     133
.SETUP      1#     2#     191
.SWRHI      1#     2#      15
.SWRLO      2#    27#
.$ACT1      1#     2#     222
```

```
.$APTB      1#
.$APTH      1#
.$APTY      1#
.$ASTA      1#
.$CATC      1#      2#    191
.$CMTA      1#      2#    233
.$DB2D      1#
.$DB2O      1#
.$DIV       1#
.$EOP       1#      2#   1791
.$ERRO      1#      2#   1907
.$ERRT      1#      2#   1952
.$MULT      1#
.$POWE      1#      2#   2429
.$RAND      1#
.$RDDE      1#
.$RDOC      1#
.$READ      1#      2#   2000
.$R2AZ      1#
.$SAVE      1#      2#   2129
.$SB2D      1#
.$SB2O      1#
.$SCOP      1#      2#   1842
.$SIZE      1#      2#   2048
.$SUPR      1#
.$TRAP      1#      2#   2394
.$TYPB      1#
.$TYPD      1#      2#   2326
.$TYPE      1#      2#   2175
.$TYPO      1#      2#   2248
.$40CA      1#


. ABS.  020342     000


 ERRORS DETECTED:  0

 CZKUAD.BIN,CZKUAD.LST/CRF/SOL/NL:TOC=DSKZ:CZKUAD.SML,DSKZ:CZKUAD.P11
 RUN-TIME: 13 16 1 SECONDS
 RUN-TIME RATIO: 263/31=8.3
 CORE USED:  28K  (55 PAGES)
```