PDP-11

UNIBUS EXER MOD

CZKUBC0

AH-8860C-MC

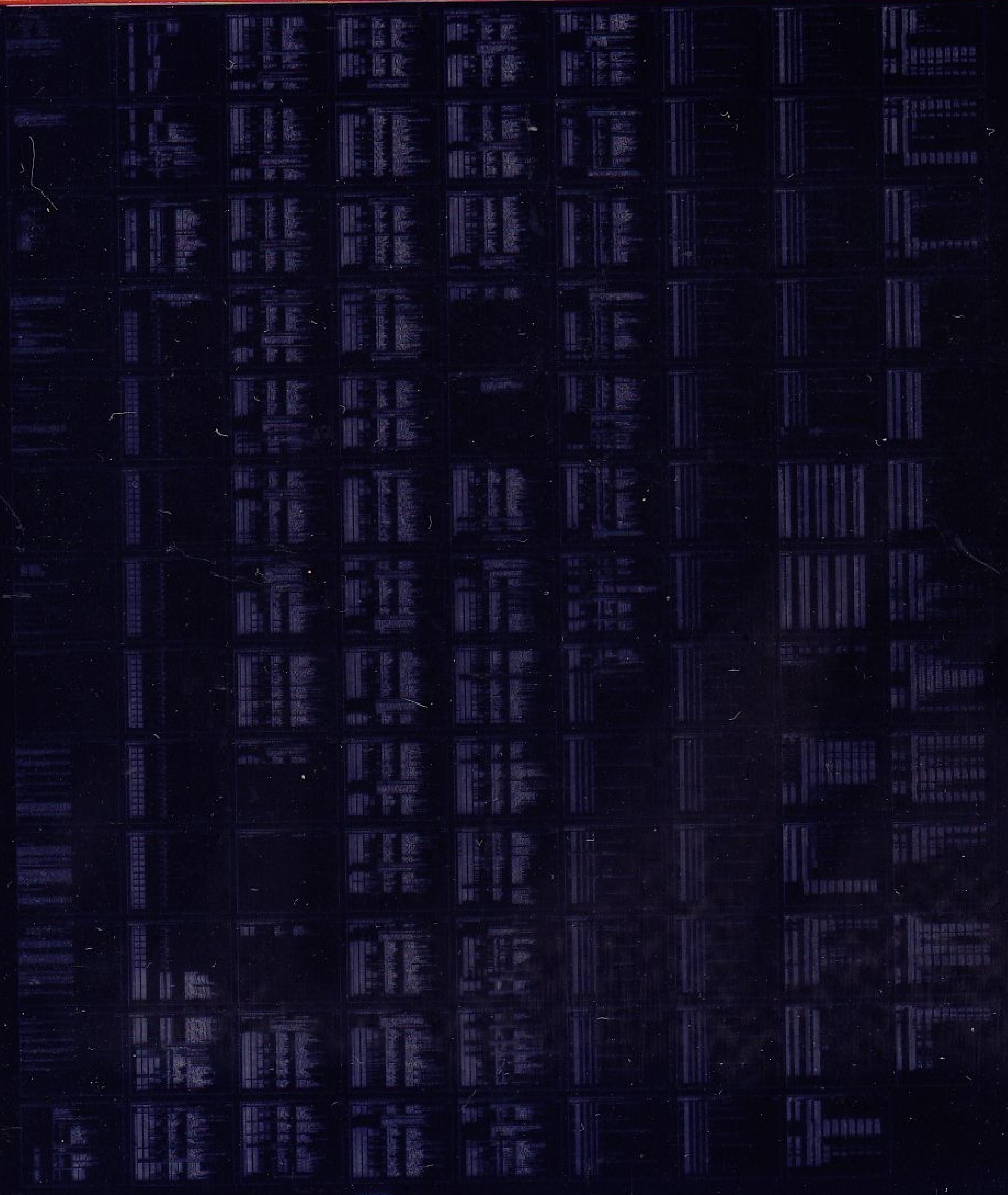
COPYRIGHT ' 75-80

FICHE 1 OF 1

JAN 1980

digital

MADE IN USA



IDENTIFICATION

PRODUCT CODE:	AC-8859C-MC
PRODUCT NAME:	CZKUBCO UNIBUS EXER MOD
DATE CREATED:	8-JUNE-79
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	WARREN SALTZ
MODIFIED BY:	CHUCK ROBINSON

```
HISTORY SECTION
----------------------------

'.  CZKUBCO WAS RELEASED OCT 1979.

A. CZKUBCO WAS REVISED TO ACCOMODATE THE ASYNCHRONOUS ISSUINGG
OF BUS GRANTS OF THE 11/44 CPU. IN ALL TESTS WHICH ALLOW FOR INTERRUPT
ADD A 'NOP' INSTRUCTION DIRECTLY FOLLOWING THE INSTRUCTION WHICH
LOWERS  THE PRIORITY LEVEL, THUS ALLOWING ONE INSTRUCTION
TIME FOR INTERRUPT TO OCCUR.
THIS CHANGE AFFECTS THE 'TIME DELAY AND BUSS LATENCY ERROR BITS
TEST'.
B.  CZKUBCO WAS REVISED TO ACCOMODATE THE XON/XOFF FEATURE OF CERTAIN
    TERMINALS. THE $TYPE SYSMAC MACRO WAS AFFECTED.
```

Table of Contents

1.0 Abstract

The Unibus Exercisor (UBE) module diagnostic is comprised of a series of tests that check all programmatically accessable areas of the exercisors (95%). The tests are arranged in a logical order such that simpler functions are examined first followed by the more complex ones. The tests build on one another such that the present test will use hardware previously tested. This should provide a very effective degree of fault isolation.

The program is written to test a maximum of four UBE's at one time and is intended to run in a stand-alone environment.

2.0 Requirements

2.1 Equipment

1. A working PDP-11 and Unibus
2. A working Teletype
3. A good 6K of Memory
4. A minimum of 1 to a maximum of 4 UBE on the system

2.2 Preliminary Requirements

It is expected that the module will have been tested on a GR or similar tester. This is to ensure that those areas that can not be thouroughly exercised by this program are working. These areas are:

1. Wrong Grant Error bit
2. No, No SACK time out Error bit
3. Wrong A lines Error bit
4. No Grant or not one Grant Error bit
5. No Interrupt SSYN Error bit
6. Inhibit Sack Logic.

In addition the passing of grants can not be tested if only one exercisor is present (see section 6.0). On those machines that don't have a parity trap (11/05, 11/20), the parity hardware is not checked. THE PARITY OPTION TEST (TEST 6) SHOULD BE DESELECTED BY SETTING SWITCH 5 FOR OTHER MACHINES WITHOUT PARITY MEMORY. ALSO, THE POWER DOWN TEST SHOULD NOT BE RUN ON THE 11/05.

2.3 Execution Time

For an error free, first pass run on an 11/45 with core memory, it takes approximately 15 seconds per UBE tested.

3.0 Starting Address

```
  200  - for normal startup and restart
  1100 - if halted in Interrupt test and wish to restart
```

4.0 Program Control and Operator Action

4.1

The paper tape is loaded using the standard procedure for ABS. tapes.

4.2

Load address 200

4.3

If the power down sequence is to be tested set SW4=1.

4.4

If more than one exercisor is present and it is desired to inhibit testing one or more of them, set the corresponding SW0,1,2,3=1. Switch 0 corresponds to the UBE which has the lowest address on the bus. Switch 1 to the next highest etc.. All UBE should not be inhibited. If this is done the program will trap to 4 after several end of passes. If all exercisors are to be tested SW0,1,2,3-0.

4.5

Start Test

5.0 Switch Options

THE USE OF THIS PROGRAM ON PROCESSORS HAVING A SOFTWARE SWITCH REGISTER NECESSITATES OPERATOR INTERACTION: THE OPERATOR MUST SET UP LOCATION 176 WITH THE SWITCH REGISTER VALUES DESIRED.

```
         SW<15>=1   Halt on Error
         SW<14>=1   Loop on Test
```

```
        SW<13>=1   Inhibit Error Typouts
        SW<12>=1   Inhibit Most Typeouts Except Error
        SW<11>=1   Inhibit Test Iterations
        SW<10>=1   Bell on Error
        SW<09>=1   Loop on Error
        SW<05>=1   INHIBIT TEST 6
        SW<04>=1   Test Power Down
        SW<03>=1   inhibit Test of UBE4
        SW<02>=1   Inhibit Test of UBE3
        SW<01>=1   Inhibit Test of UBE2
        SW<00>=1   Inhibit Test of UBE1
```

5.1 SW<15>

The program halts on encountering an error after printing out the error message. Pressing 'continue' restores normal program operation.

5.2 SW<14>

The program loops on the subtest that is being executed when the switch is put on.

5.3 SW<13>

This switch inhibits all error typeouts

5.4 SW<12>

This switch inhibits most typeouts except error typeouts.

5.5 SW<11>

When one iterations of each test is inhibited.

5.6 SW<10>

The bell is rung upon encountering an error.

5.7 SW<09>

Upon finding an error, the program will cycle from the point of error to the previous scope statement (see sec. 8.2).

5.8 SW<05>

```
THE PARITY OPTION TEST (TEST 6) SHOULD BE DESELECTED BY SETTING SWITCH 5
FOR MACHINES WITHOUT PARITY MEMORY.
```

5.9 SW<04>

When set this switch enables the test of the power down sequence and the test that DCLO clears BECC, BEBA, BECR2 and BECR1 registers. This switch should not be set when running under ACT11 since a power down will cause an error statement from ACT.

5.10 SW<03>

When set this switch inhibits testing of the fourth UBE on the bus. The fourth exercisor is defined as the exercisor that responds to the fourth lowest address of the four exercisors. If there are less than four this switch has no effect on the program.

5.11 SW<02>

When set this switch inhibits test of that UBE with the third lowest address. If there are less than three, this switch has no effect on the program.

5.12 SW<01>

When set this switch inhibits test of that UBE with the second lowest address. If there are less than two, this switch has no effect on the program.

5.13 SW<00>

When set this switch inhibits testing the lowest address exercisor on the buss. If there is one exercisor, this switch should not be set.

6.0 Program Description

Upon start of the program, a map, called EMAP, of all the exercisors present is typed out in octal. Each bit set in the map corresponds to a UBE present. The least significant bit represents the UBE whose BEBD address is 770000. The second bit represents the UBE whose BEBD address is 770020 and so on.A maximum of 4 consecutive UBEs are allowed up to the maximum address of 770076. The addresses of the first UBE to be examined are then calculated and tests 1-37 are run.

The program then checks if more exercisors are to be tested up to a maximum of four. When these are done and if there were more than one UBE, the last test is executed. This tests the passing of grants between the exercisors.

7.0 Error Reporting

Error calls are made via the EMT instruction. The lower byte of the instruction is encoded to indicate the error number. For example ERROR 1 would be (EMT+1) or 104001. Once an error instructior is executed, an error handler routine will then process the error call. The error message to be typed is determined from the item table at the beginning of the program. Item 1 corresponds to error 1 and so on. The item table contains a series of pointers to the message to be typed.

Every time an error occurs, the PC of the error call is typed out. This will tell the user the exact test where the error occurred. Many times other pertinent information is typed out as the contents of registers and bad addresses.

All messages refer to the UBE. For example, the message "DATI failed to set ready" means that the UBE when it did a DATI failed to set its ready.

It should be pointed out when trouble shooting a failing board, that the first error reported should be the first one fixed. This is because the nature of the hardware and software can cause additional, false or misleading error messages to appear after the first one. Since the tests build on one another and involve previously tested hardware, it will aid in the fault isolation to look up the tests previously run to know which hardware has been tested.Also,when multiple UBEs are being tested,a UBE can fail in such a way as to cause false error reports on a good board.This is especially true when the first failing UBE reports a "fatal error".Due to this,it is suggested that the first failing board reported should be repaired before proceeding to test the others.

8.0 Handlers and Common Routines

8.1 Trap Handler

This handler uses the trap instruction. The lower byte of the instruction is encoded differently for each of the different routines that use it. When a call for a routine is executed a trap occurs to the handler located at $TRAP. The handler then determines by looking at the lower byte which address to go to for servicing the call. The following routines use this handler:

1. TYPE - this routine is used to type ASCIZ messages.

2. TYPOC,TYPOS,TYPON - these routines are used to change a binary number to a 6 digit octal number and type it.

3. TYPDS - this routine converts a binary number to decimal number and types it.

8.2 Scope Handler

This handler is called via the 'IOT' trap. When 'scope' is executed an 'IOT' trap occurs to the memory location '$SCOPE'. Depending on the switch settings, the handler then decides to loop on test, loop on error etc. The scope statement that is located at the first instruction of the following test is the one that enables the desired action (looping etc.) for the present test.

8.3 Error Handler

This handler uses the 'EMT' trap. The lower byte of the instruction is encoded to indicate the error number. For example ERROR 1 would be (EMT+1) or 104001. Once an error instruction is executed the error handler determines the message to be typed. An item table at the beginning of the program contains pointers for each message to be typed. Each item corresponds to each error (Item 1 corresponds to error 1). The 'ERRTYP' routine then processes the table for the final error type out.

8.4 Trap Catcher

This is a series of instructions starting in location 0 to detect unexpected traps and interrupts to the trap and interrupt vector area of memory.

Each vector PC address is loaded with the address of the next location. The next location is loaded with a halt. Thus an illegal trap or interrupt will cause a halt at the trap PSW location plus 2.

Once a halt occurs, by examining the contents of the address pointed to by the stack, the value of the PC when the trap or interrupt occurred can be determined.

8.5 Power Down and Up Routines

When a power fail condition occurs, the contents of registers R0-R7 are saved on the stack. When the power returns, the same registers are restored.

8.6 CLRREG Routine

This subroutine will clear all the registers and error conditions of the UBE presently being tested.

8.7 RCATCH Routine

This routine restores the trap catcher to the vector area of the UBE presently being tested.

8.8 CRDY Routine

This routine checks for the ready bit to set from the UBE presently being tested. If ready fails to set in a time > 100 microseconds, the LSB of register R4 is set to a one.

8.9 DINT Routine

This routine is used to disregard interrupts from the UBE under test. It places the address of the next location in the UBE's vector area. The next location then contains an 'RTI' instruction.

8.10 RVEC Routine

This subroutine restores the vector area 0-56 from the stack and puts the trap catcher in the remaining locations.

8.11 TERRPC Routine

This routine is used any time an error occurs. It types out the PC of the error message, AND THE TEST NUMBER.

```
                                .TITLE  CZKUBCO UNIBUS EXER MOD
                                ;*COPYRIGHT (C) 1979
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*PROGRAM BY CHUCK ROBINSON
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*
              000001            $TN=1
                                .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        12            INHIBIT MOST TYPEOUTS EXCEPT ERROR
                                ;*        11            INHIBIT ITERATIONS
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
                                ;*         5            WHEN SET, INHIBIT TEST 6
                                ;*         4            TEST POWER DOWN
                                ;*         3            INHIBIT TEST OF UBE 4
                                ;*         2            INHIBIT TEST OF UBE 3
                                ;*         1            INHIBIT TEST OF UBE 2
                                ;*         0            INHIBIT TETS OF UBE 1
                                .SBTTL  BASIC DEFINITIONS

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

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

                                ;*GENERAL PURPOSE REGISTER DEFINITIONS
              000000            R0=     %0              ;;GENERAL REGISTER
              000001            R1=     %1              ;;GENERAL REGISTER
              000002            R2=     %2              ;;GENERAL REGISTER
              000003            R3=     %3              ;;GENERAL REGISTER
              000004            R4=     %4              ;;GENERAL REGISTER
              000005            R5=     %5              ;;GENERAL REGISTER
              000006            R6=     %6              ;;GENERAL REGISTER
              000007            R7=     %7              ;;GENERAL REGISTER
              000006            SP=     %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
           000140                  PR3=    140             ;;PRIORITY LEVEL 3
           000200                  PR4=    200             ;;PRIORITY LEVEL 4
           000240                  PR5=    240             ;;PRIORITY LEVEL 5
           000300                  PR6=    300             ;;PRIORITY LEVEL 6
           000340                  PR7=    340             ;;PRIORITY LEVEL 7

                                   ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
           100000                  SW15=   100000
           040000                  SW14=   40000
           020000                  SW13=   20000
           010000                  SW12=   10000
           004000                  SW11=   4000
           002000                  SW10=   2000
           001000                  SW09=   1000
           000400                  SW08=   400
           000200                  SW07=   200
           000100                  SW06=   100
           000040                  SW05=   40
           000020                  SW04=   20
           000010                  SW03=   10
           000004                  SW02=   4
           000002                  SW01=   2
           000001                  SW00=   1
           001000                          SW9=SW09
           000400                          SW8=SW08
           000200                          SW7=SW07
           000100                          SW6=SW06
           000040                          SW5=SW05
           000020                          SW4=SW04
           000010                          SW3=SW03
           000004                          SW2=SW02
           000002                          SW1=SW01
           000001                          SW0=SW00

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

```
             001000                       BIT9=BIT09
             000400                       BIT8=BIT08
             000200                       BIT7=BIT07
             000100                       BIT6=BIT06
             000040                       BIT5=BIT05
             000020                       BIT4=BIT04
             000010                       BIT3=BIT03
             000004                       BIT2=BIT02
             000002                       BIT1=BIT01
             000001                       BIT0=BIT00

                                  ;*BASIC ''CPU'' TRAP VECTOR ADDRESSES
             000004               ERRVEC= 4                ;;TIME OUT AND OTHER ERRORS
             000010               RESVEC= 10               ;;RESERVED AND ILLEGAL INSTRUCTIONS
             000014               TBITVEC=14               ;;''T'' BIT
             000014               TRTVEC= 14               ;;TRACE TRAP
             000014               BPTVEC= 14               ;;BREAKPOINT TRAP (BPT)
             000020               IOTVEC= 20               ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
             000024               PWRVEC= 24               ;;POWER FAIL
             000030               EMTVEC= 30               ;;EMULATOR TRAP (EMT) **ERROR**
             000034               TRAPVEC=34               ;;''TRAP'' TRAP
             000060               TKVEC=  60               ;;TTY KEYBOARD VECTOR
             000064               TPVEC=  64               ;;TTY PRINTER VECTOR
             000240               PIRQVEC=240              ;;PROGRAM INTERRUPT REQUEST VECTOR
                                  .MCALL  TYPTYT,POP,PUSH,NEWTST,$$NEWTEST,SWRSU,SETUP,SPACE,STARS
             170000               DB=170000                ;DATA BUFFER OF LOWEST ADDRESS UBE
                                  .SBTTL  TRAP CATCHER

             000000                       .=0
                                  ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ''.+2,HALT''
                                  ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                  ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
             000174                       .=174
     000174  000000               DISPREG: .WORD  0                ;;SOFTWARE DISPLAY REGISTER
     000176  000000               SWREG:   .WORD  0                ;;SOFTWARE SWITCH REGISTER
                                  .SBTTL  STARTING ADDRESS(ES)
     000200  000137  002632               JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
             001100                       .=1100
     001100  012737  000137  000200 RSTART: MOV   #000137,@#200   ;RESTART HERE IF HALTED IN INTERRUPT TEST
     001106  012737  002632  000202         MOV   #START,@#202
     001114  020627  001014                 CMP R6,#1014          ;WAS VECTOR AREA DESTROYED IN INT. TEST?
     001120  101002                         BHI B                 ;BRANCH IF NO
     001122  004767  015170                 JSR PC,RVEC           ;RESTORE VECTOR AREA
     001126  000137  002632         B:      JMP   @#START         ;GO TO BEGINNING OF PROGRAM
                                  .SBTTL  ACT11 HOOKS

                                  ;;*******************************************************************
                                  ;HOOKS REQUIRED BY ACT11
             001132                       $SVPC=.                  ;SAVE PC
             000046                       .=46
     000046  016136                       $ENDAD                   ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
             000052                       .=52
     000052  000000                       .WORD   0                ;;2)SET LOC.52 TO ZERO
             001132                       .=$SVPC                  ;; RESTORE PC
```

```
    29                                          .SBTTL  COMMON TAGS

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

            001132                                      .=1132
      001132                                    $CMTAG:                                 ;;START OF COMMON TAGS
      001132  000000                            $PASS:  .WORD   0                       ;;CONTAINS PASS COUNT
      001134     000                            $TSTNM: .BYTE   0                       ;;CONTAINS THE TEST NUMBER
      001135     000                            $ERFLG: .BYTE   0                       ;;CONTAINS ERROR FLAG
      001136  000000                            $ICNT:  .WORD   0                       ;;CONTAINS SUBTEST ITERATION COUNT
      001140  000000                            $LPADR: .WORD   0                       ;;CONTAINS SCOPE LOOP ADDRESS
      001142  000000                            $LPERR: .WORD   0                       ;;CONTAINS SCOPE RETURN FOR ERRORS
      001144  000000                            $ERTTL: .WORD   0                       ;;CONTAINS TOTAL ERRORS DETECTED
      001146     000                            $ITEMB: .BYTE   0                       ;;CONTAINS ITEM CONTROL BYTE
      001147     001                            $ERMAX: .BYTE   1                       ;;CONTAINS MAX. ERRORS PER TEST
      001150  000000                            $ERRPC: .WORD   0                       ;;CONTAINS PC OF LAST ERROR INSTRUCTION
      001152  000000                            $GDADR: .WORD   0                       ;;CONTAINS ADDRESS OF 'GOOD' DATA
      001154  000000                            $BDADR: .WORD   0                       ;;CONTAINS ADDRESS OF 'BAD' DATA
      001156  000000                            $GDDAT: .WORD   0                       ;;CONTAINS 'GOOD' DATA
      001160  000000                            $BDDAT: .WORD   0                       ;;CONTAINS 'BAD' DATA
      001162  000000                                    .WORD   0                       ;;RESERVED--NOT TO BE USED
      001164  000000                                    .WORD   0
      001166     000                            $AUTOB: .BYTE   0                       ;;AUTOMATIC MODE INDICATOR
      001167     000                            $INTAG: .BYTE   0                       ;;INTERRUPT MODE INDICATOR
      001170  000000                                    .WORD   0
      001172  177570                            SWR:    .WORD   DSWR                    ;;ADDRESS OF SWITCH REGISTER
      001174  177570                            DISPLAY: .WORD  DDISP                   ;;ADDRESS OF DISPLAY REGISTER
      001176  177560                            $TKS:   177560                          ;;TTY KBD STATUS
      001200  177562                            $TKB:   177562                          ;;TTY KBD BUFFER
      001202  177564                            $TPS:   177564                          ;;TTY PRINTER STATUS REG. ADDRESS
      001204  177566                            $TPB:   177566                          ;;TTY PRINTER BUFFER REG. ADDRESS
      001206     000                            $NULL:  .BYTE   0                       ;;CONTAINS NULL CHARACTER FOR FILLS
      001207     002                            $FILLS: .BYTE   2                       ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
      001210     012                            $FILLC: .BYTE   12                      ;;INSERT FILL CHARS. AFTER A "LINE FEED"
      001211     000                            $TPFLG: .BYTE   0                       ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
      001212  000000                            $REGAD: .WORD   0                       ;;CONTAINS THE ADDRESS FROM
                                                                                        ;;WHICH ($REG0) WAS OBTAINED
              000004                                    .REPT   $CM3
      001214  000000                            $REG0:  .WORD   0                       ;;CONTAINS (($REGAD)+0)
      001216  000000                            $REG1:  .WORD   0                       ;;CONTAINS (($REGAD)+2)
      001220  000000                            $REG2:  .WORD   0                       ;;CONTAINS (($REGAD)+4)
      001222  000000                            $REG3:  .WORD   0                       ;;CONTAINS (($REGAD)+6)
              000004                            .REPT   4
      001224  000000                            $TMP0:  .WORD   0                       ;;USER DEFINED
      001226  000000                            $TMP1:  .WORD   0                       ;;USER DEFINED
      001230  000000                            $TMP2:  .WORD   0                       ;;USER DEFINED
      001232  000000                            $TMP3:  .WORD   0                       ;;USER DEFINED
      001234  000000                            $TIMES: 0                               ;;MAX. NUMBER OF ITERATIONS
      001236  000000                            $ESCAPE:0                               ;;ESCAPE ON ERROR ADDRESS
      001240     207        377       377       $BELL:  .ASCIZ  <207><377><377>         ;;CODE FOR BELL
      001243     000
      001244     077                            $QUES:  .ASCII  /?/                     ;;QUESTION MARK
      001245     015                            $CRLF:  .ASCII  <15>                    ;;CARRIAGE RETURN
      001246     012        000                 $LF:    .ASCIZ  <12>                    ;;LINE FEED
                                                ;;*****************************************************************
```

```
                                .SBTTL  ERROR POINTER TABLE

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

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


   001250                       $ERRTB:
                                ;ITEM1
   001250  020750                       EM1
   001252  000000                       0
   001254  000000                       0
   001256  000000                       0
                                ;ITEM2
   001260  021032                       EM2
   001262  021072                       DH2
   001264  021120                       DT2
   001266  000000                       0
                                ;ITEM3
   001270  021126                       EM3
   001272  021173                       DH3
   001274  021202                       DT3
   001276  000000                       0
                                ;ITEM 4
   001300  021206                       EM4
   001302  021254                       DH4
   001304  021314                       DT4
   001306  000000                       0
                                ;ITEM 5
   001310  021324                       EM5
   001312  021254                       DH4
   001314  021314                       DT4
   001316  000000                       0
                                ;ITEM 6
   001320  021372                       EM6
   001322  021254                       DH4
   001324  021314                       DT4
   001326  000000                       0
                                ;ITEM 7
   001330  021442                       EM7
   001332  021504                       DH7
   001334  021562                       DT7
   001336  000000                       0
                                ;ITEM 8
   001340  021570                       EM8
   001342  000000                       0
   001344  000000                       0
   001346  000000                       0
                                ;ITEM 9
   001350  021655                       EM9
```

```
 001352  000000                                  0
 001354  000000                                  0
 001356  000000                                  0
                                        ;ITEM 10
 001360  021716                                  EM10
 001362  000000                                  0
 001364  000000                                  0
 001366  000000                                  0
                                        ;ITEM 11
 001370  021757                                  EM11
 001372  000000                                  0
 001374  000000                                  0
 001376  000000                                  0
                                        ;ITEM 12
 001400  022023                                  EM12
 001402  000000                                  0
 001404  000000                                  0
 001406  000000                                  0
                                        ;ITEM 13
 001410  000000                                  0
 001412  000000                                  0
 001414  000000                                  0
 001416  000000                                  0
                                        ;ITEM 14
 001420  022070                                  EM14
 001422  000000                                  0
 001424  000000                                  0
 001426  000000                                  0
                                        ;ITEM 15
 001430  022121                                  EM15
 001432  022205                                  DH15
 001434  021202                                  DT3
 001436  000000                                  0
                                        ;ITEM 16
 001440  022227                                  EM16
 001442  000000                                  0
 001444  000000                                  0
 001446  000000                                  0
                                        ;ITEM 17
 001450  022322                                  EM17
 001452  022361                                  DH17
 001454  021120                                  DT2
 001456  000000                                  0
                                        ;ITEM 18
 001460  022406                                  EM18
 001462  022475                                  DH18
 001464  021202                                  DT3
 001466  000000                                  0
                                        ;ITEM 19
 001470  022510                                  EM19
 001472  022571                                  DH19
 001474  021202                                  DT3
 001476  000000                                  0
                                        ;ITEM 20
 001500  022612                                  EM20
 001502  000000                                  0
 001504  000000                                  0
 001506  000000                          0
                                ;ITEM 21
 001510  022661                          EM21
 001512  000000                          0
 001514  000000                          0
 001516  000000                          0
                                ;ITEM 22
 001520  022717                          EM22
 001522  000000                          0
 001524  000000                          0
 001526  000000                          0
                                ;ITEM 23
 001530  022762                          EM23
 001532  000000                          0
 001534  000000                          0
 001536  000000                          0
                                ;ITEM 24
 001540  023026                          EM24
 001542  023075                          DH24
 001544  023152                          DT24
 001546  000000                          0
                                ;ITEM 25
 001550  023164                          EM25
 001552  023075                          DH24
 001554  023152                          DT24
 001556  000000                          0
                                ;ITEM 26
 001560  023224                          EM26
 001562  023075                          DH24
 001564  023152                          DT24
 001566  000000                          0
                                ;ITEM 27
 001570  023265                          EM27
 001572  023075                          DH24
 001574  023152                          DT24
 001576  000000                          0
                                ;ITEM 28
 001600  023325                          EM28
 001602  000000                          0
 001604  000000                          0
 001606  000000                          0
                                ;ITEM 29
 001610  023354                          EM29
 001612  000000                          0
 001614  000000                          0
 001616  000000                          0
                                ;ITEM 30
 001620  023403                          EM30
 001622  000000                          0
 001624  000000                          0
 001626  000000                          0
                                ;ITEM 31
 001630  023433                          EM31
 001632  000000                          0
 001634  000000                          0
 001636  000000                          0
                                ;ITEM 32
```

```
001640  023463                 EM32
001642  023075                 DH24
001644  023152                 DT24
001646  000000                 0
                       ;ITEM 33
001650  023532                 EM33
001652  023075                 DH24
001654  023152                 DT24
001656  000000                 0
                       ;ITEM 34
001660  023567                 EM34
001662  023637                 DH34
001664  021202                 DT3
001666  000000                 0
                       ;ITEM 35
001670  023656                 EM35
001672  023733                 DH35
001674  021120                 DT2
001676  000000                 0
                       ;ITEM 36
001700  023761                 EM36
001702  024030                 DH36
001704  021202                 DT3
001706  000000                 0
                       ;ITEM 37
001710  024040                 EM37
001712  023733                 DH35
001714  021120                 DT2
001716  000000                 0
                       ;ITEM 38
001720  024077                 EM38
001722  023733                 DH35
001724  021120                 DT2
001726  000000                 0
                       ;ITEM 39
001730  024167                 EM39
001732  000000                 0
001734  000000                 0
001736  000000                 0
                       ;ITEM 40
001740  024245                 EM40
001742  000000                 0
001744  000000                 0
001746  000000                 0
                       ;ITEM 41
001750  024323                 EM41
001752  000000                 0
001754  000000                 0
001756  000000                 0
                       ;ITEM 42
001760  024365                 EM42
001762  000000                 0
001764  000000                 0
001766  000000                 0
                       ;ITEM 43
001770  024424                 EM43
001772  024510                 DH43
```

```
001774  021120                  DT2
001776  000000                  0
                        ;ITEM 44
002000  024541                  EM44
002002  000000                  0
002004  000000                  0
002006  000000                  0
                        ;ITEM 45
002010  024605                  EM45
002012  000000                  0
002014  000000                  0
002016  000000                  0
                        ;ITEM 46
002020  024632                  EM46
002022  024702                  DH46
002024  021314                  DT4
002026  000000                  0
                        ;ITEM 47
002030  024740                  EM47
002032  024510                  DH43
002034  021120                  DT2
002036  000000                  0
                        ;ITEM 48
002040  024740                  EM47
002042  000000                  0
002044  000000                  0
002046  000000                  0
                        ;ITEM 49
002050  025016                  EM49
002052  000000                  0
002054  000000                  0
002056  000000                  0
                        ;ITEM 50
002060  025016                  EM49
002062  024510                  DH43
002064  021120                  DT2
002066  000000                  0
                        ;ITEM 51
002070  025075                  EM51
002072  000000                  0
002074  000000                  0
002076  000000                  0
                        ;ITEM 52
002100  025126                  EM52
002102  000000                  0
002104  000000                  0
002106  000000                  0
                        ;ITEM 53
002110  025161                  EM53
002112  000000                  0
002114  000000                  0
002116  000000                  0
                        ;ITEM 54
002120  025233                  EM54
002122  000000                  0
002124  000000                  0
002126  000000                  0
```

```
                                        ;ITEM 55
     002130  024424                             EM43
     002132  000000                             0
     002134  000000                             0
     002136  000000                             0
                                        ;ITEM 56
     002140  025476                             EM56
     002142  000000                             0
     002144  000000                             0
     002146  000000                             0
                                        ;ITEM 57
     002150  025555                             EM57
     002152  000000                             0
     002154  000000                             0
     002156  000000                             0
                                        ;ITEM 58
     002160  025605                             EM58
     002162  022205                             DH15
     002164  021202                             DT3
     002166  000000                             0
                                        ;ITEM 59
     002170  025626                             EM59
     002172  000000                             0
     002174  000000                             0
     002176  000000                             0
                                        ;ITEM 60
     002200  025674                             EM60
     002202  000000                             0
     002204  000000                             0
     002206  000000                             0
                                        ;ITEM 61
     002210  025722                             EM61
     002212  000000                             0
     002214  000000                             0
     002216  000000                             0
                                        ;ITEM 62
     002220  025751                             EM62
     002222  000000                             0
     002224  000000                             0
     002226  000000                             0
                                        ;ITEM 63
     002230  026001                             EM63
     002232  022205                             DH15
     002234  021202                             DT3
     002236  000000                             0
                                        ;ITEM 64
     002240  026031                             EM64
     002242  000000                             0
     002244  000000                             0
     002246  000000                             0
                                        ;ITEM 65
     002250  026127                             EM65
     002252  026207                             DH65
     002254  021202                             DT3
     002256  000000                             0
                                        ;ITEM 66
     002260  026226                             EM66
```

```
 002262   000000                       0
 002264   000000                       0
 002266   000000                       0
                              ;ITEM 67
 002270   026254                       EM67
 002272   026207                       DH65
 002274   021202                       DT3
 002276   000000                       0
                              ;ITEM 68
 002300   000000                       0
 002302   026207                       DH65
 002304   021202                       DT3
 002306   000000                       0
                              ;ITEM 69
 002310   026316                       EM69
 002312   000000                       0
 002314   000000                       0
 002316   000000                       0
                              ;ITEM 70
 002320   026347                       EM70
 002322   000000                       0
 002324   000000                       0
 002326   000000                       0
                              ;ITEM 71
 002330   026430                       EM71
 002332   000000                       0
 002334   000000                       0
 002336   000000                       0
                              ;ITEM 72
 002340   026456                       EM72
 002342   000000                       0
 002344   000000                       0
 002346   000000                       0
                              ;ITEM 73
 002350   026506                       EM73
 002352   000000                       0
 002354   000000                       0
 002356   000000                       0
                              ;ITEM 74
 002360   026553                       EM74
 002362   000000                       0
 002364   000000                       0
 002366   000000                       0
                              ;ITEM 75
 002370   026575                       EM75
 002372   000000                       0
 002374   000000                       0
 002376   000000                       0
                              ;ITEM 76
 002400   026615                       EM76
 002402   000000                       0
 002404   000000                       0
 002406   000000                       0
                              ;ITEM 77
 002410   026642                       EM77
 002412   000000                       0
 002414   000000                       0
```

```
002416  000000                          0
                                ;ITEM 78
002420  026670                          EM78
002422  021254                          DH4
002424  021314                          DT4
002426  000000                          0
                                ;ITEM 79
002430  000000                          0
002432  000000                          0
002434  000000                          0
002436  000000                          0
                                ;ITEM 80
002440  026730                          EM80
002442  000000                          0
002444  000000                          0
002446  000000                          0
                                ;ITEM 81
002450  026772                          EM81
002452  024702                          DH46
002454  021314                          DT4
002456  000000                          0
                                ;ITEM 82
002460  027016                          EM82
002462  000000                          0
002464  000000                          0
002466  000000                          0
                                ;ITEM 83
002470  027063                          EM83
002472  000000                          0
002474  000000                          0
002476  000000                          0
                                ;ITEM 84
002500  027144                          EM84
002502  000000                          0
002504  000000                          0
002506  000000                          0
002510  000000                  EMAP:   .WORD 0                 ;MAP OF UBE PRESENT
002512  000000                  TMAP:   .WORD 0                 ;TEMPORARY MAP
002514  000000                  SPTR:   .WORD 0                 ;SWITCH POINTER
002516  000000                  BEBD:   .WORD 0                 ;BEBD ADDRESS OF UBE UNDER TEST
002520  000000                  BECC:   .WORD 0                 ;BECC ADDRESS OF UBE UNDER TEST
002522  000000                  BEBA:   .WORD 0                 ;BEBA ADDRESS OF UBE UNDER TEST
002524  000000                  BECR1:  .WORD 0                 ;BECR1 ADDRESS OF UBE UNDER TEST
002526  000000                  BECR2:  .WORD 0                 ;BECR2 ADDRESS OF UBE UNDER TEST
002530  000000                  BERE:   .WORD 0                 ;CLEAR ERROR ADDRESS OF UBE UNDER TEST
002532  000000                  INTVEC: .WORD 0                 ;INTERRUPT VECTOR ADDRESS OF UBE UNDER TEST
002534  170014                  BEGO:   .WORD 170014            ;GO ADDRESS
002536  000000                  BE1BD:  .WORD 0                 ;BEBD ADDRESS OF FIRST UBE TESTED
002540  000000                  BE1CC:  .WORD 0                 ;BECC ADDRESS OF FIRST UBE TESTED
002542  000000                  BE1BA:  .WORD 0                 ;BEBA ADDRESS OF FIRST UBE TESTED
002544  000000                  BE1CR1: .WORD 0                 ;BECR1 ADDRESS OF FIRST UBE TESTED
002546  000000                  BE1CR2: .WORD 0                 ;BECR2 ADDRESS OF FIRST UBE TESTED
002550  000000                  BE1RE:  .WORD 0                 ;CLEAR ERROR ADDRESS OF FIRST UBE TESTED
002552  000000                  BE1VEC: .WORD 0                 ;INTERRUPT VECTOR ADDRESS OF FIRST UBE TESTED
002554  000000                  BE2BD:  .WORD 0                 ;BEBD ADDRESS OF SECOND UBE TESTED
002556  000000                  BE2CC:  .WORD 0                 ;BECC ADDRESS OF SECOND UBE TESTED
002560  000000                  BE2BA:  .WORD 0                 ;BEBA ADDRESS OF SECOND UBE TESTED
```

```
    002562  000000                   BE2CR1: .WORD 0              ;BECR1 ADDRESS OF SECOND UBE TESTED
    002564  000000                   BE2CR2: .WORD 0              ;BECR2 ADDRESS OF SECOND UBE TESTED
    002566  000000                   BE2RE:  .WORD 0              ;CLEAR ERROR ADDRESS OF SECOND UBE TESTED
    002570  000000                   BE2VEC: .WORD 0              ;INTERRUPT VECTOR ADDRESS OF SECOND UBE TESTED
    002572  000000                   BE3BD:  .WORD 0              ;BEBD ADDRESS OF THIRD UBE TESTED
    002574  000000                   BE3CC:  .WORD 0              ;BECC ADDRESS OF THIRD UBE TESTED
    002576  000000                   BE3BA:  .WORD 0              ;BEBA ADDRESS OF THIRD UBE TESTED
    002600  000000                   BE3CR1: .WORD 0              ;BECR1 ADDRESS OF THIRD UBE TESTED
    002602  000000                   BE3CR2: .WORD 0              ;BECR2 ADDRESS OF THIRD UBE TESTED
    002604  000000                   BE3RE:  .WORD 0              ;CLEAR ERROR ADDRESS OF THIRD UBE TESTED
    002606  000000                   BE3VEC: .WORD 0              ;INTERRUPT VECTOR ADDRESS OF THIRD UBE TESTED
    002610  000000                   BE4BD:  .WORD 0              ;BEBD ADDRESS OF FOURTH UBE TESTED
    002612  000000                   BE4CC:  .WORD 0              ;BECC ADDRESS OF FOURTH UBE TESTED
    002614  000000                   BE4BA:  .WORD 0              ;BEBA ADDRESS OF FOURTH UBE TESTED
    002616  000000                   BE4CR1: .WORD 0              ;BECR1 ADDRESS OF FOURTH UBE TESTED
    002620  000000                   BE4CR2: .WORD 0              ;BECR2 ADDRESS OF FOURTH UBE TESTED
    002622  000000                   BE4RE:  .WORD 0              ;CLEAR ERROR ADDRESS OF FOURTH UBE TESTED
    002624  000000                   BE4VEC: .WORD 0              ;INTERRUPT VECTOR ADDRESS OF FOURTH UBE TESTED
    002626  000000                   UCNT:   .WORD 0              ;COUNT OF UBE TESTED
    002630  000000                   NO:     .WORD 0              ;INDEX NUMBER FOR ADDRESS OF 1,2,3,4 UBE
                                     ;;*****************************************************************
                                     ;;*****************************************************************
    002632                           START:
                                     .SBTTL  INITIALIZE THE COMMON TAGS
                                     ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
        002632  012706  001132               MOV     #$CMTAG,R6       ;;FIRST LOCATION TO BE CLEARED
        002636  005026                       CLR     (R6)+            ;;CLEAR MEMORY LOCATION
        002640  022706  001172               CMP     #SWR,R6 ;;DONE?
        002644  001374                       BNE     .-6              ;;LOOP BACK IF NO
        002646  012706  001100               MOV     #STACK,SP        ;;SETUP THE STACK POINTER
                                     ;;INITIALIZE A FEW VECTORS
        002652  012737  016472  000020       MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
        002660  012737  000340  000022       MOV     #340,@#IOTVEC+2 ;;LEVEL 7
        002666  012737  016722  000030       MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
        002674  012737  000340  000032       MOV     #340,@#EMTVEC+2 ;;LEVEL 7
        002702  012737  020166  000034       MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
        002710  012737  000340  000036       MOV     #340,@#TRAPVEC+2;LEVEL 7
        002716  012737  020236  000024       MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
        002724  012737  000340  000026       MOV     #340,@#PWRVEC+2 ;;LEVEL 7
        002732  016767  013146  013136       MOV     $ENDCT,$EOPCT    ;;SETUP END-OF-PROGRAM COUNTER
        002740  005067  176270               CLR     $TIMES           ;;INITIALIZE NUMBER OF ITERATIONS
        002744  005067  176266               CLR     $ESCAPE          ;;CLEAR THE ESCAPE ON ERROR ADDRESS
        002750  112767  000001  176171       MOVB    #1,$ERMAX        ;;ALLOW ONE ERROR PER TEST
        002756  012767  002756  176154       MOV     #.,$LPADR        ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
        002764  012767  002764  176150       MOV     #.,$LPERR        ;;SETUP THE ERROR LOOP ADDRESS
                                     ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                     ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
        002772  013746  000004               MOV     @#ERRVEC,-(SP)   ;;SAVE ERROR VECTOR
        002776  012737  003032  000004       MOV     #64$,@#ERRVEC    ;;SET UP ERROR VECTOR
        003004  012767  177570  176160       MOV     #DSWR,SWR        ;;SETUP FOR A HARDWARE SWICH REGISTER
        003012  012767  177570  176154       MOV     #DDISP,DISPLAY   ;;AND A HARDWARE DISPLAY REGISTER
        003020  022777  177777  176144       CMP     #-1,@SWR         ;;TRY TO REFERENCE HARDWARE SWR
        003026  001012                       BNE     66$              ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                      ;;AND  THE HARDWARE SWR IS NOT = -1
        003030  000403                       BR      65$              ;;BRANCH IF NO TIMEOUT
        003032  012716  003040       64$:    MOV     #65$,(SP)        ;;SET UP FOR TRAP RETURN
        003036  000002                       RTI
```

```
003040  012767  000176  176124  65$:    MOV     #SWREG,SWR          ;;POINT TO SOFTWARE SWR
003046  012767  000174  176120          MOV     #DISPREG,DISPLAY
003054  012637  000004          66$:    MOV     (SP)+,@#ERRVEC      ;;RESTORE ERROR VECTOR

003060  032777  010000  176104          BIT #SW12,@SWR              ;INHIBIT TYPEOUTS?
003066  001004                          BNE START1                  ;BRANCH IF YES
003070  104401  027737                  TYPE ,MSG16                 ;UBE MODULE TEST
003074  104401  027442                  TYPE ,MSG12                 ;JUMPER W1 SHOULD BE IN TO PREVENT MULTIPLE SSYNS
003100  005067  177404          START1: CLR EMAP                    ;INIT. EMAP
003104  012706  001100                  MOV     #STACK, SP          ;SETUP THE STACK POINTER
003110  012767  000001  177376          MOV #1,SPTR                 ;INITIALIZE SWITCH POINTER TO LOOK AT FIRST SWITCH
003116  012767  002632  176016          MOV #START,$LPERR           ;SET UP RETURN FOR ERROR1
003124  012737  003234  000004          MOV #MTRAP,@#4              ;SET UP MAP TRAP
003132  012737  000340  000006          MOV #340,@#6                ;SET PSW PRIORITY=7
003140  012701  170000                  MOV #DB,R1                  ;DATA REG ADDR. OF FIRST REG
003144  012700  000001                  MOV #1,R0                   ;LD PTER
003150  005711                  LOOP1:  TST (R1)                    ;LOOK IF EXER. PRESENT,NO TRAPS
003152  050067  177332                  BIS R0,EMAP                 ;YES,INDIC. EXER. PRESENT
003156  062701  000020          LOOP2:  ADD #20,R1                  ;LOOK AT NEXT EXER. ADDR.
003162  006100                          ROL R0                      ;UPDATE PTER
003164  020027  000020                  CMP R0,#20                  ;AT LAST UBE?
003170  001367                          BNE LOOP1                   ;BRANCH IF NOT AT LAST POSSIBLE EXER.
003172  012737  000006  000004  A:      MOV #6,@#4                  ;RESTORE TRAP CATCHER
003200  005037  000006                  CLR @#6                     ;
003204  032777  010000  175760          BIT #SW12,@SWR              ;INHIBIT TYPEOUTS?
003212  001007                          BNE 1$                      ;BRANCH IF YES
003214  104401  020414                  TYPE ,MSG1                  ;TYPE MAP
003220  016746  177264                  MOV     EMAP,-(SP)          ;;SAVE EMAP FOR TYPEOUT
003224  104402                          TYPOC                       ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
003226  104401  001245                  TYPE ,$CRLF                 ;
003232  000415                  1$:     BR IADD                     ;GO CALC. ADDRESSES OF UBE

003234  022626                  MTRAP:  CMP     (SP)+,  (SP)+       ;RESTORE THE STACK
003236  020027  000010                  CMP R0,#10                  ;AT END OF UBE ADDRESS SPACE?
003242  001345                          BNE LOOP2                   ;NO LOOK AT NEXT EXER.
003244  026727  177240  000000          CMP EMAP,#0                 ;YES,IS MAP = 0?
003252  001347                          BNE A                       ;NO,BRANCH TO A
003254  104001                          ERROR +^D1                  ;NO RESPONSE TO REG ADDRESSES OR NO DEVICE PRESENT
003256  004767  013150                  JSR PC,TERRPC               ;TYPE PC OF ERROR MSG
003262  000167  012562                  JMP $EOP                    ;GO TO END OF TEST
                                ;////////////////////////////////////////////////////////////////////////
                                ;       ROUTINE TO CALCULATE ADDRESSES OF UBE TESTED
                                ;////////////////////////////////////////////////////////////////////////
003266  012767  167760  177222  IADD:   MOV #167760, BEBD           ;INITIALIZE BEBD
003274  012767  167762  177216          MOV #167762, BECC           ;INITIALIZE BECC
003302  012767  167764  177212          MOV #167764, BEBA           ;INITIALIZE BEBA
003310  012767  167766  177206          MOV #167766, BECR1          ;INITIALIZE BECR1
003316  012767  167776  177202          MOV #167776, BECR2          ;INITIALIZE BECR2
003324  012767  167770  177176          MOV #167770, BERE           ;INITIALIZE BERE
003332  012767  170014  177174          MOV #170014, BEGO           ;INITIALIZE BEGO
003340  012767  000504  177164          MOV #504,       INTVEC      ;INITIALIZE INTERRUPT VECTOR
003346  012700  002536                  MOV #BE1BD,R0               ;GET POINTER TO PERMANENT VECTOR AREA
003352  005020                  1$:     CLR (R0)+                   ;CLEAR PERMANENT VECTOR AREA
003354  020027  002630                  CMP R0,#NO                  ;ENTIRE AREA CLEARED?
003360  001374                          BNE 1$                      ;BRANCH IF NO
003362  012767  002536  177240          MOV #BE1BD,NO               ;INITIALIZE POINTER TO BE1BD
003370  016767  177114  177114          MOV EMAP,TMAP               ;MOVE MAP TO WORK AREA
```

```
003376  062767  000020  177112  ACALC:  ADD #20, BEBD           ;CALC. ADDR. OF BEBD TESTING
003404  062767  000020  177106          ADD #20, BECC           ;CALC. ADDR. OF BECC TESTING
003412  062767  000020  177102          ADD #20, BEBA           ;CALC. ADDR. OF BEBA TESTING
003420  062767  000020  177076          ADD #20, BECR1          ;CALC. ADDR. OF BECR1 TESTING
003426  062767  000020  177072          ADD #20, BECR2          ;CALC. ADDR. OF BECR2 TESTING
003434  062767  000020  177066          ADD #20, BERE           ;CALC. ADDR. OF BERE TESTING
003442  062767  000004  177062          ADD #4,  INTVEC         ;CALC. ADDR. OF INTERRUPT VECTOR
003450  000241                          CLC                     ;INIT. CARRY
003452  006267  177034                  ASR TMAP                ;LOOK FOR BIT INDICATING EXERCISOR
003456  042767  100000  177026          BIC #100000,TMAP        ;CLEAR MSB IF SET
003464  103405                          BCS C                   ;IF EXERCISOR PRESENT GO SEE IF TO BE TESTED
003466  005767  177020                  TST TMAP                ;ANY EXERCISORS LEFT?
003472  001341                          BNE ACALC               ;BRANCH IF MORE
003474  000167  010740                  JMP LAST                ;GO TO LAST TEST
003500  032767  000020  177006  C:      BIT #20,SPTR            ;TESTED 4 UBE?
003506  001402                          BEQ D                   ;BRANCH IF NO
003510  000167  010724                  JMP LAST                ;GO TO LAST TEST
003514  036777  176774  175450  D:      BIT SPTR,@SWR           ;SHOULD THIS UBE BE TESTED?
003522  001403                          BEQ E                   ;BRANCH IF YES
003524  006367  176764                  ASL SPTR                ;ROTATE POINTER TO NEXT SWITCH
003530  000722                          BR ACALC                ;LOOK FOR NEXT UBE
003532  006367  176756          E:      ASL SPTR                ;ROTATE POINTER TO NEXT SWITCH
003536  005267  177064                  INC UCNT                ;UPDATE COUNT OF UBE TESTED
003542  104401  027570                  TYPE ,MSG13             ;TESTING UBE WITH BEBD ADDRESS:
003546  016746  176744                  MOV     BEBD,-(SP)      ;;SAVE BEBD FOR TYPEOUT
003552  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
003554  104401  001245                  TYPE ,$CRLF
                                ;//////////////////////////////////////////////////////////////////////
                                ;ROUTINE TO STORE TEMPORARY ADDRESS OF UBE TESTING IN PERMANENT LOC
                                ;//////////////////////////////////////////////////////////////////////
003560  016701  177044                  MOV NO,R1               ;GET POINTER TO BE1BD
003564  012700  002516                  MOV #BEBD,R0            ;GET POINTER FOR BEBD
003570  012021                  F:      MOV (R0)+,(R1)+         ;SAVE ADDRESSES
003572  020027  002534                  CMP R0,#BEGO            ;ALL SAVED?
003576  001374                          BNE F                   ;BRANCH IF NO
003600  062767  000016  177022          ADD #16,NO              ;UPDATE PTER TO NEXT UBE

003606  012767  003632  175324          MOV #FIRST,$LPADR       ;INIT. SCOPE WHEN MORE THAN 1 UBE
003614  012767  003632  175320          MOV #FIRST,$LPERR       ;INIT. SCOPE WHEN MORE THAN 1 UBE
003622  105067  175306                  CLRB $TSTNM             ;INIT. TEST NUMBER
003626  000005                          RESET                   ;INIT. ALL UBE FOR LOOPS


                                ;;*****************************************************************
                                ;*TEST 1         TEST ALL UBE REG CAN BE CLEARED
                                ;*
                                ;*R0 CONTAINS ADDRESS OF REG UNDER TEST
                                ;*
                                ;*IF THIS TEST FAILS, ALL FOLLOWING TESTS FOR THIS MODULE ARE ABORTED.
                                ;;*****************************************************************
003630  000004                  TST1:   SCOPE
003632  012706  001100          FIRST:  MOV #STACK,SP           ;RESTORE STACK
003636  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
003644  012737  004030  000004          MOV #STRAP,@#4          ;SET UP NSSYN TRAP
003652  012737  000340  000006          MOV #340,@#6            ;SET PSW PRIORTY =7
003660  012777  000000  176640          MOV #0,@BECR2           ;DO DATO TO CLEAR PB BIT IF SET
003666  005077  176636                  CLR @BERE               ;CLEAR ERROR CONDITIONS
```

```
003672  016700  176620                    MOV BEBD,R0             ;SETUP TO LOOK AT FIRST REG.
003676  005010                   T01L01:  CLR (R0)                ;CLR UBE REG
003700  020067  176620                    CMP R0,BECR1            ;TESTING BECR1?
003704  001425                            BEQ T01L04              ;BRANCH IF YES
003706  005710                            TST (R0)                ;IS REG CLEARED?
003710  001421                            BEQ T01L02              ;BRANCH IF YES
003712  010067  175276           T01L03:  MOV R0,$REG0            ;SAVE FAILING ADDRESS
003716  011067  175274                    MOV (R0),$REG1          ;SAVE BAD DATA
003722  104002                            ERROR +^D2                      ;FATAL ERROR:REG FAILED TO CLEAR
003724  020067  176576                    CMP R0,BECR2            ;DID BECR2 FAIL?
003730  001006                            BNE T01L06              ;BRANCH IF NO
003732  032777  020000  176566            BIT #20000,@BECR2       ;WAS CCOVF =1?
003740  001402                            BEQ T01L06              ;BRANCH IF NO
003742  104401  027632                    TYPE ,MSG14             ;DISREGARD BIT 13=1 OF BECR2
003746  004767  012460           T01L06:  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
003752  000433                            BR T01L05               ;RESTORE TRAP
003754  005720                   T01L02:  TST (R0)+               ;INC ADDRESS
003756  000747                            BR T01L01               ;CONTINUE LOOP
003760  022777  000200  176536   T01L04:  CMP #200,@BECR1         ;ALL BITS IN BECR1 0 EXCEPT RDY?
003766  001351                            BNE T01L03              ;BRANCH TO ERROR IF NO
003770  016700  176532                    MOV BECR2,R0            ;INDICATE LOOKING AT BECR2
003774  005077  176530                    CLR @BERE               ;RESET ERROR CONDITIONS
004000  005077  176522                    CLR @BECR2              ;CLEAR BECR2
004004  032777  157777  176514            BIT #157777,@BECR2      ;IS BECR2 =0 EXCEPT CCOVF?
004012  001337                            BNE T01L03              ;NO, TYPE ADDRESS AND DATA ERROR
004014  012737  000006  000004            MOV #6,@#4              ;RESTORE TRAP CATCHER
004022  005037  000006                    CLR @#6
004026  000414                            BR      TST2            ;;GO TO NEXT TEST

004030  011667  175160           STRAP:   MOV (SP),$REG0          ;SAVE PC FROM STACK
004034  104003                            ERROR +^D3              ;FATAL ERROR:CPU DID NOT RECEIVE SSYN
004036  004767  012370                    JSR PC,TERRPC           ;TYPE PC OF ERROR MSG

004042  012737  000006  000004   T01L05:  MOV #6,@#4              ;RESTORE TRAP CATCHER
004050  005037  000006                    CLR @#6
004054  000167  010354                    JMP NUBE1               ;TEST NEXT UBE

                                 ;;*****************************************************************
                                 ;*TEST 2        TST 1,6,8,14 BECR1 & BITS 0-3,14 OF BECR2 CHANGE
                                 ;*
                                 ;*R2, R3 CONTAIN THE TRUE AND COMPLEMENT TEST DATA
                                 ;*R4 CONTAINS A POINTER TO THE REG ADDRESS BEING TESTED
                                 ;*R5 CONTAINS THE MASKED CONTENTS OF THE REG BEING TESTED
                                 ;*$TMP1 CONTAINS THE MASK FOR THE REG
                                 ;*
                                 ;*IF THIS TEST FAILS, ALL FOLLOWING TESTS FOR THIS MODULE ARE ABORTED
                                 ;;*****************************************************************
004060  000004                   TST2:    SCOPE
004062  012706  001100                    MOV #STACK,SP           ;RESTORE STACK
004066  012737  000340  177776            MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
004074  012702  052652                    MOV #52652,R2           ;SETUP TEST DATA BECR1
004100  012703  025324                    MOV #25324,R3           ;SETUP COMP. TEST DATA BECR1
004104  012704  002524                    MOV #BECR1,R4           ;LOAD ADDRESS PTER. FOR BECR1
004110  005077  176414                    CLR @BERE               ;CLEAR ERROR CONDITIONS
004114  012767  177777  175104            MOV #177777,$TMP1       ;LOAD MASK TO LOOK AT ALL BECR1
004122  016705  175100           T02L03:  MOV $TMP1,R5            ;LOAD R5 WITH MASK
004126  011400                            MOV (R4),R0             ;GET ADDRESS OF BECR TESTING
```

```
    004130  010210                           MOV R2,(R0)              ;LOAD BECR WITH DATA
    004132  011001                           MOV (R0),R1              ;GET CONTENTS OF BECR
    004134  005101                           COM R1                   ;ONLY LOOK AT BITS
    004136  040105                           BIC R1,R5                ;SET IN MASK =R5
    004140  020502                           CMP R5,R2                ;DATA OK?
    004142  001424                           BEQ T02L01               ;BRANCH IF YES
    004144  011467  175044         T02L02:   MOV (R4),$REG0           ;SAVE BECR ADDRESS
    004150  011067  175042                   MOV (R0),$REG1           ;SAVE BECR BAD DATA
    004154  010267  175040                   MOV R2,$REG2             ;SAVE GOOD DATA
    004160  104006                           ERROR +^D6               ;FATAL ERROR: CONTROL REG HELD WRONG DATA
    004162  021467  176340                   CMP (R4),BECR2           ;DID BECR2 FAIL?
    004166  001006                           BNE T02L04               ;BRANCH IF NO
    004170  032777  020000  176330           BIT #20000,@BECR2        ;WAS CCOVF=1?
    004176  001402                           BEQ T02L04               ;BRANCH IF NO
    004200  104401  027632                   TYPE ,MSG14              ;DISREGARD BIT 13=1 OF BECR2
    004204  004767  012222         T02L04:   JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
    004210  000167  010214                   JMP NUBE                 ;TEST NEXT UBE
    004214  010302                 T02L01:   MOV R3,R2                ;XFER NEW TEST DATA
    004216  010210                           MOV R2,(R0)              ;LOAD BECR WITH COMP.DATA
    004220  011001                           MOV (R0),R1              ;GET CONTENTS OF BECR
    004222  016705  175000                   MOV $TMP1,R5             ;LOAD R5 WITH MASK
    004226  005101                           COM R1                   ;ONLY LOOK AT BITS
    004230  040105                           BIC R1,R5                ;SET IN MASK =R5
    004232  020502                           CMP R5,R2                ;DATA OK?
    004234  001343                           BNE T02L02               ;BRANCH IF NO
    004236  012702  040012                   MOV #40012,R2            ;SETUP TEST DATA BECR2
    004242  012703  000005                   MOV #5,R3                ;SETUP COMP. TEST DATA BECR2
    004246  012704  002526                   MOV #BECR2,R4            ;LOAD ADDRESS PTER. FOR BECR2
    004252  012767  157777  174746           MOV #157777,$TMP1        ;HAVE MASK LOOK AT ALL BECR2 EXECPT CCOVF
    004260  020067  176242                   CMP R0,BECR2             ;TESTED BECR2?
    004264  001316                           BNE T02L03               ;NO, BRANCH TO START TEST OF BECR2


                                   ;;*****************************************************************
                                   ;*TEST 3        FLOAT A '1' THROUGH BEBD, BECC, BEBA
                                   ;*
                                   ;*R0 CONTAINS A POINTER TO THE REG ADDRESS BEING TESTED
                                   ;*R1 CONTAINS TEST DATA
                                   ;*
                                   ;*IF THIS TEST FAILS, ALL FOLLOWING TESTS FOR THIS MODULE ARE ABORTED
                                   ;;*****************************************************************
    004266  000004                 TST3:     SCOPE
    004270  012706  001100                   MOV #STACK,SP            ;RESTORE STACK
    004274  012737  000340  177776           MOV #340,@#PSW           ;LOCK OUT INTERRUPTS
    004302  012700  002516                   MOV #BEBD,R0             ;GET BEBD ADDRESS PTER.
    004306  012701  000001         T03L04:   MOV #1,R1                ;SETUP TEST DATA REG
    004312  010130                 T03L03:   MOV R1,@(R0)+            ;PUT TEST DATA IN REG
    004314  025001                           CMP @-(R0),R1            ;TEST REG
    004316  001413                           BEQ T03L01               ;BRANCH IF OK
    004320  011067  174670                   MOV (R0),$REG0           ;SAVE FAILING REG ADDRESS
    004324  010167  174670                   MOV R1,$REG2             ;SAVE GOOD DATA
    004330  013067  174662                   MOV @(R0)+,$REG1         ;SAVE BAD DATA
    004334  104004                           ERROR +^D4               ;FATAL ERROR:REG FAILED TO FLOAT A '1'
    004336  004767  012070                   JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
    004342  000167  010062                   JMP NUBE                 ;TEST NEXT UBE
    004346  005701                 T03L01:   TST R1                   ;TESTED ALL 16 BITS?
    004350  100402                           BMI T03L02               ;BRANCH IF YES
    004352  006301                           ASL R1                   ;TEST NEXT BIT
    004354  000756                           BR T03L03              ;CONTINUE LOOP
    004356  022067  176140          T03L02: CMP (R0)+,BEBA          ;TESTED LAST REG? ALSO UPDATE ADDR. PTER.
    004362  001351                          BNE T03L04              ;BRANCH IF REGS NOT TESTED

                                    ;;*****************************************************************
                                    ;*TEST 4         FLOAT A '0' THROUGH BEBD,BECC,BEBA
                                    ;*
                                    ;*R0 CONTAINS A POINTER TO THE REG ADDRESS BEING TESTED
                                    ;*R1 CONTAINS TEST DATA
                                    ;*
                                    ;*IF THIS TEST FAILS, ALL FOLLOWING TESTS FOR THIS MODULE ARE ABORTED
                                    ;;*****************************************************************
    004364  000004                  TST4:   SCOPE
    004366  012706  001100                 MOV #STACK,SP           ;RESTORE STACK
    004372  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
    004400  012700  002516                  MOV #BEBD,R0            ;GET BEBD ADDRESS PTER.
    004404  012701  177776          T04L04: MOV #177776,R1          ;SETUP TEST DATA REG
    004410  010130                  T04L03: MOV R1,@(R0)+           ;PUT TEST DATA IN REG
    004412  025001                          CMP@-(R0),R1            ;TEST REG
    004414  001413                          BEQ T04L01              ;BRANCH IF OK
    004416  011067  174572                  MOV (R0),$REG0          ;SAVE FAILING REG ADDRESS
    004422  010167  174572                  MOV R1,$REG2            ;SAVE GOOD DATA
    004426  013067  174564                  MOV @(R0)+,$REG1        ;SAVE BAD DATA
    004432  104005                          ERROR +^D5              ;FATAL ERROR: REG FAILED TO FLOAT A '0'
    004434  004767  011772                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
    004440  000167  007764                  JMP NUBE                ;TEST NEXT UBE
    004444  005701                  T04L01: TST R1                  ;TESTED ALL 16 BITS?
    004446  100002                          BPL T04L02              ;BRANCH IF YES
    004450  006001                          ROR R1                  ;TEST NEXT BIT
    004452  000756                          BR T04L03               ;CONTINUE LOOP
    004454  022067  176042          T04L02: CMP(R0)+,BEBA           ;TESTED LAST REG? ALSO UPDATE ADDR. PTER.
    004460  001351                          BNE T04L04              ;BRANCH IF REG NOT TESTED

                                    ;;*****************************************************************
                                    ;*TEST 5         TEST FOR DUAL ADDRESSING IN REGS
                                    ;*
                                    ;*THIS TEST CLEARS ALL REGS AND THEN WRITES INTO THE
                                    ;*REG BEING TESTED.  ALL OTHER REGS ARE THEN CHECKED IF THEY WERE
                                    ;*SIMULTANEOUSLY WRITTEN.  THIS IS THEN REPEATED FOR ALL REGS.
                                    ;*R0 CONTAINS ADDRESS OF REG BEING WRITTEN
                                    ;*R1 CONTAINS ADDRESS OF REG BEING EXAMINED
                                    ;*R2 CONTAINS MASK OF BITS TO BE LOOKED AT
                                    ;*
                                    ;*IF THIS TEST FAILS, ALL FOLLOWING TESTS FOR THIS MODULE ARE ABORTED
                                    ;;*****************************************************************
    004462  000004                  TST5:   SCOPE
    004464  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
    004470  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
    004476  004767  011470                  JSR PC,CLRREG           ;CLEAR ALL REG
    004502  016700  176010                  MOV BEBD,R0             ;INITIALIZE TEST ADDRESS
    004506  016701  176004          T05L04: MOV BEBD,R1             ;INITIALIZE PTER.
    004512  012710  000002                  MOV #2,(R0)             ;LOAD TEST REG
    004516  012702  177777                  MOV #177777,R2          ;INITIALIZE MASK TO LOOK AT ALL BITS
    004522  030211                  T05L03: BIT R2,(R1)             ;IS DATA  IN REG =0?
    004524  001422                          BEQ T05L01              ;BRANCH IF DATA OK(=0)
    004526  020100                          CMP R1,R0               ;LOOKING AT REG LOADED?
    004530  001420                          BEQ T05L01              ;BRANCH IF YES (DATA OK)
```

```
004532  020167  175766                   CMP R1,BECR1            ;LOOKING AT BECR1?
004536  001411                           BEQ T05L07              ;BRANCH IF YES
004540  010067  174450          T05L08:  MOV R0,$REG0            ;ERROR; SAVE REG ADDRESS LOADED
004544  010167  174446                   MOV R1,$REG1            ;SAVE REG ADDRESS EXAMINED
004550  104007                           ERROR +^D7              ;FATAL ERROR: DUAL ADDRESSING ERROR
004552  004767  011654                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
004556  000167  007646                   JMP NUBE                ;TEST NEXT UBE
004562  022777  000200  175734  T05L07:  CMP #200,@BECR1         ;ALL BITS IN BECR1 0 EXCEPT RDY?
004570  001363                           BNE T05L08              ;BRANCH IF NO
004572  020167  175730          T05L01:  CMP R1,BECR2            ;LOOKED AT BECR2?
004576  001412                           BEQ T05L02              ;BRANCH IF YES
004600  020167  175720                   CMP R1,BECR1            ;PTER UP TO BECR1?
004604  001005                           BNE T05L06              ;NO, LOOK AT NEXT REG
004606  016701  175714                   MOV BECR2,R1            ;NOW LOOK AT BECR2
004612  012702  157777                   MOV #157777,R2          ;LOOK AT ALL BECR2 EXCEPT CCOVF
004616  000741                           BR T05L03               ;CONTINUE LOOKING
004620  005721                  T05L06:  TST (R1)+               ;UPDATE PTER.
004622  000737                           BR T05L03               ;LOOK AT NEXT REG.
004624  004767  011342          T05L02:  JSR PC,CLRREG           ;CLEAR ALL REG
004630  020067  175672                   CMP R0,BECR2            ;LOADED AND TESTED BECR2?
004634  001410                           BEQ     TST6            ;;BRANCH IF YES TO NEXT TEST
004636  020067  175662                   CMP R0,BECR1            ;LOADED BECR1 WITH DATA YET?
004642  001003                           BNE T05L05              ;BRANCH IF NO
004644  016700  175656                   MOV BECR2,R0            ;YES, NOW LOAD BECR2
004650  000716                           BR T05L04               ;CONTINUE LOOKING
004652  005720                  T05L05:  TST(R0)+                ;UPDATE ADDRESS OF REG LOADED
004654  000714                           BR T05L04               ;TEST THIS REG

                                ;;*****************************************************************
                                ;*TEST 6         TEST BUS PARITY BIT PB
                                ;*
                                ;*THIS TEST IS NOT RUN ON THOSE MACHINE
                                ;*WITH NO PARITY TRAP (11/05, 11/20)
                                ;*
                                ;*FOR OTHER MACHINES, THIS TEST SHOULD BE DESELECTED IF THE
                                ;*MEMORY PARITY OPTION IS NOT PRESENT OR NOT ENABLED, ELSE
                                ;*AN ERROR WILL BE REPORTED ALTHOUGH HARDWARE IS FUNCTIONING
                                ;*PROPERLY.
                                ;*SW05=1         INHIBIT TEST 6 AND GO TO NEXT TEST
                                ;;*****************************************************************
004656  000004                  TST6:    SCOPE
004660  012706  001100                   MOV #STACK,SP           ;RESTORE STACK

                                ;//////////////////////////////////////////////////////////////////////////
004664  032777  000040  174300           BIT     #SW05,  @SWR    ;INHIBIT TEST 6?
004672  001057                           BNE     TST7            ;GO TO NEXT TEST
                                ;ROUTINE TO DETERMINE IF RUNNING UNDER 11/05 OR 11/20
                                ;        IF 11/05 OR 11/20 BUSS PARITY TEST IS SKIPPED
                                ;//////////////////////////////////////////////////////////////////////////
004674  012737  004770  000010           MOV #ITRAP,@#10         ;SET UP TO GO TO NEXT TEST IF ILLEGAL INST TRAP
004702  012737  000340  000012           MOV #340,@#12
004710  006700                           SXT R0                  ;IF INST TRAPS HAVE 11/05 OR 11/20

004712  012737  000340  177776           MOV #340,@#PSW          ;SET PSW PRIORITY=7
004720  012737  004754  000114           MOV #PTRAP,@#114        ;SET UP PARITY TRAP
004726  012737  000340  000116           MOV #340,@#116
004734  012777  010000  175564           MOV #10000,@BECR2       ;ENABLE PB PARITY
```

```
 004742  005777  175560                   TST @BECR2                  ;START PARITY TRAP
 004746  104010                           ERROR +^D8                  ;SETTING PB PARITY FAILED TO CAUSE CPU TO TRAP
 004750  004767  011456                   JSR PC,TERRPC               ;TYPE PC OF ERROR MSG
 004754  012737  000116  000114  PTRAP:   MOV #116,@#114              ;RESTORE TRAP CATCHER
 004762  005037  000116                   CLR @#116                   ;RESTORE TRAP CATCHER
 004766  000411                           BR T06L01                   ;SKIP MSG
 004770  032777  010000  174174  ITRAP:   BIT #SW12,@SWR              ;INHIBIT TYPEOUTS?
 004776  001005                           BNE T06L01                  ;BRANCH IF YES
 005000  012767  000001  174226           MOV #1,$TIMES               ;DO 1 ITERATION WHEN TEST NOT NOT RUN
 005006  104401  020663                   TYPE ,MSG5                  ;BUS PARITY NOT TESTED ON 11/05 OR 11/20 MACHINES
 005012  012737  000012  000010  T06L01:  MOV #12,@#10                ;RESTORE TRAP CATCHER
 005020  005037  000012                   CLR @#12                    ;RESTORE TRAP CATCHER
 005024  012777  000000  175474           MOV #0,@BECR2               ;DO DATO TO CLEAR PB BIT

                                 ;;*****************************************************************
                                 ;*TEST 7         TST GO ,RDY SETS & CLRS,RELEASE BUS IMMED
                                 ;*
                                 ;*THE READY AND GO BIT ARE CHECKED USING A RELEASE
                                 ;*BUSS IMMEDIATE FUNCTION.  FALSE INTERRUPT ARE CHECKED FOR
                                 ;*
                                 ;*IF THE GO OR READY BITS FAIL, ALL FOLLOWING TESTS FOR THIS MODULE ARE ABORTED.
                                 ;;*****************************************************************
 005032  000004                  TST7:    SCOPE
 005034  012706  001100                   MOV #STACK,SP               ;RESTORE STACK
 005040  012737  000340  177776           MOV #340,@#PSW              ;LOCK OUT INTERRUPTS
 005046  004767  011120                   JSR PC,CLRREG               ;CLR ALL REG
 005052  012777  005172  175452           MOV #FINT1,@INTVEC          ;SET UP FOR FALSE INTERRUPT
 005060  016700  175446                   MOV INTVEC,R0               ;GET INTERRUPT VECTOR
 005064  012760  000340  000002           MOV #340,2(R0)              ;SET PSW PRIORITY=7
 005072  012777  006003  175424           MOV #6003,@BECR1            ;SET GO BIT AND DO RELEASE BUSS IMMEDIATE WITH BR4 1
 005100  032777  000200  175416           BIT #200,@BECR1             ;LOOK AT RDY BIT
 005106  001035                           BNE T07L08                  ;BRANCH IF NOT CLEARED
 005110  005037  177776                   CLR @#PSW                   ;ALLOW INTERRUPTS
 005114  005000                  T07L07:  CLR R0                      ;INITIALIZE A COUNT TO WAIT FOR RDY 1
 005116  005200                  T07L03:  INC R0                      ;UPDATE COUNT AND LOOP
 005120  022700  000011                   CMP #11,R0                  ;TILL COUNT=10 OR RDY=1
 005124  001416                           BEQ T07L04                  ;BRANCH IF RDY WAS NOT SET
 005126  105777  175372                   TSTB @BECR1                 ;READY SET?
 005132  100371                           BPL T07L03                  ;CONTINUE TO LOOK FOR RDY
 005134  032777  000001  175362           BIT #1,@BECR1               ;SEE IF GO BIT CLEARED
 005142  001426                           BEQ T07L05                  ;PROCEED TO NEXT TEST IF YES
 005144  004767  011054                   JSR PC,RCATCH               ;RESTORE TRAP CATCHER
 005150  104013                           ERROR +^D11                 ;FATAL ERROR: GO BIT FAILED TO CLEAR
 005152  004767  011254                   JSR PC,TERRPC               ;TYPE PC OF ERROR MSG
 005156  000167  007246                   JMP NUBE                    ;TEST NEXT UBE
 005162  104014                  T07L04:  ERROR +^D12                 ;FATAL ERROR: RDY BIT FAILED TO SET
 005164  004767  011242                   JSR PC,TERRPC               ;TYPE PC OF ERROR MSG
 005170  000407                           BR T07L06                   ;ABORT UBE TEST

 005172  104123                  FINT1:   ERROR +^D83                 ;ERROR: FALSE INTERRUPT WHEN DO RELEASE BUSS IMMED.
 005174  004767  011232                   JSR PC,TERRPC               ;TYPE PC OF ERROR MSG
 005200  000745                           BR T07L07                   ;NOW CHECK IF RDY=1 AND GO BIT=0

 005202  104020                  T07L08:  ERROR +^D16                 ;FATAL ERROR: RDY BIT FAILED TO CLEAR OR GO DID NOT SET
 005204  004767  011222                   JSR PC,TERRPC               ;TYPE PC OF ERROR MSG
 005210  004767  011010          T07L06:  JSR PC,RCATCH               ;RESTORE TRAP CATCHER
 005214  000167  007210                   JMP NUBE                    ;TEST NEXT UBE
```

```
    005220  004767  011000          T07L05: JSR PC,RCATCH           ;RESTORE TRAP CATCHER


                                    ;;*************************************************************
                                    ;*TEST 10        TEST UBE CAN INTERRUPT 4,7 NO SSYN BIT SET
                                    ;*
                                    ;*THE PSW PRIORITY IS FIRST SET EQUAL TO THE BR
                                    ;*LEVEL OF THE UBE.  ALL LEVELS ARE FIRST CHECKED
                                    ;*THIS WAY.  IF THE UBE FALSELY INTERRUPTS, A
                                    ;*SUBROUTINE, FINT3, WILL DETERMINE THE LEVEL IT
                                    ;INTERRUPTED.
                                    ;*AFTER THIS, THE UBE IS ALLOWED TO INTERRUPT BY
                                    ;*SETTING THE PSW PRIORITY ONE LEVEL BELOW THE BR.
                                    ;*ALL LEVELS ARE THEN CHECKED THIS WAY.  THE
                                    ;*PROPER INTERRUPT VECTOR IS TESTED FOR BY SETTING UP
                                    ;*THE ENTIRE VECTOR AREA 0-776 TO DETECT FOR WRONG
                                    ;*INTERRUPTS.
                                    ;*
                                    ;*NOTE:  IF THIS TEST IS HALTED IN THE MIDDLE
                                    ;*       AND IT IS DESIRED TO RESTART THE PROGRAM,
                                    ;*       THE PROGRAM SHOULD BE RESTARTED AT 1100 AND
                                    ;*       NOT AT 200.
                                    ;* TEST UBE CAN INTERRUPT 4,7,& NO INTERRUPT SSYN BIT DOESN T SET
                                    ;;*************************************************************
    005224  000004                  TST10:  SCOPE
    005226  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
    005232  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
    005240  004767  010726                  JSR PC,CLRREG           ;CLEAR ALL UBE REG
    005244  010667  173754                  MOV SP,$TMP0            ;SAVE STACK ADDRESS
    005250  005000                          CLR R0                  ;INIT. R0
    005252  012046                  T08L08: MOV (R0)+,-(SP)         ;SAVE VECTOR AREA 0-56
    005254  022700  000060                  CMP #60,R0              ;ALL SAVED?
    005260  001374                          BNE T08L08              ;BRANCH  IF NO
    005262  013746  000174                  MOV     @#174,  -(SP)   ;SAVE SOFTWARE SWR
    005266  013746  000176                  MOV     @#176,  -(SP)   ;
    005272  012737  000341  000002          MOV #341,@#2            ;SET UP VECTOR AREA TO DETECT WRONG INT. VECTORS
    005300  012700  000004                  MOV #4,R0               ;INITIALIZE ADDRESS REG
    005304  012720  005716          T08L01: MOV #WINT,(R0)+         ;PUT WRONG INTERRUPT PTER IN ALL VECTOR LOCATIONS
    005310  012720  000341                  MOV #341,(R0)+          ;PUT AN ODD PSW IN ALL PSW LOCATIONS
    005314  022700  001000                  CMP #1000,R0            ;AT END OF VECTOR AREA?
    005320  001371                          BNE T08L01              ;BRANCH IF NO
    005322  012777  005600  175202          MOV #FINT3,@INTVEC      ;SET UP UBE VECTOR AREA FOR FALSE INT.
    005330  012767  000004  173656          MOV #4,$REG0            ;INDICATE DOING BR 4
    005336  012767  000200  173652          MOV #200,$REG1          ;INDICATE PSW PRIORITY 4
    005344  012777  000003  175152          MOV #3,@BECR1           ;HAVE UBE DO BR=4
    005352  012737  000200  177776          MOV #200,@#PSW          ;SET PRIORITY=4
    005360  000240                          NOP                     ;UBE SHOULD NOT INTERRUPT HERE
    005362  012767  000005  173624          MOV #5,$REG0            ;INDICATE DOING BR-5
    005370  012767  000240  173620          MOV #240,$REG1          ;INDICATE PSW PRIORITY 5
    005376  012737  000240  177776          MOV #240,@#PSW          ;SET PRIORITY=5
    005404  012777  000005  175112          MOV #5,@BECR1           ;HAVE UBE DO BR=5
    005412  000240                          NOP                     ;UBE SHOULD NOT INTERRUPT HERE
    005414  012767  000006  173572          MOV #6,$REG0            ;INDICATE DOING BR=6
    005422  012767  000300  173566          MOV #300,$REG1          ;INDICATE PRIORITY-6
    005430  012737  000300  177776          MOV #300,@#PSW          ;SET PRIORITY=6
    005436  012777  000011  175060          MOV #11,@BECR1          ;HAVE UBE DO BR-6
    005444  000240                          NOP                     ;UBE SHOULD NOT INTERRUPT HERE
```

```
                                          ;NOW TEST UBE WILL INTERRUPT WITH PRIORITY ONE LEVEL BELOW BR

005446  012777  000002  175050                    MOV #2,@BECR1            ;INITIALIZE UBE TO DO BR-4
005454  012767  000004  173532                    MOV #4,$REG0             ;INITIALIZE INDICATOR FOR BR-4
005462  012767  000003  173526                    MOV #3,$REG1             ;INITIALIZE INDICATOR FOR PRIORITY 3
005470  012777  005552  175034                    MOV #T08L02,@INTVEC      ;SET RETURN ADDRESS WHEN GET PROPER INTERRUPT
005476  012737  000140  177776                    MOV #140,@#PSW           ;INITIALIZE PSW PRIORITY-3
005504  000240                                    NOP                      ;UBE SHOULD INTERRUPT HERE
005506  000413                                    BR T08L09                ;BRANCH TO ERROR IF NO INT.
005510  005267  173500                  T08L03:   INC $REG0                ;INDICATE BR LEVEL DOING
005514  005267  173476                            INC $REG1                ;INDICATE PSW PRIORITY LEVEL DOING
005520  000257                                    CCC                      ;CLEAR N,Z,V,C
005522  062737  000040  177776                    ADD #40,@#PSW            ;SET PRIORITY LEVEL BELOW BR LEVEL
005530  005277  174770                            INC @BECR1               ;HAVE UBE DO BR 1 LEVEL ABOVE PRIORITY
005534  000240                                    NOP                      ;UBE SHOULD INTERRUPT HERE
005536  004767  010554                  T08L09:   JSR PC,RVEC              ;RESTORE TRAP CATCHER AND HANDLER
005542  104021                                    ERROR +^D17              ;ERROR: UBE FAILED TO INTERRUPT
005544  004767  010662                            JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
005550  000472                                    BR      T08L06           ;;BRANCH TO TEST NO INT. SSYN ERROR BIT
005552  022626                          T08L02:   CMP (SP)+,(SP)+          ;RESTORE STACK AFTER INTERRUPT
005554  032777  000020  174742                    BIT #20,@BECR1           ;TESTED LAST BR?
005562  001063                                    BNE     T08L07           ;;BRANCH IF YES TO TEST NO INT. SSYN ERROR BIT
005564  006377  174734                            ASL @BECR1               ;SHIFT BECR1 FOR NEXT BR LEVEL
005570  042777  000400  174726                    BIC #400,@BECR1          ;CLEAR SHIFTED RDY BIT
005576  000744                                    BR T08L03                ;GO TEST NEXT BR

005600  022626                          FINT3:    CMP (SP)+,(SP)+          ;RESTORE STACK AFTER INTERRUPT
005602  004767  010510                            JSR PC,RVEC              ;RESTORE VECTOR AREA
005606  104022                                    ERROR +^D18              ;ERROR: UBE INT. WHEN PSW AT SAME PRIORITY LEVEL
005610  004767  010616                            JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
005614  032777  007740  174704                    BIT #7740,@BECR2         ;SEE IF ERROR CONDITION OCCURRED IN BECR2
005622  001407                                    BEQ T08L04               ;BRANCH IF NO
005624  017767  174676  173362                    MOV @BECR2,$REG0         ;SAVE ERROR CONDITIONS
005632  104017                                    ERROR +^D15              ;ERROR: ERROR BITS IN BECR2 SET WHEN SHOULD=0
005634  004767  010572                            JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
005640  000445                                    BR      TST11            ;;BRANCH TO NEXT TEST

005642  012777  005650  174662          T08L04:   MOV #T08L05,@INTVEC      ;SET UP INTVEC TO FIND BR LEVEL UBE MADE
005650  012706  001100                  T08L05:   MOV #STACK,SP            ;RESTORE STACK
005654  062767  000040  173334                    ADD #40,$REG1            ;RAISE PRIORITY LEVEL BY 1
005662  005267  173326                            INC $REG0                ;INDICATE NEW LEVEL OF PRIORITY
005666  016737  173324  177776                    MOV $REG1,@#PSW          ;SET PSW PRIORITY
005674  005277  174624                            INC @BECR1               ;HAVE UBE INTERRUPT AGAIN
005700  000240                                    NOP                      ;IF UBE INT. HERE, INCREMENT PRIORITY
005702  004767  010316                            JSR PC,RCATCH            ;RESTORE TRAP CATCHER
005706  104023                                    ERROR +^D19              ;ERROR: UBE FALSELY INTERRUPTED AT HIGHER LEVEL
005710  004767  010516                            JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
005714  000417                                    BR      TST11            ;;BRANCH TO NEXT TEST

005716  022626                          WINT:     CMP (SP)+,(SP)+          ;RESTORE STACK AFTER INTERRUPT
005720  004767  010372                            JSR PC,RVEC              ;RESTORE VECTOR AREA
005724  104024                                    ERROR +^D20              ;ERROR: UBE INTERRUPTED TO WRONG VECTOR
005726  004767  010500                            JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
005732  004767  010360                  T08L07:   JSR PC,RVEC              ;RETURN VECTOR AREA WHEN FINISH BR TEST
005736  032777  004000  174562          T08L06:   BIT #4000,@BECR2         ;WAS NO INT. SSYN ERROR BIT SET?
005744  001403                                    BEQ     TST11            ;;BRANCH TO NEXT TEST IF NO
005746  104027                                    ERROR +^D23              ;ERROR: NO INT. SSYN BIT FALSELY SET
```

```
 005750  004767  010456                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG

                                 ;;***********************************************************************
                                 ;*TEST 11       TEST THE NO,NO SACK ERROR BIT DOESN'T SET
                                 ;*
                                 ;*THE INHIBIT SACK BIT IS SET AND THE UBE IS TOLD TO
                                 ;*DO A FUN. 3.THE NO,NO SACK ERROR BIT IS THEN
                                 ;*CHECKED TO NOT HAVE SET.
                                 ;;***********************************************************************
 005754  000004                  TST11:  SCOPE
 005756  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
 005762  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
 005770  004767  010176                  JSR PC,CLRREG           ;CLEAR ALL UBE REGS.
 005774  012777  000010  174524          MOV #10,@BECR2          ;ENABLE INH SACK IN BECR2
 006002  012777  006003  174514          MOV #6003,@BECR1        ;DO  FUN 3 VIA  BR4
```

```
   1008 006010  005037  177776              CLR @#PSW               ;ALLOW INTERRUPTS
   1009 006014  000240                      NOP                     ;ALLOW UBE TO GET BUSS. CPU SHOULD TIME OUT
```

```

006016  005000                              CLR R0                 ;INIT COUNTER
006020  005200                      1$:     INC R0                 ;INC COUNTER
006022  105700                              TSTB R0                ;DELAY AT LEAST 41 USEC
006024  100375                              BPL 1$                 ;BRANCH IF NO
006026  032777  000200  174472              BIT #200,@BECR2        ;WAS NO, NO SACK BIT SET?
006034  001403                              BEQ  RTR               ;BRANCH IF NO
006036  104026                              ERROR +^D22            ;ERROR: NO, NO SACK BIT FALSELY SET
```

```
006040  004767  010366                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006044  004767  010122          RTR:    JSR PC,CLRREG           ;CLEAR ALL UBE REG

                                ;;*************************************************************
                                ;*TEST 12       TEST DATI,DATIP,DATO,DATOB AND FUNCTION 1 WORKS
                                ;*
                                ;*ALL DATA TRANSFERS ARE DONE VIA BR TRANSFERS.
                                ;*EACH OPERATION (DATI, DATO, DATIP, DATOB) DOES ONE
                                ;*TRANSFER AND THE DATA IS THEN CHECKED.
                                ;*EACH TIME AN OFERATION IS STARTED THE READY
                                ;*BIT IS TESTED BY THE SUBROUTINE 'RDYS' TO SEE IF IT SETS.
                                ;;*************************************************************
006050  000004                  TST12:  SCOPE
006052  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
006056  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
006064  012767  052525  021770          MOV #052525,BUFF1       ;PUT TEST DATA IN BUFFER
006072  004767  010074                  JSR PC,CLRREG           ;CLEAR ALL UBE REG
006076  012777  177777  174414          MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
006104  012777  030062  174410          MOV #BUFF1,@BEBA        ;LOAD UBE WITH BUFFER ADDRESS
006112  012705  006620                  MOV #ERR1,R5            ;INITIALIZE R5 FOR ERROR ADDRESS
006116  012777  002003  174400          MOV #2003,@BECR1        ;HAVE UBE DO DATI VIA BR=4 AND FUNCTION 1
006124  005037  177776                  CLR @#PSW               ;ALLOW DATA XFER
006130  004767  000434                  JSR PC,RDYS             ;GO CHECK FOR RDY TO SET
006134  022777  052525  174354          CMP #052525,@BEBD       ;IS DATA OK?
006142  001421                          BEQ T10L01              ;GO TEST DATO IF YES
006144  017767  174346  173042          MOV @BEBD,$REG0         ;SAVE (BEBD)
006152  016767  021704  173036          MOV BUFF1,$REG1         ;SAVE MEM DATA
006160  012767  030062  173032          MOV #BUFF1,$REG2        ;SAVE MEM ADDRESS
006166  012767  052525  173026          MOV #52525,$REG3        ;SAVE CORRECT DATA
006174  104030                          ERROR +^D24             ;ERROR: DATI FAILED TO LOAD PROPER DATA
006176  004767  010230                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006202  000167  000450                  JMP TSTA                ;GO TO NEXT TEST
006206  004767  007760          T10L01: JSR PC,CLRREG           ;CLEAR UBE REG
006212  005067  021644                  CLR BUFF1               ;CLEAR TEST AREA
006216  012777  177777  174274          MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
006224  012777  030062  174270          MOV #BUFF1,@BEBA        ;LOAD UBE WITH BUFFER ADDRESS
006232  012777  052525  174256          MOV #052525,@BEBD       ;LOAD UBE WITH DATA
006240  012705  006630                  MOV #ERR2,R5            ;INITIALIZE R5 FOR ERROR ADDRESS
006244  012777  003003  174252          MOV #3003,@BECR1        ;HAVE UBE DO DATO VIA BR=4 AND FUNCTION 1
006252  004767  000312                  JSR PC,RDYS             ;GO CHECK FOR RDY TO SET
006256  022767  052525  021576          CMP #052525,BUFF1       ;WAS BUFFER LOADED PROPERLY?
006264  001420                          BEQ     T10L02          ;GO TEST DATIP IF YES
006266  017767  174224  172720          MOV @BEBD,$REGC         ;SAVE (BEBD)
006274  016767  021562  172714          MOV BUFF1,$REG1         ;SAVE MEM DATA
006302  012767  030062  172710          MOV #BUFF1,$REG2        ;SAVE MEM ADDRESS
006310  012767  052525  172704          MOV #052525,$REG3       ;SAVE CORRECT DATA
006316  104031                          ERROR +^D25             ;ERROR: DATO FAILED TO LOAD PROPER DATA
006320  004767  010106                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006324  000554                          BR      TST13           ;;BRANCH TO NEXT TEST

006326  004767  007640          T10L02: JSR PC,CLRREG           ;CLEAR UBE REG
006332  012767  052525  021522          MOV #052525,BUFF1       ;PUT TEST DATA IN BUFFER
006340  012777  177777  174152          MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
006346  012777  030062  174146          MOV #BUFF1,@BEBA        ;LOAD UBE WITH BUFFER ADDRESS
006354  012705  006640                  MOV #ERR3,R5            ;INITIALIZE R5 FOR ERROR ADDRESS
006360  012777  002403  174136          MOV #2403,@BECR1        ;HAVE UBE DO DATIP VIA BR=4 AND FUNCTION 1
006366  004767  000176                  JSR PC,RDYS             ;GO CHECK FOR RDY SET
```

```
006372  022777  125252  174116              CMP #125252,@BEBD       ;HAS UBE SHIFTED DATA?
006400  001004                              BNE T10L06              ;BRANCH IF NO
006402  022767  125252  021452              CMP #125252,BUFF1       ;HAS MEM LOC BEEN SHIFTED?
006410  001420                              BEQ T10L03              ;GO TEST DATOB IF YES
006412  017767  174100  172574    T10L06:   MOV @BEBD,$REG0         ;SAVE (BEBD)
006420  016767  021436  172570              MOV BUFF1,$REG1         ;SAVE MEM DATA
006426  012767  030062  172564              MOV #BUFF1,$REG2        ;SAVE MEM ADDRESS
006434  012767  125252  172560              MOV #125252,$REG3       ;SAVE CORRECT DATA
006442  104032                              ERROR +^D26             ;ERROR: DATIP FAILED TO LOAD PROPER DATA
006444  004767  007762                      JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006450  000502                              BR      TST13           ;;BRANCH TO NEXT TEST

006452  012767  000377  021402    T10L03:   MOV #377,BUFF1          ;INITIALIZE BUFFER
006460  012705  006650                      MOV #ERR4,R5            ;INITIALIZE R5 FOR ERROR ADDRESS
006464  012777  177400  174024              MOV #177400,@BEBD       ;LOAD HIGH BYTE OF UBE WITH 1'S
006472  012777  030063  174022              MOV #BUFF1+1,@BEBA      ;LOAD HIGH BYTE BUFF ADDR. INTO UBE
006500  012777  177777  174012              MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
006506  012777  003403  174010              MOV #3403,@BECR1        ;HAVE UBE DO DATOB VIA BR=4 AND FUNCTION 1
006514  004767  000050                      JSR PC,RDYS             ;GO CHECK FOR RDY SET
006520  022767  177777  021334              CMP #177777,BUFF1       ;TEST IF DATOB DONE CORRECTLY
006526  001453                              BEQ     TST13           ;;BRANCH IF YES TO NEXT TEST

006530  017767  173762  172456              MOV @BEBD,$REG0         ;SAVE (BEBD)
006536  016767  021320  172452              MOV BUFF1,$REG1         ;SAVE NEW DATA
006544  012767  030062  172446              MOV #BUFF1,$REG2        ;SAVE MEM ADDRESS
006552  012767  177777  172442              MOV #177777,$REG3       ;SAVE CORRECT DATA
006560  104033                              ERROR +^D27             ;ERROR: DATOB FAILED TO LOAD DATA PROPERLY
006562  004767  007644                      JSR PC,TERRPC     -     ;TYPE PC OF ERROR MSG
006566  000433                              BR      TST13           ;;BRANCH TO NEXT TEST

                                  ;SUBROUTINE TO TEST IF RDY BIT SET

006570  005004                    RDYS:     CLR R4                  ;INITIALIZE R4
006572  032777  000200  173724    T10L05:   BIT #200,@BECR1         ;IS RDY SET?
006600  001006                              BNE T10L04              ;BRANCH IF YES
006602  005204                              INC R4                  ;UPDATE COUNT
006604  032704  000020                      BIT #20,R4              ;COUNT=16?
006610  001770                              BEQ T10L05              ;IF NO, GO TEST RDY AGAIN
006612  005726                              TST (SP)+               ;RETURN STACK PTER
006614  000115                              JMP (R5)                ;GO INDICATE ERROR
006616  000207                    T10L04:   RTS PC                          ;RETURN AND CHECK DATA
006620  104034                    ERR1:     ERROR +^D28             ;ERROR: DATI FAILED TO SET RDY
006622  004767  007604                      JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006626  000413                              BR      TST13           ;;GO TO NEXT TEST
006630  104035                    ERR2:     ERROR +^D29             ;ERROR: DATO FAILED TO SET RDY
006632  004767  007574                      JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006636  000407                              BR      TST13           ;;GO TO NEXT TEST
006640  104036                    ERR3:     ERROR +^D30             ;ERROR: DATIP FAILED TO SET RDY
006642  004767  007564                      JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
006646  000403                              BR      TST13           ;;GO TO NEXT TEST
006650  104037                    ERR4:     ERROR +^D31             ;ERROR: DATOB FAILED TO SET RDY
006652  004767  007554                      JSR PC,TERRPC           ;TYPE PC OF ERROR MSG

006656                            TSTA:


                                  ;;*****************************************************************
                                  ;*TEST 13      TEST INHIBIT DATA SHIFT ON DATIP
```

```
                                          ;;*************************************************************
     006656  000004                       TST13:  SCOPE
     006660  012706  001100                       MOV #STACK,SP           ;RESTORE STACK
     006664  004767  007302                       JSR PC,CLRREG           ;CLEAR UBE REG
     006670  005037  177776                       CLR @#PSW               ;ALLOW INTERRUPTS
     006674  012767  052525  021160               MOV #052525,BUFF1       ;PUT TEST DATA IN BUFFER
     006702  012777  177777  173610               MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
     006710  012777  030062  173604               MOV #BUFF1,@BEBA        ;LOAD UBE WITH BUFFER ADDRESS
     006716  012777  022403  173600               MOV #22403,@BECR1       ;HAVE UBE DO DATIP WITH INH DATA SHIFT
     006724  004767  007316                       JSR PC,CRDY             ;CHECK FOR RDY BIT
     006730  005704                               TST R4                  ;DID RDY SET?
     006732  001404                               BEQ     T11L01          ;BRANCH IF YES
     006734  104036                               ERROR +^D30             ;ERROR: DATIP FAILED TO SET RDY
     006736  004767  007470                       JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
     006742  000427                               BR      TST14           ;;BRANCH TO NEXT TEST
     006744  022777  052525  173544       T11L01: CMP #052525,@BEBD       ;IS (BEBD) OK?
     006752  001004                               BNE T11L02              ;BRANCH IF NO
     006754  022767  052525  021100               CMP #052525,BUFF1       ;IS MEM OK?
     006762  001417                               BEQ     TST14           ;;BRANCH IF YES TO NEXT TEST
     006764  017767  173526  172222       T11L02: MOV @BEBD,$REG0         ;SAVE (BEBD)
     006772  016767  021064  172216               MOV BUFF1,$REG1         ;SAVE MEM DATA
     007000  012767  030062  172212               MOV #BUFF1,$REG2        ;SAVE MEM ADDRESS
     007006  012767  052525  172206               MOV #052525,$REG3       ;SAVE CORRECT DATA
     007014  104040                               ERROR +^D32             ;ERROR: INH. DATA SHIFT ON DATIP FAILED
     007016  004767  007410                       JSR PC,TERRPC           ;TYPE PC OF ERROR MSG


                                          ;;*************************************************************
                                          ;*TEST 14       TEST DATOB ON DATIP
                                          ;;*************************************************************
     007022  000004                       TST14:  SCOPE
     007024  012706  001100                       MOV #STACK,SP           ;RESTORE STACK
     007030  004767  007136                       JSR PC,CLRREG           ;CLEAR UBE REG
     007034  005037  177776                       CLR @#PSW               ;ALLOW INTERRUPTS
     007040  012767  177525  021014               MOV #177525,BUFF1       ;LOAD TEST DATA IN BUFFER
     007046  012777  030062  173446               MOV #BUFF1,@BEBA        ;LOAD UBE WITH LOW BYTE ADDRESS
     007054  012777  177777  173436               MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
     007062  012777  042403  173434               MOV #42403,@BECR1       ;HAVE UBE DO DATOB ON DATIP
     007070  004767  007152                       JSR PC,CRDY             ;CHECK FOR RDY SET
     007074  022777  177253  173414               CMP #177253,@BEBD       ;CHECK (BEBD) OK
     007102  001004                               BNE T12L01              ;BRANCH IF NO
     007104  022767  177653  020750               CMP #177653,BUFF1       ;CHECK BUFFER OK
     007112  001417                               BEQ     TST15           ;;BRANCH IF YES TO NEXT TEST
     007114  017767  173376  172072       T12L01: MOV @BEBD,$REG0         ;SAVE (BEBD)
     007122  016767  020734  172066               MOV BUFF1,$REG1         ;SAVE MEM DATA
     007130  012767  030062  172062               MOV #BUFF1,$REG2        ;SAVE MEM ADDRESS
     007136  012767  177653  172056               MOV #177653,$REG3       ;SAVE CORRECT DATA
     007144  104041                               ERROR +^D33             ;ERROR: DATOB ON DATIP FAILED
     007146  004767  007260                       JSR PC,TERRPC           ;TYPE PC OF ERROR MSG



                                          ;;*************************************************************
                                          ;*TEST 15       TEST NO SSYN ERROR BIT WORK
                                          ;*
                                          ;*A DATI NPR IS DONE TO A MEM LOC (760000) THAT RETURNS
                                          ;*NO SSYN.  THE NO SSYN ERROR BIT AND BIT 15 OF BECR1
                                          ;*ARE CHECKED TO SET.  THE ERROR INTERRUPT IS THEN TESTED.
                                          ;*AFTER THIS THE ERROR IS CLEARED BY THE CLEAR ERROR
```

```
                                            ;*ADDRESS.  FINALLY THE FUN A,B BITS (BITS 10,11 OF BECR1)
                                            ;*ARE EXAMINED TO SEE IF THEY RESET WHEN AN ERROR
                                            ;*INTERRUPT OCCURS.
                                            ;* TEST NO SSYN ERROR BIT WORKS & FUN A,B BITS RESET ERROR INTRRUPT
                                            ;;*********************************************************************
 007152  000004                             TST15:  SCOPE
 007154  012706  001100                             MOV #STACK,SP           ;RESTORE STACK
 007160  012737  000340  177776                     MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
 007166  004767  007000                             JSR PC,CLRREG           ;CLEAR UBE REG
 007172  012777  007320  173332                     MOV #T23L01,@INTVEC     ;SET UP FOR INTERRUPTS
 007200  012777  160000  173314                     MOV #160000,@BEBA       ;LOAD UBE WITH TEST ADDRESS WHICH RETURNS NO SSYN
 007206  012777  000003  173312                     MOV #3,@BECR2           ;LOAD UBE WITH TEST ADDRESS WHICH RETURNS NO SSYN
 007214  012777  177777  173276                     MOV #177777,@BECC       ;HAVE UBE DO 1 CYCLE
 007222  012777  002041  173274                     MOV #2041,@BECR1        ;HAVE DATI NPR DONE
 007230  004767  007012                             JSR PC,CRDY             ;WAIT TILL RDY SET
 007234  032777  000400  173264                     BIT #400,@BECR2         ;WAS NSSYN ERROR BIT SET?
 007242  001004                                     BNE T23L02              ;BRANCH IF YES
 007244  104073                                     ERROR +^D59             ;ERROR: TEST OF NSSYN ERROR BIT FAILED
 007246  104074                                     ERROR +^D60             ;TO SET BIT 8 OF BECR2
 007250  004767  007156                             JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
 007254  032777  100000  173242     T23L02: BIT #100000,@BECR1      ;WAS ERROR BIT SET?
 007262  001004                                     BNE T23L03              ;BRANCH IF YES
 007264  104073                                     ERROR +^D59             ;ERROR: TEST OF NSSYN ERROR BIT FAILED
 007266  104075                                     ERROR +^D61             ;TO SET BIT 15 OF BECR1
 007270  004767  007136                             JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
 007274  005037  177776             T23L03: CLR @#PSW               ;ALLOW UBE TO INTERRUPT
 007300  000240                                     NOP                     ;UBE SHOULD INTERRUPT HERE
 007302  017767  173220  171704                     MOV @BECR2,$REG0        ;SAVE BECR2
 007310  104073                                     ERROR +^D59             ;ERROR: TEST OF NSSYN ERROR BIT FAILED
 007312  104072                                     ERROR +^D58             ;TO INTERRUPT CPU
 007314  004767  007112                             JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
 007320  005077  173204             T23L01: CLR @BERE               ;CLEAR ERROR BITS
 007324  032777  000400  173174                     BIT #400,@BECR2         ;WAS NSSYN ERROR BIT CLEARED?
 007332  001404                                     BEQ T23L05              ;BRANCH IF YES TO TEST FUN A, B BITS
 007334  104073                                     ERROR +^D59             ;ERROR: TEST OF NSSYN ERROR BIT FAILED
 007336  104076                                     ERROR +^D62             ;TO CLEAR BIT 8 OF BECR2
 007340  004767  007066                             JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
 007344  032777  002000  173152     T23L05: BIT #2000,@BECR1        ;WAS FUN A BIT RESET?
 007352  001404                                     BEQ T23L06              ;BRANCH IF YES
 007354  104073                                     ERROR +^D59             ;ERROR: TEST OF NSSYN ERROR BIT FAILED
 007356  104016                                     ERROR +^D14             ;TO CLEAR BIT 10 OF BECR1
 007360  004767  007046                             JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
 007364  012777  160000  173130     T23L06: MOV #160000,@BEBA       ;LOAD UBE WITH TEST ADDRESS WHICH RETURNS NO SSYN
 007372  012777  000003  173126                     MOV #3,@BECR2           ;LOAD UBE WITH TEST ADDRESS WHICH RETURNS NO SSYN
 007400  012777  177772  173112                     MOV #177772,@BECC       ;DO 2 CYCLES
 007406  012777  007426  173116                     MOV #T23L07,@INTVEC     ;SET UP FOR INT
 007414  012777  004041  173102                     MOV #4041,@BECR1        ;HAVE UBE DO FUN2 DATI VIA NPR
 007422  004767  006620                             JSR PC,CRDY             ;WAIT TILL RDY SETS
 007426  032777  004000  173070     T23L07: BIT #4000,@BECR1        ;WAS FUN B BIT RESET
 007434  001404                                     BEQ T23L04              ;RESTORE TRAP
 007436  104073                                     ERROR +^D59             ;ERROR: TEST OF NSSYN ERROR BIT FAILED
 007440  104105                                     ERROR +^D69             ;TO CLEAR BIT 11 OF BECR1
 007442  004767  006764                             JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
 007446  004767  006552             T23L04: JSR PC,RCATCH           ;RESTORE TRAP
 007452  005077  173052                     CLR @BERE               ;CLEAR ALL ERROR CONDITIONS
```

```
                                        ;;*****************************************************************
                                        ;*TEST 16        TEST ADDRESS REG COUNTS BY 2 AND 1
                                        ;*
                                        ;*RO CONTAINS THE TEST DATA
                                        ;;*****************************************************************
      007456  000004                    TST16:  SCOPE
      007460  012706  001100                    MOV #STACK,SP           ;RESTORE STACK
      007464  004767  006502                    JSR PC,CLRREG           ;CLEAR UBE REGS
      007470  004767  006602                    JSR PC,DINT             ;DISREGARD UBE INTERRUPTS
      007474  005037  177776                    CLR @#PSW               ;ALLOW INTERRUPTS
      007500  012700  000002                    MOV #2,R0               ;INITIALIZE TEST COUNTER
      007504  012777  177777  173006    T14L02: MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
      007512  012777  002003  173004            MOV #2003,@BECR1        ;HAVE UBE DO DATI
      007520  004767  006522                    JSR PC,CRDY             ;CHECK RDY SET
      007524  020077  172772                    CMP R0,@BEBA            ;IS ADDRESS CORRECT?
      007530  001057                            BNE T14L01              ;BRANCH TO ERROR IF NO
      007532  005200                            INC R0                  ;UPDATE R0
      007534  005200                            INC R0                  ;UPDATE R0
      007536  022700  000002                    CMP #2,R0               ;HAVE ALL ADRESSES BEEN TESTED?
      007542  001360                            BNE T14L02              ;LOOK AT NEXT ADDRESS IF NO
      007544  012777  177776  172750            MOV #177776,@BEBA       ;LOAD MAX ADDRESS IN LOWER 16 BITS UBE
      007552  012777  000003  172746            MOV #3,@BECR2           ;LOAD A16,A17 OF UBE WITH 1
      007560  012777  177777  172732            MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
      007566  005277  172732                    INC @BECR1              ;HAVE UBE DO DATI
      007572  004767  006450                    JSR PC,CRDY             ;CHECK RDY SET
      007576  032777  000003  172722            BIT #3,@BECR2           ;TEST A16,A17=0
      007604  001042                            BNE T14L03              ;BRANCH TO ERROR IF NO

                                        ;NOW TEST ADDRESS COUNTS BY 1

      007606  012777  030063  172706            MOV #BUFF1+1,@BEBA      ;PUT ODD ADD OF BUFFER IN UBE
      007614  012777  177777  172676            MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
      007622  012777  003403  172674            MOV #3403,@BECR1        ;HAVE UBE DO DATOB
      007630  004767  006412                    JSR PC,CRDY             ;CHECK RDY
      007634  022777  030064  172660            CMP #BUFF1+2,@BEBA      ;DID ADDRESS UPDATE BY 1?
      007642  001434                            BEQ     T14L04          ;;BRANCHIF YES TO RESTORE TRAPS
      007644  017767  172652  171342            MOV @BEBA,$REG0         ;SAVE BAD ADDRESS
      007652  012767  030064  171336            MOV     #BUFF1+2,$REG1  ;SAVE GOOD ADDRESS
      007660  104045                            ERROR +^D37             ;ERROR: BEBA DID NOT COUNT BY 1
      007662  004767  006544                    JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
      007666  000422                            BR      T14L04          ;;GO TO RESTORE TRAPS
      007670  017767  172626  171316    T14L01: MOV @BEBA,$REG0         ;SAVE BAD ADDRESS
      007676  010067  171314                    MOV R0,$REG1            ;SAVE CORRECT ADDRESS
      007702  104043                            ERROR +^D35             ;ERROR: BEBA DID NOT COUNT BY 2
      007704  004767  006522                    JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
      007710  000411                            BR      T14L04          ;;GO TO RESTORE TRAPS
      007712  017700  172610            T14L03: MOV @BECR2,R0           ;GET ADDRESS BITS FROM UBE
      007716  042700  177774                    BIC #177774,R0          ;JUST LOOK AT A16,A17
      007722  010067  171266                    MOV R0,$REG0            ;SAVE ADDRESS
      007726  104044                            ERROR +^D36             ;ERROR: BEBA BITS A16,A17 DID NOT COUNT   0
      007730  004767  006476                    JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
      007734  004767  006264            T14L04: JSR     PC,RCATCH       ;RESTORE TRAPS AND GO TO NEXT TEST

                                        ;;*****************************************************************
                                        ;*TEST 17        TEST BUS ADDRESS BITS WILL CHANGE
                                        ;*
                                        ;*THE UBE BUS ADDRESS BITS ARE CHECKED TO
```

```
                                           ;*SEE IF THEY CAN CHANGE FROM 0,1. SEVERAL DATIS
                                           ;*ARE DONE FROM LOCATION 0, THE HIGHEST LOC IN THE FIRST
                                           ;*8K AND FROM THE UBE SIMULTANEOUS (O ADDRESS.
                                           ;;*************************************************************
     007740  000004                        TST17:  SCOPE
     007742  012706  001100                        MOV #STACK,SP           ;RESTORE STACK
     007746  004767  006220                        JSR PC,CLRREG           ;CLEAR UBE REG
     007752  004767  006320                        JSR PC,DINT             ;DISREGARD INTERRUPTS
     007756  005037  177776                        CLR @#PSW               ;ALLOW DATA TRANSFERS


                                           ;SIZE MEMORY FROM 4K TO 8K


     007762  012737  010012  000004                MOV #T13L01,@#4         ;SET UP TIME OUT TRAP
     007770  012700  017776                        MOV #17776,R0           ;SET R0=LAST ADDRESS IN 1ST 4K OF MEM
     007774  062700  004000                T13L02: ADD #4000,R0            ;UPDATE R0 TO NEXT 1K OF MEM
     010000  005710                                TST (R0)                ;TEST IF 1K PRESENT. TIMES OUT IF NOT.
     010002  022700  037776                        CMP #37776,R0           ;AT 8K?
     010006  001372                                BNE T13L02              ;LOOK AT NEXT 1K IF NOT
     010010  000402                                BR T13L03
     010012  162700  004000                T13L01: SUB #4000,R0            ;GET ADDRESS OF LAST 1K OF MEM PRESENT

     010016  012737  000006  000004        T13L03: MOV #6,@#4              ;RESTORE TRAP
     010024  011001                                MOV (R0),R1             ;SAVE CONTENTS OF LAST LOC IN FIRST 8K
     010026  010010                                MOV R0,(R0)             ;PUT ADDRESS OF LOC IN MEM LOC
     010030  012737  000000  000000                MOV #0,@#0              ;PUT 0 IN LOC 0
     010036  012777  177777  172454                MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
     010044  012777  002003  172452                MOV #2003,@BECR1        ;HAVE UBE DO DATI FROM MEM LOC 0
     010052  004767  006170                        JSR PC,CRDY             ;CHECK FOR RDY SET
     010056  005777  172434                        TST @BEBD               ;SEE IF UBE READ 0 FROM LOC 0
     010062  001034                                BNE T13L04              ;BRANCH TO ERROR IF DATA NOT   0
     010064  010077  172432                        MOV R0,@BEBA            ;HAVE UBE ADDRESS HIGHEST MEMORY IN 4K-8K LOCATIONS
     010070  012777  177777  172422                MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
     010076  005277  172422                        INC @BECR1              ;HAVE UBE DO DATI FROM HIGHEST MEMORY IN 4K-8K LOCATIONS
     010102  004767  006140                        JSR PC,CRDY             ;CHECK FOR RDY SET
     010106  020077  172404                        CMP R0,@BEBD            ;DID UBE READ FROM PROPER LOCATION?
     010112  001020                                BNE T13L04              ;BRANCH IF DATA  NOT = R0
     010114  016777  172414  172400                MOV BEGO,@BEBA          ;HAVE UBE ADDRESS ITS GO ADDRESS
     010122  012777  000003  172376                MOV #3,@BECR2           ;HAVE UBE ADDRESS ITS GO ADDRESS
     010130  012777  177777  172362                MOV #177777,@BECC       ;HAVE UBE DO 1 XFER
     010136  005277  172362                        INC @BECR1              ;HAVE UBE DO DATI FROM GO ADDRESS
     010142  004767  006100                        JSR PC,CRDY             ;CHECK FOR RDY SET
     010146  005777  172344                        TST @BEBD               ;DID UBE READ PROPER LOCATION?
     010152  001411                                BEQ T13L05              ;BRANCH IF YES
     010154  017767  172342  171032        T13L04: MOV @BEBA,$REG0         ;GET ADDRESS+2 TRIED TO READ FROM
     010162  162767  000002  171024                SUB #2,$REG0            ;CALC. ADDRESS TRIED TO READ FROM
     010170  104042                                ERROR +^D34             ;ERROR: UBE DID DATI FROM WRONG LOCATION
     010172  004767  006234                        JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
     010176  004767  006022                T13L05: JSR PC,RCATCH           ;RESTORE TRAPS
     010202  010110                                MOV R1,(R0)             ;RESTORE CONTENTS OF LAST LOC OF FIRST 8K


                                           ;;*************************************************************
                                           ;*TEST 20        TEST CYCLE  COUNTS BY 1 AND INC WITH EACH INT
                                           ;*
                                           ;*THE BECC REG IS CYCLED FROM 0 TO 177777 BY INTERRUPTING THE
                                           ;*CPU.  AFTER EACH INTERRUPT, THE REG IS COMPARED WITH R0 WHICH
                                           ;*CONTAINS THE PROPER DATA.
                                           ;;*************************************************************
```

```
010204  000004                          TST20:  SCOPE
010206  012706  001100                          MOV #STACK,SP           ;RESTORE STACK
010212  012737  000340  177776                  MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
010220  004767  005746                          JSR PC,CLRREG           ;CLEAR UBE REG
010224  005000                                  CLR R0                  ;INITIALIZE TEST COUNTER
010226  012777  010250  172276                  MOV #T15L01,@INTVEC     ;SET UP INT VECTOR AREA
010234  012777  000003  172262          T15L03: MOV #3,@BECR1           ;HAVE UBE INT.VIA BR-4
010242  005037  177776                          CLR @#PSW               ;ALLOW INTERRUPTS
010246  000240                                  NOP                     ;UBE WILL INTERRUPT HERE
010250  022626                          T15L01: CMP (SP)+,(SP)+         ;RESTORE STACK AFTER INTERRUPT
010252  005200                                  INC R0                  ;UPDATE TEST COUNTER
010254  005700                                  TST R0                  ;IS R0=0?
010256  001423                                  BEQ T15L02              ;RESTORE TRAPS IF YES
010260  020077  172234                          CMP R0,@BECC            ;DID CYCLE COUNT UPDATE PROPERLY?
010264  001763                                  BEQ T15L03              ;INCREMENT BECC IF YES
010266  017767  172226  170720                  MOV @BECC,$REG0         ;SAVE BAD DATA
010274  010067  170716                          MOV R0,$REG1            ;SAVE GOOD DATA
010300  104046                                  ERROR +^D38             ;ERROR: INTERRUPT FAILED TO UPDATE BECC TO CORRECT VALUE
010302  004767  006124                          JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
010306  012737  000340  177776                  MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
010314  012777  006003  172202                  MOV #6003,@BECR1        ;HAVE UBE CYCLE SO IT SETS RDY
010322  005037  177776                          CLR @#PSW               ;ALLOW UBE TO CYCLE
010326  004767  005672                  T15L02: JSR PC,RCATCH           ;RESTORE TRAPS

                                        ;;*****************************************************************
                                        ;*TEST 21        TEST INHIBIT INCREMENT OF BECC AND BEBA
                                        ;*
                                        ;*A DATI IS DONE VIA BR ARBITRATION AND THE BECC AND BEBA REGS
                                        ;*ARE CHECKED TO NOT INCREMENT.
                                        ;;*****************************************************************
010332  000004                          TST21:  SCOPE
010334  012706  001100                          MOV #STACK,SP           ;RESTORE STACK
010340  012737  000340  177776                  MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
010346  004767  005620                          JSR PC,CLRREG           ;CLEAR UBE REG
010352  012777  030062  172142                  MOV #BUFF1,@BEBA        ;LOAD UBE WITH TEST ADDRESS
010360  012777  177777  172132                  MOV #177777,@BECC       ;LOAD TEST DATA INTO BECC
010366  012767  000001  017466                  MOV #1,BUFF1            ;SETUP BUFFER DATA
010374  012777  000004  172124                  MOV #4,@BECR2           ;HAVE UBE INH. INC. OF BECC AND BEBA
010402  012777  002003  172114                  MOV #2003,@BECR1        ;HAVE UBE DO DATI FROM BUFFER AREA
010410  005037  177776                          CLR @#PSW               ;ALLOW DATA XFER
010414  005777  172076                  T16L01: TST @BEBD               ;WAS DATA XFERED?
010420  001775                                  BEQ T16L01              ;WAIT TILL DATA IN BEBD
010422  022777  177777  172070                  CMP #177777,@BECC       ; HECK BECC WAS NOT UPDATED
010430  001010                                  BNE T16L02              ;BRANCH IF WAS TO ERROR
010432  022777  030062  172062                  CMP #BUFF1,@BEBA        ;CHECK BEBA WAS NOT UPDATED
010440  001407                                  BEQ T16L03              ;BRANCH IF WAS NOT UPDATED
010442  104047                                  ERROR +^D39             ;ERROR: BEBA INCREMENTED WHEN IT WAS INHIBITED
010444  004767  005762                          JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
010450  000403                                  BR T16L03
010452  104050                          T16L02: ERROR +^D40             ;ERROR: BECC INCREMENTED WHEN IT WAS INHIBITED
010454  004767  005752                          JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
010460  042777  000004  172040          T16L03: BIC #4,@BECR2           ;ALLOW BEBA AND BECC TO COUNT
010466  004767  005554                          JSR PC,CRDY             ;WAIT TILL UBE IS DONE

                                        ;;*****************************************************************
                                        ;*TEST 22        TEST INTERRUPT ENABLE & CCOVF WORKS
                                        ;*
```

```
                                         ;*THE UBE IS SETUP TO DO 4 DATO XFERS VIA BR ARBITRATION AND
                                         ;*INTERRUPT WHEN DONE.  THE INTERRUPT IS CHECKED FOR
                                         ;*AND THEN A BUFFER AREA IS TESTED TO SEE IF EXACTLY
                                         ;*FOUR TRANSFERS WERE DONE.
                                         ;* TEST INTERRUPT ENABLE & CCOVF WORKS UBE WILL DO SEVERAL XFERS
                                         ;;*****************************************************************
     010472  000004                      TST22:  SCOPE
     010474  012706  001100                      MOV #STACK,SP            ;RESTORE STACK
     010500  012737  000340  177776              MOV #340,@#PSW           ;LOCK OUT INTERRUPTS
     010506  004767  005460                      JSR PC,CLRREG            ;CLEAR UBE REG
     010512  012700  030062                      MOV #BUFF1,R0            ;GET BUFFER ADDRESS
     010516  005020                      T17L01: CLR (R0)+                ;CLEAR BUFFER AREA
     010520  020027  030102                      CMP R0,#BUFF1+20         ;AT END OF BUFFER?
     010524  001374                              BNE T17L01               ;BRANCH IF NO
     010526  012777  000377  171762              MOV #377,@BEBD           ;SET UP XFER TEST DATA
     010534  012777  030062  171760              MOV #BUFF1,@BEBA         ;LOAD UBE WITH BUFF ADDRESS
     010542  012777  177774  171750              MOV #177774,@BECC        ;SET UBE TO DO 4 XFERS
     010550  012777  010612  171754              MOV #T17L02,@INTVEC      ;SET UP INT VECTOR
     010556  012777  003121  171740              MOV #3121,@BECR1         ;HAVE UBE DO DATO VIA BR 7 AND INTERRUPT ON DONE
     010564  005037  177776                      CLR @#PSW                ;ALLOW XFERS
     010570  005000                              CLR R0                   ;INITIALIZE COUNT
     010572  005200                      T17L03: INC R0                   ;UPDATE COUNT TO WAIT FOR INTERRUPT
     010574  022700  001000                      CMP #1000,R0             ;WAITED LONG ENOUGH?
     010600  001374                              BNE T17L03               ;BRANCH IF NO
     010602  104051                              ERROR +^D41              ;ERROR: UBE FAILED TO INT. ON DONE
     010604  004767  005622                      JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
     010610  000470                              BR      T17L09           ;;GO RESTORE TRAPS
     010612  012700  030062              T17L02: MOV #BUFF1,R0            ;GET START OF BUFFER
     010616  005720                      T17L05: TST (R0)+                ;TEST FIRST 4 LOC WRITTEN
     010620  001433                              BEQ T17L04               ;BRANCH IF NOT WRITTEN TO ERROR
     010622  022700  030072                      CMP #BUFF1+10,R0         ;LOOKED AT ALL WRITTEN LOCS.
     010626  001373                              BNE T17L05               ;BRANCH IF NO
     010630  005720                      T17L06: TST (R0)+                ;TEST LAST 4 LOC WERE NOT WRITTEN
     010632  001027                              BNE T17L10               ;BRANCH TO ERROR IF WERE
     010634  022700  030102                      CMP #BUFF1+20,R0         ;AT END OF BUFFER?
     010640  001373                              BNE T17L06               ;NO, LOOK AT NEXT LOCATION
     010642  032777  000100  171654              BIT #100,@BECR1          ;YES, TEST INT. ON DONE BIT-0
     010650  001041                              BNE T17L07               ;BRANCH TO ERROR IF NOT=0
     010652  032777  020000  171646              BIT #20000,@BECR2        ;TEST CCOVF=1
     010660  001441                              BEQ T17L08               ;BRANCH TO ERROR IF=0
     010662  012777  006003  171634              MOV #6003,@BECR1         ;SET GO BIT TO SEE IF CCOVF IS RESET
     010670  032777  020000  171630              BIT #20000,@BECR2        ;TEST CCOVF=0
     010676  001435                              BEQ     T17L09           ;;GO RESTORE TRAPS IF YES
     010700  104052                              ERROR +^D42              ;ERROR: CCOVF NOT CLEARED BY GO
     010702  004767  005524                      JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
     010706  000431                              BR      T17L09           ;;GO RESTORE TRAPS
     010710  005740                      T17L04: TST -(R0)                ;CALC. LAST ADD. WRITTEN
     010712  005740                      T17L10: TST -(R0)                ;CALC. LAST ADD. WRITTEN
     010714  022700  030062                      CMP #BUFF1,R0            ;WERE ANY ADD. WRITTEN?
     010720  003404                              BLE T17L11               ;BRANCH IF YES
     010722  104067                              ERROR +^D55              ;ERROR: UBE DID NOT DO DATO TO PROPER # OF LOC (4)
     010724  004767  005502                      JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
     010730  000420                              BR      T17L09           ;;GO RESTORE TRAPS
     010732  012767  030062  170254      T17L11: MOV #BUFF1,$REG0         ;SAVE FIRST LOCATION WRITTEN
     010740  010067  170252                      MOV R0,$REG1             ;SAVE LAST LOCATION WRITTEN
     010744  104053                              ERROR +^D43              ;ERROR: UBE DID NOT DO DATO TO PROPER # OF LOCATIONS (4)
     010746  004767  005460                      JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
```

```
010752  000407                          BR      T17L09          ;;GO RESTORE TRAPS
010754  104054                  T17L07: ERROR +^D44             ;ERROR: INT. ON DONE BIT NOT CLEARED
010756  004767  005450                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
010762  000403                          BR      T17L09          ;;GO RESTORE TRAPS
010764  104055                  T17L08: ERROR +^D45             ;ERROR: CCOVF NOT SET
010766  004767  005440                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
010772  004767  005226          T17L09: JSR PC,RCATCH           ;RESTORE TRAPS


                                ;;*************************************************************
                                ;*TEST 23        TEST DATA XFERS FROM BECC
                                ;*
                                ;*THE UBE IS SET UP TO DO 4 DATO XFERS VIA BR ARBITRATION FROM
                                ;*THE BECC REG TO A BUFFER AREA.  THE AREA IS THEN CHECKED.
                                ;;*************************************************************
010776  000004                  TST23:  SCOPE
011000  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
011004  004767  005162                  JSR PC,CLRREG           ;CLEAR UBE REG
011010  005037  177776                  CLR @#PSW               ;ALLOW INTERRUPTS
011014  012700  030062                  MOV #BUFF1,R0           ;GET BUFFER ADDRESS
011020  005020                  T18L01: CLR (R0)+               ;CLEAR BUFFER AREA
011022  020027  030102                  CMP R0,#BUFF1+20        ;AT END OF BUFFER?
011026  001374                          BNE T18L01              ;BRANCH IF NO
011030  012777  030062  171464          MOV #BUFF1,@BEBA        ;LOAD STARTING ADDRESS INTO UBE
011036  012777  177774  171454          MOV #177774,@BECC       ;SETUP UBE TO DO 4 XFERS
011044  012777  013003  171452          MOV #13003,@BECR1       ;HAVE UBE DO 4 XFERS FROM BECC
011052  032777  000200  171444  T18L02: BIT #200,@BECR1         ;LOOK FOR RDY SET
011060  001774                          BEQ T18L02              ;BRANCH TILL SET
011062  012700  030062                  MOV #BUFF1,R0           ;GET BUFFER ADDRESS
011066  012701  177774                  MOV #177774,R1          ;INITIALIZE R1=TO FIRST DATA WORD
011072  022001                  T18L04: CMP (R0)+,R1            ;IS DATA OK?
011074  001005                          BNE T18L03              ;NO, GO TO ERROR
011076  005201                          INC R1                  ;UPDATE FOR NEXT DATA
011100  020027  030072                  CMP R0,#BUFF1+10        ;LOOKED AT ALL DATA?
011104  001372                          BNE T18L04              ;NO, LOOK AT NEXT WORD
011106  000412                          BR      TST24           ;;GO TO NEXT TEST

011110  005740                  T18L03: TST -(R0)               ;CALC. ADDRESS OF FAILURES
011112  010067  170076                  MOV R0,$REG0            ;SAVE ADDRESS
011116  011067  170074                  MOV (R0),$REG1          ;SAVE BAD DATA
011122  010167  170072                  MOV R1,$REG2            ;SAVE GOOD DATA
011126  104056                          ERROR +^D46             ;ERROR: DATO FROM BECC NOT DONE PROPERLY
011130  004767  005276                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG


                                ;;*************************************************************
                                ;*TEST 24        TEST UBE CAN DO 2 XFERS PER BUS REQUEST
                                ;*
                                ;*THE UBE IS SET UP TO DO 2 DATO XFERS PER REQUEST VIA
                                ;*BR ARBITRATION.  THE CYCLE COUNT IS SET TO DO A TOTAL OF
                                ;*FOUR XFERS.  THE UBE IS TOLD TO GO. THE FIRST TIME
                                ;*THE CPU GETS THE BUS, AFTER THIS, THE PSW PRIORITY IS
                                ;*SET FOR 7 HOLDING OFF FURTHER UBE ACTION.  A BUFFER
                                ;*AREA IS THEN CHECKED THAT THE UBE DID EXACTLY 2 XFERS
                                ;*PER REQUEST.
                                ;;*************************************************************
011134  000004                  TST24:  SCOPE
011136  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
011142  012737  000340  177776          MOV #340,@#PSW          ;LOCK ON INTERRUPTS
```

```
011150  004767  005016                   JSR PC,CLRREG           ;CLEAR UBE REGS
011154  012700  030062                   MOV #BUFF1,R0           ;GET BUFFER ADDRESS
011160  005020                   T19L01: CLR (R0)+               ;CLEAR BUFFER AREA
011162  020027  030102                   CMP R0,#BUFF1+20        ;AT END OF BUFFER?
011166  001374                           BNE T19L01              ;CONTINUE TO CLEAR IF NO
011170  012777  030062  171324           MOV #BUFF1,@BEBA        ;LOAD BUFFER ADDRESS INTO UBE
011176  012777  177774  171314           MOV #177774,@BECC       ;SET UBE TO DO 4 XFERS
011204  012777  000377  171304           MOV #377,@BEBD          ;LOAD TEST DATA INTO UBE
011212  012777  005003  171304           MOV #5003,@BECR1        ;HAVE UBE DO 2 DATO/REQUEST VIA BR 4
011220  005037  177776                   CLR @#PSW               ;ALLOW UBE TO DO XFERS
011224  000240                           NOP                     ;UBE SHOULD DO 2 XFERS HERE
011226  012737  000340  177776           MOV #340,@#PSW          ;SET PRIORITY=7 TO STOP LAST 2 XFERS
011234  012700  030062                   MOV #BUFF1,R0           ;GET BUFF ADDRESS
011240  005720                   T19L03: TST (R0)+               ;WAS BUFF WRITTEN?
011242  001411                           BEQ T19L09              ;BRANCH TO ERROR IF NO
011244  020027  030066                   CMP R0,#BUFF1+4         ;LOOKED AT FIRST 2 LOCATIONS?
011250  001373                           BNE T19L03              ;BRANCH IF NO
011252  005720                   T19L04: TST (R0)+               ;TEST BUFF LOC NOT WRITTEN
011254  001005                           BNE T19L02              ;BRANCH TO ERROR IF WRITTEN
011256  020027  030072                   CMP R0,#BUFF1+10        ;LOOKED AT FOURTH LOC?
011262  001373                           BNE T19L04              ;BRANCH IF NO
011264  000421                           BR      T19L05          ;;GO TO END OF TEST
011266  005740                   T19L09: TST -(R0)               ;CALC LAST ADDRESS WRITTEN
011270  005740                   T19L02: TST -(R0)               ;CALC LAST ADDRESS WRITTEN
011272  022700  030062                   CMP #BUFF1,R0           ;WERE ANY ADDRESS WRITTEN?
011276  101404                           BLOS T19L07             ;BRANCH IF YES
011300  104060                           ERROR +^D48             ;ERROR: UBE DID NOT DO 2 XFERS/REQUEST
011302  004767  005124                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
011306  000410                           BR      T19L05          ;;GO TO END OF TEST
011310  012767  030062  167676   T19L07: MOV #BUFF1,$REG0        ;SAVE FIRST ADDRESS WRITTEN
011316  010067  167674                   MOV R0,$REG1            ;SAVE LAST ADDRESS WRITTEN
011322  104057                           ERROR +^D47             ;ERROR: UBE DID NOT DO 2 XFERS FOR EACH REQUEST
011324  004767  005102                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
011330  005037  177776           T19L05: CLR @#PSW               ;ALLOW LAST 2 XFERS
011334  000240                           NOP                     ;ALLOW UBE TO GET BUS
011336  004767  004704                   JSR PC,CRDY             ;WAIT TILL UBE FINISHES XFERS

                                 ;;*************************************************************
                                 ;*TEST 25        TEST UBE CAN DO 2 DATIP XFERS PER REQUEST
                                 ;*
                                 ;*THE UBE IS SET UP TO DO 2 DATIP XFERS PER REQUEST VIA
                                 ;*BR ARBITRATION.  THE CYCLE COUNT IS SET TO DO A TOTAL OF
                                 ;*FOUR XFERS.  THE UBE IS TOLD TO GO. THE FIRST TIME
                                 ;*THE CPU GETS THE BUS, AFTER THIS, THE PSW PRIORITY IS
                                 ;*SET FOR 7 HOLDING OFF FURTHER UBE ACTION.  A BUFFER
                                 ;*AREA IS THEN CHECKED THAT THE UBE DID EXACTLY 2 XFERS
                                 ;*PER REQUEST.
                                 ;;*************************************************************
011342  000004                   TST25:  SCOPE
011344  012706  001100                   MOV #STACK,SP           ;RESTORE STACK
011350  012737  000340  177776           MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
011356  004767  004610                   JSR PC,CLRREG           ;CLEAR UBE REG
011362  012700  030062                   MOV #BUFF1,R0           ;GET BUFFER ADDRESS
011366  012720  125252           T20L01: MOV #125252,(R0)+       ;LOAD TEST DATA
011372  020027  030072                   CMP R0,#BUFF1+10        ;LOADED FIRST 4 LOCS?
011376  001373                           BNE T20L01              ;BRANCH IF NO
011400  012777  030062  171114           MOV #BUFF1,@BEBA        ;LOAD BUFFER ADDRESS INTO UBE
```

```
011406  012777  177774  171104              MOV #177774,@BECC          ;SET UBE TO DO 4 CYCLES
011414  012777  004403  171102              MOV #4403,@BECR1           ;HAVE UBE DO 2 DATIP/REQUEST VIA BR=4
011422  005037  177776                      CLR @#PSW                  ;ALLOW UBE TO DO CYCLES
011426  000240                              NOP                        ;UBE SHOULD DO XFERS HERE
011430  012737  000340  177776              MOV #340,@#PSW             ;SET PRIORITY = 7 TO STOP LAST 2 CYCLES
011436  012700  030062                      MOV #BUFF1,R0              ;GET BUFF ADDRESS
011442  022720  052525             T20L03:  CMP #052525,(R0)+          ;TEST BUFF LOCS WRITTEN
011446  001012                              BNE T20L02                 ;BRANCH TO ERROR IF NOT DONE PROPERLY
011450  022700  030066                      CMP #BUFF1+4,R0            ;LOOKED AT 2 WRITTEN LOCS?
011454  001372                              BNE T20L03                 ;BRANCH IF NO
011456  022720  125252             T20L04:  CMP #125252,(R0)+          ;TEST BUFF LOCS NOT WRITTEN
011462  001005                              BNE T20L08                 ;BRANCH TO ERROR IF WRITTEN
011464  020027  030072                      CMP R0,#BUFF1+10           ;LOOKED AT FOURTH LOC?
011470  001372                              BNE T20L04                 ;BRANCH IF NO
011472  000421                              BR      T20L05             ;;GO TO END OF TEST
011474  005740                     T20L02:  TST -(R0)                  ;CALC LAST ADDRESS WRITTEN
011476  005740                     T20L08:  TST -(R0)                  ;CALC LAST ADDRESS WRITTEN
011500  022700  030062                      CMP #BUFF1,R0              ;WERE ANY LOC WRITTEN?
011504  101404                              BLOS T20L06                ;BRANCH IF YES
011506  104061                              ERROR +^D49                ;ERROR: DID NOT DO 2 DATIP/REQUEST
011510  004767  004716                      JSR PC,TERRPC              ;TYPE PC OF ERROR MSG
011514  000410                              BR      T20L05             ;;GO TO END OF TEST
011516  012767  030062  167470     T20L06:  MOV #BUFF1,$REG0           ;SAVE FIRST ADDRESS WRITTEN
011524  010067  167466                      MOV R0,$REG1               ;SAVE LAST ADDRESS WRITTEN
011530  104062                              ERROR +^D50                ;ERROR: UBE DID NOT DO 2 DATIP/REQUEST
011532  004767  004674                      JSR PC,TERRPC              ;TYPE PC OF ERROR MSG
011536  005037  177776             T20L05:  CLR @#PSW                  ;ALLOW LAST 2 CYCLES
011542  000240                              NOP                        ;ALLOW UBE TO GET BUS
011544  004767  004476                      JSR PC,CRDY                ;WAIT FOR UBE TO FINISH XFERS

                                   ;;*************************************************************
                                   ;*TEST 26        TEST DATA XFERS VIA NPR AND INT ON DONE WORK
                                   ;*
                                   ;*THIS IS THE FIRST TEST WHERE THE NPR IS EXERCISED.  ONE
                                   ;*DATO NPR IS DONE TO A BUFFER AREA.  THE READY BIT IS
                                   ;*THEN CHECKED FOR SETTING.  NEXT, THE SAME OPERATION IS
                                   ;*REPEATED ONLY THE INTERRUPT ON DONE BIT IS SET.
                                   ;*THE PROGRAM TESTS FOR THE INTERRUPT AND THEN EXAMINES
                                   ;*THE BUFFER AREA TO SEE THAT ONLY ONE XFER WAS DONE.
                                   ;;*************************************************************
011550  000004                     TST26:   SCOPE
011552  012706  001100                      MOV #STACK,SP              ;RESTORE STACK
011556  012737  000340  177776              MOV #340,@#PSW             ;LOCK OUT INTERRUPTS
011564  004767  004402                      JSR PC,CLRREG              ;CLEAR UBE REG
011570  005067  016266                      CLR BUFF1                  ;CLEAR BUFFER LOC
011574  012777  177777  170714              MOV #177777,@BEBD          ;LOAD UBE DATA REG WITH TEST DATA
011602  012777  030062  170712              MOV #BUFF1,@BEBA           ;LOAD UBE ADDRESS REG WITH BUFF ADD.
011610  012777  177777  170702              MOV #177777,@BECC          ;SET UBE TO DO 1 CYCLE
011616  012777  003041  170700              MOV #3041,@BECR1           ;HAVE UBE DO DATO VIA NPR
011624  000240                              NOP                        ;ALLOW UBE TO SET BUS
011626  004767  004414                      JSR PC,CRDY                ;CHECK RDY SET
011632  005704                              TST R4                     ;DID RDY SET?
011634  001042                              BNE T21L01                 ;BRANCH TO ERROR IF RDY DID NOT SET
011636  005767  016220                      TST BUFF1                  ;WAS DATO DONE?
011642  001452                              BEQ T21L02                 ;BRANCH TO ERROR IF NPR NOT DONE
011644  005067  016212                      CLR BUFF1                  ;CLEAR BUFF LOC
011650  005067  016210                      CLR BUFF1+2                ;CLEAR BUFF LOC +2
```

```
011654  012777  011724  170650            MOV #T21L03,@INTVEC       ;SET UP FOR INTERRUPT
011662  012777  030062  170632            MOV #BUFF1,@BEBA          ;LOAD TEST ADDRESS
011670  012777  177777  170622            MOV #177777,@BECC         ;SET UBE TO DO 1 CYCLE
011676  012777  003143  170620            MOV #3143,@BECR1          ;HAVE UBE DO DATO NPR AND INT WHEN DONE VIA BR 4
011704  005037  177776                    CLR @#PSW                 ;ALLOW UBE TO INTERRUPT
011710  004767  004332                    JSR PC,CRDY               ;WAIT FOR INT. OR RDY TO SET
011714  104065                            ERROR +^D53               ;ERROR: UBE DID NOT INT WHEN NPR DONE
011716  004767  004510                    JSR PC,TERRPC             ;TYPE PC OF ERROR MSG
011722  000425                            BR T21L04                 ;RESTORE TRAPS
011724  005767  016134           T21L03:  TST BUFF1+2               ;DID NPR WRITE MORE THAN 1 LOC?
011730  001422                            BEQ     T21L04            ;;GO TO END OF TEST
011732  104066                            ERROR +^D54               ;ERROR: UBE WROTE 2 LOC WHEN 1 NPR AND INT DONE
011734  004767  004472                    JSR PC,TERRPC             ;TYPE PC OF ERROR MSG
011740  000416                            BR T21L04                 ;RESTORE TRAPS
011742  104064                   T21L01:  ERROR +^D52               ;ERROR: NPR DID NOT SET RDY
011744  004767  004462                    JSR PC,TERRPC             ;TYPE PC OF ERROR MSG
011750  012777  006003  170546            MOV #6003,@BECR1          ;HAVE UBE SET ITS RDY
011756  005037  177776                    CLR @#PSW                 ;
011762  004767  004260                    JSR PC,CRDY               ;WAIT TILL SET
011766  000403                            BR T21L04                 ;RESTORE TRAPS
011770  104063                   T21L02:  ERROR +^D51               ;ERROR: NPR DATO NOT DONE
011772  004767  004434                    JSR PC,TERRPC             ;TYPE PC OF ERROR MSG
011776  004767  004222           T21L04:  JSR PC,RCATCH             ;RESTORE TRAPS

                                 ;;*************************************************************
                                 ;*TEST 27        TST UBE WILL NOT INT DURING AN NPR & GO BIT SETS
                                 ;*
                                 ;*IF THIS TEST FAILS AND THE UBE DOES INTERRUPT AFTER
                                 ;*TRYING TO DO AN NPR, THE CPU WILL GO DOWN
                                 ;;*************************************************************
012002  000004                   TST27:   SCOPE
012004  012767  000001  167222            MOV     #1,$TIMES         ;;DO 1 ITERATION
012012  012706  001100                    MOV #STACK,SP             ;RESTORE STACK
012016  004767  004150                    JSR PC,CLRREG             ;CLEAR UBE REG
012022  032777  010000  167142            BIT #SW12,@SWR            ;INHIBIT TYPEOUTS?
012030  001002                            BNE 1$                    ;BRANCH IF YES
012032  104401  025331                    TYPE ,MSG3                ;TESTING UBE WILL NOT INTERRUPT
                                                                    ;DURING NPR. IF DOES, CPU WILL GO DOWN
012036  012777  177777  170454   1$:      MOV #177777,@BECC         ;SET UBE TO DO 1 CYCLE
012044  012777  000043  170452            MOV #0043,@BECR1          ;HAVE UBE DO DATI NPR AND INT. (FUN. 0)
012052  005037  177776                    CLR @#PSW
012056  000240                            NOP                       ;UBE SHOULD NOT GET BUSS HERE
012060  032777  000001  170436            BIT #1,@BECR1             ;IS GO BIT SET?
012066  001003                            BNE T22L01                ;BRANCH IF YES
012070  104011                            ERROR +^D9                ;ERROR: GO BIT FAILED TO LOAD '1'
012072  004767  004334                    JSR PC,TERRPC             ;TYPE PC OF ERROR MSG
012076  005077  170422           T22L01:  CLR @BECR1                ;RESET GO BIT, NPR AND INTERRUPT
```

```
012102  032777  010000  167062          BIT #SW12,@SWR          ;INHIBIT TYPEOUTS?
012110  001002                          BNE     TST30           ;;BRANCH IF YES
012112  104401  025457                  TYPE ,MSG4              ;EXITING TEST


                                ;;*************************************************************
                                ;*TEST 30        TEST WRONG A LINE ERROR BIT DOES NOT SET
                                ;*
                                ;*A DATI NPR IS DONE FROM THE UBE GO ADDRESS
                                ;*THE ERROR BIT IS TESTED NOT TO HAVE SET AND NOT TO HAVE INTERRUPTED.
                                ;*THE ADDRESS BITS 14,15,16,17 ARE NEXT TESTED SEPARATELY
                                ;*AND THE ERROR BIT IS CHECKED NOT TO HAVE SET.
                                ;;*************************************************************
012116  000004                  TST30:  SCOPE
012120  012706  001100                  MOV #STACK,SP           ;RESTORE STACK
012124  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
012132  004767  004034                  JSR PC,CLRREG           ;CLEAR UBE REGS
012136  016777  170372  170356          MOV BEGO,@BEBA          ;HAVE UBE ADDRESS ITS GO ADDRESS
012144  012777  000003  170354          MOV #3,@BECR2           ;HAVE UBE ADDRESS ITS GO ADDRESS
012152  012777  177777  170340          MOV #177777,@BECC       ;SET UP TO DO 1 CYCLE
012160  012777  012230  170344          MOV #T24L01,@INTVEC     ;SET UP FOR INT.
012166  012777  002041  170330          MOV #2041,@BECR1        ;HAVE DATI NPR DONE FROM GO ADDRESS
012174  004767  004046                  JSR PC,CRDY             ;CHECK FOR RDY SET
012200  032777  001000  170320          BIT #1000,@BECR2        ;WAS ADDRESS ERROR SET?
012206  001404                          BEQ T24L02              ;BRANCH IF NO
012210  104070                          ERROR +^D56             ;ERROR: TEST OF WRONG A LINES ERROR BIT FAILED
012212  104071                          ERROR +^D57             ;BECR2 BIT 9 FALSELY SET
012214  004767  004212                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012220  005037  177776          T24L02: CLR @#PSW               ;ALLOW ANY INTERRUPTS
012224  000240                          NOP                     ;UBE SHOULD NOT INTERRUPT HERE
012226  000410                          BR T24L06               ;GO TEST INDIVIDUAL ADDRESS BITS
012230  017767  170272  166756  T24L01: MOV @BECR2,$REG0         ;SAVE BECR2
012236  104070                          ERROR +^D56             ;ERROR:TEST OF WRONG A LINES ERROR BIT FAILED
012240  104077                          ERROR +^D63             ;FALSELY INTERRUPTED CPU
012242  004767  004164                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012246  000447                          BR T24L03               ;GO RESTORE TRAP
012250  004767  004022          T24L06: JSR PC,DINT             ;DISREGARD INTERRUPTS
012254  005077  170242                  CLR @BEBA               ;CLEAR ADDRESS 0-15
012260  012777  000001  170240          MOV #1,@BECR2           ;TEST ADDRESS 16
012266  012777  177777  170224  T24L05: MOV #177777,@BECC       ;DO 1 CYCLE
012274  062777  040000  170220          ADD #40000,@BEBA        ;TEST NEXT ADDRESS
012302  032777  140000  170212          BIT #140000,@BEBA       ;HAVE ADDRESS BITS 14,15 BEEN EXERCISED?
012310  001011                          BNE T24L04              ;TEST NEXT ADDRESS IF NO
012312  032777  000003  170206          BIT #3,@BECR2           ;HAVE ADDRESS BITS 16,17 BEEN EXERCISED?
012320  001422                          BEQ T24L03              ;GO RESTORE TRAPS IF YES
012322  005277  170200                  INC @BECR2              ;INC ADDRESS BITS 16,17
012326  042777  000004  170172          BIC #4,@BECR2           ;CLEAR BIT 2 OF BECR2 IF SET
012334  012777  002041  170162  T24L04: MOV #2041,@BECR1        ;DO DATI NPR TO ADDRESS
012342  004767  003700                  JSR PC,CRDY             ;WAIT TILL RDY SET
012346  032777  001000  170152          BIT #1000,@BECR2        ;WAS WRONG ADDRESS LINES ERROR BIT SET?
012354  001744                          BEQ T24L05              ;TEST NEXT ADDRESS IF NO
012356  104070                          ERROR +^D56             ;ERROR: TEST OF WRONG A LINES ERROR BIT FAILED
012360  104071                          ERROR +^D57             ;BECR2 BIT 9 FALSELY SET
012362  004767  004044                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012366  004767  003632          T24L03: JSR PC,RCATCH           ;RESTORE TRAP CATCHER

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

```
                                        ;*TEST 31        TEST WRONG GRANTS OR NOT ONE ERROR BIT SET
                                        ;*
                                        ;*THE UBE IS SET UP TO DO ONE DATI XFER/REQUEST.  ALL
                                        ;*THE POSSIBLE COMBINATIONS OF BR AND NPR LEVELS ARE THEN
                                        ;*EXERCISED.  AFTER EACH, THE ERROR BITS AND INTERRUPTS ARE
                                        ;*CHECKED FOR.  FINALLY, A DATI NPR IS DONE FROM A BUFFER
                                        ;*AREA WITH THE INTERRUPT ON DONE BIT SET.  UPON INTERRUPT, THE
                                        ;*ERROR BITS ARE CHECKED.
                                        ;* TEST WRONG GRANT & NO GRANT OR NOT ONE GRANT ERR BITS DO NOT SET
                                        ;;***************************************************************
012372  000004                          TST31:  SCOPE
012374  012706  001100                          MOV #STACK,SP           ;RESTORE STACK
012400  004767  003566                          JSR PC,CLRREG           ;CLEAR UBE REG
012404  012777  002000  170112                  MOV #2000,@BECR1        ;SET UP UBE TO DO 1 DATI XFER/REQ.
012412  012777  012512  170112                  MOV #T25L01,@INTVEC     ;SET UP FOR INTERRUPTS
012420  012737  000340  177776  T25L05: MOV     #340,   @#PSW           ;LOCK OUT INTERRUPTS
012426  012777  177777  170064                  MOV #177777,@BECC       ;SET UBE TO DO 1 CYCLE
012434  012777  030062  170060                  MOV #BUFF1,@BEBA        ;SET UBE TO ADDRESS BUFFER AREA
012442  062777  000003  170054                  ADD #3,@BECR1           ;HAVE UBE DO NEXT LEVEL OF REQUEST
012450  005037  177776                          CLR     @#PSW           ;ALLOW DATA XFERS VIA BR AND NPR LEVELS
012454  004767  003566                          JSR PC,CRDY             ;WAIT TILL RDY SET
012460  032777  000076  170036                  BIT #76,@BECR1          ;HAVE ALL REQUEST LEVELS BEEN EXERCISED
012466  001425                                  BEQ T25L02              ;BRANCH IF YES
012470  032777  000040  170030                  BIT #40,@BECR2          ;WAS WRONG GRANT ERROR BIT SET?
012476  001062                                  BNE T25L03              ;BRANCH TO ERROR IF SET
012500  032777  002000  170020                  BIT #2000,@BECR2        ;WAS NO GRANT OR NOT ONE GRANT ERROR BIT SET?
012506  001066                                  BNE T25L04              ;BRANCH TO ERROR IF YES
012510  000743                                  BR T25L05               ;GO TEST NEXT LEVEL
012512  104100                          T25L01: ERROR +^D64             ;ERROR: TEST OF WRONG GRANT OR NOT ONE GRANT FAILED
012514  017767  170006  166472                  MOV @BECR2,$REG0        ;SAVE ERROR BITS
012522  104077                                  ERROR +^D63             ;FALSELY INTERRUPTED CPU
012524  017767  167774  166462                  MOV @BECR1,$REG0        ;SAVE BECR1
012532  104104                                  ERROR +^D68             ;WITH BECR1=
012534  004767  003672                          JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012540  000460                                  BR T25L08               ;GO RESTORE TRAPS
012542  012777  012560  167762  T25L02: MOV #T25L06,@INTVEC     ;SET UP NEW INT. AREA
012550  012777  002143  167746                  MOV #2143,@BECR1        ;HAVE UBE DO 1 DATI NPR AND INT ON DONE
012556  000001                                  WAIT                    ;WAIT TO BE INTERRUPTED
012560  032777  000040  167740  T25L06: BIT #40,@BECR2          ;WAS WRONG GRANT ERROR BIT SET?
012566  001015                                  BNE T25L07              ;BRANCH TO ERROR IF WAS
012570  032777  002000  167730                  BIT #2000,@BECR2        ;WAS NO GRANT OR NOT ONE GRANT BIT SET?
012576  001441                                  BEQ T25L08              ;GO RESTORE TRAPS IF WAS NOT
012600  104100                                  ERROR +^D64             ;ERROR: TEST OF WRONG GRANT OR NOT ONE GRANT FAILED
012602  017767  167716  166404                  MOV @BECR1,$REG0        ;SAVE BECR1
012610  104101                                  ERROR +^D65             ;NO GRANT OR NOT ONE GRANT ERROR BIT FALSELY SET
012612  104102                                  ERROR +^D66             ;WITH INT ON DONE = 1
012614  004767  003612                          JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012620  000430                                  BR T25L08               ;GO RESTORE TRAPS
012622  104100                          T25L07: ERROR +^D64             ;ERROR: TEST OF WRONG GRANT OR NOT ONE GRANT FAILED
012624  017767  167674  166362                  MOV @BECR1,$REG0        ;SAVE BECR1
012632  104103                                  ERROR +^D67             ;WRONG GRANT ERROR BIT FALSELY SET
012634  104102                                  ERROR +^D66             ;WITH INT ON DONE = 1
012636  004767  003570                          JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012642  000417                                  BR T25L08               ;GO RESTORE TRAPS
012644  104100                          T25L03: ERROR +^D64             ;ERROR: TEST OF WRONG GRANT OR NOT ONE GRANT FAILED
012646  017767  167652  166340                  MOV @BECR1,$REG0        ;SAVE BECR1
012654  104103                                  ERROR +^D67             ;WRONG GRANT ERROR BIT FALSELY SET
```

```
012656  004767  003550                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012662  000407                           BR T25L08               ;GO RESTORE TRAPS
012664  104100                  T25L04:  ERROR +^D64             ;ERROR: TEST OF WRONG GRANT OR NOT ONE GRANT FAILED
012666  017767  167632  166320           MOV @BECR1,$REGO        ;SAVE BECR1
012674  104101                           ERROR +^D65             ;NO GRANT OR NOT ONE GRANT ERROR BIT FALSELY SET
012676  004767  003530                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
012702  004767  003316          T25 08:  JSR PC,RCATCH           ;RESTORE TRAP CATCHER

                                ;;*************************************************************
                                ;*TEST 32       TEST TIME DELAY AND BUSS LATENCY ERROR BITS
                                ;*
                                ;*THE BUS LATENCY ERROR BIT IS SET BY DOING A RELEASE
                                ;*BUS IMMEDIATE FUNCTION AND SETTING THE TIME DELAY BIT.  THE
                                ;*ERROR BIT AND BIT 15 OF BECR1 ARE CHECKED TO SET.  THE
                                ;*ERROR INTERRUPT IS THEN CHECKED FOR AND THE ERROR CONDITION
                                ;*IS TESTED TO CLEAR.
                                ;;*************************************************************
012706  000004                  TST32:   SCOPE
012710  012706  001100                   MOV #STACK,SP           ;RESTORE STACK
012714  012737  000340  177776           MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
012722  004767  003244                   JSR PC,CLRREG           ;CLEAR UBE REG
012726  012777  040000  167572           MOV #40000,@BECR2       ;SET TIME DELAY BIT
012734  012777  013044  167570           MOV #T26L01,@INTVEC     ;SET UP FOR INTERRUPTS
012742  012777  006003  167554           MOV #6003,@BECR1        ;DO RELEASE BUS IMMED.
012750  005000                           CLR R0                  ;INITIALIZE R0
012752  005200                  T26L02:  INC R0                  ;DELAY TO WAIT FOR
012754  022700  000400                   CMP #400,R0             ;BUSS LATENCY ERROR BIT
012760  001374                           BNE T26L02              ;TO SET
012762  032777  000100  167536           BIT #100,@BECR2         ;WAS BUSS LATENCY ERROR BIT SET?
012770  001004                           BNE T26L03              ;BRANCH IF YES
012772  104106                           ERROR +^D70             ;ERROR: TEST OF TIME DALAY AND BUSS LATENCY FAILED
012774  104107                           ERROR +^D71             ;TO SET BIT 6 OF BECR2
012776  004767  003430                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
013002  032777  100000  167514  T26L03:  BIT #100000,@BECR1      ;WAS ERROR BIT SET?
013010  001004                           BNE T26L04              ;BRANCH IF YES
013012  104106                           ERROR +^D70 ;           ;ERROR: TEST OF TIME DELAY AND BUSS LATENCY FAILED
013014  104075                           ERROR +^D61             ;TO SET BIT 15 OF BECR1
013016  004767  003410                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
013022  005037  177776          T26L04:  CLR @#PSW               ;ALLOW ERROR INTERRUPTS
013026  000240                           NOP                     ;** UBE SHOULD INTERRUPT
013030  000240                           NOP                     ;** UBE SHOULD INTERRUPT ON LEVEL 7
013032  104106                           ERROR +^D70             ;ERROR: TEST OF TIME DELAY AND BUSS LATENCY FAILED
013034  104072                           ERROR +^D58             ;TO INTERRUPT CPU
013036  004767  003370                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
013042  000412                           BR T26L05               ;GO TO END OF TEST
013044  005077  167460          T26L01:  CLR @BERE               ;CLEAR ERROR CONDITION
013050  032777  000100  167450           BIT #100,@BECR2         ;WAS ERROR CLEARED?
013056  001404                           BEQ T26L05              ;BRANCH IF YES
013060  104106                           ERROR +^D70             ;ERROR: TEST OF TIME DELAY AND BUSS LATENCY FAILED
013062  104110                           ERROR +^D72             ;TO CLEAR BIT 6 OF BECR2
013064  004767  003342                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
013070  004767  003076          T26L05:  JSR PC,CLRREG           ;CLEAR ALL UBE REG
013074  004767  003176                   JSR PC,DINT             ;DISREGARD ERROR INTERRUPTS
013100  012777  177777  167412           MOV #177777,@BECC       ;HAVE UBE DO DATI
013106  012777  030062  167406           MOV #BUFF1,@BEBA        ;SO BUSS LATENCY REG
013114  012777  002041  167402           MOV #2041,@BECR1        ;HOLD FLOP CLEARED
013122  004767  003120                   JSR PC,CRDY             ;WAIT FOR RDY SET
```

```
013126  005077  167376                  CLR @BERE               ;CLEAR LATENCY ERROR IF SET
013132  004767  003066                  JSR PC,RCATCH           ;RESTORE TRAPS


                                ;;*****************************************************************
                                ;*TEST 33        TEST MULTIPLE INTERRUPTS SET RDY BIT
                                ;;*****************************************************************
013136  000004                  TST33:  SCOPE
013140  012706  001100                  MOV #STACK,SP           ;INITIALIZE STACK
013144  004767  003022                  JSR  PC,CLRREG          ;CLEAR ALL UBE REG
013150  004767  003122                  JSR  PC,DINT            ;DISREGARD INTERRUPTS
013154  005037  177776                  CLR @#PSW               ;ALLOW INTERRUPTS
013160  012777  177776  167332          MOV #177776,@BECC       ;HAVE UBE DO 2 CYCLES
013166  012777  040000  167332          MOV #40000,@BECR2       ;DO TIME DLY
013174  012777  000003  167322          MOV #3,@BECR1           ;HAVE UBE INT. VIA BR4
013202  004767  003040                  JSR PC,CRDY             ;CHECK FOR RDY SET
013206  005704                          TST R4                  ;WAS RDY SET?
013210  001403                          BEQ T31L01              ;BRANCH IF YES
013212  104124                          ERROR  +^D84            ;ERROR:TEST OF MULTIPLE INTERRUPTS FAILED TO SET RDY
013214  004767  003212                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
013220  004767  003000          T31L01: JSR PC,RCATCH           ;RESTORE TRAP CATCHER


                                ;;*****************************************************************
                                ;*TEST 34        TEST POWER DOWN SEQUENCE
                                ;*
                                ;*THE POWER DOWN TEST IS ONLY DONE IF SW4=1.
                                ;*THE POWER DOWN IS TESTED FOR AND THEN THE POWER UP
                                ;*IS TESTED.  AN INTERNAL REG R0 COUNTS FOR A TIME >150
                                ;*MS TO SEE IF THE CPU GETS POWERED UP.  THE PROGRAM
                                ;*THEN WAITS FOR A TIME >150MS TO SEE IF THE CPU
                                ;*GETS POWERED DOWN AGAIN.
                                ;;*****************************************************************
013224  000004                  TST34:  SCOPE
013226  012767  000001  166000          MOV     #1,$TIMES       ;;DO 1 ITERATION
013234  032777  000020  165730          BIT #20,@SWR            ;SEE IF POWER DOWN TO BE TESTED
013242  001516                          BEQ     TST35           ;;GO TO NEXT TEST IF SWR4 = 0
013244  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INTERRUPTS
013252  012706  001100                  MOV #STACK,SP           ;INITIALIZE STACK
013256  013746  000024                  MOV @#24,-(SP)          ;SAVE POWER FAIL VECTOR ON STACK
013262  013746  000026                  MOV @#26,-(SP)          ;SAVE POWER FAIL VECTOR ON STACK
013266  012737  013324  000024          MOV #T27L01,@#24        ;SET UP FOR POWER FAIL
013274  012737  000340  000026          MOV #340,@#26           ;SET UP FOR POWER FAIL
013302  012777  000020  167216          MOV #20,@BECR2          ;HAVE UBE DO POWER FAIL
013310  000240                          NOP                     ;SHOULD POWER FAIL HERE
013312  104111                          ERROR +^D73             ;ERROR: TEST OF POWER DOWN BIT FAILED
013314  104112                          ERROR +^D74             ;TO POWER DOWN CPU
013316  004767  003110                  JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
013322  000450                          BR T27L02               ;RESTORE TRAPS
013324  022626                  T27L01: CMP (SP)+,(SP)+         ;RESTORE STACK
013326  012737  013370  000024          MOV #T27L03,@#24        ;SET UP FOR POWER UP SEQUENCE
013334  005000                          CLR R0                  ;INITIALIZE COUNTER
013336  005001                          CLR R1                  ;INITIALIZE COUNTER
013340  005200                  T27L04: INC R0                  ;COUNT FOR A TIME
013342  005700                          TST R0                  ;GREATER THAN 150 MS
013344  001375                          BNE T27L04
013346  005201                          INC R1
013350  022701  000004                  CMP #4,R1               ;IS TIME > 150 MS?
013354  001371                          BNE T27L04              ;BRANCH IF NO
```

```
013356  104111                              ERROR +^D73           ;ERROR: TEST OF POWER DOWN BIT FAILED
013360  104113                              ERROR +^D75           ;TO POWER UP CPU
013362  004767  003044                      JSR PC,TERRPC         ;TYPE PC OF ERROR MSG
013366  000426                              BR T27L02             ;RESTORE TRAPS
013370  012737  013432  000024    T27L03:   MOV #T27L05,@#24      ;SET UP TO POWER DOWN AGAIN
013376  005000                              CLR R0
013400  005001                              CLR R1
013402  005200                    T27L06:   INC R0                ;COUNT FOR A TIME
013404  005700                              TST R0                ;GREATER THAN 150 MS
013406  001375                              BNE T27L06
013410  005201                              INC R1
013412  022701  000004                      CMP #4,R1             ;IS TIME > 150 MS?
013416  001371                              BNE T27L06            ;BRANCH IF NO
013420  104111                              ERROR +^D73           ;ERROR: TEST OF POWER DOWN BIT FAILED
013422  104114                              ERROR +^D76           ;TO REPOWER DOWN CPU
013424  004767  003002                      JSR PC,TERRPC         ;TYPE PC OF ERROR MSG
013430  000405                              BR T27L02             ;GO CHECK POWER DOWN BIT
013432  022626                    T27L05:   CMP (SP)+,(SP)+       ;RESTORE STACK
013434  012737  013444  000024              MOV #T27L02,@#24      ;SET UP TO POWER UP AGAIN
013442  000001                              WAIT                  ;WAIT TO POWER UP AGAIN
013444  032777  000020  167054    T27L02:   BIT #20,@BECR2        ;WAS POWER DOWN BIT SET?
013452  001004                              BNE T27L07            ;BRANCH IF YES
013454  104111                              ERROR +^D73           ;ERROR: TEST OF POWER DOWN BIT FAILED
013456  104115                              ERROR +^D77           ;TO SET BIT 4 OF BECR2
013460  004767  002746                      JSR PC,TERRPC         ;TYPE PC OF ERROR MSG
013464  012637  000026            T27L07:   MOV (SP)+,@#26        ;RESTORE POWER FAIL VECTOR
013470  012637  000024                      MOV (SP)+,@#24
013474  005077  167026                      CLR @BECR2            ;CLEAR POWER DOWN BIT

                                  ;;*****************************************************************
                                  ;*TEST 35        TEST DCLO CLRS BECC,BEBA,BECR2,0,6,7,15
                                  ;*
                                  ;*THIS TEST IS ONLY DONE IF SW4=1.
                                  ;* TEST DCLO CLRS BECC,BEBA,BECR2,& BITS,0-6,7-15,OF BECR1
                                  ;;*****************************************************************
013500  000004                    TST35:    SCOPE
013502  012767  000001  165524              MOV     #1,$TIMES     ;;DO 1 ITERATION
013510  032777  000020  165454              BIT #20,@SWR          ;SEE IF POWER DOWN TO BE TESTED
013516  001002                              BNE T28L10            ;BRANCH IF SW4=1
013520  000167  000410                      JMP TSTB              ;GO TO NEXT TEST
013524  012777  177777  166766    T28L10:   MOV #177777,@BECC     ;HAVE UBE DO 1 CYCLE
013532  012777  000003  166766              MOV #3,@BECR2         ;SET ADDRESS BITS 16, 17
013540  012777  160000  166754              MOV #160000,@BEBA     ;LOAD UBE WITH ADDRESS THAT RETURNS NO SSYN
013546  004767  002524                      JSR PC,DINT           ;DISREGARD INTERRUPTS
013552  012777  002041  166744              MOV #2041,@BECR1      ;HAVE UBE DO DATI SO CCOVF=1 AND NSSYN ERROR = 1
013560  005037  177776                      CLR @#PSW             ;ALLOW INTERRUPTS
013564  000001                              WAIT                  ;WAIT TILL ERROR INTERRUPT
013566  013746  000024                      MOV @#24,-(SP)        ;STORE POWER VECTOR ON STACK
013572  013746  000026                      MOV @#26,-(SP)        ;STORE POWER VECTOR ON STACK
013576  012777  177777  166716              MOV #177777,@BEBA     ;LOAD ADDRESS REG WITH ALL "1"
013604  012777  177777  166706              MOV #177777,@BECC     ;LOAD CYCLE COUNT REG WITH ALL "1"
013612  012777  077776  166704              MOV #77776,@BECR1     ;LOAD BECR1 WITH ONES
013620  012737  013636  000024              MOV #T28L01,@#24      ;SET UP FOR POWER DOWN
013626  012777  040037  166672              MOV #40037,@BECR2     ;LOAD BECR2 WITH ONES AND DO POWER DOWN
013634  000001                              WAIT                  ;CPU SHOULD POWER DOWN
013636  022626                    T28L01:   CMP (SP)+,(SP)+       ;RESTORE STACK
013640  012737  013650  000024              MOV #T28L05,@#24      ;SETUP FOR POWER UP
```

```
013646  000001                                   WAIT                   ;CPU SHOULD POWER UP
013650  042777  000020  166650  T28L05: BIC #20,@BECR2           ;CLEAR POWER DOWN BIT
013656  016767  166636  165330          MOV BECC,$REG0           ;SAVE BECC ADDRESS
013664  005067  165330                  CLR $REG2                ;SAVE CORRECT DATA
013670  005777  166624                  TST @BECC                ;(BECC)=0?
013674  001026                          BNE T28L02               ;BRANCH IF NO
013676  016767  166620  165310          MOV BEBA,$REG0           ;SAVE BEBA ADDRESS
013704  005777  166612                  TST @BEBA                ;(BEBA)=0?
013710  001020                          BNE T28L02               ;BRANCH IF NO
013712  016767  166610  165274          MOV BECR2,$REG0          ;SAVE BECR2 ADDRESS
013720  005777  166602                  TST @BECR2               ;WAS BECR2 CLEARED?
013724  001012                          BNE T28L02               ;BRANCH IF NO
013726  016767  166572  165260          MOV BECR1,$REG0          ;SAVE BECR1 ADDRESS
013734  012767  000200  165256          MOV #200,$REG2           ;SAVE CORRECT DATA (BECR1)
013742  022777  000200  166554          CMP #200,@BECR1          ;WAS BECR1 CLEARED?
013750  001407                          BEQ T28L03               ;BRANCH IF YES
013752  017767  165236  165236  T28L02: MOV @$REG0,$REG1         ;SAVE BAD DATA
013760  104116                          ERROR +^D78              ;ERROR: DCLO FAILED TO CLEAR REG
013762  004767  002444                  JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
013766  000454                          BR T28L04                ;GO RESTORE VECTORS
013770  012737  000340  177776  T28L03: MOV #340,@#PSW           ;LOCK OUT INTERRUPTS
013776  012777  040000  166522          MOV #40000,@BECR2        ;SET TIME DLY BIT
014004  012777  006003  166512          MOV #6003,@BECR1         ;DO RELEASE BUSS IMMED. TO SET LATENCY ERROR BIT
014012  032777  000100  166506  T28L06: BIT #100,@BECR2          ;TEST LATENCY ERROR BIT
014020  001774                          BEQ T28L06               ;WAIT TILL IT SETS
014022  005037  177776                  CLR @#PSW                ;ALLOW LATENCY ERROR INTERRUPT
014026  000240                          NOP                      ;ALLOW INTERRUPT TO BE IGNORED
014030  012737  014046  000024          MOV #T28L08,@#24         ;SET UP FOR POWER DOWN
014036  052777  000020  166462          BIS #20,@BECR2           ;SET POWER DOWN BIT
014044  000001                          WAIT                     ;WAIT FOR POWER DOWN
014046  022626                  T28L08: CMP (SP)+,(SP)+          ;RESTORE STACK
014050  012737  014060  000024          MOV #T28L09,@#24         ;SETUP FOR POWER UP
014056  000001                          WAIT                     ;CPU SHOULD POWER UP
014060  005077  166442          T28L09: CLR @BECR2               ;CLEAR POWER DOWN BIT
014064  005777  166436                  TST @BECR2               ;WAS BUSS LATENCY ERROR BIT CLEARED?
014070  001413                          BEQ T28L04               ;BRANCH IF YES
014072  016767  166430  165114          MOV BECR2,$REG0          ;SAVE REG ADDRESS
014100  017767  166422  165110          MOV @BECR2,$REG1         ;SAVE REG DATA
014106  005067  165106                  CLR $REG2                ;SAVE CORRECT DATA
014112  104116                          ERROR +^D78              ;ERROR: DCLO FAILED TO CLEAR REG
014114  004767  002312                  JSR PC,TERRPC            ;TYPE PC OF ERROR MSG
014120  004767  002100          T28L04: JSR PC,RCATCH            ;RESTORE TRAP CATCHER
014124  012637  000026                  MOV (SP)+,@#26           ;RESTORE POWER VECTOR
014130  012637  000024                  MOV (SP)+,@#24           ;RESTORE POWER VECTOR

014134                          TST8:


                                ;;***********************************************************
                                ;*TEST 36        TEST SIMULTANEOUS GO ADDRESS
                                ;*
                                ;*THE UBE IS SETUP TO INTERRUPT ON LEVEL 7 AND
                                ;*THEN TOLD TO GO VIA THE SIMULTANEOUS GO.  NO
                                ;*INTERRUPT INDICATES AN ERROR.
                                ;;***********************************************************
014134  000004                  TST36:  SCOPE
014136  012706  001100                  MOV #STACK,SP            ;RESTORE STACK
014142  012737  000340  177776          MOV #340,@#PSW           ;LOCK OUT INTERRUPTS
```

```
  2007 014150  004767  002016                JSR PC,CLRREG          ;CLEAR ALL UBE REGS.
  2008 014154  012777  014212  166350        MOV #T09L01,@INTVEC    ;SETUP TO RECEIVE INTERRUPT
  2009 014162  012777  000020  166334        MOV #20,@BECR1         ;SETUP TO DO BR=7
  2010 014170  005277  166340                INC @BEGO              ;START SIMULTANEOUS GO
  2011 014174  012737  000300  177776        MOV #300,@#PSW         ;ALLOW INTERRUPTS
  2012 014202  000240                        NOP                    ;UBE SHOULD INTERRUPT HERE
  2013 014204  104025                        ERROR +^D21            ;ERROR: SIMULTANEOUS GO FAILED
  2014 014206  004767  002220                JSR PC,TERRPC          ;TYPE PC OF ERROR MSG
  2015 014212  004767  002006       T09L01:  JSR PC,RCATCH          ;RESTORE TRAP CATCHER
  2016
  2017
  2029                                    ;;*************************************************************
                                          ;*TEST 37        DYNAMIC TEST OF UBE
                                          ;*
                                          ;*THIS TEST EXERCISES THE MOST HARDWARE IN THE
                                          ;*UBE AT ONE TIME.  THE EXERCISOR IS SET UP TO DO EIGHT
                                          ;*DATOB ON DATIP XFERS VIA NPR AND INTERRUPT ON DONE.
                                          ;*AFTER INTERRUPTING, A BUFFER AREA IS EXAMINED TO SEE IF
                                          ;*THE OPERATIONS WERE DONE PROPERLY.  THE ABOVE IS THEN
                                          ;*REPEATED 100 TIMES.
                                          ;;*************************************************************
       014216  000004                     TST37:  SCOPE
       014220  012767  000001  165006             MOV     #1,$TIMES       ;;DO 1 ITERATION
```

```
014226  004767  001740                   JSR PC,CLRREG           ;CLEAR UBE REG
014232  005002                           CLR R2                  ;INITIALIZE COUNT
014234  005037  177776                   CLR @#PSW               ;ALLOW INTERRUPTS
014240  012700  030062          T29L04:  MOV #BUFF1,R0           ;GET BUFFER ADDRESS
014244  012720  052525          T29L01:  MOV #52525,(R0)+        ;LOAD BUFFER
014250  020027  030104                   CMP R0,#BUFF1+22        ;ENTIRE BUFFER LOADED?
014254  001373                           BNE T29L01              ;BRANCH IF NO
014256  012777  014336  166246           MOV #T29L02,@INTVEC     ;SET UP FOR INTERRUPTS
014264  012777  030062  166230           MOV #BUFF1,@BEBA        ;LOAD BUFF ADDRESS IN UBE
014272  012777  177760  166220           MOV #177760,@BECC       ;SET UBE TO DO 16 CYCLES
014300  012777  042561  166216           MOV #42561,@BECR1       ;DO DATOB ON DATIP, AND INT. VIA BR7 WHEN DONE
014306  005000                           CLR R0                  ;INITIALIZE COUNTER
014310  016767  013566  013564  T29L06:  MOV BUFF1+20,BUFF1+20   ;DO BACKGROUND NOISE PATTERN
014316  005200                           INC R0                  ;WAIT FOR COUNTER R0
014320  005700                           TST R0                  ;TO OVERFLOW. IF DOES
014322  001372                           BNE T29L06              ;UBE FAILED TO INTERRUPT
014324  104120                           ERROR +^D80             ;ERROR: DYNAMIC TEST OF UBE FAILED
014326  104072                           ERROR +^D58             ;TO INTERRUPT CPU
014330  004767  002076                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
014334  000432                           BR T29L07               ;GO RESTORE TRAPS CATCHER
014336  022626                  T29L02:  CMP (SP)+,(SP)+         ;RESTORE STACK
014340  012700  030062                   MOV #BUFF1,R0           ;GET BUFFER ADDRESS
014344  022710  125652          T29L05:  CMP #125652,(R0)        ;WAS DATA SHIFTED PROPERLY?
014350  001011                           BNE T29L03              ;BRANCH TO ERROR IF NO
014352  005720                           TST (R0)+               ;INC R0 BY 2
014354  022700  030102                   CMP #BUFF1+20,R0        ;AT END OF BUFFER?
014360  001371                           BNE T29L05              ;BRANCH IF NO
014362  005202                           INC R2                  ;UPDATE COUNT
014364  020227  000100                   CMP R2,#100             ;WAS UBE EXERCISED 100 TIMES?
014370  001323                           BNE T29L04              ;BRANCH IF NO
014372  000413                           BR      T29L07          ;RESTORE TRAPS
014374  010067  164614          T29L03:  MOV R0,$REG0            ;SAVE ADDRESS
014400  011067  164612                   MOV (R0),$REG1          ;SAVE BAD DATA
014404  012767  125652  164606           MOV #125652,$REG2       ;SAVE CORRECT DATA
014412  104120                           ERROR +^D80             ;ERROR: DYNAMIC TEST OF UBE FAILED
014414  104121                           ERROR +^D81             ;TO LOAD PROPER DATA
014416  004767  002010                   JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
014422  004767  001576          T29L07:  JSR PC,RCATCH           ;RESTORE TRAP CATCHER

                                ;//////////////////////////////////////////////////////////////////////
                                ;RETURN ROUTINE TO TEST NEXT UBE BEFORE DO LAST TEST
                                ;//////////////////////////////////////////////////////////////////////
014426  000004                           SCOPE                   ;SCOPE FOR PREVIOUS TEST
014430  004767  001536          NUBE:    JSR PC,CLRREG           ;CLEAR UBE SO NO INT.
014434  000167  166736          NUBE1:   JMP ACALC               ;GO SEE IF MORE UBE

014440  012767  014462  164472  LAST:    MOV #LAST1,$LPADR       ;SETUP LOOP ADDRESS FOR LAST TEST
014446  012767  014462  164466           MOV #LAST1,$LPERR       ;SETUP LOOP ON ERROR ADDRESS FOR LAST TEST
014454  105367  164454                   DECB $TSTNM             ;ADJUST TEST NUMBER




                                ;;*****************************************************************
                                ;*TEST 40        TEST PASSING OF GRANTS
                                ;*
                                ;*THIS TEST IS ONLY RUN IF THERE ARE MORE THAN ONE
                                ;*UBE.IT IS COMPOSED OF TWO PARTS.THE FIRST PART CHECKS THAT
```

```
                                        ;*A HIGHER ELECTRICAL PRIORITY UBE WITH ALL BR LEVELS -1
                                        ;*AND GO BIT =0 WILL PASS A GRANT TO THE NEXT LOWER ONE.
                                        ;*THEN THIS SAME UBE IS CHECKED TO ALSO PASS A GRANT WHEN ALL BR-0
                                        ;*AND THE GO BIT IS ENABLED.
                                        ;*      THE SECOND PART VERIFIES THAT A UBE WITH A HIGHER ELECTRICAL PRIORITY
                                        ;*BUT DOING A LOWER BR THAN A UBE OF LOWER ELECTRICAL
                                        ;*PRIORITY, WILL PASS THE GRANT TO THE UBE OF LOWER ELECTRICAL
                                        ;*PRIORITY.
                                        ;*
                                        ;*NOTE:  THE UBE WITH THE LOWEST ELECTRICAL PRIORITY
                                        ;*       ON THE BUS MUST BE SWAPPED WITH A HIGHER
                                        ;*       ONE AND THEN THE ENTIRE PROGRAM RERUN INORDER
                                        ;*       THAT ITS PASSING GRANT LOGIC IS TESTED.
                                        ;;**************************************************************
014460  000004                          TST40:  SCOPE
014462  005767  166066                  LAST1:  TST BE2BD               ;IS THERE MORE THAN ONE EXERCISOR?
014466  001013                                  BNE T30L01              ;BRANCH IF YES
014470  032777  010000  164474                  BIT #SW12,@SWR          ;INHIBIT TYPEOUTS?
014476  001005                                  BNE 1$                  ;BRANCH IF YES
014500  104401  027356                          TYPE ,MSG11             ;PASSING OF GRANTS NOT TESTED WITH 1 EXERCISOR
014504  012767  000001  164522                  MOV #1,$TIMES           ;DO 1 ITERATION IF THIS TEST NOT DONE
014512  000167  001332                  1$:     JMP $EOP                ;GO TO END OF TEST

                                        ;DETERMINE ELECTRICAL PRIORITY OF EXERCISORS

014516  012706  001100                  T30L01: MOV #STACK,SP           ;INITIALIZE STACK
014522  012777  014730  166022                  MOV #T30L02,@BE1VEC     ;SET UP UBE1 INTERRUPT HANDLER
014530  016700  166016                          MOV BE1VEC,R0
014534  012760  000340  000002                  MOV #340,2(R0)
014542  012777  014744  166020                  MOV #T30L03,@BE2VEC     ;SET UP UBE2 INTERRUPT HANDLER
014550  016700  166014                          MOV BE2VEC,R0
014554  012760  000340  000002                  MOV #340,2(R0)
014562  005767  166020                          TST BE3VEC              ;ARE THERE 3 UBE?
014566  001423                                  BEQ T30L21              ;BRANCH IF NO
014570  012777  014760  166010                  MOV #T30L04,@BE3VEC     ;SET UP UBE3 INTERRUPT HANDLER
014576  016700  166004                          MOV BE3VEC,R0
014602  012760  000340  000002                  MOV #340,2(R0)
014610  005767  166010                          TST BE4VEC              ;ARE THERE 4 UBE?
014614  001410                                  BEQ T30L21              ;BRANCH IF NO
014616  012777  014774  166000                  MOV #T30L05,@BE4VEC     ;SET UP UBE4 INTERRUPT HANDLER
014624  016700  165774                          MOV BE4VEC,R0
014630  012760  000340  000002                  MOV #340,2(R0)
014636  012700  030062                  T30L21: MOV #BUFF1,R0           ;GET BUFFER ADDRESS
014642  005001                                  CLR R1                  ;INITIALIZE COUNT OF INTERRUPTS
014644  012737  000340  177776                  MOV #340,@#PSW          ;SET PSW PRIORITY=7
014652  012777  000020  165664                  MOV #20,@BE1CR1         ;LOAD FIRST UBE TO DO INT. VIA BR7
014660  012777  000020  165674                  MOV #20,@BE2CR1         ;LOAD SECOND UBE TO DO INT. VIA BR7
014666  005767  165706                          TST BE3CR1              ;TEST IF 3 EXERCISORS
014672  001411                                  BEQ T30L07              ;BRANCH IF NO
014674  012777  000020  165676                  MOV #20,@BE3CR1         ;LOAD THIRD UBE TO DO INT. VIA BR7
014702  005767  165710                          TST BE4CR1              ;TEST IF 4 EXERCISORS
014706  001403                                  BEQ T30L07              ;BRANCH IF NO
014710  012777  000020  165700                  MOV #20,@BE4CR1         ;LOAD FOURTH UBE TO DO INT. VIA BR7
014716  005277  165612                  T30L07: INC @BEGO               ;LET ALL EXERCISORS INTERRUPT
014722  005037  177776                          CLR @#PSW               ;ALLOW INTERRUPTS
014726  000001                                  WAIT                    ;WAIT FOR 1ST INTERRUPT
014730  012720  002536                  T30L02: MOV #BE1BD,(R0)+        ;LOAD BUFFER WITH POINTER TO ADDRESS OF UBE
```

```
014734  012777  006002  165602          MOV #6002,@BE1CR1       ;SETUP FIRST UBE TO DO A FUN 3
014742  000421                          BR T30L06               ;GO SEE IF ALL UBE INTERRUPTED
014744  012720  002554         T30L03:  MOV #BE2BD,(R0)+        ;LOAD BUFFER WITH POINTER TO UBE ADDRESSES
014750  012777  006002  165604          MOV #6002,@BE2CR1       ;SETUP SECOND UBE TO DO A FUN3
014756  000413                          BR T30L06               ;GO SEE IF ALL UBE INTERRUPED
014760  012720  002572         T30L04:  MOV #BE3BD,(R0)+        ;LOAD BUFFER WITH POINTER TO UBE ADDRESS
014764  012777  006002  165606          MOV #6002,@BE3CR1       ;SETUP THIRD UBE TO DO A FUN3
014772  000405                          BR T30L06               ;GO SEE IF ALL UBE INTERRUPTED
014774  012720  002610         T30L05:  MOV #BE4BD,(R0)+        ;LOAD BUFFER WITH POINTER TO UBE ADDRESS
015000  012777  006002  165610          MOV #6002,@BE4CR1       ;SETUP FOURTH UBE TO DO A FUN3
015006  022626                 T30L06:  CMP (SP)+,(SP)+         ;RESTORE STACK
015010  005201                          INC R1                  ;COUNT INTERRUPTS
015012  020167  165610                  CMP R1,UCNT             ;HAVE ALL EXERCISORS INTERRUPTED?
015016  001403                          BEQ T30L22              ;BRANCH IF YES
015020  005037  177776                  CLR @#PSW               ;ALLOW NEXT UBE TO INTERRUPT
015024  000001                          WAIT                    ;WAIT FOR INTERRUPT
015026  024040                 T30L22:  CMP -(R0),-(R0)         ;DECREMENT R0 BY 4
015030  011067  013036                  MOV (R0),BUFF1+10       ;PUT NEXT TO LOWEST PRIORITY POINTER IN BUFF1+10

                               ;BUFFER NOW CONTAINS VECTORS IN ORDER OF ELECTRICAL PRIORITY

                               ;PART 1

015034  016700  165566                  MOV UCNT,R0             ;GET COUNT OF UBE
015040  005300                          DEC R0                  ;ADJUST COUNT
015042  005001                          CLR R1                  ;CLEAR INDEX REG
015044  016102  030062         T30L28:  MOV BUFF1(R1),R2        ;GET PTER TO ADDRESS OF HIGHER PRIORITY UBE
015050  012772  000036  000006          MOV #36,@6(R2)          ;SET ALL BR =1 IN THIS UBE
015056  005721                          TST (R1)+               ;UPDATE INDEX
015060  016103  030062                  MOV BUFF1(R1),R3        ;GET PTER TO ADDRESS OF NEXT LOWER PRIORITY UBE
015064  012773  015202  000014          MOV #T30L25,@14(R3)     ;SET UP FOR INT.
015072  012773  000002  000006 T30L30:  MOV #2,@6(R3)           ;SETUP LOWER PRIORITY UBE FOR BR4
015100  005273  000006         T30L26:  INC @6(R3)              ;HAVE UBE INT.
015104  005037  177776                  CLR @#PSW               ;ALLOW INT.
015110  000240                          NOP                     ;SHOULD INT. HERE
015112  012737  000340  177776          MOV #340,@#PSW          ;LOCK OUT INT.
015120  104122                 T30L29:  ERROR +^D82             ;ERROR:TEST OF PASSING GRANTS FAILED
015122  032777  020000  164042          BIT #SW13,@SWR          ;INHIBIT ERROR TYPEOUTS?
015130  001022                          BNE 1$                  ;BRANCH IF YES
015132  016367  000014  164054          MOV 14(R3),$REG0        ;SAVE INT. VECTOR
015140  104401  027230                  TYPE ,MSG7              ;UBE WITH INT. VECTOR:
015144  016746  164044                  MOV     $REG0,-(SP)     ;;SAVE $REG0 FOR TYPEOUT
015150  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
015152  017367  000006  164036          MOV @6(R3),$REG1        ;SAVE (BECR1)
015160  104401  026207                  TYPE ,DH65              ;WITH BECR1=
015164  016746  164026                  MOV     $REG1,-(SP)     ;;SAVE $REG1 FOR TYPEOUT
015170  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
015172  104401  027323                  TYPE ,MSG10             ;SHOULD HAVE INT.
015176  000167  000474         1$:      JMP T30L12              ;GO TO END OF TEST
015202  006373  000006         T30L25:  ASL @6(R3)              ;DO NEXT BR LEVEL
015206  042773  000400  000006          BIC #400,@6(R3)         ;CLEAR SHIFTED RDY BIT
015214  032773  000040  000006          BIT #40,@6(R3)          ;ALL BR TESTED?
015222  001726                          BEQ T30L26              ;BRANCH IF NO

015224  012773  015250  000014          MOV #T30L27,@14(R3)     ;SETUP FOR INT.
015232  012772  015120  000014          MOV #T30L29,@14(R2)     ;SETUP FOR ERROR INT.
015240  012772  000001  000006          MOV #1,@6(R2)           ;HAVE HIGHER UBE TRY TO INT.
```

```
015246  000711                           BR T30L30             ;LET LOWER UBE INT.

015250  006373  000006          T30L27:  ASL @6(R3)            ;DO NEXT LEVEL BR
015254  042773  000400  000006           BIC #400,@6(R3)       ;CLEAR SHIFTED RDY
015262  032773  000040  000006           BIT #40,@6(R3)        ;ALL BR TESTED?
015270  001703                           BEQ T30L26            ;BRANCH IF NO
015272  012772  006003  000006           MOV #6003,@6(R2)      ;HAVE HIGHER UBE DO FUN3
015300  005037  177776                   CLR @#PSW             ;ALLOW REQUESTS
015304  105772  000006          1$:      TSTB @6(R2)           ;IS UBE DONE?
015310  100375                           BPL 1$                ;BRANCH IF NO
015312  012737  000340  177776           MOV #340,@#PSW        ;SET LEVEL =7
015320  005300                           DEC R0                ;ADJUST UBE COUNT
015322  005700                           TST R0                ;ALL UBE TESTED?
015324  001247                           BNE T30L28            ;BRANCH IF NO

                                ;PART 2

015326  012700  000510                   MOV #510,R0           ;GET FIRST POSSIBLE VECTOR AREA
015332  012720  015506          T30L09:  MOV #T30L08,(R0)+     ;SET UP VECTOR AREA TO HANDLE DOUBLE INTERRUPTS
015336  012720  000340                   MOV #340,(R0)+        ;SET PRIORITY = 7
015342  022700  001000                   CMP #1000,R0          ;AT END OF AREA?
015346  001371                           BNE T30L09            ;BRANCH IF NO
015350  016700  012506                   MOV BUFF1,R0          ;GET HIGHEST PRIORITY UBE ADDRESS POINTER
015354  016701  012504                   MOV BUFF1+2,R1        ;GET NEXT PRIORITY UBE ADDRESS POINTER
015360  012770  000002  000006  T30L14:  MOV #2,@6(R0)         ;HAVE HIGHER PRIORITY UBE DO BR4
015366  012771  000004  000006           MOV #4,@6(R1)         ;HAVE NEXT LOWER ELEC. PRIORITY UBE DO BR5
015374  012770  015506  000014           MOV #T30L08,@14(R0)   ;SET UP HIGHER PRIORITY UBE VECTOR FOR DOUBLE INT.
015402  012771  015422  000014           MOV #T30L10,@14(R1)   ;SET UP FOR INTERRUPT FROM NEXT LOWER ELEC. PRIORITY UBE
015410  005277  165120          T30L11:  INC @BEGO             ;START INTERRUPT
015414  005037  177776                   CLR @#PSW             ;ALLOW INTERRUPTS
015420  000001                           WAIT
015422  022626                  T30L10:  CMP (SP)+,(SP)+       ;RESTORE STACK
015424  006371  000006                   ASL @6(R1)            ;HAVE NEXT PRIORITY UBE INT. ONE LEVEL HIGHER
015430  042771  000400  000006           BIC #400,@6(R1)       ;CLEAR SHIFTED RDY
015436  032771  000040  000006           BIT #40,@6(R1)        ;TESTED ALL BR LEVELS?
015444  001761                           BEQ T30L11            ;BRANCH IF NO
015446  020067  012420                   CMP R0,BUFF1+10       ;TESTED ALL UBE POSSIBLE?
015452  001511                           BEQ T30L12            ;BRANCH IF YES TO CLEAR BECR1 AND RESTORE TRAPS
015454  020067  012402                   CMP R0,BUFF1          ;JUST TESTED FIRST UBE?
015460  001005                           BNE T30L13            ;BRANCH IF NO
015462  016700  012376                   MOV BUFF1+2,R0        ;TEST SECOND HIGHEST PRIORITY UBE
015466  016701  012374                   MOV BUFF1+4,R1        ;GET THIRD HIGHEST PRIORITY UBE
015472  000732                           BR T30L14             ;GO TEST SECOND HIGHEST PRIORITY UBE
015474  016700  012366          T30L13:  MOV BUFF1+4,R0        ;TEST THIRD HIGHEST PRIORITY UBE
015500  016701  012364                   MOV BUFF1+6,R1        ;GET FOURTH HIGHEST PRIORITY UBE
015504  000725                           BR T30L14             ;GO TEST THIRD HIGH PRIORITY UBE
015506  022626                  T30L08:  CMP (SP)+,(SP)+       ;RESTORE STACK
015510  016067  000014  163476           MOV 14(R0),$REG0      ;SAVE INTERRUPT VECTOR OF BAD UBE
015516  012767  000004  163472           MOV #4,$REG1          ;SAVE BAD BR LEVEL
015524  016167  000014  163466           MOV 14(R1),$REG2      ;SAVE NEXT HIGHER PRIORITY UBE VECTOR
015532  032771  000004  000006           BIT #4,@6(R1)         ;WAS BR=5?
015540  001404                           BEQ T30L15            ;BRANCH IF NO
015542  012767  000005  163452           MOV #5,$REG3          ;BR=5
015550  000413                           BR T30L17             ;GO INDICATE ERROR
015552  032771  000010  000006  T30L15:  BIT #10,@6(R1)        ;WAS BR=6?
015560  001404                           BEQ T30L16            ;BRANCH IF NO
015562  012767  000006  163432           MOV #6,$REG3          ;INDICATE BR-6
```

```
015570  000403                              BR T30L17               ;GO INDICATE ERROR
015572  012767  000007  163422   T30L16:    MOV #7,$REG3            ;INDICATE BR=7
015600  104122                   T30L17:    ERROR +^D82             ;ERROR: TEST OF PASSING GRANTS FAILED
015602  032777  020000  163362              BIT #SW13,@SWR          ;INHIBIT ERROR TYPEOUTS?
015610  001032                              BNE T30L12              ;BRANCH IF YES
015612  104401  027230                      TYPE ,MSG7              ;TYPE FAILING UBE VECTOR
015616  016746  163372                      MOV     $REG0,-(SP)     ;;SAVE $REG0 FOR TYPEOUT
015622  104402                              TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
015624  104401  027252                      TYPE ,MSG8              ;TYPE FAILING UBE BR LEVEL
015630  016746  163362                      MOV     $REG1,-(SP)     ;;SAVE $REG1 FOR TYPEOUT
015634  104402                              TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
015636  104401  027267                      TYPE ,MSG9
015642  104401  027230                      TYPE ,MSG7              ;TYPE UBE USED TO TEST FAILING ONE
015646  016746  163346                      MOV     $REG2,-(SP)     ;;SAVE $REG2 FOR TYPEOUT
015652  104402                              TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
015654  104401  027252                      TYPE ,MSG8              ;TYPE BR LEVEL TESTING
015660  016746  163336                      MOV     $REG3,-(SP)     ;;SAVE $REG3 FOR TYPEOUT
015664  104402                              TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
015666  104401  027323                      TYPE ,MSG10
015672  004767  000534                      JSR PC,TERRPC           ;TYPE PC OF ERROR MSG
015676  012777  006003  164640   T30L12:    MOV #6003,@BE1CR1       ;SETUP UBE TO DO A FUN3
015704  012777  006003  164650              MOV #6003,@BE2CR1       ;SETUP UBE TO DO A FUN3
015712  005767  164662                      TST BE3CR1              ;ARE THERE 3 UBE?
015716  001411                              BEQ 1$                  ;BRANCH IF NO
015720  012777  006003  164652              MOV #6003,@BE3CR1       ;SETUP UBE TO DO A FUN3
015726  005767  164664                      TST BE4CR1              ;ARE THERE 4 UBE?
015732  001403                              BEQ 1$                  ;BRANCH IF NO
015734  012777  006003  164654              MOV #6003,@BE4CR1       ;SETUP UBE TO DO A FUN3
015742  005037  177776           1$:        CLR @#PSW               ;ALLOW ALL UBE TO DO FUN3
015746  105777  164572           2$:        TSTB @BE1CR1            ;FIRST UBE DONE?
015752  100375                              BPL 2$                  ;BRANCH IF NO
015754  105777  164602           3$:        TSTB  @BE2CR1           ;SECOND UBE DONE?
015760  100375                              BPL 3$                  ;BRANCH IF NO
015762  005767  164612                      TST BE3CR1              ;ARE THERE THREE UBE?
015766  001411                              BEQ 6$                  ;BRANCH IF NO
015770  105777  164604           4$:        TSTB @BE3CR1            ;THIRD UBE DONE?
015774  100375                              BPL 4$                  ;BRANCH IF NO
015776  005767  164614                      TST BE4CR1              ;ARE THERE 4 UBE?
016002  001403                              BEQ 6$                  ;BRANCH IF NO
016004  105777  164606           5$:        TSTB @BE4CR1            ;FOURTH UBE DONE?
016010  100375                              BPL 5$                  ;BRANCH IF NO

                                 ;RESTORE TRAP CATCHER

016012  012700  000510           6$:        MOV #510,R0             ;GET FIRST VECTOR ADDRESS
016016  012701  000512                      MOV #512,R1
016022  010120                   T30L20:    MOV R1,(R0)+            ;PUT ADDRESS OF NEXT LOC IN THIS ONE
016024  005020                              CLR (R0)+               ;PUT HALT IN NEXT LOCATION
016026  022121                              CMP (R1)+,(R1)+         ;INC R1 BY 4
016030  020027  001000                      CMP R0,#1000            ;AT END OF VECTOR AREA?
016034  001372                              BNE T30L20              ;BRANCH IF NO
016036  005767  163070                      TST $PASS               ;FIRST PASS OF PROGRAM?
016042  001002                              BNE $EOP                ;BRANCH IF NO
016044  104401  020425                      TYPE ,MSG2              ;ALL EXERCISORS TESTED
                                                                    ;NOTE:TO TEST PASSING OF GRANTS FOR
                                                                    ;THE LAST UBE,IT SHOULD BE
                                                                    ;SWAPPED WITH A UBE OF HIGHER
```

```
                                                             ;ELECTRICAL PRIORITY



                                    .SBTTL  END OF PASS ROUTINE

                                    ;;*****************************************************************
                                    ;;*INCREMENT THE PASS NUMBER ($PASS)
                                    ;;*TYPE 'END PASS #XXXXX'' (WHERE XXXXX IS A DECIMAL NUMBER)
                                    ;;*IF THERES A MONITOR GO TO IT
                                    ;;*IF THERE ISN'T JUMP TO START1

 016050                             $EOP:
 016050  000004                             SCOPE
 016052  005067  163056                     CLR     $TSTNM          ;;ZERO THE TEST NUMBER
 016056  005067  163152                     CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
 016062  005267  163044                     INC     $PASS           ;;INCREMENT THE PASS NUMBER
 016066  042767  100000  163036             BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
 016074  005327                             DEC     (PC)+           ;;LOOP?
 016076  000001                     $EOPCT: .WORD   1
 016100  003022                             BGT     $DOAGN          ;;YES
 016102  012737                             MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
 016104  000001                     $ENDCT: .WORD   1
 016106  016076                             $EOPCT
 016110  104401  016155                     TYPE    ,$ENDMG         ;;TYPE ''END PASS #''
 016114  016746  163012                     MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
 016120  104405                             TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
 016122  104401  016152                     TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
 016126  013700  000042             $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
 016132  001405                             BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
 016134  000005                             RESET                   ;;CLEAR THE WORLD
 016136  004710                     $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
 016140  000240                             NOP                     ;;SAVE ROOM
 016142  000240                             NOP                     ;;FOR
 016144  000240                             NOP                     ;;ACT11
 016146                             $DOAGN:
 016146  000137                             JMP     @(PC)+          ;;RETURN
 016150  003100                     $RTNAD: .WORD   START1
 016152     377     377     000     $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
 016155     015     012     105     $ENDMG: .ASCIZ  <15><12>/END PASS #/
 016160     116     104     040
 016163     120     101     123
 016166     123     040     043
 016171     000
                                    ;///////////////////////////////////////////////////////////////////
                                    ;SUBROUTINE TO CLEAR ALL UBE REG
                                    ;///////////////////////////////////////////////////////////////////
 016172  005077  164332             CLRREG: CLR @BERE               ;CLEAR ERROR CONDITIONS
 016176  005077  164324                     CLR @BECR2              ;CLEAR BECR2 REG
 016202  005077  164316                     CLR @BECR1              ;CLEAR BECR1 REG, EXCEPT RDY
 016206  005077  164310                     CLR @BEBA               ;CLEAR BEBA REG
 016212  005077  164302                     CLR @BECC               ;CLEAR BECC REG
 016216  005077  164274                     CLR @BEBD               ;CLEAR BEBD REG
 016222  000207                             RTS PC                  ;RETURN
                                    ;///////////////////////////////////////////////////////////////////
                                    ;SUBROUTINE TO RESTORE TRAP CATCHER TO UBE VECTOR AREA
                                    ;///////////////////////////////////////////////////////////////////
 016224  010546                     RCATCH: MOV R5,-(SP)            ;SAVE R5 ON STACK
```

```
016226  016705  164300                    MOV INTVEC,R5           ;GET INT. VECTOR
016232  005725                            TST(R5)+                ;CALC. INTVEC+2
016234  010577  164272                    MOV R5,@INTVEC          ;PUT INTVEC+2 IN INTVEC
016240  005015                            CLR (R5)                ;PUT HALT IN INTVEC+2
016242  012605                            MOV (SP)+,R5            ;RESTORE R5
016244  000207                            RTS PC



                                 ;//////////////////////////////////////////////////////////////////
                                 ;SUBROUTINE TO CHECK IF RDY BIT SET
                                 ;//////////////////////////////////////////////////////////////////
016246  005004                   CRDY:    CLR R4
016250  005005                            CLR R5
016252  005205                   2$:      INC R5                  ;UPDATE COUNT
016254  105777  164244                    TSTB @BECR1             ;SEE IF RDY SET
016260  100405                            BMI 1$                  ;BRANCH IF SET
016262  032705  000200                    BIT #200,R5             ;WAITED >100 MICROSECS?
016266  001771                            BEQ     2$              ;CONTINUE TO LOOK FOR RDY IF R5 NOT =128
016270  012704  000001                    MOV     #1,R4           ;SET R4=1 TO INDICATE ERROR
016274  000207                   1$:      RTS     PC              ;RETURN

                                 ;//////////////////////////////////////////////////////////////////
                                 ;SUBROUTINE TO DISREGARD UBE INTERRUPTS
                                 ;//////////////////////////////////////////////////////////////////
016276  016705  164230           DINT:    MOV     INTVEC,R5       ;GET INTVEC AND
016302  005725                            TST     (R5)+           ;CALC. INTVEC+2
016304  010577  164222                    MOV R5,@INTVEC          ;PUT ADDRESS OF NEXT LOC IN THIS ONE
016310  012715  000002                    MOV     #2,(R5)         ;PUT AN RTI IN INTVEC+2
016314  000207                            RTS PC
                                 ;//////////////////////////////////////////////////////////////////
                                 ;SUBROUTINE TO RESTORE VECTOR AREA 0-56, 174, AND 176 FROM STACK AREA AND PUT TRAP CATCHER I
                                 ;//////////////////////////////////////////////////////////////////
016316  016705  162702           RVEC:    MOV $TMP0,R5            ;GET AREA WHERE VECTOR STORED
016322  005004                            CLR R4                  ;SET R4 =TO FIRST LOC
016324  014524                   1$:      MOV -(R5),(R4)+         ;RESTORE VECTORS
016326  022704  000060                    CMP #60,R4              ;AT END OF AREA?
016332  001374                            BNE 1$                  ;BRANCH IF NO
016334  014537  000174                    MOV     -(R5),  @#174   ;RESTORE SOFTWARE SWR
016340  014537  000176                    MOV     -(R5),  @#176   ;
016344  012704  000060                    MOV     #60,    R4      ;SET R4 FOR FIRST TRAP CATCHER
016350  012705  000062                    MOV #62,R5              ;SET R5=TO FIRST TRAP CATCHER ADDRESS
016354  010524                   2$:      MOV R5,(R4)+            ;PUT ADDRESS OF NEXT LOC IN THIS ONE
016356  005024                            CLR(R4)+                ;PUT HALT IN NEXT LOC
016360  022525                            CMP (R5)+,(R5)+         ;INC R5 BY 4
016362  022704  000174                    CMP #174,R4             ;AT END OF  VECTOR AREA?
016366  001372                            BNE 2$                  ;BRANCH IF NO
016370  012704  000200                    MOV     #200,   R4      ;AS ABOVE, PUT TRAP CATCHER IN AREA 200-776
016374  012705  000202                    MOV     #202,   R5
016400  010524                   3$:      MOV     R5,     (R4)+
016402  005024                            CLR     (R4)+
016404  022525                            CMP     (R5)+,  (R5)+
016406  022704  001000                    CMP     #1000,  R4
016412  001372                            BNE     3$
016414  012737  000137  000200            MOV #137,@#200          ;RESTORE JMP @#START TO LOC 200
016422  012737  002632  000202            MOV #START,@#202        ;
016430  000207                            RTS PC                  ;RETURN
```

```
                                              ;//////////////////////////////////////////////////////////////////////
                                              ;SUBROUTINE TO TYPE PC OF ERROR MESSAGE
                                              ;//////////////////////////////////////////////////////////////////////
 016432  032777  020000  162532  TERRPC: BIT #SW13,@SWR            ;INHIBITS ERROR TYPOUTS?
 016440  001013                          BNE 1$                    ;BRANCH IF YES
 016442  104401  027703                  TYPE ,MSG15               ;PC OF ERROR MSG WAS:
 016446  016746  162476                  MOV     $ERRPC,-(SP)      ;;SAVE $ERRPC FOR TYPEOUT
 016452  104402                          TYPOC                     ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
 016454  104401  030026                  TYPE    ,MSG17            ;TEST NUMBER WAS:
 016460  016746  162450                  MOV     $TSTNM, -(SP)     ;SAVE $TSTNM FOR TYPEOUT
 016464  104403                          TYPOS                     ;GO TYPE -OCTAL ASCII
 016466     002                          .BYTE   2                 ;TYPE 2 DIGITS
 016467     000                          .BYTE   0                 ;SUPPRESS LEADING ZEROS
 016470  000207                  1$:     RTS PC

                                 .SBTTL  SCOPE HANDLER ROUTINE

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

 016472                          $SCOPE:
 016472  032777  040000  162472  1$:     BIT     #BIT14,@SWR       ;;LOOP ON PPESENT TEST?
 016500  001101                          BNE     $OVER             ;;YES IF SW14=1
                                 ;#####START OF CODE FOR THE XOR TESTER#####
 016502  000416                  $XTSTR: BR      6$                ;;IF RUNNING ON THE ''XOR'' TESTER CHANGE
                                                                   ;;THIS INSTRUCTION TO A ''NOP'' (NOP-240)
 016504  013746  000004                  MOV     @#ERRVEC,-(SP)    ;;SAVE THE CONTENTS OF THE ERROR VECTOR
 016510  012737  016530  000004          MOV     #5$,@#ERRVEC      ;;SET FOR TIMEOUT
 016516  005737  177060                  TST     @#177060          ;;TIME OUT ON XOR?
 016522  012637  000004                  MOV     (SP)+,@#ERRVEC    ;;RESTORE THE ERROR VECTOR
 016526  000453                          BR      $SVLAD            ;;GO TO THE NEXT TEST
 016530  022626                  5$:     CMP     (SP)+,(SP)+       ;;CLEAR THE STACK AFTER A TIME OUT
 016532  012637  000004                  MOV     (SP)+,@#ERRVEC    ;;RESTORE THE ERROR VECTOR
 016536  000413                          BR      7$                ;;LOOP ON THE PRESENT TEST
 016540                          6$:;#####END OF CODE FOR THE XOR TESTER#####
 016540  105767  162371          2$:     TSTB    $ERFLG            ;;HAS AN ERROR OCCURRED?
 016544  001421                          BEQ     3$                ;;BR IF NO
 016546  126767  162375  162361          CMPB    $ERMAX,$ERFLG     ;;MAX. ERRORS FOR THIS TEST OCCURRED?
 016554  101015                          BHI     3$                ;;BR IF NO
 016556  032777  001000  162406          BIT     #BIT09,@SWR       ;;LOOP ON ERROR?
 016564  001404                          BEQ     4$                ;;BR IF NO
 016566  016767  162350  162344  7$:     MOV     $LPERR,$LPADR     ;;SET LOOP ADDRESS TO LAST SCOPE
 016574  000443                          BR      $OVER
 016576  105067  162333          4$:     CLRB    $ERFLG            ;;ZERO THE ERROR FLAG
 016602  005067  162426                  CLR     $TIMES            ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
 016606  000415                          BR      1$                ;;ESCAPE TO THE NEXT TEST
 016610  032777  004000  162354  3$:     BIT     #BIT11,@SWR       ;;INHIBIT ITERATIONS?
 016616  001011                          BNE     1$                ;;BR IF YES
 016620  005767  162306                  TST     $PASS             ;;IF FIRST PASS OF PROGRAM
```

```
        016624  001406                          BEQ     1$                  ;;       INHIBIT ITERATIONS
        016626  005267  162304                  INC     $ICNT               ;;INCREMENT ITERATION COUNT
        016632  026767  162376  162276          CMP     $TIMES,$ICNT        ;;CHECK THE NUMBER OF ITERATIONS MADE
        016640  002021                          BGE     $OVER               ;;BR IF MORE ITERATION REQUIRED
        016642  012767  000001  162266  1$:     MOV     #1,$ICNT            ;;REINITIALIZE THE ITERATION COUNTER
        016650  016767  000044  162356          MOV     $MXCNT,$TIMES       ;;SET NUMBER OF ITERATIONS TO DO
        016656  105267  162252          $SVLAD: INCB    $TSTNM              ;;COUNT TEST NUMBERS
        016662  011667  162252                  MOV     (SP),$LPADR         ;;SAVE SCOPE LOOP ADDRESS
        016666  011667  162250                  MOV     (SP),$LPERR         ;;SAVE ERROR LOOP ADDRESS
        016672  005067  162340                  CLR     $ESCAPE             ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
        016676  112767  000001  162243          MOVB    #1,$ERMAX           ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
        016704  016777  162224  162262  $OVER:  MOV     $TSTNM,@DISPLAY     ;;DISPLAY TEST NUMBER
        016712  016716  162222                  MOV     $LPADR,(SP)         ;;FUDGE RETURN ADDRESS
        016716  000002                          RTI                         ;;FIXES PS
        016720  000012                  $MXCNT: 10.                         ;;MAX. NUMBER OF ITERATIONS
   2399                                 .SBTTL  ERROR HANDLER ROUTINE

                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                        ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                        ;*AND GO TO $ERRTYP ON ERROR
                                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;*SW15=1         HALT ON ERROR
                                        ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                        ;*SW10=1         BELL ON ERROR
                                        ;*SW09=1         LOOP ON ERROR
                                        ;*CALL
                                        ;*       ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER

        016722                          $ERROR:
        016722  105267  162207          7$:     INCB    $ERFLG              ;;SET THE ERROR FLAG
        016726  001775                          BEQ     7$                  ;;DON'T LET THE FLAG GO TO ZERO
        016730  016777  162200  162236          MOV     $TSTNM,@DISPLAY     ;;DISPLAY TEST NUMBER AND ERROR FLAG
        016736  032777  002000  162226          BIT     #BIT10,@SWR         ;;BELL ON ERROR?
        016744  001402                          BEQ     1$                  ;;NO - SKIP
        016746  104401  001240                  TYPE    ,$BELL              ;;RING BELL
        016752  005267  162166          1$:     INC     $ERTTL              ;;COUNT THE NUMBER OF ERRORS
        016756  011667  162166                  MOV     (SP),$ERRPC         ;;GET ADDRESS OF ERROR INSTRUCTION
        016762  162767  000002  162160          SUB     #2,$ERRPC
        016770  117767  162154  162150          MOVB    @$ERRPC,$ITEMB      ;;STRIP AND SAVE THE ERROR ITEM CODE
        016776  032777  020000  162166          BIT     #BIT13,@SWR         ;;SKIP TYPEOUT IF SET
        017004  001004                          BNE     20$                 ;;SKIP TYPEOUTS
        017006  004767  000056                  JSR     PC,$ERRTYP          ;;GO TO USER ERROR ROUTINE
        017012  104401  001245                  TYPE    ,$CRLF
        017016                          20$:
        017016  005777  162150          2$:     TST     @SWR                ;;HALT ON ERROR
        017022  100001                          BPL     3$                  ;;SKIP IF CONTINUE
        017024  000000                          HALT                        ;;HALT ON ERROR!
        017026  032777  001000  162136  3$:     BIT     #BIT09,@SWR         ;;LOOP ON ERROR SWITCH SET?
        017034  001402                          BEQ     4$                  ;;BR IF NO
        017036  016716  162100                  MOV     $LPERR,(SP)         ;;FUDGE RETURN FOR LOOPING
        017042  005767  162170          4$:     TST     $ESCAPE             ;;CHECK FOR AN ESCAPE ADDRESS
        017046  001402                          BEQ     5$                  ;;BR IF NONE
        017050  016716  162162                  MOV     $ESCAPE,(SP)        ;;FUDGE RETURN ADDRESS FOR ESCAPE
        017054                          5$:
        017054  022737  016136  000042          CMP     #$ENDAD,@#42        ;;ACT-11 AUTO-ACCEPT?
        017062  001001                          BNE     6$                  ;;BRANCH IF NO
        017064  000000                          HALT                    ;;YES
        017066                          6$:
        017066  000002                          RTI                     ;;RETURN
                                        .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

        017070                          $ERRTYP:
        017070  104401  001245                  TYPE    ,$CRLF          ;;''CARRIAGE RETURN'' & ''LINE FEED''
        017074  010046                          MOV     R0,-(SP)        ;;SAVE R0
        017076  005000                          CLR     R0              ;;PICKUP THE ITEM INDEX
        017100  153700  001146                  BISB    @#$ITEMB,R0
        017104  001004                          BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                        ;;TYPE THE PC OF THE ERROR
        017106  016746  162036                  MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                                        ;;ERROR ADDRESS
        017112  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
        017114  000425                          BR      6$              ;;GET OUT
        017116  005300                  1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
        017120  006300                          ASL     R0              ;;      WORK FOR THE ERROR TABLE
        017122  006300                          ASL     R0
        017124  006300                          ASL     R0
        017126  062700  001250                  ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
        017132  012067  000004                  MOV     (R0)+,2$        ;;PICKUP ''ERROR MESSAGE'' POINTER
        017136  001404                          BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
        017140  104401                          TYPE                    ;;TYPE THE ''ERROR MESSAGE''
        017142  000000                  2$:     .WORD   0               ;;''ERROR MESSAGE'' POINTER GOES HERE
        017144  104401  001245                  TYPE    ,$CRLF          ;;''CARRIAGE RETURN'' & ''LINE FEED''
        017150  012067  000004          3$:     MOV     (R0)+,4$        ;;PICKUP ''DATA HEADER'' POINTER
        017154  001404                          BEQ     5$              ;;SKIP TYPEOUT IF 0
        017156  104401                          TYPE                    ;;TYPE THE ''DATA HEADER''
        017160  000000                  4$:     .WORD   0               ;;''DATA HEADER'' POINTER GOES HERE
        017162  104401  001245                  TYPE    ,$CRLF          ;;''CARRIAGE RETURN'' & ''LINE FEED''
        017166  011000                  5$:     MOV     (R0),R0         ;;PICKUP ''DATA TABLE'' POINTER
        017170  001004                          BNE     7$              ;;GO TYPE THE DATA
        017172  012600                  6$:     MOV     (SP)+,R0        ;;RESTORE R0
        017174  104401  001245                  TYPE    ,$CRLF          ;;''CARRIAGE RETURN'' & ''LINE FEED''
        017200  000207                          RTS     PC              ;;RETURN
        017202                          7$:
        017202  013046                          MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
        017204  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
        017206  005710                          TST     (R0)            ;;IS THERE ANOTHER NUMBER?
        017210  001770                          BEQ     6$              ;;BR IF NO
        017212  104401  017220                  TYPE    ,8$             ;;TYPE TWO(2) SPACES
        017216  000771                          BR      7$              ;;LOOP
        017220     040     040     000  8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
                                                .EVEN
                                        .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

       017224                           $TYPDS:
       017224  010046                           MOV     R0,-(SP)        ;;PUSH R0 ON STACK
       017226  010146                           MOV     R1,-(SP)        ;;PUSH R1 ON STACK
       017230  010246                           MOV     R2,-(SP)        ;;PUSH R2 ON STACK
       017232  010346                           MOV     R3,-(SP)        ;;PUSH R3 ON STACK
       017234  010546                           MOV     R5,-(SP)        ;;PUSH R5 ON STACK
       017236  012746  020200                   MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
       017242  016605  000020                   MOV     20(SP),R5       ;;GET THE INPUT NUMBER
       017246  100004                           BPL     1$              ;;BR IF INPUT IS POS.
       017250  005405                           NEG     R5              ;;MAKE THE BINARY NUMBER POS.
       017252  112766  000055  000001           MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
       017260  005000                   1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
       017262  012703  017440                   MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
       017266  112723  000040                   MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
       017272  005002                   2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
       017274  016001  017430                   MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
       017300  160105                   3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
       017302  002402                           BLT     4$              ;;BR IF DONE
       017304  005202                           INC     R2              ;;INCREASE THE BCD DIGIT BY 1
       017306  000774                           BR      3$
       017310  060105                   4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
       017312  005702                           TST     R2              ;;CHECK IF BCD DIGIT=0
       017314  001002                           BNE     5$              ;;FALL THROUGH IF 0
       017316  105716                           TSTB    (SP)            ;;STILL DOING LEADING 0'S?
       017320  100407                           BMI     7$              ;;BR IF YES
       017322  106316                   5$:     ASLB    (SP)            ;;MSD?
       017324  103003                           BCC     6$              ;;BR IF NO
       017326  116663  000001  177777           MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
       017334  052702  000060           6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
       017340  052702  000040           7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
       017344  110223                           MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
       017346  005720                           TST     (R0)+           ;;JUST INCREMENTING
       017350  020027  000010                   CMP     R0,#10          ;;CHECK THE TABLE INDEX
       017354  002746                           BLT     2$              ;;GO DO THE NEXT DIGIT
       017356  003002                           BGT     8$              ;;GO TO EXIT
       017360  010502                           MOV     R5,R2           ;;GET THE LSD
       017362  000764                           BR      6$              ;;GO CHANGE TO ASCII
       017364  105726                   8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
       017366  100003                           BPL     9$              ;;BR IF NO
       017370  116663  177777  177776           MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
       017376  105013                   9$:     CLRB    (R3)            ;;SET THE TERMINATOR
       017400  012605                           MOV     (SP)+,R5        ;;POP STACK INTO R5
       017402  012603                           MOV     (SP)+,R3        ;;POP STACK INTO R3
       017404  012602                           MOV     (SP)+,R2        ;;POP STACK INTO R2
       017406  012601                           MOV     (SP)+,R1        ;;POP STACK INTO R1
       017410  012600                           MOV     (SP)+,R0        ;;POP STACK INTO R0
       017412  104401  017440                   TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
       017416  016666  000002  000004           MOV     2(SP),4(SP)     ;;ADJUST THE STACK
       017424  012616                           MOV     (SP)+,(SP)
       017426  000002                           RTI                     ;;RETURN TO USER
       017430  023420                   $DTBL:  10000.
       017432  001750                           1000.
```

```
        017434  000144                          100.
        017436  000012                          10.
        017440                          $DBLK:  .BLKW   4
  2402                                  .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
                                        ;*

        017450  105767  161535          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
        017454  100002                          BPL     1$              ;;BR IF YES
        017456  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
        017460  000407                          BR      3$              ;;LEAVE
        017462  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
        017464  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
        017470  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
        017472  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
        017474  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
        017476  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
        017500  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
        017504  000002                          RTI                     ;;RETURN
        017506  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
        017512  001430                          BEQ     8$
        017514  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
        017520  001006                          BNE     5$
        017522  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
        017524  104401                          TYPE                    ;;TYPE A CR AND LF
        017526  001245                          $CRLF
        017530  105067  000200                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
        017534  000755                          BR      2$              ;;GET NEXT CHARACTER
        017536  004767  000056          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
        017542  126726  161442          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
        017546  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
        017550  016746  161432                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                        ;;AND THE NULL CHAR.
        017554  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
        017560  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
        017562  004767  000032                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
        017566  105367  000142                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
        017572  000770                          BR      7$              ;;LOOP

                                        ;HORIZONTAL TAB PROCESSOR

        017574  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
        017600  004767  000014          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
        017604  132767  000007  000122          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
        017612  001372                          BNE     9$                      ;;TAB STOP
        017614  005726                          TST     (SP)+                   ;;POP SPACE OFF STACK
        017616  000724                          BR      2$                      ;;GET NEXT CHARACTER
        017620  105777  161356          $TYPEC: TSTB    @$TPS                   ;;WAIT UNTIL PRINTER IS READY
        017624  100375                          BPL     $TYPEC
        017626  116677  000002  161350          MOVB    2(SP),@$TPB             ;;LOAD CHAR TO BE TYPED INTO DATA REG.
        017634  105777  161336                  TSTB    @$TKS                   ;;SEE IF KEYBOARD IS TALKING.
        017640  100021                          BPL     2$                      ;;BRANCH IF IT ISN'T.
        017642  017746  161332                  MOV     @$TKB,-(SP)             ;;PUSH CHARACTER ONTO STACK.
        017646  042716  177600                  BIC     #177600,(SP)            ;;BIT CLEAR TOP BYTE AND PARITY BIT.
        017652  022726  000023                  CMP     #23,(SP)+               ;;SEE IF THIS IS A ^S.
        017656  001012                          BNE     2$                      ;;BRANCH TO CONTINUE IF IT ISN'T.
        017660  105777  161312          3$:     TSTB    @$TKS                   ;;WAIT FOR ANOTHER INPUT.
        017664  100375                          BPL     3$                      ;;BRANCH BACK IF NOT READY.
        017666  017746  161306                  MOV     @$TKB,-(SP)             ;;PUSH NEXT CHARACTER ON STACK.
        017672  042716  177600                  BIC     #177600,(SP)            ;;BIT CLEAR TOP BYTE AND PARITY BIT.
        017676  022726  000021                  CMP     #21,(SP)+               ;;SEE IF THIS IS A ^Q.
        017702  001366                          BNE     3$                      ;;BRANCH BACK FOR MORE WAIT IF NOT.
        017704  122766  000015  000002  2$:     CMPB    #CR,2(SP)               ;;IS CHARACTER A CARRIAGE RETURN?
        017712  001003                          BNE     1$                      ;;BRANCH IF NO
        017714  105067  000014                  CLRB    $CHARCNT                ;;YES--CLEAR CHARACTER COUNT
        017720  000406                          BR      $TYPEX                  ;;EXIT
        017722  122766  000012  000002  1$:     CMPB    #LF,2(SP)               ;;IS CHARACTER A LINE FEED?
        017730  001402                          BEQ     $TYPEX                  ;;BRANCH IF YES
        017732  105227                          INCB    (PC)+                   ;;COUNT THE CHARACTER
        017734  000000                  $CHARCNT:.WORD  0                       ;;CHARACTER COUNT STORAGE
        017736  000207                  $TYPEX: RTS     PC

  2403                                  .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

                                        ;;*****************************************************************
                                        ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                        ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                        ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)               ;;NUMBER TO BE TYPED
                                        ;*      TYPOS                           ;;CALL FOR TYPEOUT
                                        ;*      .BYTE   N                       ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                        ;*      .BYTE   M                       ;;M=1 OR 0
                                        ;*                                              ;;1=TYPE LEADING ZEROS
                                        ;*                                              ;;0=SUPPRESS LEADING ZEROS
                                        ;*
                                        ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                        ;*$TYPOS OR $TYPOC
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)               ;;NUMBER TO BE TYPED
                                        ;*      TYPON                           ;;CALL FOR TYPEOUT
                                        ;*
                                        ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)               ;;NUMBER TO BE TYPED
                                        ;*      TYPOC                           ;;CALL FOR TYPEOUT

        017740  017646  000000          $TYPOS: MOV     @(SP),-(SP)             ;;PICKUP THE MODE
        017744  116667  000001  000211          MOVB    1(SP),$OFILL            ;;LOAD ZERO FILL SWITCH
        017752  112667  000207                  MOVB    (SP)+,$OMODE+1          ;;NUMBER OF DIGITS TO TYPE
        017756  062716  000002                  ADD     #2,(SP)                 ;;ADJUST RETURN ADDRESS
        017762  000406                            BR      $TYPON
        017764  112767  000001  000171  $TYPOC: MOVB    #1,$OFILL        ;;SET THE ZERO FILL SWITCH
        017772  112767  000006  000165          MOVB    #6,$OMODE+1      ;;SET FOR SIX(6) DIGITS
        020000  112767  000005  000154  $TYPON: MOVB    #5,$OCNT         ;;SET THE ITERATION COUNT
        020006  010346                          MOV     R3,-(SP)         ;;SAVE R3
        020010  010446                          MOV     R4,-(SP)         ;;SAVE R4
        020012  010546                          MOV     R5,-(SP)         ;;SAVE R5
        020014  116704  000145                  MOVB    $OMODE+1,R4      ;;GET THE NUMBER OF DIGITS TO TYPE
        020020  005404                          NEG     R4
        020022  062704  000006                  ADD     #6,R4            ;;SUBTRACT IT FOR MAX. ALLOWED
        020026  110467  000132                  MOVB    R4,$OMODE        ;;SAVE IT FOR USE
        020032  116704  000125                  MOVB    $OFILL,R4        ;;GET THE ZERO FILL SWITCH
        020036  016605  000012                  MOV     12(SP),R5        ;;PICKUP THE INPUT NUMBER
        020042  005003                          CLR     R3               ;;CLEAR THE OUTPUT WORD
        020044  006105                  1$:     ROL     R5               ;;ROTATE MSB INTO "C"
        020046  000404                          BR      3$               ;;GO DO MSB
        020050  006105                  2$:     ROL     R5               ;;FORM THIS DIGIT
        020052  006105                          ROL     R5
        020054  006105                          ROL     R5
        020056  010503                          MOV     R5,R3
        020060  006103                  3$:     ROL     R3               ;;GET LSB OF THIS DIGIT
        020062  105367  000076                  DECB    $OMODE           ;;TYPE THIS DIGIT?
        020066  100016                          BPL     7$               ;;BR IF NO
        020070  042703  177770                  BIC     #177770,R3       ;;GET RID OF JUNK
        020074  001002                          BNE     4$               ;;TEST FOR 0
        020076  005704                          TST     R4               ;;SUPPRESS THIS 0?
        020100  001403                          BEQ     5$               ;;BR IF YES
        020102  005204                  4$:     INC     R4               ;;DON'T SUPPRESS ANYMORE 0'S
        020104  052703  000060                  BIS     #'0,R3           ;;MAKE THIS DIGIT ASCII
        020110  052703  000040          5$:     BIS     #' ,R3           ;;MAKE ASCII IF NOT ALREADY
        020114  110367  000040                  MOVB    R3,8$            ;;SAVE FOR TYPING
        020120  104401  020160                  TYPE    ,8$              ;;GO TYPE THIS DIGIT
        020124  105367  000032          7$:     DECB    $OCNT            ;;COUNT BY 1
        020130  003347                          BGT     2$               ;;BR IF MORE TO DO
        020132  002402                          BLT     6$               ;;BR IF DONE
        020134  005204                          INC     R4               ;;INSURE LAST DIGIT ISN'T A BLANK
        020136  000744                          BR      2$               ;;GO DO THE LAST DIGIT
        020140  012605                  6$:     MOV     (SP)+,R5         ;;RESTORE R5
        020142  012604                          MOV     (SP)+,R4         ;;RESTORE R4
        020144  012603                          MOV     (SP)+,R3         ;;RESTORE R3
        020146  016666  000002  000004          MOV     2(SP),4(SP)      ;;SET THE STACK FOR RETURNING
        020154  012616                          MOV     (SP)+,(SP)
        020156  000002                          RTI                      ;;RETURN
        020160     000                  8$:     .BYTE   0                ;;STORAGE FOR ASCII DIGIT
        020161     000                          .BYTE   0                ;;TERMINATOR FOR TYPE ROUTINE
        020162     000                  $OCNT:  .BYTE   0                ;;OCTAL DIGIT COUNTER
        020163     000                  $OFILL: .BYTE   0                ;;ZERO FILL SWITCH
        020164  000000                  $OMODE: .WORD   0                ;;NUMBER OF DIGITS TO TYPE
 2404                                   .SBTTL  TRAP DECODER

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

        020166  010046                  $TRAP:  MOV     R0,-(SP)         ;;SAVE R0
        020170  016600  000002                     MOV     2(SP),R0            ;;GET TRAP ADDRESS
        020174  005740                             TST     -(R0)               ;;BACKUP BY 2
        020176  111000                             MOVB    (R0),R0             ;;GET RIGHT BYTE OF TRAP
        020200  006300                             ASL     R0                  ;;POSITION FOR INDEXING
        020202  016000  020222                     MOV     $TRPAD(R0),R0       ;;INDEX TO TABLE
        020206  000200                             RTS     R0                  ;;GO TO ROUTINE


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

        020210  011646                     $TRAP2: MOV     (SP),-(SP)          ;;MOVE THE PC DOWN
        020212  016666  000004  000002             MOV     4(SP),2(SP)         ;;MOVE THE PSW DOWN
        020220  000002                             RTI                         ;;RESTORE THE PSW

                                           .SBTTL  TRAP TABLE

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

                                           ;       ROUTINE
                                           ;       -------
        020222  020210                     $TRPAD: .WORD   $TRAP2
        020224  017450                             $TYPE   ;;CALL=TYPE        TRAP+1(104401)  TTY TYPEOUT ROUTINE
        020226  017764                             $TYPOC  ;;CALL=TYPOC       TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
        020230  017740                             $TYPOS  ;;CALL=TYPOS       TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
        020232  020000                             $TYPON  ;;CALL=TYPON       TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
        020234  017224                             $TYPDS  ;;CALL=TYPDS       TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)


   2405                                    .SBTTL  POWER DOWN AND UP ROUTINES

                                           ;;*************************************************************************
                                           ;POWER DOWN ROUTINE
        020236  012737  020376  000024     $PWRDN: MOV     #$ILLUP,@#PWRVEC  ;;SET FOR FAST UP
        020244  012737  000340  000026             MOV     #340,@#PWRVEC+2   ;;PRIO:7
        020252  010046                             MOV     R0,-(SP)            ;;PUSH R0 ON STACK
        020254  010146                             MOV     R1,-(SP)            ;;PUSH R1 ON STACK
        020256  010246                             MOV     R2,-(SP)            ;;PUSH R2 ON STACK
        020260  010346                             MOV     R3,-(SP)            ;;PUSH R3 ON STACK
        020262  010446                             MOV     R4,-(SP)            ;;PUSH R4 ON STACK
        020264  010546                             MOV     R5,-(SP)            ;;PUSH R5 ON STACK
        020266  017746  160700                     MOV     @SWR,-(SP)          ;;PUSH @SWR ON STACK
        020272  010667  000104                     MOV     SP,$SAVR6           ;;SAVE SP
        020276  012737  020310  000024             MOV     #$PWRUP,@#PWRVEC  ;;SET UP VECTOR
        020304  000000                             HALT
        020306  000776                             BR      .-2                 ;;HANG UP

                                           ;;*************************************************************************
                                           ;POWER UP ROUTINE
        020310  012737  020376  000024     $PWRUP: MOV     #$ILLUP,@#PWRVEC  ;;SET FOR FAST DOWN
        020316  016706  000060                     MOV     $SAVR6,SP           ;;GET SP
        020322  005067  000054                     CLR     $SAVR6              ;;WAIT LOOP FOR THE TTY
        020326  005267  000050             1$:     INC     $SAVR6              ;;WAIT FOR THE INC
        020332  001375                             BNE     1$                  ;;OF  WORD
        020334  012677  160632                     MOV     (SP)+,@SWR          ;;POP STACK INTO @SWR
        020340  012605                             MOV     (SP)+,R5            ;;POP STACK INTO R5
        020342  012604                             MOV     (SP)+,R4            ;;POP STACK INTO R4
```

```
      020344  012603                           MOV     (SP)+,R3          ;;POP STACK INTO R3
      020346  012602                           MOV     (SP)+,R2          ;;POP STACK INTO R2
      020350  012601                           MOV     (SP)+,R1          ;;POP STACK INTO R1
      020352  012600                           MOV     (SP)+,R0          ;;POP STACK INTO R0
      020354  012737  020236  000024           MOV     #$PWRDN,@#PWRVEC  ;;SET UP THE POWER DOWN VECTOR
      020362  012737  000340  000026           MOV     #340,@#PWRVEC+2   ;;PRIO:7
      020370  104401                           TYPE                      ;REPORT THE POWER FAILURE
      020372  020404                   $PWRMG: .WORD   $POWER            ;;POWER FAIL MESSAGE POINTER
      020374  000002                           RTI
      020376  000000                   $ILLUP: HALT                      ;;THE POWER UP SEQUENCE WAS STARTED
      020400  000776                           BR      .-2               ;; BEFORE THE POWER DOWN WAS COMPLETE
      020402  000000                   $SAVR6: 0                         ;;PUT THE SP HERE
      020404     015     012     120   $POWER: .ASCIZ  <15><12>'POWER''
      020407     117     127     105
      020412     122     000
                                               .EVEN
                                       ;;*******************************************************************
                                       ;;*******************************************************************
      020414     015     012     105   MSG1:   .ASCIZ<15><12>/EMAP: /
      020417     115     101     120
      020422     072     040     000
      020425     015     012     101   MSG2:   .ASCII<15><12>/ALL EXERCISORS TESTED/<15><12>
      020430     114     114     040
      020433     105     130     105
      020436     122     103     111
      020441     123     117     122
      020444     123     040     124
      020447     105     123     124
      020452     105     104     015
      020455     012
      020456     040     040     040           .ASCII/   NOTE:TO TEST PASSING OF GRANTS FOR THE LAST UBE/<15><12>
      020461     116     117     124
      020464     105     072     124
      020467     117     040     124
      020472     105     123     124
      020475     040     120     101
      020500     123     123     111
      020503     116     107     040
      020506     117     106     040
      020511     107     122     101
      020514     116     124     123
      020517     040     106     117
      020522     122     040     124
      020525     110     105     040
      020530     114     101     123
      020533     124     040     125
      020536     102     105     015
      020541     012
      020542     040     040     040           .ASCII/         IT SHOULD BE SWAPPED WITH A UBE/<15><12>
      020545     040     040     040
      020550     040     040     111
      020553     124     040     123
      020556     110     117     125
      020561     114     104     040
      020564     102     105     040
      020567     123     127     101
      020572     120     120     105
```

```
       020575   104    040    127
       020600   111    124    110
       020603   040    101    040
       020606   125    102    105
       020611   015    012
  2411 020613   040    040    040             .ASCIZ/        OF HIGHER ELECTRICAL PRIORITY/<15><12>
       020616   040    040    040
       020621   040    040    117
       020624   106    040    110
       020627   111    107    110
       020632   105    122    040
       020635   105    114    105
       020640   103    124    122
       020643   111    103    101
       020646   114    040    120
       020651   122    111    117
       020654   122    111    124
       020657   131    015    012
       020662   000
  2412 020663   015    012    102    MSG5:    .ASCIZ<15><12>*BUS PARITY NOT TESTED ON 11/05 OR 11/20 MACHINES*<15><12>
       020666   125    123    040
       020671   120    101    122
       020674   111    124    131
       020677   040    116    117
       020702   124    040    124
       020705   105    123    124
       020710   105    104    040
       020713   117    116    040
       020716   061    061    057
       020721   060    065    040
       020724   117    122    040
       020727   061    061    057
       020732   062    060    040
       020735   115    101    103
       020740   110    111    116
       020743   105    123    015
       020746   012    000
  2413 020750   116    117    040    EM1:     .ASCIZ/NO RESPONSE TO REG ADDRESSES OR NO DEVICE PRESENT/
       020753   122    105    123
       020756   120    117    116
       020761   123    105    040
       020764   124    117    040
       020767   122    105    107
       020772   040    101    104
       020775   104    122    105
       021000   123    123    105
       021003   123    040    117
       021006   122    040    116
       021011   117    040    104
       021014   105    126    111
       021017   103    105    040
       021022   120    122    105
       021025   123    105    116
       021030   124    000
  2414 021032   106    101    124    EM2:     .ASCIZ/FATAL ERROR:REG FAILED TO CLEAR/
       021035   101    114    040
       021040   105    122    122
```

```
     021043     117     122     072
     021046     122     105     107
     021051     040     106     101
     021054     111     114     105
     021057     104     040     124
     021062     117     040     103
     021065     114     105     101
     021070     122     000
     021072     122     105     107   DH2:     .ASCIZ*REG ADD/REG CONTENTS *
     021075     040     101     104
     021100     104     057     122
     021103     105     107     040
     021106     103     117     116
     021111     124     105     116
     021114     124     123     040
     021117     000
                                               .EVEN
     021120  001214  001216  000000   DT2:     .WORD $REG0,$REG1,0
     021126     106     101     124   EM3:     .ASCIZ/FATAL ERROR:CPU DID NOT RECEIVE SSYN/
     021131     101     114     040
     021134     105     122     122
     021137     117     122     072
     021142     103     120     125
     021145     040     104     111
     021150     104     040     116
     021153     117     124     040
     021156     122     105     103
     021161     105     111     126
     021164     105     040     123
     021167     123     131     116
     021172     000
     021173     120     103     040   DH3:     .ASCIZ/PC WAS/
     021176     127     101     123
     021201     000
                                               .EVEN
     021202  001214  000000           DT3:     .WORD $REG0,0
     021206     106     101     124   EM4:     .ASCIZ/FATAL ERROR:REG FAILED TO FLOAT A '1'/
     021211     101     114     040
     021214     105     122     122
     021217     117     122     072
     021222     122     105     107
     021225     040     106     101
     021230     111     114     105
     021233     104     040     124
     021236     117     040     106
     021241     114     117     101
     021244     124     040     101
     021247     040     047     061
     021252     047     000
     021254     122     105     107   DH4:     .ASCIZ*REG ADD/DATA IS/DATA SHOULD BE*
     021257     040     101     104
     021262     104     057     104
     021265     101     124     101
     021270     040     111     123
     021273     057     104     101
     021276     124     101     040
     021301     123     110     117
```

```
      021304      125      114      104
      021307      040      102      105
      021312      000
2424                                              .EVEN
2425  021314   001214   001216   001220   DT4:    .WORD $REG0,$REG1,$REG2,0
      021322   000000
2426  021324      106      101      124   EM5:    .ASCIZ/FATAL ERROR:REG FAILED TO FLOAT A '0'/
      021327      101      114      040
      021332      105      122      122
      021335      117      122      072
      021340      122      105      107
      021343      040      106      101
      021346      111      114      105
      021351      104      040      124
      021354      117      040      106
      021357      114      117      101
      021362      124      040      101
      021365      040      047      060
      021370      047      000
2427  021372      106      101      124   EM6:    .ASCIZ/FATAL ERROR:CONTROL REG HELD WRONG DATA/
      021375      101      114      040
      021400      105      122      122
      021403      117      122      072
      021406      103      117      116
      021411      124      122      117
      021414      114      040      122
      021417      105      107      040
      021422      110      105      114
      021425      104      040      127
      021430      122      117      116
      021433      107      040      104
      021436      101      124      101
      021441      000
2428  021442      106      101      124   EM7:    .ASCIZ/FATAL ERROR:DUAL ADDRESSING ERROR/
      021445      101      114      040
      021450      105      122      122
      021453      117      122      072
      021456      104      125      101
      021461      114      040      101
      021464      104      104      122
      021467      105      123      123
      021472      111      116      107
      021475      040      105      122
      021500      122      117      122
      021503      000
2429  021504      122      105      107   DH7:    .ASCIZ*REG ADD/REG ADD WERE SIMULATANEOUSLY WRITTEN*
      021507      040      101      104
      021512      104      057      122
      021515      105      107      040
      021520      101      104      104
      021523      040      127      105
      021526      122      105      040
      021531      123      111      115
      021534      125      114      101
      021537      124      101      116
      021542      105      117      125
      021545      123      114      131
```

```
     021550     040     127     122
     021553     111     124     124
     021556     105     116     000
2430                                            .EVEN
2431 021562  001214  001216  000000  DT7:    .WORD $REG0,$REG1,0
2432 021570     105     122     122  EM8:    .ASCIZ/ERROR: SETTING PB PARITY FAILED TO CAUSE CPU TO TRAP/
     021573     117     122     072
     021576     040     123     105
     021601     124     124     111
     021604     116     107     040
     021607     120     102     040
     021612     120     101     122
     021615     111     124     131
     021620     040     106     101
     021623     111     114     105
     021626     104     040     124
     021631     117     040     103
     021634     101     125     123
     021637     105     040     103
     021642     120     125     040
     021645     124     117     040
     021650     124     122     101
     021653     120     000
2433 021655     105     122     122  EM9:    .ASCIZ/ERROR: GO BIT FAILED TO LOAD '1'/
     021660     117     122     072
     021663     040     107     117
     021666     040     102     111
     021671     124     040     106
     021674     101     111     114
     021677     105     104     040
     021702     124     117     040
     021705     114     117     101
     021710     104     040     047
     021713     061     047     000
2434 021716     105     122     122  EM10:   .ASCIZ/ERROR: GO BIT FAILED TO LOAD '0'/
     021721     117     122     072
     021724     040     107     117
     021727     040     102     111
     021732     124     040     106
     021735     101     111     114
     021740     105     104     040
     021743     124     117     040
     021746     114     117     101
     021751     104     040     047
     021754     060     047     000
2435 021757     106     101     124  EM11:   .ASCIZ/FATAL ERROR: GO BIT FAILED TO CLEAR/
     021762     101     114     040
     021765     105     122     122
     021770     117     122     072
     021773     040     107     117
     021776     040     102     111
     022001     124     040     106
     022004     101     111     114
     022007     105     104     040
     022012     124     117     040
     022015     103     114     105
     022020     101     122     000
```

```
2436 022023     106     101     124  EM12:   .ASCIZ/FATAL ERROR: READY BIT FAILED TO SET/
     022026     101     114     040
     022031     105     122     122
     022034     117     122     072
     022037     040     122     105
     022042     101     104     131
     022045     040     102     111
     022050     124     040     106
     022053     101     111     114
     022056     105     104     040
     022061     124     117     040
     022064     123     105     124
     022067     000
2437 022070     124     117     040  EM14:   .ASCIZ/TO CLEAR BIT 10 OF BECR1/
     022073     103     114     105
     022076     101     122     040
     022101     102     111     124
     022104     040     061     060
     022107     040     117     106
     022112     040     102     105
     022115     103     122     061
     022120     000
2438 022121     105     122     122  EM15:   .ASCIZ/ERROR: ERROR BITS IN BECR2 SET WHEN SHOULD BE CLEAR/
     022124     117     122     072
     022127     040     105     122
     022132     122     117     122
     022135     040     102     111
     022140     124     123     040
     022143     111     116     040
     022146     102     105     103
     022151     122     062     040
     022154     123     105     124
     022157     040     127     110
     022162     105     116     040
     022165     123     110     117
     022170     125     114     104
     022173     040     102     105
     022176     040     103     114
     022201     105     101     122
     022204     000
2439 022205     103     117     116  DH15:   .ASCIZ/CONTENTS OF BECR2/
     022210     124     105     116
     022213     124     123     040
     022216     117     106     040
     022221     102     105     103
     022224     122     062     000
2440 022227     106     101     124  EM16:   .ASCIZ/FATAL ERROR: READY BIT FAILED TO CLEAR OR GO FAILED TO SET/
     022232     101     114     040
     022235     105     122     122
     022240     117     122     072
     022243     040     122     105
     022246     101     104     131
     022251     040     102     111
     022254     124     040     106
     022257     101     111     114
     022262     105     104     040
     022265     124     117     040
```

```
        022270    103    114    105
        022273    101    122    040
        022276    117    122    040
        022301    107    117    040
        022304    106    101    111
        022307    114    105    104
        022312    040    124    117
        022315    040    123    105
        022320    124    000
   2441 022322    105    122    122  EM17:   .ASCIZ/ERROR: UBE FAILED TO INTERRUPT/
        022325    117    122    072
        022330    040    125    102
        022333    105    040    106
        022336    101    111    114
        022341    105    104    040
        022344    124    117    040
        022347    111    116    124
        022352    105    122    122
        022355    125    120    124
        022360    000
   2442 022361    102    122    040  DH17:   .ASCIZ*BR IS  / PRIORITY IS*
        022364    111    123    040
        022367    040    057    040
        022372    120    122    111
        022375    117    122    111
        022400    124    131    040
        022403    111    123    000
   2443 022406    105    122    122  EM18:   .ASCIZ/ERROR: UBE INTERRUPTED WHEN PSW AT SAME PRIORITY LEVEL/
        022411    117    122    072
        022414    040    125    102
        022417    105    040    111
        022422    116    124    105
        022425    122    122    125
        022430    120    124    105
        022433    104    040    127
        022436    110    105    116
        022441    040    120    123
        022444    127    040    101
        022447    124    040    123
        022452    101    115    105
        022455    040    120    122
        022460    111    117    122
        022463    111    124    131
        022466    040    114    105
        022471    126    105    114
        022474    000
   2444 022475    125    102    105  DH18:   .ASCIZ/UBE BR WAS/
        022500    040    102    122
        022503    040    127    101
        022506    123    000
   2445 022510    105    122    122  EM19:   .ASCIZ/ERROR: UBE FALSELY INTERRUPTED AT A HIGHER LEVEL/
        022513    117    122    072
        022516    040    125    102
        022521    105    040    106
        022524    101    114    123
        022527    105    114    131
        022532    040    111    116
        022535     124     105     122
        022540     122     125     120
        022543     124     105     104
        022546     040     101     124
        022551     040     101     040
        022554     110     111     107
        022557     110     105     122
        022562     040     114     105
        022565     126     105     114
        022570     000
   2446 022571     110     111     107  DH19:   .ASCIZ/HIGHER LEVEL WAS/
        022574     110     105     122
        022577     040     114     105
        022602     126     105     114
        022605     040     127     101
        022610     123     000
   2447 022612     105     122     122  EM20:   .ASCIZ/ERROR: UBE INTERRUPTED TO WRONG VECTOR/
        022615     117     122     072
        022620     040     125     102
        022623     105     040     111
        022626     116     124     105
        022631     122     122     125
        022634     120     124     105
        022637     104     040     124
        022642     117     040     127
        022645     122     117     116
        022650     107     040     126
        022653     105     103     124
        022656     117     122     000
   2448
   2449 022661     105     122     122  EM21:   .ASCIZ/ERROR: SIMULTANEOUS GO FAILED/
        022664     117     122     072
        022667     040     123     111
        022672     115     125     114
        022675     124     101     116
        022700     105     117     125
        022703     123     040     107
        022706     117     040     106
        022711     101     111     114
        022714     105     104     000
   2450 022717     105     122     122  EM22:   .ASCIZ/ERROR: NO, NO SACK BIT FALSELY SET/
        022722     117     122     072
        022725     040     116     117
        022730     054     040     116
        022733     117     040     123
        022736     101     103     113
        022741     040     102     111
        022744     124     040     106
        022747     101     114     123
        022752     105     114     131
        022755     040     123     105
        022760     124     000
   2451 022762     105     122     122  EM23:   .ASCIZ/ERROR: NO INT. SSYN BIT FALSELY SET/
        022765     117     122     072
        022770     040     116     117
        022773     040     111     116
        022776     124     056     040
```

```
       023001    123     123     131
       023004    116     040     102
       023007    111     124     040
       023012    106     101     114
       023015    123     105     114
       023020    131     040     123
       023023    105     124     000
  2452 023026    105     122     122   EM24:   .ASCIZ/ERROR: DATI FAILED TO LOAD PROPER DATA/
       023031    117     122     072
       023034    040     104     101
       023037    124     111     040
       023042    106     101     111
       023045    114     105     104
       023050    040     124     117
       023053    040     114     117
       023056    101     104     040
       023061    120     122     117
       023064    120     105     122
       023067    040     104     101
       023072    124     101     000
  2453 023075    102     105     102   DH24:   .ASCIZ*BEBD /MEM DATA/MEM ADD/DATA SHOULD BE IN MEM*
       023100    104     040     057
       023103    115     105     115
       023106    040     104     101
       023111    124     101     057
       023114    115     105     115
       023117    040     101     104
       023122    104     057     104
       023125    101     124     101
       023130    040     123     110
       023133    117     125     114
       023136    104     040     102
       023141    105     040     111
       023144    116     040     115
       023147    105     115     000
  2454                                         .EVEN
  2455 023152  001214  001216  001220  DT24:   .WORD   $REG0,$REG1,$REG2,$REC3,0
       023160  001222  000000
  2456 023164    104     101     124   EM25:   .ASCIZ/DATO FAILED TO LOAD PROPER DATA/
       023167    117     040     106
       023172    101     111     114
       023175    105     104     040
       023200    124     117     040
       023203    114     117     101
       023206    104     040     120
       023211    122     117     120
       023214    105     122     040
       023217    104     101     124
       023222    101     000
  2457 023224    104     101     124   EM26:   .ASCIZ/DATIP FAILED TO LOAD PROPER DATA/
       023227    111     120     040
       023232    106     101     111
       023235    114     105     104
       023240    040     124     117
       023243    040     114     117
       023246    101     104     040
       023251    120     122     117
```

```
        023254     120     105     122
        023257     040     104     101
        023262     124     101     000
   2458 023265     104     101     124   EM27:    .ASCIZ/DATOB FILED TO LOAD PROPER DATA/
        023270     117     102     040
        023273     106     111     114
        023276     105     104     040
        023301     124     117     040
        023304     114     117     101
        023307     104     040     120
        023312     122     117     120
        023315     105     122     040
        023320     104     101     124
        023323     101     000
   2459 023325     104     101     124   EM28:    .ASCIZ/DATI FAILED TO SET RDY/
        023330     111     040     106
        023333     101     111     114
        023336     105     104     040
        023341     124     117     040
        023344     123     105     124
        023347     040     122     104
        023352     131     000
   2460 023354     104     101     124   EM29:    .ASCIZ/DATO FAILED TO SET RDY/
        023357     117     040     106
        023362     101     111     114
        023365     105     104     040
        023370     124     117     040
        023373     123     105     124
        023376     040     122     104
        023401     131     000
   2461 023403     104     101     124   EM30:    .ASCIZ/DATIP FAILED TO SET RDY/
        023406     111     120     040
        023411     106     101     111
        023414     114     105     104
        023417     040     124     117
        023422     040     123     105
        023425     124     040     122
        023430     104     131     000
   2462 023433     104     101     124   EM31:    .ASCIZ/DATOB FAILED TO SET RDY/
        023436     117     102     040
        023441     106     101     111
        023444     114     105     104
        023447     040     124     117
        023452     040     123     105
        023455     124     040     122
        023460     104     131     000
   2463 023463     105     122     122   EM32:    .ASCIZ/ERROR: INH. DATA SHIFT ON DATIP FAILED/
        023466     117     122     072
        023471     040     111     116
        023474     110     056     040
        023477     104     101     124
        023502     101     040     123
        023505     110     111     106
        023510     124     040     117
        023513     116     040     104
        023516     101     124     111
        023521     120     040     106
```

```
     023524     101     111     114
     023527     105     104     000
2464 023532     105     122     122  EM33:    .ASCIZ/ERROR: DATOB ON DATIP FAILED/
     023535     117     122     072
     023540     040     104     101
     023543     124     117     102
     023546     040     117     116
     023551     040     104     101
     023554     124     111     120
     023557     040     106     101
     023562     111     114     105
     023565     104     000
2465 023567     105     122     122  EM34:    .ASCIZ/ERROR: UBE DID DATI FROM WRONG LOCATION/
     023572     117     122     072
     023575     040     125     102
     023600     105     040     104
     023603     111     104     040
     023606     104     101     124
     023611     111     040     106
     023614     122     117     115
     023617     040     127     122
     023622     117     116     107
     023625     040     114     117
     023630     103     101     124
     023633     111     117     116
     023636     000
2466 023637     115     105     115  DH34:    .ASCIZ/MEM LOC WANTED/
     023642     040     114     117
     023645     103     040     127
     023650     101     116     124
     023653     105     104     000
2467 023656     105     122     122  EM35:    .ASCIZ/ERROR: BEBA LOWER 16 BITS DID NOT COUNT BY 2/
     023661     117     122     072
     023664     040     102     105
     023667     102     101     040
     023672     114     117     127
     023675     105     122     040
     023700     061     066     040
     023703     102     111     124
     023706     123     040     104
     023711     111     104     040
     023714     116     117     124
     023717     040     103     117
     023722     125     116     124
     023725     040     102     131
     023730     040     062     000
2468 023733     050     122     105  DH35:    .ASCIZ*(REG) /DATA SHOULD BE*
     023736     107     051     040
     023741     057     104     101
     023744     124     101     040
     023747     123     110     117
     023752     125     114     104
     023755     040     102     105
     023760     000
2469 023761     105     122     122  EM36:    .ASCIZ/ERROR: BEBA BIT A16,17 DID NOT COUNT=0/
     023764     117     122     072
     023767     040     102     105
```

```
        023772   102    101    040
        023775   102    111    124
        024000   040    101    061
        024003   066    054    061
        024006   067    040    104
        024011   111    104    040
        024014   116    117    124
        024017   040    103    117
        024022   125    116    124
        024025   075    060    000
   2470 024030   101    061    066  DH36:   .ASCIZ/A16,A17/
        024033   054    101    061
        024036   067    000
   2471 024040   105    122    122  EM37:   .ASCIZ/ERROR: BEBA DID NOT COUNT BY 1/
        024043   117    122    072
        024046   040    102    105
        024051   102    101    040
        024054   104    111    104
        024057   040    116    117
        024062   124    040    103
        024065   117    125    116
        024070   124    040    102
        024073   131    040    061
        024076   000
   2472 024077   105    122    122  EM38:   .ASCIZ/ERROR: INTERRUPT FAILED TO UPDATE BECC TO CORRECT VALUE/
        024102   117    122    072
        024105   040    111    116
        024110   124    105    122
        024113   122    125    120
        024116   124    040    106
        024121   101    111    114
        024124   105    104    040
        024127   124    117    040
        024132   125    120    104
        024135   101    124    105
        024140   040    102    105
        024143   103    103    040
        024146   124    117    040
        024151   103    117    122
        024154   122    105    103
        024157   124    040    126
        024162   101    114    125
        024165   105    000
   2473 024167   105    122    122  EM39:   .ASCIZ/ERROR: BEBA INCREMENTED WHEN IT WAS INHIBITED/
        024172   117    122    072
        024175   040    102    105
        024200   102    101    040
        024203   111    116    103
        024206   122    105    115
        024211   105    116    124
        024214   105    104    040
        024217   127    110    105
        024222   116    040    111
        024225   124    040    127
        024230   101    123    040
        024233   111    116    110
        024236   111    102    111
        024241      124      105      104
        024244      000
   2474 024245      105      122      122   EM40:    .ASCIZ/ERROR: BECC INCREMENTED WHEN IT WAS INHIBITED/
        024250      117      122      072
        024253      040      102      105
        024256      103      103      040
        024261      111      116      103
        024264      122      105      115
        024267      105      116      124
        024272      105      104      040
        024275      127      110      105
        024300      116      040      111
        024303      124      040      127
        024306      101      123      040
        024311      111      116      110
        024314      111      102      111
        024317      124      105      104
        024322      000
   2475 024323      105      122      122   EM41:    .ASCIZ/ERROR: UBE FAILED TO INT. ON DONE/
        024326      117      122      072
        024331      040      125      102
        024334      105      040      106
        024337      101      111      114
        024342      105      104      040
        024345      124      117      040
        024350      111      116      124
        024353      056      040      117
        024356      116      040      104
        024361      117      116      105
        024364      000
   2476 024365      105      122      122   EM42:    .ASCIZ/ERROR: CCOVF NOT CLEARED BY GO/
        024370      117      122      072
        024373      040      103      103
        024376      117      126      106
        024401      040      116      117
        024404      124      040      103
        024407      114      105      101
        024412      122      105      104
        024415      040      102      131
        024420      040      107      117
        024423      000
   2477 024424      105      122      122   EM43:    .ASCIZ/ERROR: UBE DID NOT DO DATO TO PROPER # OF LOCS. (4)/
        024427      117      122      072
        024432      040      125      102
        024435      105      040      104
        024440      111      104      040
        024443      116      117      124
        024446      040      104      117
        024451      040      104      101
        024454      124      117      040
        024457      124      117      040
        024462      120      122      117
        024465      120      105      122
        024470      040      043      040
        024473      117      106      040
        024476      114      117      103
        024501      123      056      040
        024504     050     064     051
        024507     000
   2478 024510     101     104     104  DH43:    .ASCIZ*ADD FROM/TO WERE WRITTEN*
        024513     040     106     122
        024516     117     115     057
        024521     124     117     040
        024524     127     105     122
        024527     105     040     127
        024532     122     111     124
        024535     124     105     116
        024540     000
   2479 024541     105     122     122  EM44:    .ASCIZ/ERROR: INT. ON DONE BIT NOT CLEARED/
        024544     117     122     072
        024547     040     111     116
        024552     124     056     040
        024555     117     116     040
        024560     104     117     116
        024563     105     040     102
        024566     111     124     040
        024571     116     117     124
        024574     040     103     114
        024577     105     101     122
        024602     105     104     000
   2480 024605     105     122     122  EM45:    .ASCIZ/ERROR: CCOVF NOT SET/
        024610     117     122     072
        024613     040     103     103
        024616     117     126     106
        024621     040     116     117
        024624     124     040     123
        024627     105     124     000
   2481 024632     105     122     122  EM46:    .ASCIZ/ERROR: DATO FROM BECC NOT DONE PROPERLY/
        024635     117     122     072
        024640     040     104     101
        024643     124     117     040
        024646     106     122     117
        024651     115     040     102
        024654     105     103     103
        024657     040     116     117
        024662     124     040     104
        024665     117     116     105
        024670     040     120     122
        024673     117     120     105
        024676     122     114     131
        024701     000
   2482 024702     101     104     104  DH46:    .ASCIZ*ADD   /DATA   /DATA SHOULD BE*
        024705     040     040     040
        024710     057     104     101
        024713     124     101     040
        024716     040     040     057
        024721     104     101     124
        024724     101     040     123
        024727     110     117     125
        024732     114     104     040
        024735     102     105     000
   2483 024740     105     122     122  EM47:    .ASCIZ/ERROR: UBE DID NOT DO 2 DATO FOR EACH REQUEST/
        024743     117     122     072
        024746     040     125     102
        024751   105     040     104
        024754   111     104     040
        024757   116     117     124
        024762   040     104     117
        024765   040     062     040
        024770   104     101     124
        024773   117     040     106
        024776   117     122     040
        025001   105     101     103
        025004   110     040     122
        025007   105     121     125
        025012   105     123     124
        025015   000
   2484 025016   105     122     122  EM49:    .ASCIZ/ERROR: UBE DID NOT DO 2 DATIP FOR EACH REQUEST/
        025021   117     122     072
        025024   040     125     102
        025027   105     040     104
        025032   111     104     040
        025035   116     117     124
        025040   040     104     117
        025043   040     062     040
        025046   104     101     124
        025051   111     120     040
        025054   106     117     122
        025057   040     105     101
        025062   103     110     040
        025065   122     105     121
        025070   125     105     123
        025073   124     000
   2485 025075   105     122     122  EM51:    .ASCIZ/ERROR: NPR DATO NOT DONE/
        025100   117     122     072
        025103   040     116     120
        025106   122     040     104
        025111   101     124     117
        025114   040     116     117
        025117   124     040     104
        025122   117     116     105
        025125   000
   2486 025126   105     122     122  EM52:    .ASCIZ/ERROR: NPR DID NOT SET RDY/
        025131   117     122     072
        025134   040     116     120
        025137   122     040     104
        025142   111     104     040
        025145   116     117     124
        025150   040     123     105
        025153   124     040     122
        025156   104     131     000
   2487 025161   105     122     122  EM53:    .ASCIZ/ERROR: UBE DID NOT INT. WHEN NPR FINISHED/
        025164   117     122     072
        025167   040     125     102
        025172   105     040     104
        025175   111     104     040
        025200   116     117     124
        025203   040     111     116
        025206   124     056     040
        025211   127     110     105
        025214   116     040     116
```

```
     025217   120   122   040
     025222   106   111   116
     025225   111   123   110
     025230   105   104   000
2488 025233   105   122   122  EM54:  .ASCIZ/ERROR: TWO LOC. WRITTEN WHEN ONE NPR AND INT. ON DONE ENABLED/
     025236   117   122   072
     025241   040   124   127
     025244   117   040   114
     025247   117   103   056
     025252   040   127   122
     025255   111   124   124
     025260   105   116   040
     025263   127   110   105
     025266   116   040   117
     025271   116   105   040
     025274   116   120   122
     025277   040   101   116
     025302   104   040   111
     025305   116   124   056
     025310   040   117   116
     025313   040   104   117
     025316   116   105   040
     025321   105   116   101
     025324   102   114   105
     025327   104   000
2489 025331   015   012   124  MSG3:  .ASCII<15><12>/TESTING UBE WILL NOT INTERRUPT DURING NPR/<15><12>
     025334   105   123   124
     025337   111   116   107
     025342   040   125   102
     025345   105   040   127
     025350   111   114   114
     025353   040   116   117
     025356   124   040   111
     025361   116   124   105
     025364   122   122   125
     025367   120   124   040
     025372   104   125   122
     025375   111   116   107
     025400   040   116   120
     025403   122   015   012
2490 025406   111   106   040         .ASCIZ*IF DOES, CPU WILL GO DOWN*<15><12>*ENTERING TEST*
     025411   104   117   105
     025414   123   054   040
     025417   103   120   125
     025422   040   127   111
     025425   114   114   040
     025430   107   117   040
     025433   104   117   127
     025436   116   015   012
     025441   105   116   124
     025444   105   122   111
     025447   116   107   040
     025452   124   105   123
     025455   124   000
2491 025457   015   012   105  MSG4:  .ASCIZ<15><12>/EXITING TEST/
     025462   130   111   124
     025465   111   116   107
```

```
        025470      040      124      105
        025473      123      124      000
   2492 025476      105      122      122   EM56:    .ASCIZ/ERROR: TEST OF WRONG A  LINES ERROR BIT FAILED/
        025501      117      122      072
        025504      040      124      105
        025507      123      124      040
        025512      117      106      040
        025515      127      122      117
        025520      116      107      040
        025523      101      040      040
        025526      114      111      116
        025531      105      123      040
        025534      105      122      122
        025537      117      122      040
        025542      102      111      124
        025545      040      106      101
        025550      111      114      105
        025553      104      000
   2493 025555      102      105      103   EM57:    .ASCIZ/BECR2 BIT 9 FALSELY SET/
        025560      122      062      040
        025563      102      111      124
        025566      040      071      040
        025571      106      101      114
        025574      123      105      114
        025577      131      040      123
        025602      105      124      000
   2494 025605      124      117      040   EM58:    .ASCIZ/TO INTERRUPT CPU/
        025610      111      116      124
        025613      105      122      122
        025616      125      120      124
        025621      040      103      120
        025624      125      000
   2495 025626      105      122      122   EM59:    .ASCIZ/ERROR: TEST OF NSSYN ERROR BIT FAILED/
        025631      117      122      072
        025634      040      124      105
        025637      123      124      040
        025642      117      106      040
        025645      116      123      123
        025650      131      116      040
        025653      105      122      122
        025656      117      122      040
        025661      102      111      124
        025664      040      106      101
        025667      111      114      105
        025672      104      000
   2496 025674      124      117      040   EM60:    .ASCIZ/TO SET BIT 8 OF BECR2/
        025677      123      105      124
        025702      040      102      111
        025705      124      040      070
        025710      040      117      106
        025713      040      102      105
        025716      103      122      062
        025721      000
   2497 025722      124      117      040   EM61:    .ASCIZ/TO SET BIT 15 OF BECR1/
        025725      123      105      124
        025730      040      102      111
        025733      124      040      061
        025736   065    040    117
        025741   106    040    102
        025744   105    103    122
        025747   061    000
   2498 025751   124    117    040   EM62:   .ASCIZ/TO CLEAR BIT 8 OF BECR2/
        025754   103    114    105
        025757   101    122    040
        025762   102    111    124
        025765   040    070    040
        025770   117    106    040
        025773   102    105    103
        025776   122    062    000
   2499 026001   106    101    114   EM63.   .ASCIZ/FALSELY INTERRUPTED CPU/
        026004   123    105    114
        026007   131    040    111
        026012   116    124    105
        026015   122    122    125
        026020   120    124    105
        026023   104    040    103
        026026   120    125    000
   2500 026031   105    122    122   EM64:   .ASCIZ/ERROR: TEST OF WRONG GRANT OR NOT ONE GRANT ERROR BITS FAILED/
        026034   117    122    072
        026037   040    124    105
        026042   123    124    040
        026045   117    106    040
        026050   127    122    117
        026053   116    107    040
        026056   107    122    101
        026061   116    124    040
        026064   117    122    040
        026067   116    117    124
        026072   040    117    116
        026075   105    040    107
        026100   122    101    116
        026103   124    040    105
        026106   122    122    117
        026111   122    040    102
        026114   111    124    123
        026117   040    106    101
        026122   111    114    105
        026125   104    000
   2501 026127   116    117    040   EM65:   .ASCIZ/NO GRANT OR NOT ONE GRANT ERROR BIT FALSELY SET/
        026132   107    122    101
        026135   116    124    040
        026140   117    122    040
        026143   116    117    124
        026146   040    117    116
        026151   105    040    107
        026154   122    101    116
        026157   124    040    105
        026162   122    122    117
        026165   122    040    102
        026170   111    124    040
        026173   106    101    114
        026176   123    105    114
        026201   131    040    123
        026204   105    124    000
```

```
  2502 026207     040     127     111  DH65:   .ASCIZ/ WITH BECR1 = /
       026212     124     110     040
       026215     102     105     103
       026220     122     061     040
       026223     075     040     000
  2503 026226     127     111     124  EM66:   .ASCIZ/WITH INT. ON DONE = 1/
       026231     110     040     111
       026234     116     124     056
       026237     040     117     116
       026242     040     104     117
       026245     116     105     040
       026250     075     040     061
       026253     000
  2504 026254     127     122     117  EM67:   .ASCIZ/WRONG GRANT ERROR BIT FALSELY SET/
       026257     116     107     040
       026262     107     122     101
       026265     116     124     040
       026270     105     122     122
       026273     117     122     040
       026276     102     111     124
       026301     040     106     101
       026304     114     123     105
       026307     114     131     040
       026312     123     105     124
       026315     000
  2505 026316     124     117     040  EM69:   .ASCIZ/TO CLEAR BIT 11 OF BECR1/
       026321     103     114     105
       026324     101     122     040
       026327     102     111     124
       026332     040     061     061
       026335     040     117     106
       026340     040     102     105
       026343     103     122     061
       026346     000
  2506 026347     105     122     122  EM70:   .ASCIZ/ERROR: TEST OF TIME DELAY AND BUS LATENCY FAILED/
       026352     117     122     072
       026355     040     124     105
       026360     123     124     040
       026363     117     106     040
       026366     124     111     115
       026371     105     040     104
       026374     105     114     101
       026377     131     040     101
       026402     116     104     040
       026405     102     125     123
       026410     040     114     101
       026413     124     105     116
       026416     103     131     040
       026421     106     101     111
       026424     114     105     104
       026427     000
  2507 026430     124     117     040  EM71:   .ASCIZ/TO SET BIT 6 OF BECR2/
       026433     123     105     124
       026436     040     102     111
       026441     124     040     066
       026444     040     117     106
       026447     040     102     105
```

```
      026452    103     122     062
      026455    000
      026456    124     117     040  EM72:    .ASCIZ/TO CLEAR BIT 6 OF BECR2/
      026461    103     114     105
      026464    101     122     040
      026467    102     111     124
      026472    040     066     040
      026475    117     106     040
      026500    102     105     103
      026503    122     062     000
      026506    105     122     122  EM73:    .ASCIZ/ERROR: TEST OF POWER DOWN BIT FAILED/
      026511    117     122     072
      026514    040     124     105
      026517    123     124     040
      026522    117     106     040
      026525    120     117     127
      026530    105     122     040
      026533    104     117     127
      026536    116     040     102
      026541    111     124     040
      026544    106     101     111
      026547    114     105     104
      026552    000
      026553    124     117     040  EM74:    .ASCIZ/TO POWER DOWN CPU/
      026556    120     117     127
      026561    105     122     040
      026564    104     117     127
      026567    116     040     103
      026572    120     125     000
      026575    124     117     040  EM75:    .ASCIZ/TO POWER UP CPU/
      026600    120     117     127
      026603    105     122     040
      026606    125     120     040
      026611    103     120     125
      026614    000
      026615    124     117     040  EM76:    .ASCIZ/TO RE POWER DOWN CPU/
      026620    122     105     040
      026623    120     117     127
      026626    105     122     040
      026631    104     117     127
      026634    116     040     103
      026637    120     125     000
      026642    124     117     040  EM77:    .ASCIZ/TO SET BIT 4 OF BECR2/
      026645    123     105     124
      026650    040     102     111
      026653    124     040     064
      026656    040     117     106
      026661    040     102     105
      026664    103     122     062
      026667    000
      026670    105     122     122  EM78:    .ASCIZ/ERROR: DCLO FAILED TO CLEAR REG/
      026673    117     122     072
      026676    040     104     103
      026701    114     117     040
      026704    106     101     111
      026707    114     105     104
      026712    040     124     117
```

```
     026715    040    103    114
     026720    105    101    122
     026723    040    122    105
     026726    107    000
     026730    105    122    122   EM80:    .ASCIZ/ERROR: DYNAMIC TEST OF UBE FAILED/
     026733    117    122    072
     026736    040    104    131
     026741    116    101    115
     026744    111    103    040
     026747    124    105    123
     026752    124    040    117
     026755    106    040    125
     026760    102    105    040
     026763    106    101    111
     026766    114    105    104
     026771    000
     026772    124    117    040   EM81:    .ASCIZ/TO LOAD PROPER DATA/
     026775    114    117    101
     027000    104    040    120
     027003    122    117    120
     027006    105    122    040
     027011    104    101    124
     027014    101    000
     027016    105    122    122   EM82:    .ASCIZ/ERROR: TEST OF PASSING GRANTS FAILED/
     027021    117    122    072
     027024    040    124    105
     027027    123    124    040
     027032    117    106    040
     027035    120    101    123
     027040    123    111    116
     027043    107    040    107
     027046    122    101    116
     027051    124    123    040
     027054    106    101    111
     027057    114    105    104
     027062    000
     027063    105    122    122   EM83:    .ASCIZ/ERROR:FALSE INTERRUPT WHEN DO RELEASE BUS IMMED./
     027066    117    122    072
     027071    106    101    114
     027074    123    105    040
     027077    111    116    124
     027102    105    122    122
     027105    125    120    124
     027110    040    127    110
     027113    105    116    040
     027116    104    117    040
     027121    122    105    114
     027124    105    101    123
     027127    105    040    102
     027132    125    123    040
     027135    111    115    115
     027140    105    104    056
     027143    000
     027144    105    122    122   EM84:    .ASCIZ/ERROR:TEST OF MULTIPLE INTERRUPTS FAILED TO SET RDY/
     027147    117    122    072
     027152    124    105    123
     027155    124    040    117
```

```
        027160    106    040    115
        027163    125    114    124
        027166    111    120    114
        027171    105    040    111
        027174    116    124    105
        027177    122    122    125
        027202    120    124    123
        027205    040    106    101
        027210    111    114    105
        027213    104    040    124
        027216    117    040    123
        027221    105    124    040
        027224    122    104    131
        027227    000
   2520 027230    125    102    105  MSG7:   .ASCIZ/UBE WITH VECTOR: /
        027233    040    127    111
        027236    124    110    040
        027241    126    105    103
        027244    124    117    122
        027247    072    040    000
   2521 027252    040    101    116  MSG8:   .ASCIZ/ AND BR AT: /
        027255    104    040    102
        027260    122    040    101
        027263    124    072    040
        027266    000
   2522 027267    040    106    101  MSG9:   .ASCIZ/ FALSELY INTERRUPTED WHEN/<15><12>
        027272    114    123    105
        027275    114    131    040
        027300    111    116    124
        027303    105    122    122
        027306    125    120    124
        027311    105    104    040
        027314    127    110    105
        027317    116    015    012
        027322    000
   2523 027323    040    123    110  MSG10:  .ASCIZ/ SHOULD HAVE INTERRUPTED/<15><12>
        027326    117    125    114
        027331    104    040    110
        027334    101    126    105
        027337    040    111    116
        027342    124    105    122
        027345    122    125    120
        027350    124    105    104
        027353    015    012    000
   2524 027356    015    012    120  MSG11:  .ASCIZ<15><12>/PASSING OF GRANTS NOT TESTED WITH ONE EXERCISOR/<15><12>
        027361    101    123    123
        027364    111    116    107
        027367    040    117    106
        027372    040    107    122
        027375    101    116    124
        027400    123    040    116
        027403    117    124    040
        027406    124    105    123
        027411    124    105    104
        027414    040    127    111
        027417    124    110    040
        027422    117    116    105
```

```
     027425   040    105    130
     027430   105    122    103
     027433   111    123    117
     027436   122    015    012
     027441   000
2525 027442   015    012    111  MSG12:  .ASCII<15><12>/IF MORE THAN ONE UBE PRESENT JUMPER W1/<15><12>
     027445   106    040    115
     027450   117    122    105
     027453   040    124    110
     027456   101    116    040
     027461   117    116    105
     027464   040    125    102
     027467   105    040    120
     027472   122    105    123
     027475   105    116    124
     027500   040    112    125
     027503   115    120    105
     027506   122    040    127
     027511   061    015    012
2526 027514   123    110    117          .ASCIZ/SHOULD BE INSERTED IN ALL UBE EXCEPT LAST/<15><12>
     027517   125    114    104
     027522   040    102    105
     027525   040    111    116
     027530   123    105    122
     027533   124    105    104
     027536   040    111    116
     027541   040    101    114
     027544   114    040    125
     027547   102    105    040
     027552   105    130    103
     027555   105    120    124
     027560   040    114    101
     027563   123    124    015
     027566   012    000
2527 027570   015    012    124  MSG13:  .ASCIZ<15><12>/TESTING UBE WITH BEDB ADDRESS: /
     027573   105    123    124
     027576   111    116    107
     027601   040    125    102
     027604   105    040    127
     027607   111    124    110
     027612   040    102    105
     027615   104    102    040
     027620   101    104    104
     027623   122    105    123
     027626   123    072    040
     027631   000
2528 027632   015    012    040  MSG14:  .ASCIZ<15><12>/   NOTE:DISREGARD BIT 13 =1 OF BECR2/<15><12>
     027635   040    040    116
     027640   117    124    105
     027643   072    104    111
     027646   123    122    105
     027651   107    101    122
     027654   104    040    102
     027657   111    124    040
     027662   061    063    040
     027665   075    061    040
     027670   117    106    040
     027673    102     105     103
     027676    122     062     015
     027701    012     000
     027703    015     012     120  MSG15:  .ASCIZ<15><12>/PC OF ERROR MESSAGE WAS: /
     027706    103     040     117
     027711    106     040     105
     027714    122     122     117
     027717    122     040     115
     027722    105     123     123
     027725    101     107     105
     027730    040     127     101
     027733    123     072     040
     027736    000
     027737    015     012     040  MSG16:  .ASCIZ<15><12>/     UNIBUS EXERCISER MODULE DIAGNOSTIC--CZKUB-C/<15><12><15><12>
     027742    040     040     040
     027745    040     125     116
     027750    111     102     125
     027753    123     040     105
     027756    130     105     122
     027761    103     111     123
     027764    105     122     040
     027767    115     117     104
     027772    125     114     105
     027775    040     104     111
     030000    101     107     116
     030003    117     123     124
     030006    111     103     055
     030011    055     103     132
     030014    113     125     102
     030017    055     103     015
     030022    012     015     012
     030025    000
     030026    040     040     040  MSG17:  .ASCIZ/         TEST NUMBER WAS: /
     030031    040     040     040
     030034    040     040     040
     030037    124     105     123
     030042    124     040     116
     030045    125     115     102
     030050    105     122     040
     030053    127     101     123
     030056    072     040     000

                                                .EVEN
                                        ;//////////////////////////////////////////////////////////////////////////
                                        ;BUFFER WORK AREA
                                        ;//////////////////////////////////////////////////////////////////////////
     030062                             BUFF1:  .BLKW   11
            000001                              .END
```

```
A         003172         BIT3   = 000010        EM22      022717        EM78      026670        PR7    = 000340
ACALC     003376         BIT4   = 000020        EM23      022762        EM8       021570        PS     = 177776
B         001126         BIT5   = 000040        EM24      023026        EM80      026730        PSW    = 177776
BEBA      002522         BIT6   = 000100        EM25      023164        EM81      026772        PTRAP    004754
BEBD      002516         BIT7   = 000200        EM26      023224        EM82      027016        PWRVEC=  000024
BECC      002520         BIT8   = 000400        EM27      023265        EM83      027063        RCATCH   016224
BECR1     002524         BIT9   = 001000        EM28      023325        EM84      027144        RDYS     006570
BECR2     002526         BPTVEC=  000014        EM29      023354        EM9       021655        RESVEC=  000010
BEGO      002534         BUFF1    030062        EM3       021126        ERROR  =  104000        RSTART   001100
BERE      002530         C        003500        EM30      023403        ERRVEC=   000004        RTR      006044
BE1BA     002542         CLRREG   016172        EM31      023433        ERR1      006620        RVEC     016316
BE1BD     002536         CR     = 000015        EM32      023463        ERR2      006630        R6     =%000006
BE1CC     002540         CRDY     016246        EM33      023532        ERR3      006640        R7     =%000007
BE1CR1    002544         CRLF   = 000200        EM34      023567        ERR4      006650        SCOPE  = 000004
BE1CR2    002546         D        003514        EM35      023656        F         003570        SPTR     002514
BE1RE     002550         DB     = 170000        EM36      023761        FINT1     005172        STACK  = 001100
BE1VEC    002552         DDISP  = 177570        EM37      024040        FINT3     005600        START    002632
BE2BA     002560         DH15     022205        EM38      024077        FIRST     003632        START1   003100
BE2BD     002554         DH17     022361        EM39      024167        HT     =  000011        STKLMT=  177774
BE2CC     002556         DH18     022475        EM4       021206        IADD      003266        STRAP    004030
BE2CR1    002562         DH19     022571        EM40      024245        INTVEC    002532        SWR      001172
BE2CR2    002564         DH2      021072        EM41      024323        IOTVEC=   000020        SWREG    000176
BE2RE     002566         DH24     023075        EM42      024365        ITRAP     004770        SW0    = 000001
BE2VEC    002570         DH3      021173        EM43      024424        LAST      014440        SW00   = 000001
BE3BA     002576         DH34     023637        EM44      024541        LAST1     014462        SW01   = 000002
BE3BD     002572         DH35     023733        EM45      024605        LF     =  000012        SW02   = 000004
BE3CC     002574         DH36     024030        EM46      024632        LOOP1     003150        SW03   = 000010
BE3CR1    002600         DH4      021254        EM47      024740        LOOP2     003156        SW04   = 000020
BE3CR2    002602         DH43     024510        EM49      025016        MSG1      020414        SW05   = 000040
BE3RE     002604         DH46     024702        EM5       021324        MSG10     027323        SW06   = 000100
BE3VEC    002606         DH65     026207        EM51      025075        MSG11     027356        SW07   = 000200
BE4BA     002614         DH7      021504        EM52      025126        MSG12     027442        SW08   = 000400
BE4BD     002610         DINT     016276        EM53      025161        MSG13     027570        SW09   = 001000
BE4CC     002612         DISPLA   001174        EM54      025233        MSG14     027632        SW1    = 000002
BE4CR1    002616         DISPRE   000174        EM56      025476        MSG15     027703        SW10   = 002000
BE4CR2    002620         DSWR   = 177570        EM57      025555        MSG16     027737        SW11   = 004000
BE4RE     002622         DT2      021120        EM58      025605        MSG17     030026        SW12   = 010000
BE4VEC    002624         DT24     023152        EM59      025626        MSG2      020425        SW13   = 020000
BIT0    = 000001         DT3      021202        EM6       021372        MSG3      025331        SW14   = 040000
BIT00   = 000001         DT4      021314        EM60      025674        MSG4      025457        SW15   = 100000
BIT01   = 000002         DT7      021562        EM61      025722        MSG5      020663        SW2    = 000004
BIT02   = 000004         E        003532        EM62      025751        MSG7      027230        SW3    = 000010
BIT03   = 000010         EMAP     002510        EM63      026001        MSG8      027252        SW4    = 000020
BIT04   = 000020         EMTVEC=  000030        EM64      026031        MSG9      027267        SW5    = 000040
BIT05   = 000040         EM1      020750        EM65      026127        MTRAP     003234        SW6    = 000100
BIT06   = 000100         EM10     021716        EM66      026226        NO        002630        SW7    = 000200
BIT07   = 000200         EM11     021757        EM67      026254        NUBE      014430        SW8    = 000400
BIT08   = 000400         EM12     022023        EM69      026316        NUBE1     014434        SW9    = 001000
BIT09   = 001000         EM14     022070        EM7       021442        PIRQ   =  177772        TBITVE=  000014
BIT1    = 000002         EM15     022121        EM70      026347        PIRQVE=   000240        TERRPC   016432
BIT10   = 002000         EM16     022227        EM71      026430        PR0    =  000000        TKVEC  = 000060
BIT11   = 004000         EM17     022322        EM72      026456        PR1    =  000040        TMAP     002512
BIT12   = 010000         EM18     022406        EM73      026506        PR2    =  000100        TPVEC  = 000064
BIT13   = 020000         EM19     022510        EM74      026553        PR3    =  000140        TRAPVE=  000034
BIT14   = 040000         EM2      021032        EM75      026575        PR4    =  000200        TRTVEC=  000014
BIT15   = 100000         EM20     022612        EM76      026615        PR5    =  000240        TSTA     006656
BIT2    = 000004         EM21     022661        EM77      026642        PR6    =  000300        TSTB     014134
```

```
SYMBOL TABLE

TST1    003630      T05L03  004522      T17L11  010732      T28L01  013636      $DOAGN  016146
TST10   005224      T05L04  004506      T18L01  011020      T28L02  013752      $DTBL   017430
TST11   005754      T05L05  004652      T18L02  011052      T28L03  013770      $ENDAD  016136
TST12   006050      T05L06  004620      T18L03  011110      T28L04  014120      $ENDCT  016104
TST13   006656      T05L07  004562      T18L04  011072      T28L05  013650      $ENDMG  016155
TST14   007022      T05L08  004540      T19L01  011160      T28L06  014012      $ENULL  016152
TST15   007152      T06L01  005012      T19L02  011270      T28L08  014046      $EOP    016050
TST16   007456      T07L03  005116      T19L03  011240      T28L09  014060      $EOPCT  016076
TST17   007740      T07L04  005162      T19L04  011252      T28L10  013524      $ERFLG  001135
TST2    004060      T07L05  005220      T19L05  011330      T29L01  014244      $ERMAX  001147
TST20   010204      T07L06  005210      T19L07  011310      T29L02  014336      $ERROR  016722
TST21   010332      T07L07  005114      T19L09  011266      T29L03  014374      $ERRPC  001150
TST22   010472      T07L08  005202      T20L01  011366      T29L04  014240      $ERRTB  001250
TST23   010776      T08L01  005304      T20L02  011474      T29L05  014344      $ERRTY  017070
TST24   011134      T08L02  005552      T20L03  011442      T29L06  014310      $ERTTL  001144
TST25   011342      T08L03  005510      T20L04  011456      T29L07  014422      $ESCAP  001236
TST26   011550      T08L04  005642      T20L05  011536      T30L01  014516      $FILLC  001210
TST27   012002      T08L05  005650      T20L06  011516      T30L02  014730      $FILLS  001207
TST3    004266      T08L06  005736      T20L08  011476      T30L03  014744      $GDADR  001152
TST30   012116      T08L07  005732      T21L01  011742      T30L04  014760      $GDDAT  001156
TST31   012372      T08L08  005252      T21L02  011770      T30L05  014774      $GET42  016126
TST32   012706      T08L09  005536      T21L03  011724      T30L06  015006      $HD   = 000001
TST33   013136      T09L01  014212      T21L04  011776      T30L07  014716      $ICNT   001136
TST34   013224      T10L01  006206      T22L01  012076      T30L08  015506      $ILLUP  020376
TST35   013500      T10L02  006326      T23L01  007320      T30L09  015332      $INTAG  001167
TST36   014134      T10L03  006452      T23L02  007254      T30L10  015422      $ITEMB  001146
TST37   014216      T10L04  006616      T23L03  007274      T30L11  015410      $LF     001246
TST4    004364      T10L05  006572      T23L04  007446      T30L12  015676      $LPADR  001140
TST40   014460      T10L06  006412      T23L05  007344      T30L13  015474      $LPERR  001142
TST5    004462      T11L01  006744      T23L06  007364      T30L14  015360      $MXCNT  016720
TST6    004656      T11L02  006764      T23L07  007426      T30L15  015552      $NULL   001206
TST7    005032      T12L01  007114      T24L01  012230      T30L16  015572      $NWTST= 000001
TYPDS = 104405      T13L01  010012      T24L02  012220      T30L17  015600      $OCNT   020162
TYPE  = 104401      T13L02  007774      T24L03  012366      T30L20  016022      $OMODE  020164
TYPOC = 104402      T13L03  010016      T24L04  012334      T30L21  014636      $OVER   016704
TYPON = 104404      T13L04  010154      T24L05  012266      T30L22  015026      $PASS   001132
TYPOS = 104403      T13L05  010176      T24L06  012250      T30L25  015202      $POWER  020404
T01L01  003676      T14L01  007670      T25L01  012512      T30L26  015100      $PWRDN  020236
T01L02  003754      T14L02  007504      T25L02  012542      T30L27  015250      $PWRMG  020372
T01L03  003712      T14L03  007712      T25L03  012644      T30L28  015044      $PWRUP  020310
T01L04  003760      T14L04  007734      T25L04  012664      T30L29  015120      $QUES   001244
T01L05  004042      T15L01  010250      T25L05  012420      T30L30  015072      $REGAD  001212
T01L06  003746      T15L02  010326      T25L06  012560      T31L01  013220      $REG0   001214
T02L01  004214      T15L03  010234      T25L07  012622      UCNT    002626      $REG1   001216
T02L02  004144      T16L01  010414      T25L08  012702      WINT    005716      $REG2   001220
T02L03  004122      T16L02  010452      T26L01  013044      $AUTOB  001166      $REG3   001222
T02L04  004204      T16L03  010460      T26L02  012752      $BDADR  001154      $RTNAD  016150
T03L01  004346      T17L01  010516      T26L03  013002      $BDDAT  001160      $SAVR6  020402
T03L02  004356      T17L02  010612      T26L04  013022      $BELL   001240      $SCOPE  016472
T03L03  004312      T17L03  010572      T26L05  013070      $CHARC  017734      $SETUP= 000037
T03L04  004306      T17L04  010710      T27L01  013324      $CMTAG  001132      $STUP = 177777
T04L01  004444      T17L05  010616      T27L02  013444      $CM1  = 000004      $SVLAD  016656
T04L02  004454      T17L06  010630      T27L03  013370      $CM2  = 000010      $SVPC = 001132
T04L03  004410      T17L07  010754      T27L04  013340      $CM3  = 000004      $SWR  = 167000
T04L04  004404      T17L08  010764      T27L05  013432      $CM4  = 000004      $SWRMK= 000000
T05L01  004572      T17L09  010772      T27L06  013402      $CRLF   001245      $TIMES  001234
T05L02  004624      T17L10  010712      T27L07  013464      $DBLK   017440      $TXB    001200
```

```
$TKS     001176          $TN    = 000041        $TRAP2   020210        $TYPE    017450        $TYPOS   017740
$TMP0    001224          $TPB     001204        $TRP   = 000006        $TYPEC   017620        $XTSTR   016502
$TMP1    001226          $TPFLG   001211        $TRPAD   020222        $TYPEX   017736        $$GET4=  000000
$TMP2    001230          $TPS     001202        $TSTNM   001134        $TYPOC   017764        $OFILL   020163
$TMP3    001232          $TRAP    020166        $TYPDS   017224        $TYPON   020000

. ABS.   030104       000
         000000       001
ERRORS DETECTED:  1

VIRTUAL MEMORY USED:  59472 WORDS  ( 233 PAGES)
DYNAMIC MEMORY:  20434 WORDS  ( 78 PAGES)
ELAPSED TIME:  00:05:46
CZKUBCO,CZKUBCO/NL:TOC/CRF/-SP=CZKUBCO.SML,CZKUBCO.P11
```

```
                                                                        J  8
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06        PAGE 1
SYMBOL CROSS REFERENCE                                      CREF                                                          SEQ 0100
SYMBOL   VALUE              REFERENCES
A          003172           #61-511     61-524
ACALC      003376           #61-545     61-557      61-565      69-2075
B          001126            59-25     #59-27
BEBA       002522           #61-455    *61-533     *61-547      62-714      62-742      65-1037     65-1054     65-1072     65-1091
                             65-1137    65-1161     65-1193     65-1225     65-1253     65-1259     65-1269     65-1273     65-1275
                             65-1280    65-1325     65-1331     65-1338     65-1384     65-1394     65-1421     65-1484     65-1523
                             65-1573    65-1619     65-1631     66-1692     66-1712     66-1715     66-1716     66-1748     66-1841
                             66-1936    66-1943     66-1957     66-1958     69-2039     69-2319
BFBD       002516           #61-453    *61-531     *61-545      61-569      61-575      61-600      62-699      62-727      62-760
                             62-761     65-1042     65-1044     65-1055     65-1061     65-1076     65-1080     65-1090     65-1098
                             65-1145    65-1149     65-1165     65-1169     65-1323     65-1329     65-1336     65-1390     65-1420
                             65-1525    65-1618     69-2321
BECC       002520           #61-454    *61-532     *61-546      65-1036     65-1053     65-1071     65-1092     65-1136     65-1162
                             65-1195    65-1227     65-1250     65-1261     65-1270     65-1320     65-1326     65-1333     65-1364
                             65-1366    65-1385     65-1392     65-1422     65-1485     65-1524     65-1574     65-1620     65-1632
                             65-1666    66-1694     66-1714     66-1747     66-1840     66-1852     66-1934     66-1944     66-1953
                             66-1955    69-2040     69-2320
BECR1      002524           #61-456    *61-534     *61-548      61-602      61-618      61-651      62-768      62-775      62-779
                             62-789     62-852      62-853      62-860      62-862      62-922      62-928      62-933      62-938
                             62-949     62-956      62-958      62-959      62-978      62-1006     65-1039     65-1057     65-1074
                             65-1093    65-1109     65-1138     65-1163     65-1196     65-1203     65-1220     65-1229     65-1231
                             65-1251    65-1262     65-1271     65-1321     65-1327     65-1334     65-1357     65-1371     65-1388
                             65-1424    65-1442     65-1446     65-1486     65-1487     65-1526     65-1575     65-1621     65-1633
                             65-1646    65-1667     65-1670     65-1674     66-1696     66-1722     66-1744     66-1749     66-1752
                             66-1762    66-1767     66-1774     66-1780     66-1786     66-1791     66-1810     66-1820     66-1842
                             66-1854    66-1938     66-1945     66-1963     66-1965     66-1973     66-2009     69-2041     69-2318
                             69-2342
BECR2      002526           #61-457    *61-535     *61-549      61-598      61-609      61-611      61-620      61-622      61-623
                             62-667     62-669      62-684      62-686      62-777      62-781      62-787      62-791      62-823
                             62-824     62-836      62-966      62-968      62-990      62-1005     64-1016     65-1194     65-1198
                             65-1210    65-1215     65-1226     65-1260     65-1264     65-1285     65-1332     65-1387     65-1401
                             65-1444    65-1447     66-1693     66-1698     66-1706     66-1713     66-1718     66-1720     66-1721
                             66-1724    66-1754     66-1756     66-1760     66-1769     66-1771     66-1808     66-1815     66-1833
                             66-1853    66-1880     66-1916     66-1923     66-1935     66-1947     66-1952     66-1960     66-1961
                             66-1972    66-1974     66-1979     66-1984     66-1985     66-1987     66-1988     69-2317
BEGO       002534           #61-460    *61-537      61-577      65-1331     66-1692     66-2010     69-2140     69-2227
BERE       002530           #61-458    *61-536     *61-550      61-599      61-621      61-652      65-1214     65-1237     66-1832
                             66-1844    69-2316
BE1BA      002542           #61-463
BE1BD      002536           #61-461     61-539      61-543      69-2143
BE1CC      002540           #61-462
BE1CR1     002544           #61-464     69-2132     69-2144     69-2272     69-2281
BE1CR2     002546           #61-465
BE1RE      002550           #61-466
BE1VEC     002552           #61-467     69-2113     69-2114
BE2BA      002560           #61-470
BE2BD      002554           #61-468     69-2102     69-2146
BE2CC      002556           #61-469
BE2CR1     002562           #61-471     69-2133     69-2147     69-2273     69-2283
BE2CR2     002564           #61-472
BE2RE      002566           #61-473
BE2VEC     002570           #61-474     69-2116     69-2117
```

```
                                                                      K  8
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 2
SYMBOL CROSS REFERENCE                                   CREF                                                  SEQ 0101
SYMBOL  VALUE               REFERENCES
BE3BA     002576            #61-477
BE3BD     002572            #61-475     69-2149
BE3CC     002574            #61-476
BE3CR1    002600            #61-478     69-2134     69-2136     69-2150     69-2274     69-2276     69-2285     69-2287
BE3CR2    002602            #61-479
BE3RE     002604            #61-480
BE3VEC    002606            #61-481     69-2119     69-2121     69-2122
BE4BA     002614            #61-484
BE4BD     002610            #61-482     69-2152
BE4CC     002612            #61-483
BE4CR1    002616            #61-485     69-2137     69-2139     69-2153     69-2277     69-2279     69-2289     69-2291
BE4CR2    002620            #61-486
BE4RE     002622            #61-487
BE4VEC    002624            #61-488     69-2124     69-2126     69-2127
BIT0    = 000001            #59-17
BIT00   = 000001            #59-17      59-17
BIT01   = 000002            #59-17      59-17
BIT02   = 000004            #59-17      59-17
BIT03   = 000010            #59-17      59-17
BIT04   - 000020            #59-17      59-17
BIT05   = 000040            #59-17      59-17
BIT06   - 000100            #59-17      59-17
BIT07   = 000200            #59-17      59-17
BIT08   = 000400            #59-17      59-17
BIT09   = 001000            #59-17      59-17       69-2398     69-2399
BIT1    = 000002            #59-17
BIT10   - 002000            #59-17      69-2399
BIT11   = 004000            #59-17      69-2398
BIT12   = 010000            #59-17
BIT13   = 020000            #59-17      69-2399
BIT14   - 040000            #59-17      69-2398
BIT15   = 100000            #59-17
BIT2    - 000004            #59-17
BIT3    = 000010            #59-17
BIT4    = 000020            #59-17
BIT5    = 000040            #59-17
BIT6    = 000100            #59-17
BIT7    - 000200            #59-17
BIT8    = 000400            #59-17
BIT9    = 001000            #59-17
BPTVEC  - 000014            #59-17
BUFF1     030062            *65-1034    65-1037     65-1045     65-1046     *65-1052    65-1054     65-1059     65-1062     65-1063
                            *65-1070    65-1072     65-1078     65-1081     65-1082     *65-1088    65-1091     65-1095     65-1099
                             65-1100    *65-1135    65-1137     65-1147     65-1150     65-1151     *65-1160    65-1161     65-1167
                             65-1170    65-1171     65-1269     65-1273     65-1276     65-1384     *65-1386    65-1394     65-1416
                             65-1418    65-1421     65-1433     65-1436     65-1440     65-1454     65-1459     65-1480     65-1482
                             65-1484    65-1489     65-1494     65-1519     65-1521     65-1523     65-1530     65-1533     65-1537
                             65-1542    65-1547     65-1569     65-1571     65-1573     65-1579     65-1582     65-1586     65-1591
                             65-1596    *65-1617    65-1619     65-1626     *65-1628    *65-1629    65-1631     65-1639     66-1748
                             66-1841    69-2034     69-2036     69-2039     69-2043     *69-2043    69-2052     69-2056     69-2129
                            *69-2161    69-2170     69-2173     69-2221     69-2222     69-2235     69-2237     69-2239     69-2240
                             69-2242    69-2243     #69-2537
```

```
                                                              L  8
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 3
SYMBOL CROSS REFERENCE                                   CREF                                                      SEQ 0102
SYMBOL   VALUE               REFERENCES
C          003500             61-555    #61-559
CLRREG     016172             62-759     62-786    62-848    62-905    62-1004   65-1021   65-1035   65-1051   65-1069
                              65-1133    65-1158   65-1191   65-1246   65-1301   65-1354   65-1383   65-1415   65-1478
                              65-1518    65-1568   65-1616   65-1661   66-1691   66-1743   66-1807   66-1838   66-1849
                              66-2007    69-2031   69-2074  #69-2316
CR       = 000015            #59-17      69-2402   69-2402
CRDY       016246             65-1139    65-1164   65-1197   65-1230   65-1252   65-1263   65-1272   65-1322   65-1328
                              65-1335    65-1402   65-1553   65-1602   65-1623   65-1635   65-1648   66-1697   66-1723
                              66-1751    66-1843   66-1855  #69-2339
CRLF     = 000200            #59-17      69-2402   69-2402
D          003514             61-560    #61-562
DB       = 170000            #59-18      61-503
DDISP    - 177570            #59-17      60-29     61-492
DH15       022205             61-102     61-317    61-342   #69-2439
DH17       022361             61-112    #69-2442
DH18       022475             61-117    #69-2444
DH19       022571             61-122    #69-2446
DH2        021072             61-37     #69-2415
DH24       023075             61-147     61-152    61-157    61-162    61-187    61-192   #69-2453
DH3        021173             61-42     #69-2419
DH34       023637             61-197    #69-2466
DH35       023733             61-202     61-212    61-217   #69-2468
DH36       024030             61-207    #69-2470
DH4        021254             61-47      61-52     61-57     61-417   #69-2423
DH43       024510             61-242     61-262    61-277   #69-2478
DH46       024702             61-257     61-432   #69-2482
DH65       026207             61-352     61-362    61-367    69-2187  #69-2502
DH7        021504             61-62     #69-2429
DINT       016276             65-1247    65-1302   66-1711   66-1839   66-1850   66-1937  #69-2352
DISPLA     001174            #60-29     *61-492   *61-492    69-2398   69-2399
DISPRE     000174            #59-20      61-492
DSWR     - 177570            #59-17      60-29     61-492
DT2        021120             61-38      61-113    61-203    61-213    61-218    61-243    61-263    61-278   #69-2417
DT24       023152             61-148     61-153    61-158    61-163    61-188    61-193   #69-2455
DT3        021202             61-43      61-103    61-118    61-123    61-198    61-208    61-318    61-343    61-353
                              61-363     61-368   #69-2421
DT4        021314             61-48      61-53     61-58     61-258    61-418    61-433   #69-2425
DT7        021562             61-63     #69-2431
E          003532             61-563    #61-566
EMAP       002510            #61-450    *61-497   *61-506    61-516    61-523    61-544
EMTVEC   = 000030            #59-17      61-492    61-492
EM1        020750             61-31     #69-2413
EM10       021716             61-76     #69-2434
EM11       021757             61-81     #69-2435
EM12       022023             61-86     #69-2436
EM14       022070             61-96     #69-2437
EM15       022121             61-101    #69-2438
EM16       022227             61-106    #69-2440
EM17       022322             61-111    #69-2441
EM18       022406             61-116    #69-2443
EM19       022510             61-121    #69-2445
EM2        021032             61-36     #69-2414
```

```
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 4
SYMBOL CROSS REFERENCE                                  CREF                                    SEQ 0103
SYMBOL  VALUE              REFERENCES
EM20        022612          61-126     #69-2447
EM21        022661          61-131     #69-2449
EM22        022717          61-136     #69-2450
EM23        022762          61-141     #69-2451
EM24        023026          61-146     #69-2452
EM25        023164          61-151     #69-2456
EM26        023224          61-156     #69-2457
EM27        023265          61-161     #69-2458
EM28        023325          61-166     #69-2459
EM29        023354          61-171     #69-2460
EM3         021126          61-41      #69-2418
EM30        023403          61-176     #69-2461
EM31        023433          61-181     #69-2462
EM32        023463          61-186     #69-2463
EM33        023532          61-191     #69-2464
EM34        023567          61-196     #69-2465
EM35        023656          61-201     #69-2467
EM36        023761          61-206     #69-2469
EM37        024040          61-211     #69-2471
EM38        024077          61-216     #69-2472
EM39        024167          61-221     #69-2473
EM4         021206          61-46      #69-2422
EM40        024245          61-226     #69-2474
EM41        024323          61-231     #69-2475
EM42        024365          61-236     #69-2476
EM43        024424          61-241      61-301     #69-2477
EM44        024541          61-246     #69-2479
EM45        024605          61-251     #69-2480
EM46        024632          61-256     #69-2481
EM47        024740          61-261      61-266     #69-2483
EM49        025016          61-271      61-276     #69-2484
EM5         021324          61-51      #69-2426
EM51        025075          61-281     #69-2485
EM52        025126          61-286     #69-2486
EM53        025161          61-291     #69-2487
EM54        025233          61-296     #69-2488
EM56        025476          61-306     #69-2492
EM57        025555          61-311     #69-2493
EM58        025605          61-316     #69-2494
EM59        025626          61-321     #69-2495
EM6         021372          61-56      #69-2427
EM60        025674          61-326     #69-2496
EM61        025722          61-331     #69-2497
EM62        025751          61-336     #69-2498
EM63        026001          61-341     #69-2499
EM64        026031          61-346     #69-2500
EM65        026127          61-351     #69-2501
EM66        026226          61-356     #69-2503
EM67        026254          61-361     #69-2504
EM69        026316          61-371     #69-2505
EM7         021442          61-61      #69-2428
EM70        026347          61-376     #69-2506
```

```
                                                                                  N  8
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 5
SYMBOL CROSS REFERENCE                                  CREF                                                          SEQ 0104
SYMBOL   VALUE          REFERENCES
EM71       026430        61-381     #69-2507
EM72       026456        61-386     #69-2508
EM73       026506        61-391     #69-2509
EM74       026553        61-396     #69-2510
EM75       026575        61-401     #69-2511
EM76       026615        61-406     #69-2512
EM77       026642        61-411     #69-2513
EM78       026670        61-416     #69-2514
EM8        021570        61-66      #69-2432
EM80       026730        61-426     #69-2515
EM81       026772        61-431     #69-2516
EM82       027016        61-436     #69-2517
EM83       027063        61-441     #69-2518
EM84       027144        61-446     #69-2519
EM9        021655        61-71      #69-2433
ERROR    - 104000       #59-17       61-525     61-608     61-630     62-666     62-707     62-735     62-772     62-825
                         62-865      62-868     62-872     62-876     62-952     62-964     62-969     62-981     62-987
                         62-992      64-1018    65-1048    65-1065    65-1084    65-1102    65-1117    65-1120    65-1123
                         65-1126     65-1142    65-1153    65-1173    65-1200    65-1201    65-1205    65-1206    65-1211
                         65-1212     65-1217    65-1218    65-1222    65-1223    65-1233    65-1234    65-1277    65-1282
                         65-1288     65-1340    65-1368    65-1396    65-1399    65-1430    65-1449    65-1456    65-1461
                         65-1464     65-1467    65-1502    65-1544    65-1549    65-1593    65-1598    65-1636    65-1641
                         65-1644     65-1650    65-1672    66-1700    66-1701    66-1707    66-1708    66-1726    66-1727
                         66-1759     66-1761    66-1763    66-1773    66-1775    66-1776    66-1779    66-1781    66-1782
                         66-1785     66-1787    66-1790    66-1792    66-1817    66-1818    66-1822    66-1823    66-1828
                         66-1829     66-1835    66-1836    66-1858    66-1882    66-1883    66-1896    66-1897    66-1909
                         66-1910     66-1918    66-1919    66-1968    66-1990    66-2013    69-2047    69-2048    69-2065
                         69-2066     69-2180    69-2258
ERRVEC   - 000004       #59-17       61-492     61-492     61-492     69-2398    69-2398    69-2398    69-2398
ERR1       006620        65-1038    #65-1117
ERR2       006630        65-1056    #65-1120
ERR3       006640        65-1073    #65-1123
ERR4       006650        65-1089    #65-1126
F          003570       #61-576      61-578
FINT1      005172        62-849     #62-872
FINT3      005600        62-919     #62-962
FIRST      003632        61-581      61-582    #61-594
GNS      = ******        59-20       59-20      69-2404    69-2404    69-2404    69-2404    69-2404    69-2404    69-2404
                         69-2404     69-2404    69-2404
HT       = 000011       #59-17       69-2402    69-2402
IADD       003266        61-518     #61-531
INTVEC     002532       #61-459     *61-538    *61-551     62-849     62-850     62-919     62-941     62-973     65-1192
                         65-1228     65-1356    65-1423    65-1630    66-1695    66-1745    66-1766    66-1809    66-2008
                         69-2038     69-2327    69-2329    69-2352    69-2354
IOTVEC   = 000020       #59-17       61-492     61-492
ITRAP      004770        62-816     #62-830
LAST       014440        61-558      61-561    #69-2077
LAST1      014462        69-2077     69-2078   #69-2102
LF       - 000012       #59-17       69-2402    69-2402
LOOP1      003150       #61-505      61-510
LOOP2      003156       #61-507      61-522
MSG1       020414        61-515     #69-2407
```

```
                                                                     B 9
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 6
SYMBOL CROSS REFERENCE                                   CREF                                                             SEQ 0105
SYMBOL  VALUE              REFERENCES
MSG10      027323           69-2189    69-2270   #69-2523
MSG11      027356           69-2106   #69-2524
MSG12      027442           61-496    #69-2525
MSG13      027570           61-568    #69-2527
MSG14      027632           61-613     62-671    #69-2528
MSG15      027703           69-2389   #69-2529
MSG16      027737           61-495    #69-2530
MSG17      030026           69-2391   #69-2531
MSG2       020425           69-2305   #69-2408
MSG3       025331           65-1664   #69-2489
MSG4       025457           66-1678   #69-2491
MSG5       020663           62-833    #69-2412
MSG7       027230           69-2184    69-2261    69-2266   #69-2520
MSG8       027252           69-2263    69-2268   #69-2521
MSG9       027267           69-2265   #69-2522
MTRAP      003234           61-501    #61-520
NO         002630          #61-490     61-541    *61-543     61-574    *61-579
NUBE       014430           62-673     62-709     62-737     62-774     62-867     62-879    #69-2074
NUBE1      014434           61-635    #69-2075
PIRQ     = 177772          #59-17
PIRQVE   = 000240          #59-17
PR0      = 000000          #59-17
PR1      = 000040          #59-17
PR2      = 000100          #59-17
PR3      = 000140          #59-17
PR4      = 000200          #59-17
PR5      = 000240          #59-17
PR6      = 000300          #59-17
PR7      = 000340          #59-17
PS       = 177776          #59-17      59-17
PSW      = 177776          #59-17      61-595     61-648     62-698     62-726     62-758     62-820     62-847     62-855
                            62-904     62-923     62-927     62-932     62-942     62-948     62-977     62-1003    63-1008
                            65-1033    65-1040    65-1134    65-1159    65-1190    65-1208    65-1248    65-1303    65-1353
                            65-1358    65-1370    65-1372    65-1382    65-1389    65-1414    65-1425    65-1479    65-1517
                            65-1527    65-1529    65-1551    65-1567    65-1576    65-1578    65-1600    65-1615    65-1634
                            65-1647    65-1668    66-1690    66-1703    66-1746    66-1750    66-1806    66-1825    66-1851
                            66-1874    66-1939    66-1971    66-1976    66-2006    66-2011    69-2033    69-2131    69-2141
                            69-2158    69-2177    69-2179    69-2206    69-2209    69-2228    69-2280
PTRAP      004754           62-821    #62-827
PWRVEC   = 000024          #59-17      61-492     61-492     69-2405    69-2405    69-2405    69-2405    69-2405    69-2405
RCATCH     016224           62-864     62-878     62-880     62-980     65-1236    65-1290    65-1342    65-1373    65-1469
                            65-1652    66-1729    66-1794    66-1845    66-1860    66-1992    66-2015    69-2068   #69-2326
RDYS       006570           65-1041    65-1058    65-1075    65-1094   #65-1108
RESVEC   = 000010          #59-17
RSTART     001100          #59-22
RTR        006044           64-1017   #65-1021
RVEC       016316           59-26      62-951     62-963     62-986     62-989    #69-2360
R6       =%000006          #59-17      59-24     *61-492    *61-492     61-492
R7        %000007          #59-17
SCOPE      000004          #59-17      61-593     61-646     62-696     62-724     62-756     62-807     62-845     62-902
                            62-1001    65-1031    65-1131    65-1156    65-1188    65-1244    65-1299    65-1351    65-1380
                            65-1412    65-1476    65-1515    65-1565    65-1613    65-1659    66-1688    66-1741    66-1804
```

```
SYMBOL  VALUE                REFERENCES
                              66-1847    66-1871    66-1930    66-2004    68-2029    69-2073    69-2101    69-2312
SPTR      002514             #61-452    *61-499     61-559     61-562    *61-564    *61-566
STACK   = 001100             #59-17      61-492     61-498     61-594     61-647     62-697     62-725     62-757     62-808
                              62-846     62-903     62-974     62-1002    65-1032    65-1132    65-1157    65-1189    65-1245
                              65-1300    65-1352    65-1381    65-1413    65-1477    65-1516    65-1566    65-1614    65-1660
                              66-1689    66-1742    66-1805    66-1848    66-1875    66-2005    69-2112
START     002632              59-20      59-23      59-27     #61-492     61-500     69-2382
START1    003100              61-494    #61-497     69-2312
STKLMT  - 177774             #59-17
STRAP     004030              61-596    #61-629
SWR       001172             #60-29      61-492    *61-492     61-492    *61-492     61-493     61-513     61-562     62-811
                              62-830     65-1662    66-1676    66-1872    66-1931    69-2104    69-2181    69-2259    69-2387
                              69-2398    69-2398    69-2398    69-2399    69-2399    69-2399    69-2399    69-2405    69-2405
SWREG     000176             #59-20      61-492
SW0     - 000001             #59-17
SW00    = 000001             #59-17      59-17
SW01    = 000002             #59-17      59-17
SW02    = 000004             #59-17      59-17
SW03    = 000010             #59-17      59-17
SW04    = 000020             #59-17      59-17
SW05    = 000040             #59-17      59-17      62-811
SW06    = 000100             #59-17      59-17
SW07    = 000200             #59-17      59-17
SW08    = 000400             #59-17      59-17
SW09    = 001000             #59-17      59-17
SW1     = 000002             #59-17
SW10    = 002000             #59-17
SW11    = 004000             #59-17
SW12    = 010000             #59-17      61-493     61-513     62-830     65-1662    66-1676    69-2104
SW13    = 020000             #59-17      69-2181    69-2259    69-2387
SW14    = 040000             #59-17
SW15    = 100000             #59-17
SW2     = 000004             #59-17
SW3     = 000010             #59-17
SW4     = 000020             #59-17
SW5     = 000040             #59-17
SW6     = 000100             #59-17
SW7     = 000200             #59-17
SW8     = 000400             #59-17
SW9     = 001000             #59-17
TBITVE  = 000014             #59-17
TERRPC    016432              61-526     61-614     61-631     62-672     62-708     62-736     62-773     62-826     62-866
                              62-869     62-873     62-877     62-953     62-965     62-970     62-982     62-988     62-993
                              65-1020    65-1049    65-1066    65-1085    65-1103    65-1118    65-1121    65-1124    65-1127
                              65-1143    65-1154    65-1174    65-1202    65-1207    65-1213    65-1219    65-1224    65-1235
                              65-1278    65-1283    65-1289    65-1341    65-1369    65-1397    65-1400    65-1431    65-1450
                              65-1457    65-1462    65-1465    65-1468    65-1503    65-1545    65-1550    65-1594    65-1599
                              65-1637    65-1642    65-1645    65-1651    65-1673    66-1702    66-1709    66-1728    66-1764
                              66-1777    66-1783    66-1788    66-1793    66-1819    66-1824    66-1830    66-1837    66-1859
                              66-1884    66-1898    66-1911    66-1920    66-1969    66-1991    66-2014    69-2049    69-2067
                              69-2271   #69-2387
TKVEC   - 000060             #59-17
```

```
SYMBOL  VALUE          REFERENCES
TMAP      002512       #61-451    *61-544    *61-553    *61-554     61-556
TPVEC   = 000064       #59-17
TRAPVE  = 000034       #59-17      61-492     61-492
TRTVEC  = 000014       #59-17
TSTA      006656        65-1050   #65-1129
TSTB      014134        66-1933   #66-1996
TST1      003630       #61-593
TST10     005224       #62-902
TST11     005754        62-971     62-983     62-991    #62-1001
TST12     006050       #65-1031
TST13     006656        65-1067    65-1086    65-1096    65-1104    65-1119    65-1122    65-1125   #65-1131
TST14     007022        65-1144    65-1148   #65-1156
TST15     007152        65-1168   #65-1188
TST16     007456       #65-1244
TST17     007740       #65-1299
TST2      004060        61-627    #61-646
TST20     010204       #65-1351
TST21     010332       #65-1380
TST22     010472       #65-1412
TST23     010776       #65-1476
TST24     011134        65-1496   #65-1515
TST25     011342       #65-1565
TST26     011550       #65-1613
TST27     012002       #65-1659
TST3      004266       #62-696
TST30     012116        66-1677   #66-1688
TST31     012372       #66-1741
TST32     012706       #66-1804
TST33     013136       #66-1847
TST34     013224       #66-1871
TST35     013500        66-1873   #66-1930
TST36     014134       #66-2004
TST37     014216       #68-2029
TST4      004364       #62-724
TST40     014460       #69-2101
TST5      004462       #62-756
TST6      004656        62-788    #62-807
TST7      005032        62-812    #62-845
TYPDS   = 104405        69-2312   #69-2404
TYPE    = 104401        61-495     61-496     61-515     61-517     61-568     61-570     61-613     62-671     62-833
                        65-1664    66-1678    69-2106    69-2184    69-2187    69-2189    69-2261    69-2263    69-2265
                        69-2266    69-2268    69-2270    69-2305    69-2312    69-2312    69-2389    69-2391    69-2399
                        69-2399    69-2400    69-2400    69-2400    69-2400    69-2400    69-2400    69-2400    69-2401
                        69-2402    69-2403   #69-2404    69-2405
TYPOC     104402        61-516     61-569     69-2185    69-2188    69-2262    69-2264    69-2267    69-2269    69-2390
                        69-2400    69-2400   #69-2404
TYPON   = 104404       #69-2404
TYPOS   - 104403        69-2393   #69-2404
T01L01    003676       #61-601     61-617
T01L02    003754        61-605    #61-616
T01L03    003712       #61-606     61-619     61-624
T01L04    003760        61-603    #61-618
```

```
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 9
SYMBOL CROSS REFERENCE                                   CREF                                                SEQ 0108
SYMBOL  VALUE              REFERENCES
T01L05     004042           61-615      #61-633
T01L06     003746           61-610       61-612      #61-614
T02L01     004214           62-662      #62-674
T02L02     004144          #62-663       62-681
T02L03     004122          #61-654       62-687
T02L04     004204           62-668       62-670      #62-672
T03L01     004346           62-703      #62-710
T03L02     004356           62-711      #62-714
T03L03     004312          #62-701       62-713
T03L04     004306          #62-700       62-715
T04L01     004444           62-731      #62-738
T04L02     004454           62-739      #62-742
T04L03     004410          #62-729       62-741
T04L04     004404          #62-728       62-743
T05L01     004572           62-765       62-767      #62-777
T05L02     004624           62-778      #62-786
T05L03     004522          #62-764       62-783       62-785
T05L04     004506          #62-761       62-792       62-794
T05L05     004652           62-790      #62-793
T05L06     004620           62-780      #62-784
T05L07     004562           62-769      #62-775
T05L08     004540          #62-770       62-776
T06L01     005012           62-829       62-831      #62-834
T07L03     005116          #62-857       62-861
T07L04     005162           62-859      #62-868
T07L05     005220           62-863      #62-880
T07L06     005210           62-870      #62-878
T07L07     005114          #62-856       62-874
T07L08     005202           62-854      #62-876
T08L01     005304          #62-915       62-918
T08L02     005552           62-941      #62-955
T08L03     005510          #62-945       62-960
T08L04     005642           62-967      #62-973
T08L05     005650           62-973      #62-974
T08L06     005736           62-954      #62-990
T08L07     005732           62-957      #62-989
T08L08     005252          #62-908       62-910
T08L09     005536           62-944      #62-951
T09L01     014212           66-2008     #66-2015
T10L01     006206           65-1043     #65-1051
T10L02     006326           65-1060     #65-1069
T10L03     006452           65-1079     #65-1088
T10L04     006616           65-1110     #65-1116
T10L05     006572          #65-1109      65-1113
T10L06     006412           65-1077     #65-1080
T11L01     006744           65-1141     #65-1145
T11L02     006764           65-1146     #65-1149
T12L01     007114           65-1166     #65-1169
T13L01     010012           65-1307     #65-1314
T13L02     007774          #65-1309      65-1312
T13L03     010016           65-1313     #65-1316
T13L04     010154           65-1324      65-1330     #65-1338
```

```
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 10
SYMBOL CROSS REFERENCE                                   CREF                                                        SEQ 0109
SYMBOL  VALUE          REFERENCES
T13L05    010176          65-1337   #65-1342
T14L01    007670          65-1254   #65-1280
T14L02    007504         #65-1250    65-1258
T14L03    007712          65-1265   #65-1285
T14L04    007734          65-1274    65-1279    65-1284   #65-1290
T15L01    010250          65-1356   #65-1360
T15L02    010326          65-1363   #65-1373
T15L03    010234         #65-1357    65-1365
T16L01    010414         #65-1390    65-1391
T16L02    010452          65-1393   #65-1399
T16L03    010460          65-1395    65-1398   #65-1401
T17L01    010516         #65-1417    65-1419
T17L02    010612          65-1423   #65-1433
T17L03    010572         #65-1427    65-1429
T17L04    010710          65-1435   #65-1452
T17L05    010616         #65-1434    65-1437
T17L06    010630         #65-1438    65-1441
T17L07    010754          65-1443   #65-1464
T17L08    010764          65-1445   #65-1467
T17L09    010772          65-1432    65-1448    65-1451    65-1458    65-1463    65-1466   #65-1469
T17L10    010712          65-1439   #65-1453
T17L11    010732          65-1455   #65-1459
T18L01    011020         #65-1481    65-1483
T18L02    011052         #65-1487    65-1488
T18L03    011110          65-1492   #65-1498
T18L04    011072         #65-1491    65-1495
T19L01    011160         #65-1520    65-1522
T19L02    011270          65-1536   #65-1541
T19L03    011240         #65-1531    65-1534
T19L04    011252         #65-1535    65-1538
T19L05    011330          65-1539    65-1546   #65-1551
T19L07    011310          65-1543   #65-1547
T19L09    011266          65-1532   #65-1540
T20L01    011366         #65-1570    65-1572
T20L02    011474          65-1581   #65-1589
T20L03    011442         #65-1580    65-1583
T20L04    011456         #65-1584    65-1587
T20L05    011536          65-1588    65-1595   #65-1600
T20L06    011516          65-1592   #65-1596
T20L08    011476          65-1585   #65-1590
T21L01    011742          65-1625   #65-1644
T21L02    011770          65-1627   #65-1650
T21L03    011724          65-1630   #65-1639
T21L04    011776          65-1638    65-1640    65-1643    65-1649   #65-1652
T22L01    012076          65-1671   #65-1674
T23L01    007320          65-1192   #65-1214
T23L02    007254          65-1199   #65-1203
T23L03    007274          65-1204   #65-1208
T23L04    007446          65-1232   #65-1236
T23L05    007344          65-1216   #65-1220
T23L06    007364          65-1221   #65-1225
T23L07    007426          65-1228   #65-1231
```

```
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 11
SYMBOL CROSS REFERENCE                                   CREF                                                                SEQ 0110
SYMBOL  VALUE            REFERENCES
T24L01    012230          66-1695   #66-1706
T24L02    012220          66-1699   #66-1703
T24L03    012366          66-1710    66-1719   #66-1729
T24L04    012334          66-1717   #66-1722
T24L05    012266         #66-1714    66-1725
T24L06    012250          66-1705   #66-1711
T25L01    012512          66-1745   #66-1759
T25L02    012542          66-1753   #66-1766
T25L03    012644          66-1755   #66-1785
T25L04    012664          66-1757   #66-1790
T25L05    012420         #66-1746    66-1758
T25L06    012560          66-1766   #66-1769
T25L07    012622          66-1770   #66-1779
T25L08    012702          66-1765    66-1772    66-1778    66-1784    66-1789   #66-1794
T26L01    013044          66-1809   #66-1832
T26L02    012752         #66-1812    66-1814
T26L03    013002          66-1816   #66-1820
T26L04    013022          66-1821   #66-1825
T26L05    013070          66-1831    66-1834   #66-1838
T27L01    013324          66-1878   #66-1886
T27L02    013444          66-1885    66-1899    66-1912    66-1914   #66-1916
T27L03    013370          66-1887   #66-1900
T27L04    013340         #66-1890    66-1892    66-1895
T27L05    013432          66-1900   #66-1913
T27L06    013402         #66-1903    66-1905    66-1908
T27L07    013464          66-1917   #66-1921
T28L01    013636          66-1946   #66-1949
T28L02    013752          66-1956    66-1959    66-1962   #66-1967
T28L03    013770          66-1966   #66-1971
T28L04    014120          66-1970    66-1986   #66-1992
T28L05    013650          66-1950   #66-1952
T28L06    014012         #66-1974    66-1975
T28L08    014046          66-1978   #66-1981
T28L09    014060          66-1982   #66-1984
T28L10    013524          66-1932   #66-1934
T29L01    014244         #69-2035    69-2037
T29L02    014336          69-2038   #69-2051
T29L03    014374          69-2054   #69-2062
T29L04    014240         #69-2034    69-2060
T29L05    014344         #69-2053    69-2057
T29L06    014310         #69-2043    69-2046
T29L07    014422          69-2050    69-2061   #69-2068
T30L01    014516          69-2103   #69-2112
T30L02    014730          69-2113   #69-2143
T30L03    014744          69-2116   #69-2146
T30L04    014760          69-2121   #69-2149
T30L05    014774          69-2126   #69-2152
T30L06    015006          69-2145    69-2148    69-2151   #69-2154
T30L07    014716          69-2135    69-2138   #69-2140
T30L08    015506          69-2217    69-2225   #69-2245
T30L09    015332         #69-2217    69-2220
T30L10    015422          69-2226   #69-2230
```

```
                                                             H  9
CZKUBCO   CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 12
SYMBOL CROSS REFERENCE                                  CREF                                                        SEQ 0111
SYMBOL  VALUE             REFERENCES
T30L11   015410       #69-2227   69-2234
T30L12   015676        69-2190   69-2236   69-2260  #69-2272
T30L13   015474        69-2238  #69-2242
T30L14   015360       #69-2223   69-2241   69-2244
T30L15   015552        69-2250  #69-2253
T30L16   015572        69-2254  #69-2257
T30L17   015600        69-2252   69-2256  #69-2258
T30L20   016022       #69-2298   69-2302
T30L21   014636        69-2120   69-2125  #69-2129
T30L22   015026        69-2157  #69-2160
T30L25   015202        69-2174  #69-2191
T30L26   015100       #69-2176   69-2194   69-2204
T30L27   015250        69-2196  #69-2201
T30L28   015044       #69-2170   69-2212
T30L29   015120       #69-2180   69-2197
T30L30   015072       #69-2175   69-2199
T31L01   013220        66-1857  #66-1860
UCNT     002626       #61-489   *61-567    69-2156   69-2167
WINT     005716        62-915   #62-985
$AUTOB   001166       #60-29
$BDADR   001154       #60-29
$BDDAT   001160       #60-29
$BELL    001240       #60-29     69-2399   69-2399   69-2399
$CHARC   017734       *69-2402  *69-2402   69-2402  *69-2402  #69-2402
$CKSWR - ******        69-2404
$CMTAG   001132       #60-29     61-492    61-492    61-492    61-492    61-492    61-492    61-492
$CM1   - 000004       #60-29     60-29     60-29    #60-29     60-29     60-29    #60-29     60-29     60-29
                      #60-29     60-29     60-29    #60-29
$CM2   = 000010       #60-29     60-29     60-29    #60-29     60-29     60-29    #60-29     60-29     60-29
                      #60-29     60-29     60-29    #60-29
$CM3   = 000004       #60-29     60-29     60-29
$CM4   = 000004       #60-29     60-29     60-29    #60-29     60-29     60-29    #60-29     60-29     60-29
                      #60-29     60-29     60-29    #60-29
$CRLF    001245       #60-29     61-517    61-570    69-2399   69-2399   69-2399   69-2400   69-2400   69-2400
                       69-2400   69-2402   69-2402   69-2402
$DBLK    017440        69-2401   69-2401  #69-2401
$DOAGN   016146        69-2312   69-2312  #69-2312
$DTBL    017430        69-2401  #69-2401
$ENDAD   016136        59-28    #69-2312   69-2399
$ENDCT   016104        61-492   #69-2312
$ENDMG   016155        69-2312  #69-2312
$ENULL   016152        69-2312  #69-2312
$EOP     016050        61-527    69-2108   69-2304  #69-2312
$EOPCT   016076       *61-492   #69-2312   69-2312
$ERFLG   001135       #60-29     69-2398   69-2398   69-2398  *69-2398   69-2398   69-2398  *69-2399   69-2399
                       69-2399
$ERMAX   001147       #60-29    *61-492    69-2398  *69-2398   69-2398   69-2398
$ERROR   016722        61-492   #69-2399
$ERRPC   001150       #60-29     69-2390  *69-2399  *69-2399   69-2399   69-2399   69-2399   69-2400
$ERRTB   001250       #61-29     69-2400
$ERRTY   017070        69-2399  #69-2400
$ERTTL   001144       #60-29    *69-2399   69-2399   69-2399
```

```
                                                                  I 9
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 13
SYMBOL CROSS REFERENCE                                   CREF                                                                          SEQ 0112
SYMBOL  VALUE            REFERENCES
$ESCAP    001236         #60-29      *61-492     *69-2398     69-2399     69-2399     69-2399     69-2399
$FILLC    001210         #60-29       69-2402     69-2402     69-2402
$FILLS    001207         #60-29       69-2402     69-2402
$GDADR    001152         #60-29
$GDDAT    001156         #60-29
$GET42    016126         #69-2312
$GTSWR  = ******          69-2404
$HD     = 000001          59-13       59-13       59-13
$ICNT     001136         #60-29      *69-2398     69-2398    *69-2398     69-2398     69-2398
$ILLUP    020376          69-2405     69-2405    #69-2405
$INTAG    001167         #60-29
$ITEMB    001146         #60-29      *69-2399     69-2399     69-2399     69-2400
$LF       001246         #60-29       69-2399     69-2399     69-2402     69-2402
$LPADR    001140         #60-29      *61-492     *61-581     *69-2077    *69-2398    *69-2398     69-2398     69-2398     69-2398
$LPERR    001142         #60-29      *61-492     *61-500     *61-582     *69-2078     69-2398    *69-2398     69-2398     69-2398
                          69-2399
$MAIL   = ******          61-492      69-2398     69-2399     69-2402
$MXCNT    016720          69-2398     69-2398     69-2398    #69-2398
$NULL     001206         #60-29       69-2402     69-2402     69-2402
$NWTST  - 000001         #61-593      61-593     #61-593      61-593     #61-646      61-646     #61-646      61-646     #62-696
                          62-696     #62-696      62-696     #62-724      62-724     #62-724      62-724     #62-756      62-756
                         #62-756      62-756     #62-807      62-807     #62-807      62-807     #62-845      62-845     #62-845
                          62-845     #62-902      62-902     #62-902      62-902     #62-1001     62-1001    #62-1001     62-1001
                         #65-1031     65-1031    #65-1031     65-1031    #65-1131     65-1131    #65-1131    #65-1156     65-1156
                         #65-1156    #65-1188     65-1188    #65-1188     65-1188    #65-1244     65-1244    #65-1244     65-1244
                         #65-1299     65-1299    #65-1299     65-1299    #65-1351     65-1351    #65-1351     65-1351    #65-1380
                          65-1380    #65-1380     65-1380    #65-1412     65-1412    #65-1412     65-1412    #65-1476     65-1476
                         #65-1476     65-1476    #65-1515     65-1515    #65-1515     65-1515    #65-1565     65-1565    #65-1565
                          65-1565    #65-1613     65-1613    #65-1613     65-1613    #65-1659     65-1659    #65-1659     65-1659
                         #66-1688     66-1688    #66-1688     66-1688    #66-1741     66-1741    #66-1741     66-1741    #66-1804
                          66-1804    #66-1804     66-1804    #66-1847     66-1847    #66-1847     66-1871    #66-1871     66-1871
                          66-1871    #66-1930     66-1930    #66-1930     66-1930    #66-2004     66-2004    #66-2004     66-2004
                         #68-2029     68-2029    #68-2029     68-2029    #69-2101     69-2101    #69-2101     69-2101
$OCNT     020162         *69-2403    *69-2403    #69-2403
$OMODE    020164         *69-2403    *69-2403     69-2403    *69-2403    *69-2403    #69-2403
$OVER     016704          69-2398     69-2398     69-2398    #69-2398
$PASS     001132         #60-29       69-2303    *69-2312    *69-2312     69-2312     69-2312     69-2312     69-2398     69-2398
                          69-2398
$POWER    020404          69-2405    #69-2405
$PWRDN    020236          61-492     #69-2405     69-2405
$PWRMG    020372         #69-2405
$PWRUP    020310          69-2405    #69-2405
$QUES     001244         #60-29       69-2399     69-2399     69-2402     69-2402
$RDCHR  = ******          69-2404
$RDDEC  = ******          69-2404
$RDLIN  = ******          69-2404
$RDOCT    ******          69-2404
$REGAD    001212         #60-29
$REGO     001214         #60-29      *61-606     *61-629     *62-663     *62-704     *62-732     *62-770     *62-920     *62-925
                         *62-930     *62-939     *62-945     *62-968     *62-976     *65-1044    *65-1061    *65-1080    *65-1098
                         *65-1149    *65-1169    *65-1210    *65-1275    *65-1280    *65-1287    *65-1338    *65-1339    *65-1366
                         *65-1459    *65-1499    *65-1547    *65-1596    *66-1706    *66-1760    *66-1762    *66-1774    *66-1780
```

```
                                                                                   J 9
CZKUBC0     CREATED BY  MACRO  ON 26-SEP-79 AT 10:06       PAGE 14
SYMBOL CROSS REFERENCE                                     CREF                                                                 SEQ 0113
SYMBOL  VALUE                  REFERENCES
                               *66-1786   *66-1791   *66-1953   *66-1957   *66-1960   *66-1963    66-1967   *66-1987   *69-2062
                               *69-2183    69-2185   *69-2246    69-2262    69-2417    69-2421    69-2425    69-2431    69-2455
$REG1        001216            #60-29     *61-607    *62-664    *62-706    *62-734    *62-771    *62-921    *62-926    *62-931
                               *62-940    *62-946    *62-975     62-977    *65-1045   *65-1062   *65-1081   *65-1099   *65-1150
                               *65-1170   *65-1276   *65-1281   *65-1367   *65-1460   *65-1500   *65-1548   *65-1597   *66-1967
                               *66-1988   *69-2063   *69-2186    69-2188   *69-2247    69-2264    69-2417    69-2425    69-2431
                                69-2455
$REG2        001220            #60-29     *62-665    *62-705    *62-733    *65-1046   *65-1063   *65-1082   *65-1100   *65-1151
                               *65-1171   *65-1501   *66-1954   *66-1964   *66-1989   *69-2064   *69-2248    69-2267    69-2425
                                69-2455
$REG3        001222            #60-29     *65-1047   *65-1064   *65-1083   *65-1101   *65-1152   *65-1172   *69-2251   *69-2255
                               *69-2257    69-2269    69-2455
$RTNAD       016150            #69-2312
$R2A       = ******             69-2404
$SAVRE     - ******             69-2404
$SAVR6       020402            *69-2405    69-2405   *69-2405   *69-2405   #69-2405
$SCOPE       016472             61-492    #69-2398
$SETUP     = 000037            #59-19      59-19     #59-19      59-19     #59-19      59-19     #59-19      59-19     #59-19
                                59-19     #59-19      61-492     61-492     61-492     61-492     61-492     61-492     61-492
                                61-492     61-492     61-492     61-492     61-492     69-2312    69-2312    69-2398    69-2399
                                69-2399    69-2399    69-2399
$STUP        177777            #59-19     #59-19      59-19     #59-19     #59-19      59-19     #59-19     #59-19      59-19
                               #59-19     #59-19      59-19     #59-19     #59-19      59-19
$SVLAD       016656             69-2398   #69-2398
$SVPC      - 001132            #59-28      59-28
$SWR       - 167000            #59-11      59-13      59-14      59-14      59-14      59-14      59-14      59-14      59-14
                                59-14      60-29      60-29      60-29      61-492     61-492     61-492     61-492     61-492
                                61-593     61-646     62-696     62-724     62-756     62-807     62-845     62-902     62-1001
                                65-1031    65-1131    65-1156    65-1188    65-1244    65-1299    65-1351    65-1380    65-1412
                                65-1476    65-1515    65-1565    65-1613    65-1659    66-1688    66-1741    66-1804    66-1847
                                66-1871    66-1930    66-2004    68-2029    69-2101    69-2312    69-2312    69-2312    69-2312
                                69-2312    69-2398    69-2398    69-2398    69-2398    69-2398    69-2398    69-2398    69-2398
                                69-2398    69-2398    69-2398    69-2398    69-2398    69-2398    69-2398    69-2398    69-2398
                                69-2398    69-2398    69-2399    69-2399    69-2399    69-2399    69-2399    69-2399    69-2399
                                69-2399    69-2399    69-2399    69-2399    69-2405
$SWRMK     - 000000             69-2398
$TIMES       001234            #60-29     *61-492    *62-832    *65-1659   *66-1871   *66-1930   *68-2029   *69-2107   *69-2312
                               *69-2398    69-2398   *69-2398    69-2398    69-2398
$TKB         001200            #60-29      69-2402    69-2402
$TKS         001176            #60-29      69-2402    69-2402
$TMP0        001224            #60-29     *62-906     69-2360
$TMP1        001226            #60-29     *61-653     61-654     62-677    *62-685
$TMP2        001230            #60-29
$TMP3        001232            #60-29
$TN          000041             59-13     #59-13      61-593     61-593    #61-593     61-627     61-646     61-646    #61-646
                                62-696     62-696    #62-696     62-724     62-724    #62-724     62-756     62-756    #62-756
                                62-788     62-807     62-807    #62-807     62-845     62-845    #62-845     62-902     62-902
                               #62-902     62-971     62-983     62-991     62-1001    62-1001   #62-1001    65-1031    65-1031
                               #65-1031    65-1067    65-1086    65-1096    65-1104    65-1119    65-1122    65-1125    65-1131
                                65-1131   #65-1131    65-1144    65-1148    65-1156    65-1156   #65-1156    65-1168    65-1188
                                65-1188   #65-1188    65-1244    65-1244   #65-1244    65-1299    65-1299   #65-1299    65-1351
                                65-1351   #65-1351    65-1380    65-1380   #65-1380    65-1412    65-1412   #65-1412    65-1476
```

```
                                                                         K  9
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06     PAGE 15
SYMBOL CROSS REFERENCE                                  CREF                                                                        SEQ 0114
SYMBOL  VALUE                 REFERENCES
                               65-1476    #65-1476     65-1496     65-1515     65-1515    #65-1515     65-1565     65-1565    #65-1565
                               65-1613     65-1613    #65-1613     65-1659     65-1659    #65-1659     66-1677     66-1688     66-1688
                              #66-1688     66-1741     66-1741    #66-1741     66-1804     66-1804    #66-1804     66-1847     66-1847
                              #66-1847     66-1871     66-1871    #66-1871     66-1873     66-1930     66-1930    #66-1930     66-2004
                               66-2004    #66-2004     68-2029     68-2029    #68-2029     69-2101     69-2101    #69-2101
$TPB       001204             #60-29       69-2402     69-2402     69-2402
$TPFLG     001211             #60-29       69-2402     69-2402     69-2402
$TPS       001202             #60-29       69-2402     69-2402     69-2402
$TRAP      020166              61-492     #69-2404
$TRAP2     020210             #69-2404     69-2404
$TRP     = 000006             #69-2404     69-2404     69-2404     69-2404     69-2404    #69-2404     69-2404     69-2404     69-2404
                               69-2404    #69-2404     69-2404     69-2404     69-2404     69-2404    #69-2404     69-2404     69-2404
                               69-2404     69-2404    #69-2404     69-2404     69-2404     69-2404     69-2404    #69-2404
$TRPAD     020222              69-2404    #69-2404
$TSTNM     001134             #60-29      *61-583     *69-2079    *69-2312     69-2392     69-2398    *69-2398     69-2398     69-2398
                               69-2398     69-2399     69-2399     69-2399
$TYPBN   = ******              69-2404
$TYPDS     017224             #69-2401     69-2404     69-2404
$TYPE      017450             #69-2402     69-2404     69-2404
$TYPEC     017620              69-2402     69-2402     69-2402    #69-2402     69-2402
$TYPEX     017736              69-2402     69-2402    #69-2402
$TYPOC     017764             #69-2403     69-2404     69-2404
$TYPON     020000              69-2403    #69-2403     69-2404
$TYPOS     017740             #69-2403     69-2404
$XTSTR     016502             #69-2398
$$GET4   = 000000             #69-2312     69-2312
$0FILL     020163             *69-2403    *69-2403     69-2403    #69-2403
$40CA1   - ******              69-2398     69-2399
```

```
                                                                   L 9
CZKUBC0   CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 16
MACRO CROSS REFERENCE                                    CREF                                                      SEQ 0115
MACRO NAME      REFERENCES
COMMEN          #18-1530  #59-17
ENDCOM          #18-1542  #59-17
ESCAPE          #20-1658  #59-17
GETPRI          #13-1282  #59-17
GETSWR          #22-1729  #59-17
MSG             #61-587   #61-593   #61-637   #61-646   #62-689   #62-696   #62-717   #62-724   #62-745   #62-756
                #62-796   #62-807   #62-838   #62-845   #62-882   #62-902   #62-995   #62-1001  #65-1023  #65-1031
                #65-1177  #65-1188  #65-1240  #65-1244  #65-1292  #65-1299  #65-1345  #65-1351  #65-1375  #65-1380
                #65-1404  #65-1412  #65-1471  #65-1476  #65-1505  #65-1515  #65-1555  #65-1565  #65-1604  #65-1613
                #65-1654  #65-1659  #66-1681  #66-1688  #66-1731  #66-1741  #66-1796  #66-1804  #66-1862  #66-1871
                #66-1925  #66-1930  #66-1998  #66-2004  #66-2018  #68-2029  #69-2083  #69-2101
MULT            #43-4409  #59-17
NEWTST          #19-1589  #59-17    #61-593   #61-646   #62-696   #62-724   #62-756   #62-807   #62-845   #62-902
                #62-1001  #65-1031  #65-1131  #65-1156  #65-1188  #65-1244  #65-1299  #65-1351  #65-1380  #65-1412
                #65-1476  #65-1515  #65-1565  #65-1613  #65-1659  #66-1688  #66-1741  #66-1804  #66-1847  #66-1871
                #66-1930  #66-2004  #68-2029  #69-2101
POP             #26-2107  #59-17     69-2401   69-2405   69-2405
PUSH            #26-2099  #59-17     69-2401   69-2405   69-2405
REPORT          #56-5368  #59-17
SETPRI          #12-1250  #59-17
SETTRA          #69-2404   69-2404   69-2404   69-2404   69-2404   69-2404
SETUP           #14-1306  #59-17    #61-492
SKIP            #21-1692  #59-17    #61-627   #62-788   #62-954   #62-957   #62-971   #62-983   #62-991   #65-1067
                #65-1086  #65-1096  #65-1104  #65-1119  #65-1122  #65-1125  #65-1144  #65-1148  #65-1168  #65-1274
                #65-1279  #65-1284  #65-1432  #65-1448  #65-1451  #65-1458  #65-1463  #65-1466  #65-1496  #65-1539
                #65-1546  #65-1588  #65-1595  #65-1640  #66-1677  #66-1873
SLASH           #17-1482  #59-17    #61-528   #61-530   #61-571   #61-573   #62-810   #62-815   #69-2070  #69-2072
                #69-2313  #69-2315  #69-2323  #69-2325  #69-2336  #69-2338  #69-2349  #69-2351  #69-2357  #69-2359
                #69-2384  #69-2386  #69-2534  #69-2536
SPACE           #59-17
STARS           #16-1451  #59-17     59-28     60-29     60-29     61-491    61-593    61-593    61-646    61-646
                 62-696    62-696    62-724    62-724    62-756    62-756    62-807    62-807    62-845    62-845
                 62-902    62-902    62-1001   62-1001   65-1031   65-1031   65-1131   65-1131   65-1156   65-1156
                 65-1188   65-1188   65-1244   65-1244   65-1299   65-1299   65-1351   65-1351   65-1380   65-1380
                 65-1412   65-1412   65-1476   65-1476   65-1515   65-1515   65-1565   65-1565   65-1613   65-1613
                 65-1659   65-1659   66-1688   66-1688   66-1741   66-1741   66-1804   66-1804   66-1847   66-1847
                 66-1871   66-1871   66-1930   66-1930   66-2004   66-2004   68-2029   68-2029   69-2101   69-2101
                 69-2312   69-2398   69-2399   69-2400   69-2401   69-2402   69-2403   69-2404   69-2405   69-2405
                 69-2406
SWRSU           #15-1420  #59-17    #61-492   #61-492
TRMTRP          #69-2404
TYPBIN          #25-2043  #59-17
TYPDEC          #25-2013  #59-17    #69-2312
TYPNAM          #23-1783  #59-17
TYPNUM          #25-1980  #59-17
TYPOCS          #25-1933  #59-17
TYPOCT          #25-1896  #59-17    #61-516   #61-569   #69-2185  #69-2188  #69-2262  #69-2264  #69-2267  #69-2269
                #69-2390  #69-2400  #69-2400
TYPTXT          #24-1850  #59-17
$$CMRE          #59-29     60-29     60-29     60-29     60-29
$$CMTM          #59-29    #60-29    #60-29    #60-29    #60-29
$$ESCA          #20-1671  #59-17
```

```
                                                                  M  9
CZKUBCO    CREATED BY  MACRO  ON 26-SEP-79 AT 10:06      PAGE 17
MACRO CROSS REFERENCE                                    CREF                                                                          SEQ 0116
MACRO NAME       REFERENCES
$$NEWT           #19-1625   #59-17     #61-593    #61-646    #62-696    #62-724    #62-756    #62-807    #62-845    #62-902
                 #62-1001   #65-1031   #65-1131   #65-1156   #65-1188   #65-1244   #65-1299   #65-1351   #65-1380   #65-1412
                 #65-1476   #65-1515   #65-1565   #65-1613   #65-1659   #66-1688   #66-1741   #66-1804   #66-1847   #66-1871
                 #66-1930   #66-2004   #68-2029   #69-2101
$$SET            #69-2404   #69-2404   #69-2404   #69-2404   #69-2404   #69-2404
$$SKIP           #21-1705   #59-17     #61-627    #62-788    #62-971    #62-983    #62-991    #65-1067   #65-1086   #65-1096
                 #65-1104   #65-1119   #65-1122   #65-1125   #65-1144   #65-1148   #65-1168   #65-1496   #66-1677   #66-1873
.EQUAT           #4-180     #59-7       59-17
.EQUIV           #59-4      #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17
                 #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17     #59-17
                 #59-17     #59-17     #59-17     #59-17
.HEADE           #2-54      #59-7       59-13
.KT11            #5-323
.SETUP           #10-1184   #59-8      #59-19
.SWRHI           #3-96      #59-7       59-14
.SWRLO           #59-14      59-15      59-16
.$ACT1           #52-4977   #59-8      #59-28
.$APTB           #53-5021
.$APTH           #54-5277
.$APTY           #57-5452
.$ASTA           #55-5323
.$CATC           #7-909     #59-8       59-20
.$CMTA           #9-1020    #59-8       59-29
.$DB2D           #46-4607
.$DB2O           #48-4730
.$DIV            #45-4510
.$EOP            #27-2166   #59-9      #69-2312
.$ERRO           #29-2647   #59-9      #69-2399
.$ERRT           #30-2842   #59-9      #69-2400
.$MULT           #44-4447
.$POWE           #40-4159   #59-8      #69-2405
.$RAND           #41-4234
.$RDDE           #37-3830
.$RDOC           #36-3739
.$READ           #35-3344
.$R2AZ           #51-4874
.$SAVE           #38-3905
.$SB2D           #47-4691
.$SB2O           #49-4792
.$SCOP           #28-2401   #59-7      #69-2398
.$SIZE           #42-4287
.$SUPR           #50-4830
.$TRAP           #39-4007   #59-8      #69-2404
.$TYPB           #34-3237
.$TYPD           #33-3160   #59-9      #69-2401
.$TYPF           #31-2929   #59-7       69-2402
.$TYPO           #32-3064   #59-7      #69-2403
.$40CA           #8-948
.1170            #6-502
```