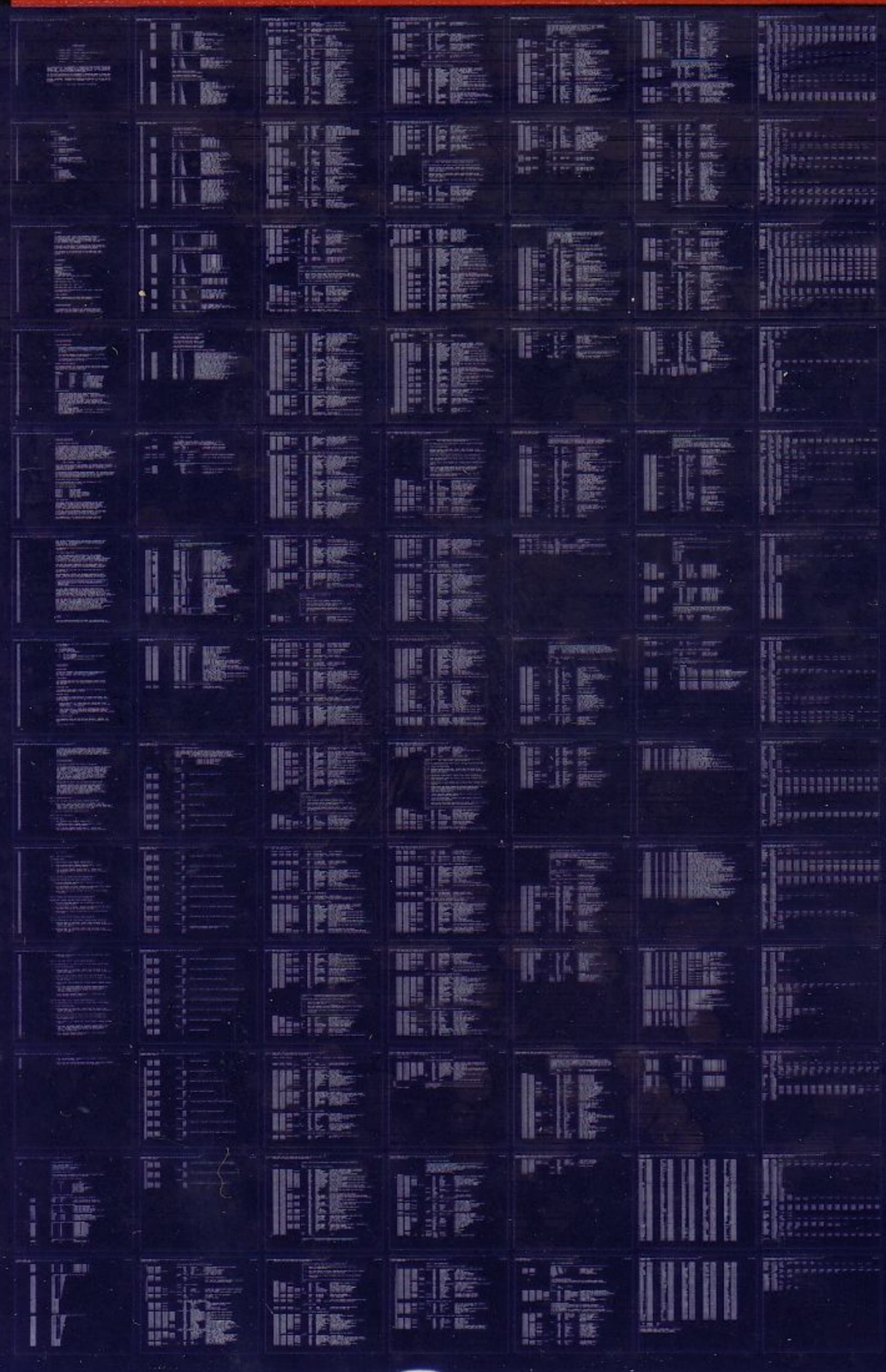
RM80

DU PORT TST PT 2
CZRNIAO

AH-T121A-MC
FICHE 1 OF 1

JUL 1982

MADE IN USA



```
.REM	^
```

IDENTIFICATION

PRODUCT CODE: AC-T120A-MC
PRODUCT NAME: CZRNIA0 RM80 DUAL PORT TEST, PT 2
PRODUCT DATE: APRIL 1, 1982
MAINTAINER: CX DIAGNOSTIC GROUP
AUTHOR: MIKE LEAVITT

CONTENTS

1. ABSTRACT

THE RM80 DUAL PORT LOGIC TEST PERFORMS A SERIES OF TESTS WHICH VERIFY THAT THE RM80 DUAL PORT LOGIC IS FUNCTIONING PROPERLY. ONLY THE CONTROL LOGIC IS TESTED BY THIS PROGRAM; DATA HANDLING IN THE DUAL PORT MODE IS NOT TESTED BY THIS PROGRAM.

BOTH PORTS OF THE DRIVE ARE CABLED TO THE SAME MASSBUS BY A SPECIAL ADAPTER CABLE. THIS ARRANGEMENT ALLOWS THE DUAL PORT LOGIC TO BE TESTED FROM ONE PDP-11 AND RH70.

THIS PROGRAM IS THE SECOND PART OF THE RM80 DUAL PORT OPTION LOGIC TEST, AND IS USED TO TEST THE "PORT SELECT" SWITCH.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11/70 PROCESSOR
8K MEMORY
KW11-L OR KW11-P CLOCK
TERMINAL
RH70 CONTROLLER
1 - RM80 DISK DRIVE
RM DUAL PORT TEST CABLE (P/N: 7010507-02)

2.2 PREREQUISITE PROGRAMS

RM80 DISKLESS TEST, PART 1 & 2

RM80 FUNCTIONAL TEST, PART 1, 2 & 3

RM80 DUAL PORT LOGIC TEST, PART 1

THE PRELIMINARY PROGRAMS MUST BE RUN TWICE: ONCE FROM EACH PORT (A & B).

2.3 OTHER PROGRAMS

DYNAMIC OPERATION OF THE DUAL PORT OPTION IS TESTED BY THE RM80 PERFORMANCE EXERCISER PROGRAM.

3. LOADING PROCEDURES

THE PROGRAM MAY BE LOADED BY THE ABSOLUTE PAPER TAPE LOADER OR IT MAY BE LOADED FROM THE APPROPIATE MEDIA USING THE ASSOCIATED'XXDP' LOADER. THE PROGRAM MAY NOT

BE INCLUDED IN AN 'XXDP' CHAIN.

4. STARTING PROCEDURES

4.1 STARTING ADDRESSES

A. THE NORMAL STARTING ADDRESS OF THE PROGRAM IS LOCATION 200(8). STARTING AT THIS ADDRESS ALLOWS THE OPERATOR TO SELECT (OR RESELECT) THE ADDRESS OF THE DRIVE TO BE TESTED.

B. THE RESTART ADDRESS IS LOCATION 204(8). THE PROGRAM WILL USE THE CURRENT DRIVE ADDRESS.

C. THE PROGRAM CAN BE STARTED AT LOCATION 210(8) TO ALLOW THE RH70 ADDRESS TO BE CHANGED.

4.2 UNIBUS & VECTOR ADDRESS

THE PROGRAM ASSUMES THE FOLLOWING UNIBUS AND VECTOR ADDRESSES. THESE ADDRESSES MAY BE CHANGED PRIOR TO STARTING THE PROGRAM FROM ANY OF THE STARTING LOCATIONS.

MEMORY LOCATION	CONTENTS	FUNCTION
1142	177560	TTY KEYBOARD STATUS REG
1144	177562	TTY KEYBOARD BUFFER REG
1146	177564	TTY PRINTER STATUS REG
1150	177566	TTY PRINTER BUFFER REG
1210	172540	KW11-P STATUS REG
1212	172542	KW11-L COUNTER BUFFER
1214	104	KW11-P VECTOR ADDRESS
1216	177546	KW11-L STATUS REGISTER
1220	100	KW11-L VECTOR ADDRESS

4.3 OPERATOR ACTION

A. CONNECT THE DUAL PORT TEST CABLE BETWEEN BUS A & BUS B ON THE DRIVE BEING TESTED. (SEE SECTION 5.4)
B. LOAD THE PROGRAM INTO MEMORY IN THE PROCESSOR CONTROLLING THE MASSBUS USED FOR TESTING.
C. SWITCH THE 'PORT SELECT' SWITCH ON THE DRIVE TO BE TESTED TO THE 'A/B' POSITION. CYCLE THE DRIVE UP.
D. LOAD THE APPROPIATE STARTING ADDRESS (200(8) OR 210(8)) INTO THE SWITCH REGISTER (OR THE 'SOFTWARE' SWITCH REGISTER, SEE SECTION 5.2.)
E. PRESS START.
F. ENTER THE DRIVE NUMBER.
G. ENTER THE NUMBER OF THE TEST TO BE RUN. ('CARRIAGE RETURN' OR '0' WILL RUN ALL TESTS.)
H. THE PROGRAM MAY BE STOPPED AT ANY TIME AND RESTARTED FROM LOCATION 204.

5. OPERATING PROCEDURES

5.1 'SOFTWARE' SWITCH REGISTER

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR THE PROGRAM WILL DETERMINE THAT THE HARDWARE SWITCH REGISTER IS NOT PRESENT AND WILL USE A 'SOFTWARE' SWITCH REGISTER. THE 'SOFTWARE' SWITCH REGISTER IS LOCATED AT LOCATION 176 (8). THE SETTINGS OF THE 'SOFTWARE' SWITCHES ARE CONTROLLED THROUGH A KEYBOARD ROUTINE WHICH IS CALLED BY TYPING A 'CONTROL G'. THE PROGRAM WILL RECOGNIZE THE 'CONTROL G' AT ANY TIME EXCEPT WHEN THE PROGRAM IS AT A HIGHER PRIORITY PROCESSING AN RM80 INTERRUPT. THE 'SOFTWARE' SWITCH VALUES ARE ENTERED AS AN OCTAL NUMBER IN RESPONSE TO THE PROMPT FROM THE SWITCH ENTRY ROUTINE:

'SWR = NNNNNN NEW ='

EACH TIME SWITCH SETTING ARE ENTERED, THE ENTIRE SWITCH REGISTER IMAGE MUST BE ENTERED. LEADING ZEROS ARE NOT REQUIRED., 'RUBOUT' AND 'CONTROL U' FUNCTIONS MAY BE USED TO CORRECT TYPING ERRORS DURING SWITCH ENTRY.

ON PROCESSORS WITH HARDWARE SWITCH REGISTERS, THE 'SOFTWARE' SWITCH REGISTER MAY BE USED, IF THE PROGRAM FINDS ALL 1'S IN THE SWITCHES. ALL SWITCH REGISTER REFERENCES WILL BE TO THE 'SOFTWARE' REGISTER AND THE PROCEDURES DESCRIBED ABOVE MUST BE FOLLOWED.

5.2 OPERATIONAL SWITCH SETTINGS

WITH ALL SWITCHES SET TO ZERO, THE PROGRAM WILL TYPE ALL ERRORS AND CONTINUE TESTING.

THE SWITCH SETTINGS ARE:

SW<15>=1	HALT ON ERROR
SW<14>=1	LOOP ON TEST
SW<13>=1	INHIBIT ERROR TYPEOUTS
SW<11>=1	INHIBIT TEST ITERATIONS
SW<10>=1	RING TTY BELL ON ERROR
SW<09>=1	LOOP ON ERROR

5.3 TEST SELECTION

INDIVIDUAL TESTS ARE SELECTED IN RESPONSE TO THE 'ENTER TEST NUMBER:' MESSAGE. ANY VALID TEST NUMBER CAN BE ENTERED. EACH ENTRY MUST BE TERMINATED BY A CARRIAGE RETURN (CR). THE LOOP ON TEST SWITCH, SW<14>, MUST BE SET TO ALL CONTINUOUS EXECUTION OF THE SELECTED TEST.

TO RUN ALL TESTS IN SEQUENCE, ENTER EITHER A '0' FOLLOWED BY A CARRIAGE RETURN OR A CARRIAGE RETURN BY ITSELF. THE PROGRAM WILL THEN EXECUTE ALL TESTS IN SEQUENCE.

THE 'RUBOUT KEY' (RO) CAN BE USED TO DELETE THE LAST CHARACTER ENTERED. SUCCESSIVELY STRIKING THE RO KEY

WILL DELETE CHARACTERS UNTIL THE PREVIOUS CHARACTERS HAVE
BEEN DELETED. CHARACTERS DELETED BY THE RO KEY WILL BE
TYPED AND WILL BE SEPARATED BY '\' FROM THE CHARACTERS
ENTERED BY THE OPERATOR.

THE OPERATOR CAN DELETE AN ENTIRE ENTRY BY TYPING A
'CONTROL U' .

5.4 TEST CABLE CONNECTION

TO TEST THE RM80 DUAL PORT OPTION WITH THIS PROGRAM,
A SPECIAL TEST CABLE MUST BE USED. (THE TEST CABLE IS
P/N: 7010507-02). THE TEST CABLE CONNECTS MASSBUS A & MASSBUS
B TOGETHER AT THE DRIVE BEING TESTED AND IS CONSTRUCTED SO
THAT BIT 0 OF THE MASSBUS UNIT SELECT LINES IS COMPLEMENTED.

WITH THE TEST CABLE CONNECTED TO THE DRIVE UNDER TEST,
THE DRIVE APPEARS AS TWO UNITS ON THE MASSBUS: EACH PORT
OF THE RM80 WILL RESPOND TO A DIFFERENT MASSBUS ADDRESS.

THE ADDRESS OF EACH PORT WILL DEPEND UPON THE DRIVE'S
ADDRESS PLUG.

THE PROGRAM WILL TYPEOUT THE APPARENT ADDRESSES OF BOTH
PORTS. (ONE PORT WILL HAVE THE ADDRESS OF THE DRIVE; THE
OTHER PORT WILL HAVE THE ADDRESS DEVELOPED BY THE CABLE).

```
**********************************************************************
* ANY OTHER DRIVE ON THE MASSBUS WHICH HAS AN ADDRESS IN  *
* CONFLICT WITH EITHER OF THE TEST ADDRESSES MUST BE      *
* POWERED DOWN.                                           *
**********************************************************************
```

THE TEST CABLE CONNECTION TO THE DRIVE UNDER TEST WILL
DEPEND ON WHICH PROCESSOR, RH CONTROLLER IS TO TEST THE DRIVE.
IF THE DRIVE IS TO BE TESTED BY THE PROCESSOR ON PORT A,
CONNECT THE MASSBUS CABLE FROM THE RH CONTROLLER TO J3 OF THE
RM ADAPTER BACK PANEL, THEN CONNECT THE TEST CABLE (P/N: 7010507-02)
FROM J2 TO J7 OF THE BACK PANEL AND TERMINATE THE PORT B AT J6.

WHEN THE DUAL PORT TEST CABLE IS CONNECTED, THE ATTENTION
BITS FOR PORTS A & B ARE ASSERTED IN THE SAME BIT POSITION
WHEN 'RMAS' (ATTENTION SUMMARY REGISTER) IS READ. THE ATTENTION
BIT POSITION IS DETERMINED BY THE ADDRESS OF THE DRIVE.
THE ATTENTION BIT THAT APPEARS FOR THE DRIVE IS THE
INCLUSIVE 'OR' OF THE PORT A & PORT B ATTENTION BITS. BECAUSE
OF THIS, THE PROGRAM LOOKS AT ONLY THE ATTENTION BIT IN
'RMDS' (DRIVE STATUS REGISTER) TO DETERMINE THE STATE
OF THE SELECTED PORT'S ATTENTION BIT.

6. ERRORS

WHEN THE PROGRAM ENCOUNTERS AN ERROR, THE ERROR ROUTINE IS
CALLED AND IF SW<13> IS NOT SET, THE ERROR MESSAGE PERTAINING

TO THE ERROR WILL BE TYPED. EACH ERROR TYPEOUT WILL CONTAIN THE FOLLOWING:

A. AN ERROR MESSAGE
B. A DATA HEADER LINE
C. A DATA LINE CONTAINING:

    1. THE TEST NUMBER
    2. THE PC (PROGRAM COUNTER VALUE) WHERE THE ERROR CALL WAS MADE
    3. CONTENTS OF THE APPROPIATE REGISTERS

7. MISCELLANEOUS

7.1 RESTRICTIONS

TO RUN THIS PROGRAM, THE SYSTEM MUST HAVE EITHER A KW11-P OR A KW11-L CLOCK. ADDITIONALLY, THE RM80 UNDER TEST MUST HAVE THE DUAL PORT TEST CABLE CONNECTED.

7.2 LIMITATIONS

THIS PROGRAM DOES NOT TEST DATA TRANSFERS THROUGH EITHER PORT AND DOES NOT TEST THE DYNAMIC OPERATION OF THE DUAL PORT OPTION.

7.3 EXECUTION TIME

THE PROGRAM TAKES ABOUT 7 MINUTES PER PASS (DEPENDING ON OPERATOR INTERVENTION EFFICIENCY).

7.4 REQUIRED TESTS

IF THE PROGRAM IS BEING EXECUTED IN SINGLE TEST MODE, THE OPERATOR MUST CALL AND RUN THE FOLLOWING TESTS BEFORE OTHER TESTS ARE RUN:

A. TEST 2 AND TEST 3. THESE TESTS SET 'VV-A' AND 'VV-B' RESPECTIVELY. THESE TESTS MUST BE PERFORMED AT LEAST ONCE BEFORE TESTS 4 - 10 ARE RUN.

B. TEST 4 AND TEST 5. THESE TESTS DETERMINE AND STORE FOR LATER USE THE TIMEOUT ONE-SHOT VALUE MEASURED THROUGH EACH PORT. THESE TESTS MUST BE PERFORMED AT LEAST ONCE BEFORE TESTS 6 - 10 ARE RUN.

7.5 DISK SURFACE USAGE

THE DIAGNOSTIC DOES NOT USE THE DISK SURFACE. HOWEVER, THE DRIVE MUST BE CYCLED UP AND ON-LINE FOR THE DIAGNOSTIC TO BE RUN.

7.8 LOOP ON ERROR OPTION

IF SW<09> IS SET, THE PROGRAM WILL LOOP ON A FAILING TEST
UNTIL EITHER THE SWITCH IS RESET OR THE ERROR STOPS OCCURING.
BECAUSE THE PROGRAM MUST RESET THE RM80 TO A KNOWN STATE
BEFORE LOOPING ON THE ERROR, THE TEST FOR SW<09> IS PERFORMED
AT THE END OF THE TEST - NOT AT THE POINT WHERE THE ERROR
WAS DETECTED.

8. TEST DESCRIPTIONS

8.1 METHOD USED TO VERIFY THAT DRIVE IS IN NEUTRAL

THE PROGRAM DETERMINES THE THE DRIVE IS IN NEUTRAL BY CHECKING
THE CONTENTS OF THE DRIVE STATUS REGISTER (RMDS) THROUGH
BOTH PORTS. THE PROGRAM MASKS OUT THE PORT DEPENDENT BITS
('ATA' & 'VV') AND VERIFIES THAT CORRECT STATUS IS READ
THROUGH BOTH PORTS. (THE CORRECT STATUS IS 'MOL', 'PGM',
'DPR', & 'DRY'.) IF NEITHER PORT SEES ALL ZEROS FROM
RMDS, THE PROGRAM CONCLUDES THAT THE DRIVE IS IN NEUTRAL
AND THAT ANY BIT DISCREPANCY BETWEEN PORTS INDICATES A
FAILURE IN THE PATH FOR THAT BIT.

8.2 METHOD USED TO VERIFY THAT THE DRIVE HAS BEEN SEIZED

THE PROGRAM VERIFIES THAT THE DRIVE HAS BEEN SEIZED BY
CHECKING THE DRIVE STATUS REGISTER (RMDS) THROUGH
THE SEIZING PORT AND VERIFING THAT CORRECT STATUS IS
SEEN. WHEN RMDS IS READ THROUGH THE OPPOSITE PORT,
ZEROS SHOULD BE SEEN. IF BOTH CONDITIONS EXIST, (I.E.,
THE OPPOSITE PORT), THE PROGRAM CONCLUDES THAT THE DRIVE
HAS BEEN SEIZED BY THE SPECIFIED PORT.

TEST 1 DRIVE ACCESS TEST

VERIFY THAT THE DRIVE CAN BE ACCESSED THROUGH BOTH PORTS

A. SELECT DRIVE, VERIFY THAT THE DRIVE IS PRESENT, THAT THE DRIVE IS A DUAL PORT RM80, THAT THE DRIVE IS ONLINE (RMDS HAS 'MOL', 'PGM', 'DPR', & 'DRY' BITS SET), AND THE THE DRIVE SERIAL NUMBER READ THROUGH BOTH PORTS IS THE SAME.

B. THE TEST IS REPEATED THROUGH BOTH PORTS.

TEST 2 SET 'VV' FOR PORT A

SET VOLUME VALID

A. ISSUE A DRIVE CLEAR COMMAND THROUGH PORT A.

B. ISSUE A READIN PRESET COMMAND THROUGH PORT A. VERIFY THAT THE 'VV' BIT IS SET FOR PORT A.

C. ISSUE A RELEASE COMMAND THROUGH PORT A. VERIFY THAT THE DRIVE RETURNED TO NEUTRAL AND THAT NEITHER ATTENTION

```
343                                   BIT IS SET.
344
345
346                                TEST 3  SET 'VV' FOR PORT B
347
348                                SET VOLUME VALID
349
350                                  A.  ISSUE A DRIVE CLEAR COMMAND THROUGH PORT B.
351
352                                  B.  ISSUE A READIN PRESET COMMAND THROUGH PORT B.  VERIFY
353                                        THAT THE 'VV' BIT IS SET FOR PORT B.
354
355                                  C.  ISSUE A RELEASE COMMAND THROUGH PORT B.  VERIFY THAT
356                                        THE DRIVE RETURNED TO NEUTRAL AND THAT NEITHER ATTENTION
357                                        BIT IS SET.
358
359
360                                TEST 4  MEASURE THE TIMEOUT ONE-SHOT THROUGH PORT A
361
362                                MEASURE THE TIMEOUT ONE-SHOT VALUE THROUGH PORT A
363
364                                  A.  WRITE 0'S INTO RMDS THROUGH PORT A AND VERIFY THAT THE
365                                        DRIVE HAS BEEN SEIZED.
366
367                                  B.  WAIT FOR TIMEOUT TO OCCUR.  MEASURE THE DURATION OF THE TIMEOUT
368                                        ONE-SHOT AND SAVE THE VALUE FOR LATER USE.
369
370                                  C.  VERIFY THAT THE TIMEOUT OCCURRED AND THAT THE DRIVE RETURNS
371                                        TO NEUTRAL
372
373
374                                TEST 5  MEASURE THE TIMEOUT ONE-SHOT THROUGH PORT B
375
376                                MEASURE THE TIMEOUT ONE-SHOT VALUE THROUGH PORT B
377
378                                  A.  WRITE 0'S INTO RMDS THROUGH PORT B AND VERIFY THAT THE
379                                        DRIVE HAS BEEN SEIZED.
380
381                                  B.  WAIT FOR TIMEOUT TO OCCUR.  MEASURE THE DURATION OF THE TIMEOUT
382                                        ONE-SHOT AND SAVE THE VALUE FOR LATER USE.
383
384                                  C.  VERIFY THAT THE TIMEOUT OCCURRED AND THAT THE DRIVE RETURNS
385                                        TO NEUTRAL
386
387
388                                TEST 6  TEST 'PORT SELECT' SWITCH, DRIVE CYCLED UP
389
390                                TEST THE OPERATION OF THE 'PORT SELECT' SWITCH (DRIVE CYCLED UP).
391
392                                  A.  SWITCH TO PORT 'A' POSITION.  VERIFY THAT THE DRIVE IS IN
393                                        NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH
394                                        PORTS, ARE CORRECT.
395
396                                  B.  SWITCH TO PORT 'B' POSITION. VERIFY THAT THE DRIVE IS IN
397                                        NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH
398                                        PORTS, ARE CORRECT.
399
```

C. RETURN THE 'PORT SELECT' SWITCH TO THE 'A/B' POSITION. VERIFY THE DRIVE STATE.

TEST 7 TEST 'PORT SELECT' SWITCH LOCKED ON PORT A

TEST THE OPERATION OF THE 'PORT SELECT' SWITCH (DRIVE CYCLED DOWN).

A. CYCLE THE DRIVE DOWN.

B. SWITCH TO PORT 'A' POSITION. VERIFY THAT THE DRIVE IS IN NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH PORTS, ARE CORRECT.

C. SWITCH THE 'PORT SELECT' SWITCH TO A; CYCLE THE DRIVE UP.

D. WHEN THE DRIVE CYCLES UP, VERIFY THAT 'VV-A' IS RESET, AND THAT 'ATA-A' IS SET.

E. ISSUE A DRIVE CLEAR COMMAND AND A READIN PRESET COMMAND THROUGH PORT A.

F. VERIFY THAT THE DRIVE CANNOT BE ACCESSED THROUGH PORT B AND 'NED' SETS WHEN ATEMPTING TO ACCESS THE DRIVE THROUGH PORT B. ATTEMPT TO SET PORT REQUEST BY WRITING 0'S INTO RMDS THROUGH PORT B.

G. ISSUE A RELEASE COMMAND THROUGH PORT A. VERIFY THAT THE DRIVE REMAINS LOCKED ON PORT A.

TEST 10 TEST 'PORT SELECT' SWITCH LOCKED ON PORT B

TEST THE OPERATION OF THE 'PORT SELECT' SWITCH (DRIVE CYCLED DOWN).

A. CYCLE THE DRIVE DOWN.

B. SWITCH TO PORT 'B' POSITION. VERIFY THAT THE DRIVE IS IN NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH PORTS, ARE CORRECT.

C. SWITCH THE 'PORT SELECT' SWITCH TO B; CYCLE THE DRIVE UP.

D. WHEN THE DRIVE CYCLES UP, VERIFY THAT 'VV-B IS RESET, AND THAT 'ATA-B IS SET.

E. ISSUE A DRIVE CLEAR COMMAND AND A READIN PRESET COMMAND THROUGH PORT B.

F. VERIFY THAT THE DRIVE CANNOT BE ACCESSED THROUGH PORT A AND 'NED' SETS WHEN ATEMPTING TO ACCESS THE DRIVE THROUGH PORT A. ATTEMPT TO SET PORT REQUEST BY WRITING 0'S INTO RMDS THROUGH PORT A.

G. ISSUE A RELEASE COMMAND THROUGH PORT B. VERIFY THAT THE DRIVE REMAINS LOCKED ON PORT B.

```
457                                   H.  CYCLE THE DRIVE DOWN.  CHANGE THE 'PORT SELECT' SWITCH TO
458                                         A/B; CYCLE THE DRIVE UP.
459
460                                   I.  VERIFY THAT BOTH PORTS CAN ACCESS THE DRIVE, THAT BOTH ATTENTION
461                                         BITS ARE SET, AND THAT BOTH 'VV' BITS ARE RESET.
462
463
464
```

```
                                ;*LAST REVISION 04-AUG-81
  509
  510                           .TITLE  CZRNIA0 RM80 DUAL PORT PT2
                                ;*COPYRIGHT (C) 1982
                                ;*DIGITAL EQUIPMENT CORPORATION
                                ;*COLORADO SPGS., CO. 80919
                                ;*
                                ;*PROGRAM BY MIKE LEAVITT
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C5), 18-MAR-81
                                ;*
  511                           .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        11            INHIBIT ITERATIONS
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
  512
  513                           .SBTTL  BASIC DEFINITIONS

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

                                ;*MISCELLANEOUS DEFINITIONS
  000011                        HT      = 11            ;;CODE FOR HORIZONTAL TAB
  000012                        LF      = 12            ;;CODE FOR LINE FEED
  000015                        CR      = 15            ;;CODE FOR CARRIAGE RETURN
  000200                        CRLF    = 200           ;;CODE FOR CARRIAGE RETURN-LINE FEED
  177776                        PS      = 177776        ;;PROCESSOR STATUS WORD
  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
```

BASIC DEFINITIONS

```
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
    514
    515                         .SBTTL  RH CONTROLLER REGISTERS
    516
    517                         ;CONTROL AND STATUS REGISTER 1 (RMCS1)
    518
    519         000100          IE      = 100                   ;INTERRUPT ENABLE (BIT #6)
    520         000200          RDY     = 200                   ;READY (BIT #7)
    521         000400          A16     = 400                   ;HIGH ORDER BUS ADDRESS BIT (BIT #8)
    522         001000          A17     = 1000                  ;HIGH ORDER BUS ADDRESS BIT (BIT #9)
    523         002000          PSEL    = 2000                  ;PORT SELECT (BIT #10)
    524         020000          MCPE    = 20000                 ;MASSBUSS PARITY ERROR (BIT #13)
    525         040000          TRE     = 40000                 ;TRANSFER ERROR (BIT #14)
    526         100000          SC      = 100000                ;SPECIAL CONDITION (BIT #15)
    527
    528                         ;WORD COUNT REGISTER (RMWC)
    529                         ;(EACH BIT IS CALLED BY BIT NUMBER)
    530
    531                         ;BUS ADDRESS REGISTER (RMBA)
    532                         ;(EACH BIT IS CALLED BY BIT NUMBER)
    533
    534                         ;CONTROL AND STATUS REGISTER 2 (RMCS2)
    535
    536         000001          U0      = 1                     ;UNIT SELECT (BIT #0)
    537         000002          U1      = 2                     ;UNIT SELECT (BIT #1)
    538         000004          U3      = 4                     ;UNIT SELECT (BIT #2)
    539         000010          BAI     = 10                    ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
    540         000020          PAT     = 20                    ;MASSBUS PARITY TEST (BIT #4)
    541         000040          CLR     = 40                    ;CLEAR (BIT #5)
    542         000100          IR      = 100                   ;INPUT READY (BIT #6)
    543         000200          OR      = 200                   ;OUTPUT READY (BIT #7)
    544         000400          MDPE    = 400                   ;MASS BUS PARITY ERROR (BIT #8)
    545         001000          MXF     = 1000                  ;MISSED TRANSFER ERROR (BIT #9)
    546         002000          PGE     = 2000                  ;PROGRAM ERROR (BIT #10)
    547         004000          NEM     = 4000                  ;NON EXISTENT MEMORY (BIT #11)
    548         010000          NED     = 10000                 ;NON EXISTENT DRIVE (BIT #12)
    549         020000          UPE     = 20000                 ;UNIBUS PARITY ERROR (BIT #13)
    550         040000          WCE     = 40000                 ;WRITE CHECK ERROR (BIT #14)
    551         100000          DLT     = 100000                ;DATA LATE (BIT #15)
```

```
                                ;DATA BUFFER REGISTER (RMDB)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                .SBTTL  RM80 REGISTERS

                                ;CONTROL AND STATUS 1 REGISTER. (#00)

000001                          GO      = 1                     ;GO BIT (BIT #0)
000002                          F0      = 2                     ;FUNCTION CODE BIT #1
000004                          F1      = 4                     ;FUNCTION CODE BIT #2
000010                          F2      = 10                    ;FUNCTION CODE BIT #3
000020                          F3      = 20                    ;FUNCTION CODE BIT #4
000040                          F4      = 40                    ;FUNCTION CODE BIT #5
004000                          DVA     = 4000                  ;DEVICE AVAILABLE (BIT #11)

                                ;DRIVE STATUS REGISTER (RMDS) (#01)

                                ;DF5    = 1                     DRIVE FORWARD 5''/SEC.  (BIT #0)
000002                          DFF20   = 2                     ;DRIVE FORWARD 20''/SEC.  (BIT #1)
000004                          DIGB    = 4                     ;DRIVE TO INNER GUARD BAND (BIT #2)
000010                          GRV     = 10                    ;GO REVERSE (BIT #3)
000020                          DL64    = 20                    ;DIFFERENCE LESS THAN 64 (BIT #4)
000040                          DE1     = 40                    ;DIFFERENCE EQUALS 1 (BIT #5)
000100                          VV      = 100                   ;VOLUME VALID (BIT #6)
000200                          DRY     = 200                   ;DRIVE READY (BIT #7)
000400                          DPR     = 400                   ;DRIVE PRESENT (BIT #8)
001000                          PGM     = 1000                  ;PROGRAMABLE (BIT #9)
002000                          LBT     = 2000                  ;LAST SECTOR TRANSFERRED (BIT #10)
004000                          WRL     = 4000                  ;WRITE LOCK (BIT #11)
010000                          MOL     = 10000                 ;MEDIUM ON-LINE (BIT #12)
020000                          PIP     = 20000                 ;POSITIONING OPERATION IN PROGRESS (BIT #13)
040000                          ERR     = 40000                 ;COMPOSITE ERROR (BIT #14)
100000                          ATA     = 100000                ;ATTENTION ACTIVE (BIT #15)

                                ;ERROR REGISTER #01 (RMER1) (#02)

000001                          ILF     = 1                     ;ILLEGAL FUNCTION (BIT #0)
000002                          ILR     = 2                     ;ILLEGAL REGISTER (BIT #1)
000004                          RMR     = 4                     ;REGISTER MODIFICATION REFUSED (BIT #2)
000010                          PAR     = 10                    ;PARITY ERROR (BIT #3)
000020                          FER     = 20                    ;FORMAT ERROR (BIT #4)
000040                          WCF     = 40                    ;WRITE CLOCK FAIL (BIT #5)
000100                          ECH     = 100                   ;ECC HARD ERROR (BIT #6)
000200                          HCE     = 200                   ;HEADER COMPARE ERROR (BIT #7)
000400                          HCRC    = 400                   ;HEADER CRC ERROR (BIT #8)
001000                          AOE     = 1000                  ;ADDRESS OVERFLOW ERROR (BIT #9)
002000                          IAE     = 2000                  ;INVALID ADDRESS ERROR (BIT #10)
004000                          WLE     = 4000                  ;WRITE LOCK ERROR (BIT #11)
010000                          DTE     = 10000                 ;DRIVE TIMING ERROR (BIT #12)
020000                          OPI     = 20000                 ;OPERATION INCOMPLETE (BIT #13)
040000                          UNS     = 40000                 ;DRIVE UNSAFE (BIT #14)
100000                          DCK     = 100000                ;DATA CHECK ERROR (BIT 15)

                                ;MAINTAINABILITY REGISTER (RMMR1)(#03)

000001                          DMD     = 1                     ;DIAGINOSTIC MODE (BIT #0)
```

```
                                ;ATTENTION SUMMARY PSEUDO-REGISTER (RMAS) (#04)

000001                          AT0     = 1                     ;DEVICE 0 (BIT #0)
000002                          AT1     = 2                     ;DEVICE 1 (BIT #1)
000004                          AT2     = 4                     ;DEVICE 2 (BIT #2)
000010                          AT3     = 10                    ;DEVICE 3 (BIT #3)
000020                          AT4     = 20                    ;DEVICE 4 (BIT #4)
000040                          AT5     = 40                    ;DEVICE 5 (BIT #5)
000100                          AT6     = 100                   ;DEVICE 6 (BIT #6)
000200                          AT7     = 200                   ;DEVICE 7 (BIT #7)

                                ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RMDA) (#05)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                ;DRIVE TYPE REGISTER (RMDT) (#06)

000001                          DT00    = 1                     ;DRIVE TYPE NUMBER BIT 1
000002                          DT01    = 2                     ;DRIVE TYPE NUMBER BIT 2
000004                          DT02    = 4                     ;DRIVE TYPE NUMBER BIT 3
000010                          DT03    = 10                    ;DRIVE TYPE NUMBER BIT 4
000020                          DT04    = 20                    ;DRIVE TYPE NUMBER BIT 5
000040                          DT05    = 40                    ;DRIVE TYPE NUMBER BIT 6
000100                          DT06    = 100                   ;DRIVE TYPE NUMBER BIT 7
000200                          DT07    = 200                   ;DRIVE TYPE NUMBER BIT 8
000400                          DT08    = 400                   ;DRIVE TYPE NUMBER BIT 9
004000                          DRQ     = 4000                  ;DRIVE REQUEST REQUIRED (BIT #11)
020000                          MOH     = 20000                 ;MOVING HEAD (BIT #13)
040000                          TAP     = 40000                 ;TAPE DRIVE (BIT #14)
100000                          NBA     = 100000                ;NOT BLOCK ADDRESSED (BIT #15)

                                ;LOOK-AHEAD REGISTER (RMLA) (#07)

000100                          SC0     = 100                   ;SECTOR COUNT FIELD 0 (BIT #6)
000200                          SC1     = 200                   ;SECTOR COUNT FIELD 1 (BIT #7)
000400                          SC2     = 400                   ;SECTOR COUNT FIELD 2 (BIT #8)
001000                          SC3     = 1000                  ;SECTOR COUNT FIELD 3 (BIT #9)
002000                          SC4     = 2000                  ;SECTOR COUNT FIELD 4 (BIT #10)

                                ;RM ERROR REGISTER #2 (RMER2) (#10)

000010                          DPE     = 10                    ;DATA PARITY ERROR  (BIT #3)
000200                          DVC     = 200                   ;DEVICE CHECK  (BIT #7)
002000                          LBC     = 2000                  ;LOSS OF BIT CLOCK (BIT #10)
004000                          LSC     = 4000                  ;LOSS OF SYSTEM CLOCK (BIT #11)
010000                          IVC     = 10000                 ;INVALID COMMAND (BIT #12)
020000                          OPE     = 20000                 ;OPERATOR ERROR  (BIT #13)
100000                          SKI     = 100000                ;SEEK INCOMPLETE (BIT #14)

                                ;OFFSET REGISTER (RMOF) (#11)

000200                          OFD     = 200                   ;OFFSET FORWARD (BIT #5)
002000                          HCI     = 2000                  ;HEADER COMPARE INHIBIT (BIT #10)
004000                          ECI     = 4000                  ;ERROR CORRECTION CODE INHIBIT (BIT #11)
010000                          FMT16   = 10000                 ;FORMAT BIT (BIT #12

                                ;DESIRED CYLINDER ADDRESS (RMDC) (#12)
```

```
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                ;SERIAL NUMBER REGISTER (RMSN) (#14)
                                ;(EACH IS CALLED BY BIT NUMBER)

                                ;ECC POSITION REGISTER (RMEC1) (#16)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                ;ECC PATTERN REGISTER (RMEC2) (#17)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                .SBTTL  DEFINITIONS OF THE RH/RM ADDRESS INDEXES

000000                          RMCS1   = 0             ;CONTROL AND STATUS REGISTER #1 (DRIVE REG. 00)
000002                          RMWC    = 2             ;WORD COUNT REGISTER (NOT A DRIVE REG)
000004                          RMBA    = 4             ;UNIBUS ADDRESS REGISTER (NOT A DRIVE REG)
000006                          RMDA    = 6             ;DESIRED SECTOR/TRACK ADDRESS REGISTER (DRIVE REG. 05)
000010                          RMCS2   = 10            ;CONTROL AND STATUS REGISTER #2 (NOT A DRIVE REG)
000012                          RMDS    = 12            ;DRIVE STATUS REGISTER (DRIVE REG 01)
000014                          RMER1   = 14            ;ERROR REGISTER #1 (DRIVE REG. 02)
000016                          RMAS    = 16            ;ATTENTION SUMMARY PSEUDO REGISTER (DRIVE REG. 04)
000020                          RMLA    = 20            ;LOOK AHEAD REGISTER (DRIVE REG. 07)
000022                          RMDB    = 22            ;DATA BUFFER REGISTER (NOT A DRIVE REG.)
000024                          RMMR1   = 24            ;MAINTAINABILITY REGISTER (DRIVE REG. 03)
000026                          RMDT    = 26            ;DRIVE TYPE REGISTER (DRIVE REG. 06)
000030                          RMSN    = 30            ;SERIAL NUMBER REGISTER (DRIVE REG. 10)
000032                          RMOF    = 32            ;OFFSET REGISTER (DRIVE REG. 11)
000034                          RMDC    = 34            ;DESIRED CYLINDER ADDRESS REGISTER (DRIVE REG. 12)
000040                          RMMR2   = 40            ;MAINTENANCE REGISTER #2 (DRIVE REG. 14)
000042                          RMER2   = 42            ;ERROR REGISTER #2 (DRIVE REG. 15)
000044                          PMEC1   = 44            ;ECC POSITION REGISTER (DRIVE REG. 16)
000046                          RMEC2   = 46            ;ECC PATTERN REGISTER (DRIVE REG.  17)
```

TRAP CATCHER

```
                                .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  001766          JMP     @#START         ;;JUMP TO STARTING ADDRESS OF PROGRAM
000204  000137  001776          JMP     @#START1        ;START AND CHANGE THE RH/RM ADDRESS

                                .SBTTL  ACT11 HOOKS

                                ;;******************************************************************
                                ;HOOKS REQUIRED BY ACT11
                        000210          $SVPC=.                 ;SAVE PC
                        000046          .=46
000046  013316                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                        000052          .=52
000052  020000                  .WORD   20000           ;;2)SET LOC.52 TO 20000
                        000210          .=$SVPC                 ;; RESTORE PC
```

```
      0                         .SBTTL  COMMON TAGS

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

            001100                      .=1100
   001100                       $CMTAG:                 ;;START OF COMMON TAGS
   001100   000000              $PASS:   .WORD   0      ;;CONTAINS PASS COUNT
   001102      000               $TSTNM: .BYTE   0      ;;CONTAINS THE TEST NUMBER
   001103      000               $ERFLG: .BYTE   0      ;;CONTAINS ERROR FLAG
   001104   000000              $ICNT:   .WORD   0      ;;CONTAINS SUBTEST ITERATION COUNT
   001106   000000              $LPADR:  .WORD   0      ;;CONTAINS SCOPE LOOP ADDRESS
   001110   000000              $LPERR:  .WORD   0      ;;CONTAINS SCOPE RETURN FOR ERRORS
   001112   000000              $ERTTL:  .WORD   0      ;;CONTAINS TOTAL ERRORS DETECTED
   001114      000               $ITEMB: .BYTE   0      ;;CONTAINS ITEM CONTROL BYTE
   001115      001               $ERMAX: .BYTE   1      ;;CONTAINS MAX. ERRORS PER TEST
   001116   000000              $ERRPC:  .WORD   0      ;;CONTAINS PC OF LAST ERROR INSTRUCTION
   001120   000000              $GDADR:  .WORD   0      ;;CONTAINS ADDRESS OF 'GOOD' DATA
   001122   000000              $BDADR:  .WORD   0      ;;CONTAINS ADDRESS OF 'BAD' DATA
   001124   000000              $GDDAT:  .WORD   0      ;;CONTAINS 'GOOD' DATA
   001126   000000              $BDDAT:  .WORD   0      ;;CONTAINS 'BAD' DATA
   001130   000000                       .WORD   0      ;;RESERVED--NOT TO BE USED
   001132   000000                       .WORD   0
   001134      000               $AUTJB:  .BYTE   0      ;;AUTOMATIC MODE INDICATOR
   001135      000               $INTAG:  .BYTE   0      ;;INTERRUPT MODE INDICATOR
   001136   000000                       .WORD   0
   001140   177570              SWR:     .WORD   DSWR   ;;ADDRESS OF SWITCH REGISTER
   001142   177570              DISPLAY: .WORD   DDISP  ;;ADDRESS OF DISPLAY REGISTER
   001144   177560              $TKS:    177560        ;;TTY KBD STATUS
   001146   177562              $TKB:    177562        ;;TTY KBD BUFFER
   001150   177564              $TPS:    177564        ;;TTY PRINTER STATUS REG. ADDRESS
   001152   177566              $TPB:    177566        ;;TTY PRINTER BUFFER REG. ADDRESS
   001154      000               $NULL:   .BYTE   0      ;;CONTAINS NULL CHARACTER FOR FILLS
   001155      002               $FILLS:  .BYTE   2      ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
   001156      012               $FILLC:  .BYTE   12     ;;INSERT FILL CHARS. AFTER A "LINE FEED"
   001157      000               $TPFLG:  .BYTE   0      ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
   001160   000000              $REGAD:  .WORD   0      ;;CONTAINS THE ADDRESS FROM
                                                        ;;WHICH  ($REG0) WAS OBTAINED
   001162   000000              $REG0:   .WORD   0      ;;CONTAINS (($REGAD)+0)
   001164   000000              $TMP0:   .WORD   0      ;;USER DEFINED
   001166   000000              $TMP1:   .WORD   0      ;;USER DEFINED
   001170   000000              $TMP2:   .WORD   0      ;;USER DEFINED
   001172   000000              $TMP3:   .WORD   0      ;;USER DEFINED
   001174   000000              $TMP4:   .WORD   0      ;;USER DEFINED
   001176   000000              $TIMES:  0              ;;MAX. NUMBER OF ITERATIONS
   001200   000000              $ESCAPE:0               ;;ESCAPE ON ERROR ADDRESS
   001202      207      377  377 $BELL:   .ASCIZ  <207><377><377> ;;CODE FOR BELL
   001206      077               $QUES:   .ASCII  /?/    ;;QUESTION MARK
   001207      015               $CRLF:   .ASCII  <15>   ;;CARRIAGE RETURN
   001210      012      000      $LF:     .ASCIZ  <12>   ;;LINE FEED
                                ;;*****************************************************************
```

```
                        .SBTTL  USER DEFINED TAGS

001212  172540  $LKCSR: .WORD   172540          ;ADDR OF KW11-P STATUS REGISTER
001214  172542  $LKCSB: .WORD   172542          ;ADDR OF KW11-P COUNTER BUFFER
001216  000104  $LPVEC: .WORD   104             ;ADDR OF KW11-P VECTOR
001220  177546  $LKS:   .WORD   177546          ;ADDR OF KW11-L STATUS REGISTER
001222  000100  $LLVEC: .WORD   100             ;ADDR OF KW11-L VECTOR
001224  000000  PORTA:  .WORD   0               ;ADDRESS OF PORT A
001226  000000  PORTB:  .WORD   0               ;ADDRESS OF PORT B
001230  000000  PORTC:  .WORD   0               ;ADDRESS OF DIFFERENT DRIVE
001232  000000  ASR1:   .WORD   0               ;ATA-A OR ATA-B = 1
001234  000000  PTNBR:  .WORD   0               ;CONTAINS THE PORT ADDRESS FOR ERROR TYPEOUTS
001236  000000  SEIZPT: .WORD   0               ;CONTAINS THE ADDRESS OF THE SEIZING PORT
001240  000000  OPPRT:  .WORD   0               ;CONTAINS THE ADDRESS OF THE 'OPPOSITE' PORT
001242  000000  TSTNUM: .WORD   0               ;NUMBER OF THE CURRENT TEST
001244  000000  CKERR:  .WORD   0               ;IF -1, A REGISTER MISCOMPARISON OCCURRED
001246  000000  NOSEIZ: .WORD   0               ;IF -1, THE PORT IN 'SEIZPT' DID NOT SEIZE THE DRIVE
001250  000000  RELERR: .WORD   0               ;IF -1, THE PORT IN 'SEIZPT' DID NOT RELEASE THE DRIVE
001252  000000  TIME:   .WORD   0               ;ELAPSED TIME COUNTER
001254  000000  WATCH:  .WORD   0               ;WATCH DOG TIMER LOCATION
001256  000000  TIMEA:  .WORD   0               ;THE TIMEOUT ONE-SHOT VALUE MEASURED THROUGH PORT A
001260  000000  TIMEAP: .WORD   0               ;PORT A TIMEOUT VALUE + 25%
001262  000000  TIMEB:  .WORD   0               ;THE TIMEOUT ONE-SHOT VALUE MEASURED THROUGH PORT B
001264  000000  TIMEBP: .WORD   0               ;PORT B TIMEOUT VALUE + 25%
001266  000000  KYBCTL: .WORD   0               ;SINGLE TEST INDICATOR
001270  000000  CHGADR: .WORD   0               ;CHANGE THE RH/RM ADDRESS INDICATOR

                        .SBTTL  RH/RM UNIBUS AND VECTOR ADDRESSES

001272  176700  $RMADR: .WORD   176700          ;RH/RM UNIBUS ADDRESS
001274  000254  $RMVEC: .WORD   254             ;INTERRUPT VECTOR ADDRESS
```

```
                                .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


  001276                        $ERRTB:
  1
  2                             ;ERROR 1
  3
  4 001276  020431                      EM1     ;DRIVE IS NON-EXISTENT ('NED' BIT SET)
  5 001300  023174                      DH1
  6 001302  024544                      DT1
  7 001304  024764                      DF1
  8
  9                             ;ERROR 2
 10
 11 001306  020477                      EM2     ;WRONG DRIVE TYPE
 12 001310  023245                      DH2
 13 001312  024560                      DT2
 14 001314  024771                      DF2
 15
 16                             ;ERROR 3
 17
 18 001316  020520                      EM3     ;PORT SELECT SWITCH ON DRIVE NOT IN 'A/B'
 19 001320  023174                      DH1
 20 001322  024544                      DT1
 21 001324  024764                      DF1
 22
 23                             ;ERROR 4
 24
 25 001326  020571                      EM4     ;DRIVE NOT ON LINE
 26 001330  023245                      DH2
 27 001332  024560                      DT2
 28 001334  024771                      DF2
 29
 30                             ;ERROR 5
 31
 32 001336  020613                      EM5     ;SERIAL NUMBER READ THROUGH EACH PORT NOT THE SAME
 33 001340  023321                      DH5
 34 001342  024576                      DT5
 35 001344  024777                      DF5
 36
 37                             ;ERROR 6
 38
 39 001346  020675                      EM6     ;TIMEOUT HAS NOT OCCURRED WITHIN 2 SECONDS
 40 001350  023370                      DH6
 41 001352  024612                      DT6
 42 001354  025004                      DF6
```

ERROR POINTER TABLE

```
                                ;ERROR 7
                                
001356  020747                          EM7     ;TIMEOUT ONE-SHOT IS LESS THAN 500 MS
001360  023417                          DH7
001362  024622                          DT7
001364  025007                          DF7
                                
                                ;ERROR 10
                                
001366  021014                          EM10    ;READIN PRESET DOES NOT SET VOLUME VALID FOR THE PORT
001370  023174                          DH1
001372  024544                          DT1
001374  024764                          DF1
                                
                                ;ERROR 11
                                
001376  021102                          EM11    ;'GO' BIT RESET DURING UNLOAD COMMAND
001400  023174                          DH1
001402  024544                          DT1
001404  024764                          DF1
                                
                                ;ERROR 12
                                
001406  021147                          EM12    ;INCORRECT STATUS DURING UNLOAD COMMAND
001410  023174                          DH1
001412  024544                          DT1
001414  024764                          DF1
                                
                                ;ERROR 13
                                
001416  021216                          EM13    ;DRIVE DID NOT RETURN TO NEUTRAL AFTER UNLOAD COMMAND
001420  023464                          DH13
001422  024634                          DT13
001424  025004                          DF6
                                
                                ;ERROR 14
                                
001426  021303                          EM14    ;ATTENTION BIT SET ON 'OPPOSITE PORT' AFTER UNLOAD
001430  023541                          DH14
001432  024644                          DT14
001434  025013                          DF14
                                
                                ;ERROR 15
                                
001436  021365                          EM15    ;ATTENTION BIT NOT SET ON PORT WHICH ISSUED 'UNLOAD'
001440  023174                          DH1
001442  024544                          DT1
001444  024764                          DF1
                                
                                ;ERROR 16
                                
001446  021451                          EM16    ;DRIVE NOT IN NEUTRAL AFTER UNLOAD WITH 'PORT
                                                ;SELECT' SWITCH MOVED FROM 'A/B'
001450  023464                          DH13
001452  024634                          DT13
001454  025004                          DF6
```

ERROR POINTER TABLE

```
                                        ;ERROR 17
                                                EM17    ;DRIVE LOCKED ON PORT 'A' BY SWITCH WHILE CYCLED UP
001456  021571                                  DH17
001460  023660                                  DT17
001462  024662                                  DF17
001464  025021
                                        ;ERROR 20
                                                EM20    ;DRIVE LOCKED ON PORT 'B' BY SWITCH WHILE CYCLED UP
001466  021654                                  DH17
001470  023660                                  DT17
001472  024662                                  DF17
001474  025021
                                        ;ERROR 21
                                                EM21    ;STATUS INCORRECT FOR PORT AFTER CYCLE UP
001476  021737                                  DH1
001500  023174                                  DT1
001502  024544                                  DF1
001504  024764
                                        ;ERROR 22
                                                EM22    ;REGISTER CONTENTS SEEN WHEN DRIVE SWITCHED ON 'OPPOSITE' PORT
001506  022010                                  DH1
001510  023174                                  DT1
001512  024544                                  DF1
001514  024764
                                        ;ERROR 23
                                                EM23    ;'NED' SET WHEN RMDS ACCESSED THROUGH PORT NOT SWITCHED
001516  022106                                  DH1
001520  023174                                  DT1
001522  024544                                  DF1
001524  024764
                                        ;ERROR 24
                                                EM24    ;DRIVE SWITCHED TO LOCKED OUT PORT WHEN RELEASED/
001526  022201                                  DH24
001530  023677                                  DT24
001532  024670                                  DF7
001534  025007
                                        ;ERROR 25
                                                EM25    ;RH/RM DIDN'T RESPOND TO ADDRESSING
001536  022261                                  DH25
001540  024002                                  DT25
001542  024702                                  DF25
001544  025023
                                        ;ERROR 26
001546  000000                                  0       ;UNUSED ERROR MESSAGES
001550  000000                                  0
001552  000000                                  0
001554  000000                                  0
```

ERROR POINTER TABLE

```
                                ;ERROR 27

001556  000000                          0       ;UNUSED ERROR MESSAGES
001560  000000                          0
001562  000000                          0
001564  000000                          0

159                             ;ERROR 30
160
161 001566  022324                      EM30    ;DRIVE NOT SEIZED BY PORT 'N'
162 001570  024011                      DH30
163 001572  024706                      DT30
164 001574  025024                      DF30
165
166                             ;ERROR 31
167
168 001576  022355                      EM31    ;WRONG STATUS SEEN BY THE SEIZING PORT
169 001600  023245                      DH2
170 001602  024560                      DT2
171 001604  024771                      DF2
172
173                             ;ERROR 32
174
175 001606  022423                      EM32    ;REGISTER CONTENTS INCORRECT
176 001610  023245                      DH2
177 001612  024560                      DT2
178 001614  024771                      DF2
179
180                             ;ERROR 33
181
182 001616  022453                      EM33    ;CONTROL BUS PARITY ERROR WHILE READING REGISTER
183 001620  023174                      DH1
184 001622  024544                      DT1
185 001624  024764                      DF1
186
187                             ;ERROR 34
188
189 001626  022537                      EM34    ;CAN'T ACCESS DRIVE THROUGH EITHER PORT
190 001630  024133                      DH34
191 001632  024726                      DT34
192 001634  025033                      DF34
193
194                             ;ERROR 35
195
196 001636  022606                      EM35    ;DRIVE NOT IN NEUTRAL AFTER RELEASE, REQUEST NOT SET
197 001640  024227                      DH35
198 001642  024740                      DT35
199 001644  025007                      DF7
200
201                             ;ERROR 36
202
203 001646  022673                      EM36    ;DRIVE NOT IN NEUTRAL AFTER TIMEOUT, REQUEST NOT SET
204 001650  024227                      DH35
205 001652  024740                      DT35
206 001654  025007                      DF7
207
208                             ;ERROR 37
```

ERROR POINTER TABLE

```
209
210 001656  022760                        EM37    ;REGISTER CONTENTS INCORRECT AFTER RELEASE/TIMEOUT
211 001660  024324                        DH37
212 001662  024706                        DT30
213 001664  025024                        DF30
214
215                             ;ERROR 40
216
217 001666  023041                        EM40    ;DRIVE NOT SEIZED BY PORT AFTER RELEASE WITH REQUEST SET
218 001670  024446                        DH40
219 001672  024752                        DT40
220 001674  025007                        DF7
221
222                             ;ERROR 41
223
224 001676  023116                        EM41    ;REGISTER WRONG AFTER RELEASE WITH REQUEST SET
225 001700  024011                        DH30
226 001702  024706                        DT30
227 001704  025024                        DF30
228
```

ERROR POINTER TABLE

```
                                        ;THIS ROUTINE HANDLES UNEXPECTED TIMEOUTS
                                        
001706  011600                  BADTMO: MOV     (SP),R0         ;SAVE PC WHERE THE TIME OUT OCCURED
001710  005740                          TST     -(R0)           ;ADJUST PC -2
001712  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
001714  104401  001722                  TYPE    ,65$            ;;TYPE ASCIZ STRING
001720  000417                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF>/UNEXPECTED BUS TIMEOUT, PC=/
001760                          64$:
001760  010046                          MOV     R0,-(SP)        ;SETUP FOR TYPING OUT PC
001762  104402                          TYPOC
001764  000240                          NOP                     ;PUT 'HALT(0)' INSTRUCTION HERE IF YOU WISH
                                                                ;TO STOP ON UNEXPECTED TIMEOUT.
                                        
                                        .SBTTL  START OF PROGRAM
                                        
001766  000240                  START:  NOP
001770  005037  001270                  CLR     CHGADR          ;CLEAR THE 'CHANGE RH/RM ADDRESS' INDICATOR
001774  000403                          BR      START2          ;GO TO THE START
001776  012737  177777  001270  START1: MOV     #-1,CHGADR      ;SET THE 'CHANGE RH/RM ADDRESS' INDICATOR
                                        
002004  005227  000000          START2: INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
002010  001375                          BNE     .-4             ;OF WORD
002012  000005                          RESET                   ;CLEAR THE WORLD
                                        
                                        .SBTTL  INITIALIZE THE COMMON TAGS
                                        ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
002014  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
002020  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
002022  022706  001140                  CMP     #SWR,R6         ;;DONE?
002026  001374                          BNE     .-6             ;;LOOP BACK IF NO
002030  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
002034  012737  013550  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
002042  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
002050  012737  014132  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
002056  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
002064  012737  017470  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
002072  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
002100  013737  013154  013146          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
002106  005037  001176                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
002112  005037  001200                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
002116  112737  000001  001115          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
002124  012737  002124  001106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
002132  012737  002132  001110          MOV     #.,$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.
002140  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
002144  012737  002200  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
002152  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
002160  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
002166  022777  177777  176744          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
002174  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
002176  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
002200  012716  002206          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
002204  000002                          RTI
```

```
INITIALIZE THE COMMON TAGS

        002206  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
        002214  012737  000174  001142           MOV     #DISPREG,DISPLAY
        002222  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

    24
    25                                  ;SETUP "TIMEOUT" TRAP VECTOR FOR UNEXPECTED BUS TIMEOUTS
    26  002226  012737  001706  000004          MOV     #BADTMO,ERRVEC  ;SETUP FOR UNEXPECTED TIMEOUT
    27  002234  012737  000300  000006          MOV     #PR6,ERRVEC+2   ;LEVEL 6
    28
                                        .SBTTL  TYPE PROGRAM NAME
                                        ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
        002242  005227  177777                  INC     #-1             ;;FIRST TIME?
        002246  001032                          BNE     67$             ;;BRANCH IF NO
        002250  022737  013316  000042          CMP     #$ENDAD,@#42    ;;ACT-11?
        002256  001426                          BEQ     67$             ;;BRANCH IF YES
        002260  104401  002266                  TYPE    ,68$            ;;TYPE ASCIZ STRING
        002264  000423                          BR      67$             ;;GET OVER THE ASCIZ
                                        ;;68$:  .ASCIZ  <CRLF>@CZRNIA0 - RM80 DUAL PORT TEST, PT 2@<CRLF>
        002334                          67$:
                                        .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
        002334  005737  000042                  TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
        002340  001006                          BNE     69$             ;;BRANCH IF YES
        002342  023727  001140  000176          CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
        002350  001005                          BNE     70$             ;;BRANCH IF NO
        002352  104406                          GTSWR                   ;;GET SOFT-SWR SETTINGS
        002354  000403                          BR      70$
        002356  112737  000001  001134  69$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
        002364                          70$:
    29  002364  004737  015774          1$:     JSR     PC,$TKINT       ;SETUP THE TTY KEYBOARD
    30  002370  004737  002764                  JSR     PC,CHANGE       ;CHECK/CHANGE THE RH/RM ADDRESS
    31  002374  104401  017556                  TYPE    ,ENTERA         ;ENTER DRIVE ADDRESS
    32  002400  104412                          RDOCT                   ;GET THE ADDRESS
    33  002402  012637  001224                  MOV     (SP)+,PORTA     ;STORE THE ADDRESS
    34  002406  023727  001224  000007          CMP     PORTA,#7        ;SEE IF ADDRESS TOO LARGE
    35  002414  101403                          BLOS    2$              ;BR IF NOT
    36  002416  104401  017605                  TYPE    ,ADRERR         ;TYPE ADDRESS ERROR MESSAGE
    37  002422  000760                          BR      1$              ;TRY AGAIN
    38  002424  013737  001224  001226  2$:     MOV     PORTA,PORTB     ;GENERATE THE PORT B ADDRESS
    39  002432  005237  001226                  INC     PORTB           ;INCREMENT THE ADDRESS
    40  002436  042737  000016  001226          BIC     #16,PORTB       ;LEAVE BIT 0
    41  002444  013746  001224                  MOV     PORTA,-(SP)     ;PUT PORT A ADDRESS ON THE STACK
    42  002450  042716  177771                  BIC     #^C6,(SP)       ;SAVE BITS 1 & 2
    43  002454  052637  001226                  BIS     (SP)+,PORTB     ;SET BITS 1 & 2 IN PORT B ADDRESS
    44  002460  104401  017630                  TYPE    ,PORTAIS        ;'PORT A ADDRESS IS '
    45  002464  013746  001224                  MOV     PORTA,-(SP)     ;;SAVE PORTA FOR TYPEOUT
                                                                        ;;TYPE PORT A ADDRESS
        002470  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
        002472     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
        002473     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
    46  002474  104401  017657                  TYPE    ,PORTBIS        ;'PORT B ADDRESS IS '
    47  002500  013746  001226                  MOV     PORTB,-(SP)     ;;SAVE PORTB FOR TYPEOUT
                                                                        ;;TYPE PORT B ADDRESS
        002504  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
        002506     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
        002507     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
    48  002510  104401  001207                  TYPE    ,$CRLF          ;ANOTHER CR-LF
    49  002514  013737  001224  001230          MOV     PORTA,PORTC     ;GENERATE ADDRESS OF DRIVE NOT TESTED
    50  002522  062737  000006  001230          ADD     #6,PORTC        ;COMPLEMENT SOME BITS
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
 51 002530  042737  177770  001230          BIC     #^C7,PORTC      ;SAVE ONLY LOWER BITS
 52 002536  013701  001224                  MOV     PORTA,R1        ;USE PORT A ADDRESS AS INDEX
 53 002542  116137  025060  001232          MOVB    ATABIT(R1),ASR1  ;GET ATTENTION BIT FOR DRIVE
 56 002550  005037  001256                  CLR     TIMEA           ;CLEAR TIMEOUT ONE-SHOT VALUE LOCATION
    002554  005037  001260                  CLR     TIMEAP          ;CLEAR TIMEOUT ONE-SHOT VALUE LOCATION
    002560  005037  001262                  CLR     TIMEB           ;CLEAR TIMEOUT ONE-SHOT VALUE LOCATION
    002564  005037  001264                  CLR     TIMEBP          ;CLEAR TIMEOUT ONE-SHOT VALUE LOCATION
 57 002570  004737  013336                  JSR     PC,CKCLK        ;SETUP CLOCK
 58 002574  000137  002610                  JMP     EXEC            ;CLOCK HAS BEEN STARTED
 59 002600  104401  017706                  TYPE    ,NOCLOCK        ;NO CLOCK ON SYSTEM
 60 002604  000000                  3$:     HALT                    ;FATAL ERROR
 61 002606  000776                          BR      3$              ;INTERLOCK THE HALT
 62
 63                                 ;ROUTINE TO GET THE TEST NUMBER FROM THE OPERATOR
 64
 65 002610  000005                  EXEC:   RESET                   ;CLEAR EVERYTHING
 66 002612  005037  177776                  CLR     PS              ;CLEAR THE PROCESSOR STATUS WORD
 67 002616  104401  001207                  TYPE    ,$CRLF          ;CR-LF
 68 002622  013700  001272                  MOV     $RMADR,R0       ;RH/RM ADDRESS FOR INDEXING
 69 002626  012706  001100                  MOV     #STACK,SP       ;LOAD STACK POINTER
 70 002632  004737  013336                  JSR     PC,CKCLK        ;START THE CLOCK
 71 002636  000240                          NOP                     ;RETURN IF NO CLOCK
 72 002640  004737  015774                  JSR     PC,$TKINT       ;INITIALIZE THE KEYBOARD
 73 002644  005037  001266                  CLR     KYBCTL          ;CLEAR SINGLE TEST INDICATOR
 74 002650  005037  001100                  CLR     $PASS           ;CLEAR THE PASS COUNT
 75 002654  112737  000001  001115          MOVB    #1,$ERMAX       ;SET ERROR MAX TO 1
 76 002662  012737  002662  001106          MOV     #.,$LPADR       ;INITIAL SETTING FOR LOOP ADDRESS
 77 002670  012737  002670  001110          MOV     #.,$LPERR       ;INITIAL SETTING FOR LOOP ON ERROR ADDRESS
 78
 79 002676  104401  017753          1$:     TYPE    ,TESTNO         ;ASK FOR TEST NUMBER
 80 002702  104412                          RDOCT                   ;GET THE NUMBER
 81 002704  012601                          MOV     (SP)+,R1        ;PUT ENTRY INTO R1
 82 002706  001002                          BNE     2$              ;BR IF NOT ZERO
 83 002710  000137  003074                  JMP     TST1AA          ;ENTER ZERO - PERFORM ALL TESTS
 84
 85 002714  020137  025070          2$:     CMP     R1,MAXTN        ;SEE IF NUMBER GREATER THAN MAXIMUM
 86 002720  003403                          BLE     3$              ;BR IF LESS OR EQUAL
 87 002722  104401  017773                  TYPE    ,BADNO          ;BAD ENTRY
 88 002726  000763                          BR      1$              ;TRY AGAIN
 89 002730  005301                  3$:     DEC     R1              ;DECREMENT ENTRY
 90 002732  006301                          ASL     R1              ;SHIFT IT LEFT
 91 002734  005237  001266                  INC     KYBCTL          ;SET SINGLE TEST INDICATOR
 92 002740  012737  000001  001104          MOV     #1,$ICNT        ;PRESET ITERATION COUNT
 93 002746  012746  000240                  MOV     #PR5,-(SP)      ;;PUT NEW PS ON STACK
    002752  012746  002760                  MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
    002756  000002                          RTI                     ;;POP NEW PC AND PS
    002760                          64$:
 94 002760  000171  025040                  JMP     @TSTADR(R1)     ;JUMP TO TEST
 95
 96                                 ;CHANGE THE RH/RM UNIBUS ADDRESS USED BY THE PROGRAM
 97
 98 002764  005737  001270          CHANGE: TST     CHGADR          ;CHANGE THE ADDRESS ?
 99 002770  001421                          BEQ     3$              ;BR IF NOT
100 002772  005037  001270                  CLR     CHGADR          ;CLEAR THE INDICATOR
101 002776  104401  020022          1$:     TYPE    ,ADDRIS         ;TYPE OUT WHAT THE PRESENT ADDRESS IS
102 003002  013746  001272                  MOV     $RMADR,-(SP)    ;PUT THE ADDRESS ON THE STACK
103 003006  104402                          TYPOC                   ;TYPE THE ACTUAL ADDRESS
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
104 003010  104401  001207                      TYPE    ,$CRLF          ;CR-LF
105 003014  104401  020057                      TYPE    ,NTRH           ;ASK FOR NEW ADDRESS
106 003020  104412                              RDOCT
107 003022  005716                              TST     (SP)            ;0 OR 'CR' ENTERED ?
108 003024  001402                              BEQ     2$              ;BR IF EITHER ENTERED (NO ADDRESS CHANGE)
109 003026  011637  001272                      MOV     (SP),$RMADR     ;NEW RH/RM ADDRESS
110 003032  005726                      2$:     TST     (SP)+           ;CORRECT THE STACK POINTER
111 003034  012737  003054  000004    3$:     MOV     #4$,@#4         ;LOAD TRAP ADDRESS
112 003042  013700  001272                      MOV     $RMADR,R0       ;GET RH/RM ADDRESS
113 003046  005760  000002                      TST     RMWC(R0)        ;RESPONDS AT THAT ADDRESS ?
114 003052  000404                              BR      5$              ;BR IF YES
115 003054                              4$:
    003054  104025                              EMT     25
116 003056  062706  000004                      ADD     #4,SP           ;RESET THE STACK POINTER
117 003062  000745                              BR      1$              ;GET ADDRESS AGAIN
118 003064  012737  000006  000004    5$:     MOV     #6,@#4          ;RESTORE THE VECTOR
119 003072  000207                              RTS     PC              ;RETURN
120
133
134 003074  013700  001272            TST1AA: MOV     $RMADR,R0       ;;RESTORE R0 AFTER END OF PASS
135 003100  012746  000240                      MOV     #PR5,-(SP)      ;;PUT NEW PS ON STACK
    003104  012746  003112                      MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
    003110  000002                              RTI                     ;;POP NEW PC AND PS
    003112                              64$:
136
137                                     ;;**********************************************************************
                                        ;*TEST 1         DRIVE ACCESS TEST
                                        ;*
                                        ;*VERIFY THAT THE DRIVE CAN BE ACCESSED THROUGH BOTH PORTS
                                        ;*
                                        ;*  A.  SELECT DRIVE, VERIFY THAT THE DRIVE IS PRESENT, THAT THE
                                        ;*      DRIVE IS A DUAL PORT RM80, THAT THE DRIVE IS ONLINE (RMDS HAS
                                        ;*      'MOL', 'PGM', 'DPR', & 'DRY' BITS SET), AND THE THE DRIVE SERIAL
                                        ;*      NUMBER READ THROUGH BOTH PORTS IS THE SAME.
                                        ;*
                                        ;*  B.  THE TEST IS REPEATED THROUGH BOTH PORTS.
                                        ;*
                                        ;**********************************************************************
    003112
    003112  005737  001266              TST1:
    003116  001406                              TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
    003120  100002                              BEQ     2$              ;BR IF NOT
    003122  000137  002610                      BPL     1$              ;BR IF JUST ENTERED TEST
    003126  012737  177777  001266    1$:     JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
    003134  012737  003150  001106    2$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
    003142  012737  003150  001110            MOV     #TEST1,$LPADR   ;SETUP SCOPE LOOP ADDRESS
    003150                              TEST1:  MOV     #TEST1,$LPERR   ;SETUP ERROR LOOP ADDRESS
    003150  112737  000001  001102              MOVB    #1,$TSTNM       ;MOVE #1 TEST NUMBER
    003156  012706  001100                      MOV     #STACK,SP       ;SETUP THE STACK POINTER
    003162  012737  000001  001176              MOV     #1,$TIMES       ;;DO 1 ITERATION
138
139 003170  012760  000040  000010              MOV     #CLR,RMCS2(R0)  ;CLEAR MASSBUS
140
141                                     ;VERIFY THAT DRIVE IS PRESENT THROUGH PORTS A & B
142
150 003176  113760  001224  000010              MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
    003204  013737  001224  001234              MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
```

T1 DRIVE ACCESS TEST

```
003212  005760  000012                  TST     RMDS(R0)          ;SEE IF DRIVE (PORT A) PRESENT
003216  005037  001244                  CLR     CKERR             ;CLEAR THE 'CHECK ERROR' INDICATOR
003222  016037  000010  001126          MOV     RMCS2(R0),$BDDAT  ;GET CONTENTS OF RMCS2
003230  012737  000010  001122          MOV     #RMCS2,$BDADR     ;FORM REGISTER ADDRESS OF ERROR MESSAGE
003236  060037  001122                  ADD     R0,$BDADR         ;ADD RH/RM BASE ADDRESS
003242  005037  001124                  CLR     $GDDAT            ;WHAT REGISTER SHOULD BE
003246  013737  001126  001164          MOV     $BDDAT,$TMP0      ;MOVE REGISTER CONTENTS TO '$TMP0'
003254  042737  167777  001164          BIC     #^CNED,$TMP0      ;SAVE SPECIFIED BITS
003262  023737  001124  001164          CMP     $GDDAT,$TMP0      ;COMPARE THE BITS
003270  001414                          BEQ     64$               ;BR IF OK
003272  013737  001126  001174          MOV     $BDDAT,$TMP4      ;COPY 'BAD DATA'
003300  042737  010000  001174          BIC     #NED,$TMP4        ;CLEAR THE MASKED BITS
003306  053737  001174  001124          BIS     $TMP4,$GDDAT      ;'OR' WITH GOOD DATA FOR TYPEOUT
003314  104001                          EMT     1
003316  005137  001244                  COM     CKERR             ;SET THE REGISTER COMPARE ERROR INDICATOR
003322  000240                  64$:    NOP
003324  005737  001244                  TST     CKERR             ;WAS 'NED' SET ?
C03330  001403                          BEQ     .+10              ;BR IF NOT
003332  012760  000040  000010          MOV     #CLR,RMCS2(R0)    ;ISSUE MASSBUS INIT TO CLEAR 'NED'
003340  113760  001226  000010          MOVB    PORTB,RMCS2(R0)   ;SELECT PORT B
003346  013737  001226  001234          MOV     PORTB,PTNBR       ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
003354  005760  000012                  TST     RMDS(R0)          ;SEE IF DRIVE (PORT B) PRESENT
003360  005037  001244                  CLR     CKERR             ;CLEAR THE 'CHECK ERROR' INDICATOR
003364  016037  000010  001126          MOV     RMCS2(R0),$BDDAT  ;GET CONTENTS OF RMCS2
003372  012737  000010  001122          MOV     #RMCS2,$BDADR     ;FORM REGISTER ADDRESS OF ERROR MESSAGE
003400  060037  001122                  ADD     R0,$BDADR         ;ADD RH/RM BASE ADDRESS
003404  005037  001124                  CLR     $GDDAT            ;WHAT REGISTER SHOULD BE
003410  013737  001126  001164          MOV     $BDDAT,$TMP0      ;MOVE REGISTER CONTENTS TO '$TMP0'
003416  042737  167777  001164          BIC     #^CNED,$TMP0      ;SAVE SPECIFIED BITS
003424  023737  001124  001164          CMP     $GDDAT,$TMP0      ;COMPARE THE BITS
003432  001414                          BEQ     66$               ;BR IF OK
003434  013737  001126  001174          MOV     $BDDAT,$TMP4      ;COPY 'BAD DATA'
003442  042737  010000  001174          BIC     #NED,$TMP4        ;CLEAR THE MASKED BITS
003450  053737  001174  001124          BIS     $TMP4,$GDDAT      ;'OR' WITH GOOD DATA FOR TYPEOUT
003456  104001                          EMT     1
003460  005137  001244                  COM     CKERR             ;SET THE REGISTER COMPARE ERROR INDICATOR
003464  000240                  66$:    NOP
003466  005737  001244                  TST     CKERR             ;WAS 'NED' SET ?
003472  001403                          BEQ     .+10              ;BR IF NOT
003474  012760  000040  000010          MOV     #CLR,RMCS2(R0)    ;ISSUE MASSBUS INIT TO CLEAR 'NED'
151
152                             ;CONFIRM THAT DRIVE IS AN RM80 AND IS DUAL PORT
153
157 003502  113760  001224  000010          MOVB    PORTA,RMCS2(R0)   ;SELECT PORT A
    003510  013737  001224  001234          MOV     PORTA,PTNBR       ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
    003516  005037  001244                  CLR     CKERR             ;CLEAR THE 'CHECK ERROR' INDICATOR
    003522  016037  000026  001126          MOV     RMDT(R0),$BDDAT   ;GET CONTENTS OF RMDT
    003530  012737  000026  001122          MOV     #RMDT,$BDADR      ;FORM REGISTER ADDRESS OF ERROR MESSAGE
    003536  060037  001122                  ADD     R0,$BDADR         ;ADD RH/RM BASE ADDRESS
    003542  012737  024026  001124          MOV     #024026,$GDDAT    ;WHAT REGISTER SHOULD BE
    003550  023737  001124  001126          CMP     $GDDAT,$BDDAT     ;IS THE REGISTER OK ?
    003556  001403                          BEQ     68$               ;BR IF OK
    003560  104002                          EMT     2
    003562  005137  001244                  COM     CKERR             ;SET THE REGISTER COMPARE ERROR INDICATOR
    003566  000240                  68$:    NOP
    003570  113760  001226  000010          MOVB    PORTB,RMCS2(R0)   ;SELECT PORT B
    003576  013737  001226  001234          MOV     PORTB,PTNBR       ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
```

T1 DRIVE ACCESS TEST

```
003604  005037  001244                    CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
003610  016037  000026  001126            MOV     RMDT(R0),$BDDAT  ;GET CONTENTS OF RMDT
003616  012737  000026  001122            MOV     #RMDT,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
003624  060037  001122                    ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
003630  012737  024026  001124            MOV     #024026,$GDDAT  ;WHAT REGISTER SHOULD BE
003636  023737  001124  001126            CMP     $GDDAT,$BDDAT   ;IS THE REGISTER OK ?
003644  001403                            BEQ     70$             ;BR IF OK
003646  104002                            EMT     2
003650  005137  001244                    COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
003654  000240                  70$:      NOP
158
159                                     ;VERIFY THROUGH BOTH PORTS THAT THE DRIVE IS ON LINE AND IN NEUTRAL
160
165 003656  113760  001224  000010        MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
003664  013737  001224  001234            MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
003672  005037  001244                    CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
003676  016037  000012  001126            MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
003704  012737  000012  001122            MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
003712  060037  001122                    ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
003716  012737  001000  001124            MOV     #PGM,$GDDAT  ;WHAT REGISTER SHOULD BE
003724  013737  001126  001164            MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
003732  042737  176777  001164            BIC     #^CPGM,$TMP0  ;SAVE SPECIFIED BITS
003740  023737  001124  001164            CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
003746  001414                            BEQ     72$             ;BR IF OK
003750  013737  001126  001174            MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
003756  042737  001000  001174            BIC     #PGM,$TMP4      ;CLEAR THE MASKED BITS
003764  053737  001174  001124            BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
003772  104003                            EMT     3
003774  005137  001244                    COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
004000  000240                  72$:      NOP
004002  005037  001244                    CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
004006  016037  000012  001126            MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
004014  012737  000012  001122            MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
004022  060037  001122                    ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
004026  012737  010600  001124            MOV     #MOL!DPR!DRY,$GDDAT  ;WHAT REGISTER SHOULD BE
004034  013737  001126  001164            MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
004042  042737  167177  001164            BIC     #^C10600,$TMP0  ;SAVE SPECIFIED BITS
004050  023737  001124  001164            CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
004056  001414                            BEQ     74$             ;BR IF OK
004060  013737  001126  001174            MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
004066  042737  010600  001174            BIC     #10600,$TMP4    ;CLEAR THE MASKED BITS
004074  053737  001174  001124            BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
004102  104004                            EMT     4
004104  005137  001244                    COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
004110  000240                  74$:      NOP
004112  113760  001226  000010            MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
004120  013737  001226  001234            MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
004126  005037  001244                    CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
004132  016037  000012  001126            MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
004140  012737  000012  001122            MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
004146  060037  001122                    ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
004152  012737  001000  001124            MOV     #PGM,$GDDAT  ;WHAT REGISTER SHOULD BE
004160  013737  001126  001164            MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
004166  042737  176777  001164            BIC     #^CPGM,$TMP0  ;SAVE SPECIFIED BITS
004174  023737  001124  001164            CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
004202  001414                            BEQ     76$             ;BR IF OK
004204  013737  001126  001174            MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
```

```
004212  042737  001000  001174          BIC     #PGM,$TMP4          ;CLEAR THE MASKED BITS
004220  053737  001174  001124          BIS     $TMP4,$GDDAT        ;'OR' WITH GOOD DATA FOR TYPEOUT
004226  104003                          EMT     3
004230  005137  001244                  COM     CKERR               ;SET THE REGISTER COMPARE ERROR INDICATOR
004234  000240                  76$:    NOP
004236  005037  001244                  CLR     CKERR               ;CLEAR THE 'CHECK ERROR' INDICATOR
004242  016037  000012  001126          MOV     RMDS(R0),$BDDAT     ;GET CONTENTS OF RMDS
004250  012737  000012  001122          MOV     #RMDS,$BDADR        ;FORM REGISTER ADDRESS OF ERROR MESSAGE
004256  060037  001122                  ADD     R0,$BDADR           ;ADD RH/RM BASE ADDRESS
004262  012737  010600  001124          MOV     #MOL!DPR!DRY,$GDDAT ;WHAT REGISTER SHOULD BE
004270  013737  001126  001164          MOV     $BDDAT,$TMP0        ;MOVE REGISTER CONTENTS TO '$TMP0'
004276  042737  167177  001164          BIC     #^C10600,$TMP0      ;SAVE SPECIFIED BITS
004304  023737  001124  001164          CMP     $GDDAT,$TMP0        ;COMPARE THE BITS
004312  001414                          BEQ     78$                 ;BR IF OK
004314  013737  001126  001174          MOV     $BDDAT,$TMP4        ;COPY 'BAD DATA'
004322  042737  010600  001174          BIC     #10600,$TMP4        ;CLEAR THE MASKED BITS
004330  053737  001174  001124          BIS     $TMP4,$GDDAT        ;'OR' WITH GOOD DATA FOR TYPEOUT
004336  104004                          EMT     4
004340  005137  001244                  COM     CKERR               ;SET THE REGISTER COMPARE ERROR INDICATOR
004344  000240                  78$:    NOP
166
167                                     ;VERIFY THAT DRIVE SERIAL NUMBER SEEN THROUGH BOTH PORTS IS THE SAME
168
169 004346  113760  001224  000010      MOVB    PORTA,RMCS2(R0) ;SELECT PORT A
170 004354  016037  000030  001124      MOV     RMSN(R0),$GDDAT ;STORE THE PORT A SERIAL NUMBER
171 004362  113760  001226  000010      MOVB    PORTB,RMCS2(R0) ;SELECT PORT B
172 004370  016037  000030  001126      MOV     RMSN(R0),$BDDAT ;STORE THE PORT B SERIAL NUMBER
173 004376  023737  001124  001126      CMP     $GDDAT,$BDDAT   ;ARE THEY THE SAME ?
174 004404  001406                      BEQ     1$              ;BR IF THEY ARE
175 004406  104005                      EMT     5
176 004410  032777  100000  174522      BIT     #SW15,@SWR      ;HALT ON ERROR ?
177 004416  001001                      BNE     1$              ;BR IF SET - PROGRAM HAS ALREADY HALTED
178 004420  000000                      HALT                    ;HALT, POSSIBLE CABLE CONNECTION PROBLEM
179 004422  000004              1$:     SCOPE                   ;LOOP ?
180
214
215
                                ;;*****************************************************************************
                                ;*TEST 2         SET 'VV' FOR PORT A
                                ;*
                                ;*SET VOLUME VALID
                                ;*
                                ;*  A.  ISSUE A DRIVE CLEAR COMMAND THROUGH PORT A.
                                ;*
                                ;*  B.  ISSUE A READIN PRESET COMMAND THROUGH PORT A.  VERIFY
                                ;*      THAT THE 'VV' BIT IS SET FOR PORT A.
                                ;*
                                ;*  C.  ISSUE A RELEASE COMMAND THROUGH PORT A.  VERIFY THAT
                                ;*      THE DRIVE RETURNED TO NEUTRAL AND THAT NEITHER ATTENTION
                                ;*      BIT IS SET.
                                ;*
                                ;;*****************************************************************************
004424                          TST2:
004424  005737  001266              TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
004430  001406                      BEQ     2$              ;BR IF NOT
004432  100002                      BPL     1$              ;BR IF JUST ENTERED TEST
004434  000137  002610              JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
```

```
T2      SET 'VV' FOR PORT A

004440  012737  177777  001266  1$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
004446  012737  004462  001106  2$:     MOV     #TEST2,$LPADR   ;SETUP SCOPE LOOP ADDRESS
004454  012737  004462  001110          MOV     #TEST2,$LPERR   ;SETUP ERROR LOOP ADDRESS
004462                          TEST2:
004462  112737  000002  001102          MOVB    #2,$TSTNM       ;MOVE #2 TEST NUMBER
004470  012706  001100                  MOV     #STACK,SP       ;SETUP THE STACK POINTER
004474  012737  000001  001176          MOV     #1,$TIMES       ;;DO 1 ITERATION

004502  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
004510  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT

                                ;SET VOLUME VALUE FOR PORT

004516  012760  000011  000000          MOV     #11,RMCS1(R0)   ;ISSUE A DRIVE CLEAR
004524  012760  000021  000000          MOV     #21,RMCS1(R0)   ;ISSUE A READIN PRESET
004532  012760  010000  000032          MOV     #FMT16,RMOF(R0)  ;SET FMT16

                                ;VERIFY THAT THE DRIVE STATUS IS CORRECT

004540  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
004544  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
004552  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
004560  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
004564  012737  011700  001124          MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;WHAT REGISTER SHOULD BE
004572  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
004600  042737  106077  001164          BIC     #^C71700,$TMP0  ;SAVE SPECIFIED BITS
004606  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
004614  001414                          BEQ     64$             ;BR IF OK
004616  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
004624  042737  071700  001174          BIC     #71700,$TMP4    ;CLEAR THE MASKED BITS
004632  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
004640  104010                          EMT     10
004642  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
004646  000240                  64$:    NOP

                                ;RELEASE THE DRIVE FROM PORT A

004650  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
004656  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
004664  012760  000013  000000          MOV     #13,RMCS1(R0)   ;ISSUE RELEASE THROUGH PORT A

                                ;VERIFY THAT THE DRIVE IS IN NEUTRAL

004672  005037  001250                  CLR     RELERR          ;CLEAR THE 'RELEASE ERROR ' INDICATOR
004676  012737  000012  001122          MOV     #RMDS,$BDADR    ;FORM THE ADDRESS OF RMDS FOR TYPEOUT
004704  060037  001122                  ADD     R0,$BDADR       ;ADD THE I/O BASE ADDRESS
004710  012737  011600  001124          MOV     #MOL!PGM!DPR!DRY,$GDDAT  ;COMPARISON CONSTANT
004716  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
004724  016037  000012  001170          MOV     RMDS(R0),$TMP2  ;GET THE DRIVE STATUS REGISTER FROM PORT A.
004732  013737  001170  001164          MOV     $TMP2,$TMP0     ;COPY IT INTO '$TMP0'
004740  042737  100100  001164          BIC     #ATA!VV,$TMP0   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
004746  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
004754  016037  000012  001172          MOV     RMDS(R0),$TMP3  ;GET THE DRIVE STATUS REGISTER FROM PORT B.
004762  013737  001172  001166          MOV     $TMP3,$TMP1     ;COPY IT INTO '$TMP1'
004770  042737  100100  001166          BIC     #ATA!VV,$TMP1   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
004776  023737  001164  001166          CMP     $TMP0,$TMP1     ;IS THE STATUS REGISTER THE SAME FROM BOTH PORTS ?
005004  001006                          BNE     66$             ;BR IF NOT
```

T2 SET 'VV' FOR PORT A

```
005006  005737  001164                  TST     $TMP0           ;REGISTERS ARE THE SAME: ARE THEY ZERO ?
005012  001037                          BNE     68$             ;BR IF NOT
005014  104034                          EMT     34
005016  000137  005202                  JMP     70$             ;BYPASS THE REST OF THE CHECKS
005022  013737  001170  001126  66$:    MOV     $TMP2,$BDDAT    ;SET UP POSSIBLE BAD DATA FOR ERROR MESSAGE
005030  013737  001226  001234          MOV     PORTB,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
005036  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
005044  005737  001164                  TST     $TMP0           ;SEE IF STATUS EQ 0 FROM PORT A.
005050  001414                          BEQ     67$             ;BR IF ZERO
005052  013737  001224  001234          MOV     PORTA,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
005060  013737  001172  001126          MOV     $TMP3,$BDDAT    ;'BAD DATA' FOR ERROR TYPE OUT
005066  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
005074  005737  001166                  TST     $TMP1           ;SEE IF STATUS EQ ZERO FROM PORT B.
005100  001004                          BNE     68$             ;BR IF NOT
005102  012737  177777  001250  67$:    MOV     #-1,RELERR      ;SET 'RELEASE ERROR' INDICATOR
005110  104036                          EMT     36
005112  013737  001170  001126  68$:    MOV     $TMP2,$BDDAT    ;LOOK FOR BIT FAILURES WHEN RMDS READ
005120  013737  001224  001234          MOV     PORTA,PTNBR     ;CHANGE PORT NUMBER
005126  042737  100100  001170          BIC     #ATA!VV,$TMP2   ;DON'T CHECK ATTN BIT OR VV BIT
005134  023737  001124  001170          CMP     $GDDAT,$TMP2    ;ALL BITS OK ?
005142  001401                          BEQ     69$             ;BR IF OK FROM PORT A.
005144  104037                          EMT     37
005146  013737  001172  001126  69$:    MOV     $TMP3,$BDDAT    ;CHECK RMDS FOR BIT FAILURES - FROM PORT B.
005154  013737  001226  001234          MOV     PORTB,PTNBR     ;CHANGE PORT NUMBER
005162  042737  100100  001172          BIC     #ATA!VV,$TMP3   ;DON'T CHECK ATTN BIT OR VV BIT
005170  023737  001124  001172          CMP     $GDDAT,$TMP3    ;SEE IF READ OK FROM PORT B.
005176  001401                          BEQ     70$             ;BR IF OK
005200  104037                          EMT     37
005202  000240                  70$:    NOP
005204  000004                          SCOPE                   ;LOOP ?
216
```

```
;*****************************************************************
;*TEST 3         SET 'VV' FOR PORT B
;*
;*SET VOLUME VALID
;*
;*  A.  ISSUE A DRIVE CLEAR COMMAND THROUGH PORT B.
;*
;*  B.  ISSUE A READIN PRESET COMMAND THROUGH PORT B.  VERIFY
;*      THAT THE 'VV' BIT IS SET FOR PORT B.
;*
;*  C.  ISSUE A RELEASE COMMAND THROUGH PORT B.  VERIFY THAT
;*      THE DRIVE RETURNED TO NEUTRAL AND THAT NEITHER ATTENTION
;*      BIT IS SET.
;*
;*****************************************************************
005206
005206  005737  001266          TST3:   TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
005212  001406                          BEQ     2$              ;BR IF NOT
005214  100002                          BPL     1$              ;BR IF JUST ENTERED TEST
005216  000137  002610                  JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
005222  012737  177777  001266  1$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
005230  012737  005244  001106  2$:     MOV     #TEST3,$LPADR   ;SETUP SCOPE LOOP ADDRESS
005236  012737  005244  001110          MOV     #TEST3,$LPERR   ;SETUP ERROR LOOP ADDRESS
005244                          TEST3:
005244  112737  000003  001102          MOVB    #3,$TSTNM       ;MOVE #3 TEST NUMBER
005252  012706  001100                  MOV     #STACK,SP       ;SETUP THE STACK POINTER
```

T3 SET 'VV' FOR PORT B

```
005256  012737  000001  001176          MOV     #1,$TIMES       ;;DO 1 ITERATION

005264  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
005272  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT

                                ;SET VOLUME VALUE FOR PORT

005300  012760  000011  000000          MOV     #11,RMCS1(R0)   ;ISSUE A DRIVE CLEAR
005306  012760  000021  000000          MOV     #21,RMCS1(R0)   ;ISSUE A READIN PRESET
005314  012760  010000  000032          MOV     #FMT16,RMOF(R0)  ;SET FMT16

                                ;VERIFY THAT THE DRIVE STATUS IS CORRECT

005322  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
005326  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
005334  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
005342  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
005346  012737  011700  001124          MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;WHAT REGISTER SHOULD BE
005354  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
005362  042737  106077  001164          BIC     #^C71700,$TMP0  ;SAVE SPECIFIED BITS
005370  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
005376  001414                          BEQ     64$             ;BR IF OK
005400  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
005406  042737  071700  001174          BIC     #71700,$TMP4    ;CLEAR THE MASKED BITS
005414  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
005422  104010                          EMT     10
005424  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
005430  000240          64$:    NOP

                                ;RELEASE THE DRIVE FROM PORT B

005432  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
005440  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
005446  012760  000013  000000          MOV     #13,RMCS1(R0)   ;ISSUE RELEASE THROUGH PORT B

                                ;VERIFY THAT THE DRIVE IS IN NEUTRAL

005454  005037  001250                  CLR     RELERR          ;CLEAR THE 'RELEASE ERROR ' INDICATOR
005460  012737  000012  001122          MOV     #RMDS,$BDADR    ;FORM THE ADDRESS OF RMDS FOR TYPEOUT
005466  060037  001122                  ADD     R0,$BDADR       ;ADD THE I/O BASE ADDRESS
005472  012737  011600  001124          MOV     #MOL!PGM!DPR!DRY,$GDDAT  ;COMPARISON CONSTANT
005500  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
005506  016037  000012  001170          MOV     RMDS(R0),$TMP2  ;GET THE DRIVE STATUS REGISTER FROM PORT A.
005514  013737  001170  001164          MOV     $TMP2,$TMP0     ;COPY IT INTO '$TMP0'
005522  042737  100100  001164          BIC     #ATA!VV,$TMP0   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
005530  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
005536  016037  000012  001172          MOV     RMDS(R0),$TMP3  ;GET THE DRIVE STATUS REGISTER FROM PORT B.
005544  013737  001172  001166          MOV     $TMP3,$TMP1     ;COPY IT INTO '$TMP1'
005552  042737  100100  001166          BIC     #ATA!VV,$TMP1   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
005560  023737  001164  001166          CMP     $TMP0,$TMP1     ;IS THE STATUS REGISTER THE SAME FROM BOTH PORTS ?
005566  001006                          BNE     66$             ;BR IF NOT
005570  005737  001164                  TST     $TMP0           ;REGISTERS ARE THE SAME: ARE THEY ZERO ?
005574  001037                          BNE     68$             ;BR IF NOT
005576  104034                          EMT     34
005600  000137  005764                  JMP     70$             ;BYPASS THE REST OF THE CHECKS
005604  013737  001170  001126  66$:    MOV     $TMP2,$BDDAT    ;SET UP POSSIBLE BAD DATA FOR ERROR MESSAGE
005612  013737  001226  001234          MOV     PORTB,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
```

T3 SET 'VV' FOR PORT B

```
005620  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
005626  005737  001164                  TST     $TMP0           ;SEE IF STATUS EQ 0 FROM PORT A.
005632  001414                          BEQ     67$             ;BR IF ZERO
005634  013737  001224  001234          MOV     PORTA,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
005642  013737  001172  001126          MOV     $TMP3,$BDDAT    ;'BAD DATA' FOR ERROR TYPE OUT
005650  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
005656  005737  001166                  TST     $TMP1           ;SEE IF STATUS EQ ZERO FROM PORT B.
005662  001004                          BNE     68$             ;BR IF NOT
005664  012737  177777  001250  67$:    MOV     #-1,RELERR      ;SET 'RELEASE ERROR' INDICATOR
005672  104036                          EMT     36
005674  013737  001170  001126  68$:    MOV     $TMP2,$BDDAT    ;LOOK FOR BIT FAILURES WHEN RMDS READ
005702  013737  001224  001234          MOV     PORTA,PTNBR     ;CHANGE PORT NUMBER
005710  042737  100100  001170          BIC     #ATA!VV,$TMP2   ;DON'T CHECK ATTN BIT OR VV BIT
005716  023737  001124  001170          CMP     $GDDAT,$TMP2    ;ALL BITS OK ?
005724  001401                          BEQ     69$             ;BR IF OK FROM PORT A.
005726  104037                          EMT     37
005730  013737  001172  001126  69$:    MOV     $TMP3,$BDDAT    ;CHECK RMDS FOR BIT FAILURES - FROM PORT B.
005736  013737  001226  001234          MOV     PORTB,PTNBR     ;CHANGE PORT NUMBER
005744  042737  100100  001172          BIC     #ATA!VV,$TMP3   ;DON'T CHECK ATTN BIT OR VV BIT
005752  023737  001124  001172          CMP     $GDDAT,$TMP3    ;SEE IF READ OK FROM PORT B.
005760  001401                          BEQ     70$             ;BR IF OK
005762  104037                          EMT     37
005764  000240                  70$:    NOP
005766  000004                          SCOPE                   ;LOOP ?
```

217
222
274

```
;;*********************************************************************
;*TEST 4         MEASURE THE TIMEOUT ONE-SHOT THROUGH PORT A
;*
;*MEASURE THE TIMEOUT ONE-SHOT VALUE THROUGH PORT A
;*
;*  A.  WRITE 0'S INTO RMDS THROUGH PORT A AND VERIFY THAT THE
;*      DRIVE HAS BEEN SEIZED.
;*
;*  B.  WAIT FOR TIMEOUT TO OCCUR.  MEASURE THE DURATION OF THE TIMEOUT
;*      ONE-SHOT AND SAVE THE VALUE FOR LATER USE.
;*
;*  C.  VERIFY THAT THE TIMEOUT OCCURRED AND THAT THE DRIVE RETURNS
;*      TO NEUTRAL
;*
;*********************************************************************
```

```
005770
005770  005737  001266          TST4:   TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
005774  001406                          BEQ     2$              ;BR IF NOT
005776  100002                          BPL     1$              ;BR IF JUST ENTERED TEST
006000  000137  002610                  JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
006004  012737  177777  001266  1$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
006012  012737  006026  001106  2$:     MOV     #TEST4,$LPADR   ;SETUP SCOPE LOOP ADDRESS
006020  012737  006026  001110          MOV     #TEST4,$LPERR   ;SETUP ERROR LOOP ADDRESS
006026
006026  112737  000004  001102  TEST4:  MOVB    #4,$TSTNM       ;MOVE #4 TEST NUMBER
006034  012706  001100                  MOV     #STACK,SP       ;SETUP THE STACK POINTER
006040  012737  000001  001176          MOV     #1,$TIMES       ;;DO 1 ITERATION

006046  005037  001256                  CLR     TIMEA           ;CLEAR THE TIMEOUT VALUE STORAGE LOCATION
```

T4 MEASURE THE TIMEOUT ONE-SHOT THROUGH PORT A

```
006052  005037  001260                 CLR     TIMEAP  ;CLEAR THE + 25% TOLERANCE LOCATION

                                ;START THE TIMER

006056  005037  001252                 CLR     TIME            ;CLEAR THE ELAPSED TIME COUNTER
006062  012737  003720  001254         MOV     #2000.,WATCH    ;SET WATCH TO 2000. MS

                                ;SEIZE THE DRIVE THROUGH PORT A

006070  113760  001224  000010         MOVB    PORTA,RMCS2(R0) ;SELECT PORT A
006076  013737  001224  001236         MOV     PORTA,SEIZPT  ;STORE SEIZING PORT'S ADDRESS
006104  005060  000012                 CLR     RMDS(R0)        ;WRITE RMDS
006110  113760  001226  000010         MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
006116  013737  001226  001234         MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
006124  013737  001226  001240         MOV     PORTB,OPPRT     ;'OPPOSITE' PORT ADDRESS
006132  016037  000012  001126         MOV     RMDS(R0),$BDDAT ;SEE IF DRIVE SEIZED BY PORT A
006140  010037  001122                 MOV     R0,$BDADR       ;RH/RM BASE ADDRESS
006144  062737  000012  001122         ADD     #RMDS,$BDADR    ;GENERATE BAD REGISTER ADDRESS
006152  005037  001124                 CLR     $GDDAT          ;REGISTER SHOULD BE ZERO
006156  023737  001124  001126         CMP     $GDDAT,$BDDAT   ;IS THE REGISTER ZERO
006164  001403                         BEQ     64$             ;BR IF IT IS
006166  104030                         EMT     30
006170  000137  006704                 JMP     4$              ;BYPASS REST OF THE SUBTEST
006174                          64$:
006174  113760  001224  000010         MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
006202  013737  001224  001234         MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
006210  016037  000012  001126         MOV     RMDS(R0),$BDDAT  ;SEE IF SEIZING PORT SEES CORRECT STATUS
006216  012737  011700  001124         MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;EXPECTED STATUS
006224  013737  001124  001166         MOV     $GDDAT,$TMP1  ;USE GOOD DATA AS A MASK
006232  005137  001166                 COM     $TMP1           ;COMPLEMENT THE EXPECTED STATUS
006236  013737  001126  001164         MOV     $BDDAT,$TMP0    ;SAVE THE ACTUAL STATUS
006244  043737  001166  001164         BIC     $TMP1,$TMP0     ;CLEAR UNWANTED BITS
006252  023737  001124  001164         CMP     $GDDAT,$TMP0    ;ARE THE EXPECTED STATUS BITS SET ?
006260  001401                         BEQ     65$             ;BR IF THEY ARE
006262  104031                         EMT     31
006264  000240                  65$:   NOP

                                ;WAIT FOR PORT A TO TIMEOUT

006266  113760  001226  000010         MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
006274  013737  001226  001234         MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
006302  005760  000012          1$:    TST     RMDS(R0)        ;WAIT FOR THE DRIVE TO TIMEOUT
006306  001006                         BNE     2$              ;BR WHEN TIMEOUT OCCURS
006310  005737  001254                 TST     WATCH           ;CHECK WATCH
006314  001372                         BNE     1$              ;BR IF NOT ZERO
006316  104006                         EMT     6
006320  000137  006356                 JMP     3$              ;BYPASS THE REST OF THE TEST
006324  013737  001252  001256  2$:    MOV     TIME,TIMEA      ;SAVE THE ELAPSED TIME FOR PORT A
006332  004537  013522                 JSR     R5,TOLER        ;CALCULATE THE TOLERANCE
006336  001256                         .WORD   TIMEA           ;TIMEOUT VALUE FOR PORT A
006340  012637  001260                 MOV     (SP)+,TIMEAP    ;+25% TOLERANCE

                                ;VERIFY THAT THE TIMEOUT ONE-SHOT VALUE IS AT LEAST 500 MS

006344  023727  001256  000764         CMP     TIMEA,#500.     ;IS TIMEOUT VALUE AT LEAST 500 MS ?
006352  103001                         BHIS    3$              ;BR IF IT IS
006354  104007                         EMT     7
```

```
                                        ;VERIFY THAT THE DRIVE RETURNED TO NEUTRAL AFTER PORT A TIMED OUT

006356                                  3$:
                                        ;VERIFY THAT THE DRIVE IS IN NEUTRAL

006356  005037  001250                        CLR     RELERR          ;CLEAR THE 'RELEASE ERROR ' INDICATOR
006362  012737  000012  001122                MOV     #RMDS,$BDADR    ;FORM THE ADDRESS OF RMDS FOR TYPEOUT
006370  060037  001122                        ADD     R0,$BDADR       ;ADD THE I/O BASE ADDRESS
006374  012737  011700  001124                MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;COMPARISON CONSTANT
006402  113760  001224  000010                MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
006410  016037  000012  001170                MOV     RMDS(R0),$TMP2  ;GET THE DRIVE STATUS REGISTER FROM PORT A.
006416  013737  001170  001164                MOV     $TMP2,$TMP0     ;COPY IT INTO '$TMP0'
006424  042737  100100  001164                BIC     #ATA!VV,$TMP0   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
006432  113760  001226  000010                MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
006440  016037  000012  001172                MOV     RMDS(R0),$TMP3  ;GET THE DRIVE STATUS REGISTER FROM PORT B.
006446  013737  001172  001166                MOV     $TMP3,$TMP1     ;COPY IT INTO '$TMP1'
006454  042737  100100  001166                BIC     #ATA!VV,$TMP1   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
006462  023737  001164  001166                CMP     $TMP0,$TMP1     ;IS THE STATUS REGISTER THE SAME FROM BOTH PORTS ?
006470  001006                                BNE     66$             ;BR IF NOT
006472  005737  001164                        TST     $TMP0           ;REGISTERS ARE THE SAME: ARE THEY ZERO ?
006476  001045                                BNE     68$             ;BR IF NOT
006500  104034                                EMT     34
006502  000137  006702                        JMP     70$             ;BYPASS THE REST OF THE CHECKS
006506  013737  001170  001126  66$:          MOV     $TMP2,$BDDAT    ;SET UP POSSIBLE BAD DATA FOR ERROR MESSAGE
006514  013737  001226  001234                MOV     PORTB,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
006522  113760  001226  000010                MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
006530  005737  001164                        TST     $TMP0           ;SEE IF STATUS EQ 0 FROM PORT A.
006534  001414                                BEQ     67$             ;BR IF ZERO
006536  013737  001224  001234                MOV     PORTA,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
006544  013737  001172  001126                MOV     $TMP3,$BDDAT    ;'BAD DATA' FOR ERROR TYPE OUT
006552  113760  001224  000010                MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
006560  005737  001166                        TST     $TMP1           ;SEE IF STATUS EQ ZERO FROM PORT B.
006564  001012                                BNE     68$             ;BR IF NOT
006566  012737  177777  001250  67$:          MOV     #-1,RELERR      ;SET 'RELEASE ERROR' INDICATOR
006574  012760  000011  000000                MOV     #11,RMCS1(R0)   ;CLEAR THE DRIVE
006602  012760  000013  000000                MOV     #13,RMCS1(R0)   ;RELEASE THE DRIVE
006610  104035                                EMT     35
006612  013737  001170  001126  68$:          MOV     $TMP2,$BDDAT    ;LOOK FOR BIT FAILURES WHEN RMDS READ
006620  013737  001224  001234                MOV     PORTA,PTNBR     ;CHANGE PORT NUMBER
006626  042737  100000  001170                BIC     #ATA,$TMP2      ;DON'T CHECK THE ATTN BIT
006634  023737  001124  001170                CMP     $GDDAT,$TMP2    ;ALL BITS OK ?
006642  001401                                BEQ     69$             ;BR IF OK FROM PORT A.
006644  104037                                EMT     37
006646  013737  001172  001126  69$:          MOV     $TMP3,$BDDAT    ;CHECK RMDS FOR BIT FAILURES - FROM PORT B.
006654  013737  001226  001234                MOV     PORTB,PTNBR     ;CHANGE PORT NUMBER
006662  042737  100000  001172                BIC     #ATA,$TMP3      ;DON'T CHECK THE ATTN BIT
006670  023737  001124  001172                CMP     $GDDAT,$TMP3    ;SEE IF READ OK FROM PORT B.
006676  001401                                BEQ     70$             ;BR IF OK
006700  104037                                EMT     37
006702  000240                  70$:          NOP
006704  000004                  4$:           SCOPE                   ;LOOP ?
275

                                        ;;*************************************************************************
                                        ;*TEST 5        MEASURE THE TIMEOUT ONE-SHOT THROUGH PORT B
                                        ;*
```

```
                                ;*MEASURE THE TIMEOUT ONE-SHOT VALUE THROUGH PORT B
                                ;*
                                ;*  A.  WRITE 0'S INTO RMDS THROUGH PORT B AND VERIFY THAT THE
                                ;*      DRIVE HAS BEEN SEIZED.
                                ;*
                                ;*  B.  WAIT FOR TIMEOUT TO OCCUR.  MEASURE THE DURATION OF THE TIMEOUT
                                ;*      ONE-SHOT AND SAVE THE VALUE FOR LATER USE.
                                ;*
                                ;*  C.  VERIFY THAT THE TIMEOUT OCCURRED AND THAT THE DRIVE RETURNS
                                ;*      TO NEUTRAL
                                ;*
                                ;*****************************************************************
006706                          TST5:
006706  005737  001266                  TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
006712  001406                          BEQ     2$              ;BR IF NOT
006714  100002                          BPL     1$              ;BR IF JUST ENTERED TEST
006716  000137  002610                  JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
006722  012737  177777  001266  1$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
006730  012737  006744  001106  2$:     MOV     #TEST5,$LPADR   ;SETUP SCOPE LOOP ADDRESS
006736  012737  006744  001110          MOV     #TEST5,$LPERR   ;SETUP ERROR LOOP ADDRESS
006744                          TEST5:
006744  112737  000005  001102          MOVB    #5,$TSTNM       ;MOVE #5 TEST NUMBER
006752  012706  001100                  MOV     #STACK,SP       ;SETUP THE STACK POINTER
006756  012737  000001  001176          MOV     #1,$TIMES       ;;DO 1 ITERATION

006764  005037  001262                  CLR     TIMEB           ;CLEAR THE TIMEOUT VALUE STORAGE LOCATION
006770  005037  001264                  CLR     TIMEBP  ;CLEAR THE + 25% TOLERANCE LOCATION

                                ;START THE TIMER

006774  005037  001252                  CLR     TIME            ;CLEAR THE ELAPSED TIME COUNTER
007000  012737  003720  001254          MOV     #2000.,WATCH    ;SET WATCH TO 2000. MS

                                ;SEIZE THE DRIVE THROUGH PORT B

007006  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B
007014  013737  001226  001236          MOV     PORTB,SEIZPT  ;STORE SEIZING PORT'S ADDRESS
007022  005060  000012                  CLR     RMDS(R0)        ;WRITE RMDS
007026  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
007034  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
007042  013737  001224  001240          MOV     PORTA,OPPRT     ;'OPPOSITE' PORT ADDRESS
007050  016037  000012  001126          MOV     RMDS(R0),$BDDAT ;SEE IF DRIVE SEIZED BY PORT B
007056  010037  001122                  MOV     R0,$BDADR       ;RH/RM BASE ADDRESS
007062  062737  000012  001122          ADD     #RMDS,$BDADR    ;GENERATE BAD REGISTER ADDRESS
007070  005037  001124                  CLR     $GDDAT          ;REGISTER SHOULD BE ZERO
007074  023737  001124  001126          CMP     $GDDAT,$BDDAT   ;IS THE REGISTER ZERO
007102  001403                          BEQ     64$             ;BR IF IT IS
007104  104030                          EMT     30
007106  000137  007622                  JMP     4$              ;BYPASS REST OF THE SUBTEST
007112                          64$:
007112  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
007120  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
007126  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;SEE IF SEIZING PORT SEES CORRECT STATUS
007134  012737  011700  001124          MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;EXPECTED STATUS
007142  013737  001124  001166          MOV     $GDDAT,$TMP1  ;USE GOOD DATA AS A MASK
007150  005137  001166                  COM     $TMP1           ;COMPLEMENT THE EXPECTED STATUS
007154  013737  001126  001164          MOV     $BDDAT,$TMP0    ;SAVE THE ACTUAL STATUS
```

```
T5      MEASURE THE TIMEOUT ONE-SHOT THROUGH PORT B

007162  043737  001166  001164          BIC     $TMP1,$TMP0     ;CLEAR UNWANTED BITS
007170  023737  001124  001164          CMP     $GDDAT,$TMP0    ;ARE THE EXPECTED STATUS BITS SET ?
007176  001401                          BEQ     65$             ;BR IF THEY ARE
007200  104031                          EMT     31
007202  000240                  65$:    NOP

                                        ;WAIT FOR PORT B TO TIMEOUT

007204  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
007212  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
007220  005760  000012                  1$:     TST     RMDS(R0)        ;WAIT FOR THE DRIVE TO TIMEOUT
007224  001006                          BNE     2$              ;BR WHEN TIMEOUT OCCURS
007226  005737  001254                  TST     WATCH           ;CHECK WATCH
007232  001372                          BNE     1$              ;BR IF NOT ZERO
007234  104006                          EMT     6
007236  000137  007274                  JMP     3$              ;BYPASS THE REST OF THE TEST
007242  013737  001252  001262  2$:     MOV     TIME,TIMEB      ;SAVE THE ELAPSED TIME FOR PORT B
007250  004537  013522                  JSR     R5,TOLER        ;CALCULATE THE TOLERANCE
007254  001262                          .WORD   TIMEB           ;TIMEOUT VALUE FOR PORT B
007256  012637  001264                  MOV     (SP)+,TIMEBP    ;+25% TOLERANCE

                                        ;VERIFY THAT THE TIMEOUT ONE-SHOT VALUE IS AT LEAST 500 MS

007262  023727  001262  000764          CMP     TIMEB,#500.     ;IS TIMEOUT VALUE AT LEAST 500 MS ?
007270  103001                          BHIS    3$              ;BR IF IT IS
007272  104007                          EMT     7

                                        ;VERIFY THAT THE DRIVE RETURNED TO NEUTRAL AFTER PORT B TIMED OUT

007274                                  3$:
                                        ;VERIFY THAT THE DRIVE IS IN NEUTRAL

007274  005037  001250                  CLR     RELERR          ;CLEAR THE 'RELEASE ERROR ' INDICATOR
007300  012737  000012  001122          MOV     #RMDS,$BDADR    ;FORM THE ADDRESS OF RMDS FOR TYPEOUT
007306  060037  001122                  ADD     R0,$BDADR       ;ADD THE I/O BASE ADDRESS
007312  012737  011700  001124          MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;COMPARISON CONSTANT
007320  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
007326  016037  000012  001170          MOV     RMDS(R0),$TMP2  ;GET THE DRIVE STATUS REGISTER FROM PORT A.
007334  013737  001170  001164          MOV     $TMP2,$TMP0     ;COPY IT INTO '$TMP0'
007342  042737  100100  001164          BIC     #ATA!VV,$TMP0   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
007350  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
007356  016037  000012  001172          MOV     RMDS(R0),$TMP3  ;GET THE DRIVE STATUS REGISTER FROM PORT B.
007364  013737  001172  001166          MOV     $TMP3,$TMP1     ;COPY IT INTO '$TMP1'
007372  042737  100100  001166          BIC     #ATA!VV,$TMP1   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
007400  023737  001164  001166          CMP     $TMP0,$TMP1     ;IS THE STATUS REGISTER THE SAME FROM BOTH PORTS ?
007406  001006                          BNE     66$             ;BR IF NOT
007410  005737  001164                  TST     $TMP0           ;REGISTERS ARE THE SAME: ARE THEY ZERO ?
007414  001045                          BNE     68$             ;BR IF NOT
007416  104034                          EMT     34
007420  000137  007620                  JMP     70$             ;BYPASS THE REST OF THE CHECKS
007424  013737  001170  001126  66$:    MOV     $TMP2,$BDDAT    ;SET UP POSSIBLE BAD DATA FOR ERROR MESSAGE
007432  013737  001226  001234          MOV     PORTB,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
007440  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
007446  005737  001164                  TST     $TMP0           ;SEE IF STATUS EQ 0 FROM PORT A.
007452  001414                          BEQ     67$             ;BR IF ZERO
007454  013737  001224  001234          MOV     PORTA,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
007462  013737  001172  001126          MOV     $TMP3,$BDDAT    ;'BAD DATA' FOR ERROR TYPE OUT
```

```
007470  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
007476  005737  001166                  TST     $TMP1           ;SEE IF STATUS EQ ZERO FROM PORT B.
007502  001012                          BNE     68$             ;BR IF NOT
007504  012737  177777  001250  67$:    MOV     #-1,RELERR      ;SET 'RELEASE ERROR' INDICATOR
007512  012760  000011  000000          MOV     #11,RMCS1(R0)   ;CLEAR THE DRIVE
007520  012760  000013  000000          MOV     #13,RMCS1(R0)   ;RELEASE THE DRIVE
007526  104035                          EMT     35
007530  013737  001170  001126  68$:    MOV     $TMP2,$BDDAT    ;LOOK FOR BIT FAILURES WHEN RMDS READ
007536  013737  001224  001234          MOV     PORTA,PTNBR     ;CHANGE PORT NUMBER
007544  042737  100000  001170          BIC     #ATA,$TMP2      ;DON'T CHECK THE ATTN BIT
007552  023737  001124  001170          CMP     $GDDAT,$TMP2    ;ALL BITS OK ?
007560  001401                          BEQ     69$             ;BR IF OK FROM PORT A.
007562  104037                          EMT     37
007564  013737  001172  001126  69$:    MOV     $TMP3,$BDDAT    ;CHECK RMDS FOR BIT FAILURES - FROM PORT B.
007572  013737  001226  001234          MOV     PORTB,PTNBR     ;CHANGE PORT NUMBER
007600  042737  100000  001172          BIC     #ATA,$TMP3      ;DON'T CHECK THE ATTN BIT
007606  023737  001124  001172          CMP     $GDDAT,$TMP3    ;SEE IF READ OK FROM PORT B.
007614  001401                          BEQ     70$             ;BR IF OK
007616  104037                          EMT     37
007620  000240                  70$:    NOP
007622  000004                  4$:     SCOPE                   ;LOOP ?
```

```
;;*****************************************************************
;*TEST 6         TEST 'PORT SELECT' SWITCH, DRIVE CYCLED UP
;*
;*TEST THE OPERATION OF THE 'PORT SELECT' SWITCH (DRIVE CYCLED UP).
;*
;*  A.  SWITCH TO PORT 'A' POSITION.  VERIFY THAT THE DRIVE IS IN
;*      NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH
;*      PORTS, ARE CORRECT.
;*
;*  B.  SWITCH TO PORT 'B' POSITION. VERIFY THAT THE DRIVE IS IN
;*      NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH
;*      PORTS, ARE CORRECT.
;*
;*  C.  RETURN THE 'PORT SELECT' SWITCH TO THE 'A/B' POSITION.  VERIFY
;*      THE DRIVE STATE.
;*
;;*****************************************************************
```

```
007624
007624  005737  001266          TST6:   TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
007630  001406                          BEQ     2$              ;BR IF NOT
007632  100002                          BPL     1$              ;BR IF JUST ENTERED TEST
007634  000137  002610                  JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
007640  012737  177777  001266  1$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
007646  012737  007662  001106  2$:     MOV     #TEST6,$LPADR   ;SETUP SCOPE LOOP ADDRESS
007654  012737  007662  001110          MOV     #TEST6,$LPERR   ;SETUP ERROR LOOP ADDRESS
007662                          TEST6:
007662  112737  000006  001102          MOVB    #6,$TSTNM       ;MOVE #6 TEST NUMBER
007670  012706  001100                  MOV     #STACK,SP       ;SETUP THE STACK POINTER
007674  012737  000001  001176          MOV     #1,$TIMES       ;;DO 1 ITERATION
```

```
;CLEAR ATTENTION BITS FOR BOTH PORTS

007702  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT #A
```

```
007710  005060  000012                  CLR     RMDS(R0)            ;SEIZE THE DRIVE
007714  012760  000011  000000          MOV     #11,RMCS1(R0)       ;ISSUE DRIVE CLEAR
007722  012760  000013  000000          MOV     #13,RMCS1(R0)       ;RELEASE THE DRIVE
007730  113760  001226  000010          MOVB    PORTB,RMCS2(R0)     ;SELECT PORT #B
007736  005060  000012                  CLR     RMDS(R0)            ;SEIZE THE DRIVE THROUGH PORT 'B'
007742  012760  000011  000000          MOV     #11,RMCS1(R0)       ;ISSUE DRIVE CLEAR
007750  012760  000013  000000          MOV     #13,RMCS1(R0)       ;RELEASE THE DRIVE
298 007756  104401  020154              TYPE    ,SWTCHA             ;SWITCH TO 'A'
299 007762  104401  020246              TYPE    ,CONTUE             ;PRESS 'CONTINUE'
300 007766  000000                      HALT
301
302                             ;VERIFY THAT THE DRIVE IS IN NEUTRAL

007770  005037  001250                  CLR     RELERR              ;CLEAR THE 'RELEASE ERROR ' INDICATOR
007774  012737  000012  001122          MOV     #RMDS,$BDADR        ;FORM THE ADDRESS OF RMDS FOR TYPEOUT
010002  060037  001122                  ADD     R0,$BDADR           ;ADD THE I/O BASE ADDRESS
010006  012737  011700  001124          MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;COMPARISON CONSTANT
010014  113760  001224  000010          MOVB    PORTA,RMCS2(R0)     ;SELECT PORT A.
010022  016037  000012  001170          MOV     RMDS(R0),$TMP2      ;GET THE DRIVE STATUS REGISTER FROM PORT A.
010030  013737  001170  001164          MOV     $TMP2,$TMP0         ;COPY IT INTO '$TMP0'
010036  042737  100100  001164          BIC     #ATA!VV,$TMP0       ;CLEAR PORT DEPENDENT BITS FROM THE COPY
010044  113760  001226  000010          MOVB    PORTB,RMCS2(R0)     ;SELECT PORT B.
010052  016037  000012  001172          MOV     RMDS(R0),$TMP3      ;GET THE DRIVE STATUS REGISTER FROM PORT B.
010060  013737  001172  001166          MOV     $TMP3,$TMP1         ;COPY IT INTO '$TMP1'
010066  042737  100100  001166          BIC     #ATA!VV,$TMP1       ;CLEAR PORT DEPENDENT BITS FROM THE COPY
010074  023737  001164  001166          CMP     $TMP0,$TMP1         ;IS THE STATUS REGISTER THE SAME FROM BOTH PORTS ?
010102  001006                          BNE     64$                 ;BR IF NOT
010104  005737  001164                  TST     $TMP0               ;REGISTERS ARE THE SAME: ARE THEY ZERO ?
010110  001045                          BNE     66$                 ;BR IF NOT
010112  104034                          EMT     34
010114  000137  010314                  JMP     68$                 ;BYPASS THE REST OF THE CHECKS
010120  013737  001170  001126  64$:    MOV     $TMP2,$BDDAT        ;SET UP POSSIBLE BAD DATA FOR ERROR MESSAGE
010126  013737  001226  001234          MOV     PORTB,PTNBR         ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
010134  113760  001226  000010          MOVB    PORTB,RMCS2(R0)     ;SELECT PORT B.
010142  005737  001164                  TST     $TMP0               ;SEE IF STATUS EQ 0 FROM PORT A.
010146  001414                          BEQ     65$                 ;BR IF ZERO
010150  013737  001224  001234          MOV     PORTA,PTNBR         ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
010156  013737  001172  001126          MOV     $TMP3,$BDDAT        ;'BAD DATA' FOR ERROR TYPE OUT
010164  113760  001224  000010          MOVB    PORTA,RMCS2(R0)     ;SELECT PORT A.
010172  005737  001166                  TST     $TMP1               ;SEE IF STATUS EQ ZERO FROM PORT B.
010176  001012                          BNE     66$                 ;BR IF NOT
010200  012737  177777  001250  65$:    MOV     #-1,RELERR          ;SET 'RELEASE ERROR' INDICATOR
010206  012760  000011  000000          MOV     #11,RMCS1(R0)       ;CLEAR THE DRIVE
010214  012760  000013  000000          MOV     #13,RMCS1(R0)       ;RELEASE THE DRIVE
010222  104017                          EMT     17
010224  013737  001170  001126  66$:    MOV     $TMP2,$BDDAT        ;LOOK FOR BIT FAILURES WHEN RMDS READ
010232  013737  001224  001234          MOV     PORTA,PTNBR         ;CHANGE PORT NUMBER
010240  042737  100000  001170          BIC     #ATA,$TMP2          ;DON'T CHECK THE ATTN BIT
010246  023737  001124  001170          CMP     $GDDAT,$TMP2        ;ALL BITS OK ?
010254  001401                          BEQ     67$                 ;BR IF OK FROM PORT A.
010256  104037                          EMT     37
010260  013737  001172  001126  67$:    MOV     $TMP3,$BDDAT        ;CHECK RMDS FOR BIT FAILURES - FROM PORT B.
010266  013737  001226  001234          MOV     PORTB,PTNBR         ;CHANGE PORT NUMBER
010274  042737  100000  001172          BIC     #ATA,$TMP3          ;DON'T CHECK THE ATTN BIT
010302  023737  001124  001172          CMP     $GDDAT,$TMP3        ;SEE IF READ OK FROM PORT B.
010310  001401                          BEQ     68$                 ;BR IF OK
010312  104037                          EMT     37
```

```
T6      TEST 'PORT SELECT' SWITCH, DRIVE CYCLED UP

        010314  000240                  68$:    NOP
    303 010316  104401  020211                  TYPE    ,SWTCHB         ;SWITCH TO 'B'
    304 010322  104401  020246                  TYPE    ,CONTUE         ;PRESS 'CONTINUE'
    305 010326  000000                          HALT
    306
    307                                 ;VERIFY THAT THE DRIVE IS IN NEUTRAL

        010330  005037  001250                  CLR     RELERR          ;CLEAR THE 'RELEASE ERROR ' INDICATOR
        010334  012737  000012  001122          MOV     #RMDS,$BDADR    ;FORM THE ADDRESS OF RMDS FOR TYPEOUT
        010342  060037  001122                  ADD     R0,$BDADR       ;ADD THE I/O BASE ADDRESS
        010346  012737  011700  001124          MOV     #MOL!PGM!DPR!DRY!VV,$GDDAT  ;COMPARISON CONSTANT
        010354  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
        010362  016037  000012  001170          MOV     RMDS(R0),$TMP2  ;GET THE DRIVE STATUS REGISTER FROM PORT A.
        010370  013737  001170  001164          MOV     $TMP2,$TMP0     ;COPY IT INTO '$TMP0'
        010376  042737  100100  001164          BIC     #ATA!VV,$TMP0   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
        010404  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
        010412  016037  000012  001172          MOV     RMDS(R0),$TMP3  ;GET THE DRIVE STATUS REGISTER FROM PORT B.
        010420  013737  001172  001166          MOV     $TMP3,$TMP1     ;COPY IT INTO '$TMP1'
        010426  042737  100100  001166          BIC     #ATA!VV,$TMP1   ;CLEAR PORT DEPENDENT BITS FROM THE COPY
        010434  023737  001164  001166          CMP     $TMP0,$TMP1     ;IS THE STATUS REGISTER THE SAME FROM BOTH PORTS ?
        010442  001006                          BNE     69$             ;BR IF NOT
        010444  005737  001164                  TST     $TMP0           ;REGISTERS ARE THE SAME: ARE THEY ZERO ?
        010450  001045                          BNE     71$             ;BR IF NOT
        010452  104034                          EMT     34
        010454  000137  010654                  JMP     73$             ;BYPASS THE REST OF THE CHECKS
        010460  013737  001170  001126  69$:    MOV     $TMP2,$BDDAT    ;SET UP POSSIBLE BAD DATA FOR ERROR MESSAGE
        010466  013737  001226  001234          MOV     PORTB,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
        010474  113760  001226  000010          MOVB    PORTB,RMCS2(R0) ;SELECT PORT B.
        010502  005737  001164                  TST     $TMP0           ;SEE IF STATUS EQ 0 FROM PORT A.
        010506  001414                          BEQ     70$             ;BR IF ZERO
        010510  013737  001224  001234          MOV     PORTA,PTNBR     ;SEIZING PORT IF TEST SHOWS DRIVE NOT IN NEUTRAL
        010516  013737  001172  001126          MOV     $TMP3,$BDDAT    ;'BAD DATA' FOR ERROR TYPE OUT
        010524  113760  001224  000010          MOVB    PORTA,RMCS2(R0) ;SELECT PORT A.
        010532  005737  001166                  TST     $TMP1           ;SEE IF STATUS EQ ZERO FROM PORT B.
        010536  001012                          BNE     71$             ;BR IF NOT
        010540  012737  177777  001250  70$:    MOV     #-1,RELERR      ;SET 'RELEASE ERROR' INDICATOR
        010546  012760  000011  000000          MOV     #11,RMCS1(R0)   ;CLEAR THE DRIVE
        010554  012760  000013  000000          MOV     #13,RMCS1(R0)   ;RELEASE THE DRIVE
        010562  104020                          EMT     20
        010564  013737  001170  001126  71$:    MOV     $TMP2,$BDDAT    ;LOOK FOR BIT FAILURES WHEN RMDS READ
        010572  013737  001224  001234          MOV     PORTA,PTNBR     ;CHANGE PORT NUMBER
        010600  042737  100000  001170          BIC     #ATA,$TMP2      ;DON'T CHECK THE ATTN BIT
        010606  023737  001124  001170          CMP     $GDDAT,$TMP2    ;ALL BITS OK ?
        010614  001401                          BEQ     72$             ;BR IF OK FROM PORT A.
        010616  104037                          EMT     37
        010620  013737  001172  001126  72$:    MOV     $TMP3,$BDDAT    ;CHECK RMDS FOR BIT FAILURES - FROM PORT B.
        010626  013737  001226  001234          MOV     PORTB,PTNBR     ;CHANGE PORT NUMBER
        010634  042737  100000  001172          BIC     #ATA,$TMP3      ;DON'T CHECK THE ATTN BIT
        010642  023737  001124  001172          CMP     $GDDAT,$TMP3    ;SEE IF READ OK FROM PORT B.
        010650  001401                          BEQ     73$             ;BR IF OK
        010652  104037                          EMT     37
        010654  000240                  73$:    NOP
    308 010656  005737  001266                  TST     KYBCTL          ;SINGLE TEST MODE ?
    309 010662  001402                          BEQ     1$              ;BR IF NOT
    310 010664  104401  020106                  TYPE    ,SWTCHN         ;RETURN SWITCH TO 'A/B'
    311 010670  000004                  1$:     SCOPE                   ;LOOP ?
    312
```

```
438
439
                        ;*****************************************************************
                        ;*TEST 7        TEST 'PORT SELECT' SWITCH ON PORT A
                        ;*
                        ;*TEST THE OPERATION OF THE 'PORT SELECT' SWITCH (DRIVE CYCLED DOWN).
                        ;*
                        ;*  A.  CYCLE THE DRIVE DOWN.
                        ;*
                        ;*  B.  SWITCH TO PORT A POSITION.  VERIFY THAT THE DRIVE IS IN
                        ;*      NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH
                        ;*      PORTS, ARE CORRECT.
                        ;*
                        ;*  C.  SWITCH THE 'PORT SELECT' SWITCH TO A; CYCLE THE DRIVE UP.
                        ;*
                        ;*  D.  WHEN THE DRIVE CYCLES UP, VERIFY THAT 'VV-A IS RESET, AND
                        ;*      THAT 'ATA-A IS SET.
                        ;*
                        ;*  E.  ISSUE A DRIVE CLEAR COMMAND AND A READIN PRESET COMMAND THROUGH
                        ;*      PORT A.
                        ;*
                        ;*  F.  VERIFY THAT THE DRIVE CANNOT BE ACCESSED THROUGH PORT B AND
                        ;*      'NED' SETS WHEN ATEMPTING TO ACCESS THE DRIVE THROUGH
                        ;*      PORT B.  ATTEMPT TO SET PORT REQUEST BY WRITING 0'S
                        ;*      INTO RMDS THROUGH PORT B.
                        ;*
                        ;*  G.  ISSUE A RELEASE COMMAND THROUGH PORT A.  VERIFY THAT THE
                        ;*      DRIVE REMAINS LOCKED ON PORT A.
                        ;*
                        ;*****************************************************************
010672
010672  005737  001266        TST7:   TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
010676  001406                        BEQ     2$              ;BR IF NOT
010700  100002                        BPL     1$              ;BR IF JUST ENTERED TEST
010702  000137  002610                JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
010706  012737  177777  001266  1$:   MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
010714  012737  010730  001106  2$:   MOV     #TEST7,$LPADR   ;SETUP SCOPE LOOP ADDRESS
010722  012737  010730  001110        MOV     #TEST7,$LPERR   ;SETUP ERROR LOOP ADDRESS
010730                        TEST7:
010730  112737  000007  001102        MOVB    #7,$TSTNM       ;MOVE #7 TEST NUMBER
010736  012706  001100                MOV     #STACK,SP       ;SETUP THE STACK POINTER
010742  012737  000001  001176        MOV     #1,$TIMES       ;;DO 1 ITERATION

010750  113760  001224  000010        MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
010756  013737  001224  001234        MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
010764  104401  020317                TYPE    ,CYCLED         ;'CYCLE DOWN THE DRIVE'
010770  104401  020154                TYPE    ,SWTCHA         ;SWITCH TO 'A'
010774  104401  020337                TYPE    ,CYCLEU         ;'CYCLE UP THE DRIVE'

011000  032760  010000  000012  1$:   BIT     #MOL,RMDS(R0)   ;IS 'MOL' RESET ?
011006  001374                        BNE     1$              ;BR IF NO (DRIVE NOT CYCLED DOWN)
011010  032760  010000  000012  2$:   BIT     #MOL,RMDS(R0)   ;IS 'MOL' SET ?
011016  001774                        BEQ     2$              ;BR IF NO (DRIVE NOT CYCLED UP)

                        ;DRIVE IS CYCLED UP, CHECK STATUS THROUGH PORT A

011020  005037  001244                CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
```

```
T7      TEST 'PORT SELECT' SWITCH ON PORT A

011024  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
011032  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
011040  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
011044  012737  110600  001124          MOV     #ATA!MOL!DPR!DRY,$GDDAT  ;WHAT REGISTER SHOULD BE
011052  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
011060  042737  066077  001164          BIC     #^C111700,$TMP0  ;SAVE SPECIFIED BITS
011066  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
011074  001414                          BEQ     64$             ;BR IF OK
011076  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
011104  042737  111700  001174          BIC     #111700,$TMP4   ;CLEAR THE MASKED BITS
011112  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
011120  104021                          EMT     21
011122  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
011126  000240                  64$:    NOP

                                ;SET VOLUME VALID FOR PORT A

011130  012760  000011  000000          MOV     #11,RMCS1(R0)   ;ISSUE A DRIVE CLEAR
011136  012760  000021  000000          MOV     #21,RMCS1(R0)   ;ISSUE A READIN PRESET
011144  012760  010000  000032          MOV     #FMT16,RMOF(R0) ;SET FMT16

                                ;CHECK THE DRIVE STATUS THROUGH PORT B; VERIFY THAT 'NED'
                                ;SETS WHEN THE DRIVE IS ACCESSED THROUGH PORT B.

011152  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
011160  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
011166  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
011172  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
011200  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
011206  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
011212  005037  001124                  CLR     $GDDAT          ;WHAT REGISTER SHOULD BE
011216  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
011224  042737  000077  001164          BIC     #^C177700,$TMP0  ;SAVE SPECIFIED BITS
011232  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
011240  001414                          BEQ     66$             ;BR IF OK
011242  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
011250  042737  177700  001174          BIC     #177700,$TMP4   ;CLEAR THE MASKED BITS
011256  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
011264  104022                          EMT     22
011266  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
011272  000240                  66$:    NOP
011274  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
011300  016037  000010  001126          MOV     RMCS2(R0),$BDDAT  ;GET CONTENTS OF RMCS2
011306  012737  000010  001122          MOV     #RMCS2,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
011314  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
011320  012737  010000  001124          MOV     #NED,$GDDAT  ;WHAT REGISTER SHOULD BE
011326  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
011334  042737  167777  001164          BIC     #^CNED,$TMP0  ;SAVE SPECIFIED BITS
011342  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
011350  001414                          BEQ     68$             ;BR IF OK
011352  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
011360  042737  010000  001174          BIC     #NED,$TMP4      ;CLEAR THE MASKED BITS
011366  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
011374  104023                          EMT     23
011376  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
011402  000240                  68$:    NOP
011404  005060  000012                  CLR     RMDS(R0)        ;TRY TO SET REQUEST BY WRITING THROUGH
```

```
T7      TEST 'PORT SELECT' SWITCH ON PORT A

                                                        ;THE LOCKED OUT PORT (PORT 'B')

                                        ;VERIFY THAT DRIVE STAYS LOCKED ON PORT A

011410  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
011416  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
011424  012760  000013  000012          MOV     #13,RMDS(R0)     ;ISSUE A RELEASE THROUGH PORT A
011432  013737  001224  001236          MOV     PORTA,SEIZPT     ;ADDRESS OF 'LOCKED ON' PORT
011440  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
011446  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
011454  005037  001244                  CLR     CKERR            ;CLEAR THE 'CHECK ERROR' INDICATOR
011460  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
011466  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
011474  060037  001122                  ADD     R0,$BDADR        ;ADD RH/RM BASE ADDRESS
011500  005037  001124                  CLR     $GDDAT           ;WHAT REGISTER SHOULD BE
011504  013737  001126  001164          MOV     $BDDAT,$TMP0     ;MOVE REGISTER CONTENTS TO '$TMP0'
011512  042737  000077  001164          BIC     #^C177700,$TMP0  ;SAVE SPECIFIED BITS
011520  023737  001124  001164          CMP     $GDDAT,$TMP0     ;COMPARE THE BITS
011526  001414                          BEQ     70$              ;BR IF OK
011530  013737  001126  001174          MOV     $BDDAT,$TMP4     ;COPY 'BAD DATA'
011536  042737  177700  001174          BIC     #177700,$TMP4    ;CLEAR THE MASKED BITS
011544  053737  001174  001124          BIS     $TMP4,$GDDAT     ;'OR' WITH GOOD DATA FOR TYPEOUT
011552  104024                          EMT     24
011554  005137  001244                  COM     CKERR            ;SET THE REGISTER COMPARE ERROR INDICATOR
011560  000240          70$:            NOP

                                        ;IF ERROR OCCURRED, CHECK FOR LOOP ON TEST

011562  105737  001103                  TSTB    $ERFLG           ;DID AN ERROR OCCUR
011566  001412                          BEQ     3$               ;BR IF NOT
011570  032777  001000  167342          BIT     #SW09,@SWR       ;SEE IF LOOP ON ERROR (SWR9 = 1)
011576  001406                          BEQ     3$               ;BR IF NOT
011600  105037  001103                  CLRB    $ERFLG           ;CLEAR THE ERROR FLAG
011604  005037  001176                  CLR     $TIMES           ;CLEAR THE MAX ITERATION COUNT
011610  000177  167274                  JMP     @$LPERR          ;GO TO THE LOOP ADDRESS
011614  005737  001266          3$:     TST     KYBCTL           ;IN SINGLE TEST MODE ?
011620  001460                          BEQ     6$               ;BR IF NOT
011622  032777  040000  167310          BIT     #SW14,@SWR       ;LOOP ON TEST ?
011630  001054                          BNE     6$               ;BR IF LOOPING
011632  104401  020317                  TYPE    ,CYCLED          ;TYPE 'CYCLE DOWN'
011636  104401  020106                  TYPE    ,SWTCHN          ;'SWITCH TO A/B'
011642  104401  020337                  TYPE    ,CYCLEU          ;'CYCLE THE DRIVE UP'
011646  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
011654  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
011662  032760  010000  000012  4$:     BIT     #MOL,RMDS(R0)    ;IS 'MOL' RESET ?
011670  001374                          BNE     4$               ;BR IF NO (DRIVE NOT CYCLED DOWN)
011672  032760  010000  000012  5$:     BIT     #MOL,RMDS(R0)    ;IS 'MOL' SET ?
011700  001774                          BEQ     5$               ;BR IF NO (DRIVE NOT CYCLED UP)

                                        ;SET VOLUME VALID FOR BOTH PORTS

011702  012760  000011  000000          MOV     #11,RMCS1(R0)    ;ISSUE A DRIVE CLEAR THROUGH PORT A
011710  012760  000021  000000          MOV     #21,RMCS1(R0)    ;ISSUE A READIN PRESET THROUGH PORT A
011716  012760  000013  000000          MOV     #13,RMCS1(R0)    ;RELEASE PORT A
011724  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
011732  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
011740  012760  000021  000000          MOV     #21,RMCS1(R0)    ;ISSUE A READIN PRESET THROUGH PORT B
```

T7 TEST 'PORT SELECT' SWITCH ON PORT A

```
011746  012760  010000  000032          MOV     #FMT16,RMOF(R0) ;SET FMT16
011754  012760  000013  000000          MOV     #13,RMCS1(R0)   ;RELEASE PORT B
011762  012737  072460  001254  6$:     MOV     #30000.,WATCH   ;SPINDLE MOTOR 'COOL DOWN' DELAY
011770  005737  001254          7$:     TST     WATCH           ;FINSIHED ?
011774  001375                          BNE     7$              ;BR IF NOT
011776  000004                          SCOPE                   ;LOOP ?
012000  000400                          BR      TST10           ;;GO TO NEXT TEST
   440
                        ;;*****************************************************************
                        ;*TEST 10       TEST 'PORT SELECT' SWITCH ON PORT B
                        ;*
                        ;*TEST THE OPERATION OF THE 'PORT SELECT' SWITCH (DRIVE CYCLED DOWN).
                        ;*
                        ;*  A.  CYCLE THE DRIVE DOWN.
                        ;*
                        ;*  B.  SWITCH TO PORT B POSITION.  VERIFY THAT THE DRIVE IS IN
                        ;*      NEUTRAL AND THAT THE STATUS BITS IN RMDS, AS READ THROUGH BOTH
                        ;*      PORTS, ARE CORRECT.
                        ;*
                        ;*  C.  SWITCH THE 'PORT SELECT' SWITCH TO B; CYCLE THE DRIVE UP.
                        ;*
                        ;*  D.  WHEN THE DRIVE CYCLES UP, VERIFY THAT 'VV-B IS RESET, AND
                        ;*      THAT 'ATA-B IS SET.
                        ;*
                        ;*  E.  ISSUE A DRIVE CLEAR COMMAND AND A READIN PRESET COMMAND THROUGH
                        ;*      PORT B.
                        ;*
                        ;*  F.  VERIFY THAT THE DRIVE CANNOT BE ACCESSED THROUGH PORT A AND
                        ;*      'NED' SETS WHEN ATEMPTING TO ACCESS THE DRIVE THROUGH
                        ;*      PORT A.  ATTEMPT TO SET PORT REQUEST BY WRITING 0'S
                        ;*      INTO RMDS THROUGH PORT A.
                        ;*
                        ;*  G.  ISSUE A RELEASE COMMAND THROUGH PORT B.  VERIFY THAT THE
                        ;*      DRIVE REMAINS LOCKED ON PORT B.
                        ;*
                        ;*  H.  CYCLE THE DRIVE DOWN.  CHANGE THE 'PORT SELECT' SWITCH TO
                        ;*      A/B; CYCLE THE DRIVE UP.
                        ;*
                        ;*  I.  VERIFY THAT BOTH PORTS CAN ACCESS THE DRIVE, THAT BOTH ATTENTION
                        ;*      BITS ARE SET, AND THAT BOTH 'VV' BITS ARE RESET.
                        ;*
                        ;*****************************************************************
012002
012002  005737  001266          TST10:  TST     KYBCTL          ;PERFORMING ONLY SINGLE TESTS ?
012006  001406                          BEQ     2$              ;BR IF NOT
012010  100002                          BPL     1$              ;BR IF JUST ENTERED TEST
012012  000137  002610                  JMP     EXEC            ;RETURN & GET NEXT TEST NUMBER
012016  012737  177777  001266  1$:     MOV     #-1,KYBCTL      ;SET SINGLE TEST INDICATOR
012024  012737  012040  001106  2$:     MOV     #TEST10,$LPADR  ;SETUP SCOPE LOOP ADDRESS
012032  012737  012040  001110          MOV     #TEST10,$LPERR  ;SETUP ERROR LOOP ADDRESS
012040                          TEST10:
012040  112737  000010  001102          MOVB    #10,$TSTNM      ;MOVE #10 TEST NUMBER
012046  012706  001100                  MOV     #STACK,SP       ;SETUP THE STACK POINTER
012052  012737  000001  001176          MOV     #1,$TIMES       ;;DO 1 ITERATION

012060  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
012066  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
```

```
T10     TEST 'PORT SELECT' SWITCH ON PORT B

012074  104401  020317                  TYPE    ,CYCLED         ;'CYCLE DOWN THE DRIVE'
012100  104401  020211                  TYPE    ,SWTCHB         ;SWITCH TO 'B'
012104  104401  020337                  TYPE    ,CYCLEU         ;'CYCLE UP THE DRIVE'

012110  032760  010000  000012  1$:     BIT     #MOL,RMDS(R0)   ;IS 'MOL' RESET ?
012116  001374                          BNE     1$              ;BR IF NO (DRIVE NOT CYCLED DOWN)
012120  032760  010000  000012  2$:     BIT     #MOL,RMDS(R0)   ;IS 'MOL' SET ?
012126  001774                          BEQ     2$              ;BR IF NO (DRIVE NOT CYCLED UP)

                                ;DRIVE IS CYCLED UP, CHECK STATUS THROUGH PORT B

012130  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
012134  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
012142  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
012150  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
012154  012737  110600  001124          MOV     #ATA!MOL!DPR!DRY,$GDDAT  ;WHAT REGISTER SHOULD BE
012162  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
012170  042737  066077  001164          BIC     #^C111700,$TMP0  ;SAVE SPECIFIED BITS
012176  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
012204  001414                          BEQ     64$             ;BR IF OK
012206  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
012214  042737  111700  001174          BIC     #111700,$TMP4   ;CLEAR THE MASKED BITS
012222  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
012230  104021                          EMT     21
012232  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
012236  000240                  64$:    NOP

                                ;SET VOLUME VALID FOR PORT B

012240  012760  000011  000000          MOV     #11,RMCS1(R0)   ;ISSUE A DRIVE CLEAR
012246  012760  000021  000000          MOV     #21,RMCS1(R0)   ;ISSUE A READIN PRESET
012254  012760  010000  000032          MOV     #FMT16,RMOF(R0) ;SET FMT16

                                ;CHECK THE DRIVE STATUS THROUGH PORT A; VERIFY THAT 'NED'
                                ;SETS WHEN THE DRIVE IS ACCESSED THROUGH PORT A.

012262  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
012270  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
012276  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
012302  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
012310  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
012316  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
012322  005037  001124                  CLR     $GDDAT          ;WHAT REGISTER SHOULD BE
012326  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
012334  042737  000077  001164          BIC     #^C177700,$TMP0  ;SAVE SPECIFIED BITS
012342  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
012350  001414                          BEQ     66$             ;BR IF OK
012352  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
012360  042737  177700  001174          BIC     #177700,$TMP4   ;CLEAR THE MASKED BITS
012366  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
012374  104022                          EMT     22
012376  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
012402  000240                  66$:    NOP
012404  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
012410  016037  000010  001126          MOV     RMCS2(R0),$BDDAT  ;GET CONTENTS OF RMCS2
012416  012737  000010  001122          MOV     #RMCS2,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
012424  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
```

T10 TEST 'PORT SELECT' SWITCH ON PORT B

```
012430  012737  010000  001124          MOV     #NED,$GDDAT  ;WHAT REGISTER SHOULD BE
012436  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
012444  042737  167777  001164          BIC     #^CNED,$TMP0  ;SAVE SPECIFIED BITS
012452  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
012460  001414                          BEQ     68$             ;BR IF OK
012462  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
012470  042737  010000  001174          BIC     #NED,$TMP4      ;CLEAR THE MASKED BITS
012476  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
012504  104023                          EMT     23
012506  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
012512  000240                  68$:    NOP
012514  005060  000012                  CLR     RMDS(R0)        ;TRY TO SET REQUEST BY WRITING THROUGH
                                                                ;THE LOCKED OUT PORT (PORT 'A')

                                ;VERIFY THAT DRIVE STAYS LOCKED ON PORT B

012520  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
012526  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
012534  012760  000013  000012          MOV     #13,RMDS(R0)    ;ISSUE A RELEASE THROUGH PORT B
012542  013737  001226  001236          MOV     PORTB,SEIZPT    ;ADDRESS OF 'LOCKED ON' PORT
012550  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
012556  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
012564  005037  001244                  CLR     CKERR           ;CLEAR THE 'CHECK ERROR' INDICATOR
012570  016037  000012  001126          MOV     RMDS(R0),$BDDAT  ;GET CONTENTS OF RMDS
012576  012737  000012  001122          MOV     #RMDS,$BDADR  ;FORM REGISTER ADDRESS OF ERROR MESSAGE
012604  060037  001122                  ADD     R0,$BDADR       ;ADD RH/RM BASE ADDRESS
012610  005037  001124                  CLR     $GDDAT          ;WHAT REGISTER SHOULD BE
012614  013737  001126  001164          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
012622  042737  000077  001164          BIC     #^C177700,$TMP0  ;SAVE SPECIFIED BITS
012630  023737  001124  001164          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
012636  001414                          BEQ     70$             ;BR IF OK
012640  013737  001126  001174          MOV     $BDDAT,$TMP4    ;COPY 'BAD DATA'
012646  042737  177700  001174          BIC     #177700,$TMP4   ;CLEAR THE MASKED BITS
012654  053737  001174  001124          BIS     $TMP4,$GDDAT    ;'OR' WITH GOOD DATA FOR TYPEOUT
012662  104024                          EMT     24
012664  005137  001244                  COM     CKERR           ;SET THE REGISTER COMPARE ERROR INDICATOR
012670  000240                  70$:    NOP

                                ;IF ERROR OCCURRED, CHECK FOR LOOP ON TEST

012672  105737  001103                  TSTB    $ERFLG          ;DID AN ERROR OCCUR
012676  001412                          BEQ     3$              ;BR IF NOT
012700  032777  001000  166232          BIT     #SW09,@SWR      ;SEE IF LOOP ON ERROR (SWR9 = 1)
012706  001406                          BEQ     3$              ;BR IF NOT
012710  105037  001103                  CLRB    $ERFLG          ;CLEAR THE ERROR FLAG
012714  005037  001176                  CLR     $TIMES          ;CLEAR THE MAX ITERATION COUNT
012720  000177  166164                  JMP     @$LPERR         ;GO TO THE LOOP ADDRESS
012724  032777  040000  166206  3$:     BIT     #SW14,@SWR      ;LOOP ON TEST ?
012732  001054                          BNE     6$              ;BR IF LOOPING
012734  104401  020317                  TYPE    ,CYCLED         ;TYPE 'CYCLE DOWN'
012740  104401  020106                  TYPE    ,SWTCHN         ;'SWITCH TO A/B'
012744  104401  020337                  TYPE    ,CYCLEU         ;'CYCLE THE DRIVE UP'
012750  113760  001226  000010          MOVB    PORTB,RMCS2(R0)  ;SELECT PORT B
012756  013737  001226  001234          MOV     PORTB,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
012764  032760  010000  000012  4$:     BIT     #MOL,RMDS(R0)   ;IS 'MOL' RESET ?
012772  001374                          BNE     4$              ;BR IF NO (DRIVE NOT CYCLED DOWN)
012774  032760  010000  000012  5$:     BIT     #MOL,RMDS(R0)   ;IS 'MOL' SET ?
```

```
013002  001774                          BEQ     5$              ;BR IF NO (DRIVE NOT CYCLED UP)

                                ;SET VOLUME VALID FOR BOTH PORTS

013004  012760  000011  000000          MOV     #11,RMCS1(R0)   ;ISSUE A DRIVE CLEAR THROUGH PORT B
013012  012760  000021  000000          MOV     #21,RMCS1(R0)   ;ISSUE A READIN PRESET THROUGH PORT B
013020  012760  000013  000000          MOV     #13,RMCS1(R0)   ;RELEASE PORT B
013026  113760  001224  000010          MOVB    PORTA,RMCS2(R0)  ;SELECT PORT A
013034  013737  001224  001234          MOV     PORTA,PTNBR  ;MOVE PORT ADDRESS TO LOCATION FOR TYPEOUT
013042  012760  000021  000000          MOV     #21,RMCS1(R0)   ;ISSUE A READIN PRESET THROUGH PORT A
013050  012760  010000  000032          MOV     #FMT16,RMOF(R0) ;SET FMT16
013056  012760  000013  000000          MOV     #13,RMCS1(R0)   ;RELEASE PORT A
013064  012737  072460  001254  6$:     MOV     #30000.,WATCH   ;SPINDLE MOTOR 'COOL DOWN' DELAY
013072  005737  001254          7$:     TST     WATCH           ;FINISHED ?
013076  001375                          BNE     7$              ;BR IF NOT
013100  000004                          SCOPE                   ;LOOP ?
013102  000137  013110                  JMP     $EOP            ;GO TO THE END OF PASS ROUTINE
    441
    442                         ;;*****************************************************************
    443                         ;PUT NEWTEST HERE
    444                         ;;*****************************************************************
013106  000004                  TST11:  SCOPE
```

END OF PASS ROUTINE

```
                                .SBTTL  END OF PASS ROUTINE

                                ;;*****************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                ;*TYPE "END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT YYYYY"
                                ;*WHERE XXXXX AND YYYYY ARE DECIMAL NUMBERS
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO TST1AA

013110                          $EOP:
013110  005737  001266                  TST     KYBCTL          ;ENTERED TEST VIA KEYBOARD COMMAND ?
013114  001402                          BEQ     .+6             ;BR IF NOT
013116  000137  002610                  JMP     EXEC            ;RETURN TO KEYBOARD CONTROL
013122  005037  001102                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
013126  005037  001176                  CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
013132  005237  001100                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
013136  042737  100000  001100        BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
013144  005327                          DEC     (PC)+           ;;LOOP?
013146  000001                  $EOPCT: .WORD   1
013150  003066                          BGT     $DOAGN          ;;YES
013152  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
013154  000001                  $ENDCT: .WORD   1
013156  013146                          $EOPCT
013160  104401  013166                  TYPE    ,65$            ;;TYPE ASCIZ STRING
013164  000407                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <12><15>/END PASS #/
013204                          64$:
013204  013746  001100                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                                                ;;TYPE PASS NUMBER
013210  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
013212  005737  001112                  TST     $ERTTL          ;;SEE IF ANY ERRORS THIS PASS
013216  001431                          BEQ     $GT42P          ;;BR IF NO ERRORS TO REPORT
013220  104401  013226                  TYPE    ,67$            ;;TYPE ASCIZ STRING
013224  000421                          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
013270                          66$:
013270  013746  001112                  MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
                                                                ;;TOTAL NUMBER OF ERRORS
013274  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
013276  005037  001112                  CLR     $ERTTL          ;;CLEAR ERROR TOTAL
013302  104401  001207          $GT42P: TYPE    ,$CRLF          ;;TYPE CARRIAGE RETURN, LINE FEED
013306  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
013312  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
013314  000005                          RESET                   ;;CLEAR THE WORLD
013316  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
013320  000240                          NOP                     ;;SAVE ROOM
013322  000240                          NOP                     ;;FOR
013324  000240                          NOP                     ;;ACT11
013326                          $DOAGN:
013326  000137                          JMP     @(PC)+          ;;RETURN
013330  003074                  $RTNAD: .WORD   TST1AA
013332     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
                                        .EVEN
```

```
                                        .SBTTL  CLOCK SUBROUTINES

                                        ;ROUTINE TO CHECK FOR KW11-L OR KW11-P CLOCKS

013336  012737  013406  000004  CKCLK:  MOV     #CKCLK1,@#ERRVEC  ;SET UP VECTOR FOR CLOCK CHECK
013344  005037  000006                  CLR     @#ERRVEC+2        ;NEW PSW
013350  005777  165636                  TST     @$LKCSR         ;CHECK FOR KW11-P
013354  013701  001216                  MOV     $LPVEC,R1       ;KW11-P VECTOR ADDRESS
013360  012721  013470                  MOV     #CLOCK,(R1)+    ;SET UP KW11-P VECTOR
013364  012711  000300                  MOV     #300,(R1)       ;PSW - PRI 6
013370  012777  177777  165616          MOV     #-1,@$LKCSB     ;LOAD COUNTER BUFFER WITH 1'S
013376  012777  000135  165606          MOV     #135,@$LKCSR    ;SET CLOCK - CNT UP, 16MS, CONT INT
013404  000425                          BR      CKCLK3
013406  062706  000004          CKCLK1: ADD     #4,SP           ;RESTORE THE STACK POINTER
013412  012737  013450  000004          MOV     #CKCLK2,@#ERRVEC  ;CHANGE ERROR VECTOR TO CHECK FOR KW11-L
013420  005777  165574                  TST     @$LKS           ;LOOK FOR KW11-L
013424  013701  001222                  MOV     $LLVEC,R1       ;KW11-L VECTOR ADDRESS
013430  012721  013470                  MOV     #CLOCK,(R1)+    ;SET UP KW11-L VECTOR
013434  012711  000300                  MOV     #300,(R1)       ;PSW - PRI 6
013440  012777  000100  165552          MOV     #100,@$LKS      ;SET KW11-L INTERRUPT
013446  000404                          BR      CKCLK3
013450  062706  000004          CKCLK2: ADD     #4,SP           ;RESTORE THE STACK POINTER
013454  062716  000002                  ADD     #2,(SP)         ;INCREMENT RETURN, NO CLOCK
013460  012737  000006  000004  CKCLK3: MOV     #6,@#ERRVEC     ;RESTORE THE ERROR VECTOR
013466  000207                          RTS     PC

                                        ;ROUTINE TO COUNT CLOCK TICKS

013470  062737  000021  001252  CLOCK:  ADD     #17.,TIME       ;ADD 17 MS TO ELAPSED TIME COUNTER
013476  005737  001254                  TST     WATCH           ;IS WATCH ALREADY ZERO ?
013502  001406                          BEQ     1$              ;BR IF IT IS
013504  162737  000021  001254          SUB     #17.,WATCH      ;SUBTRACT 17 MS FROM WATCH DOG COUNTER
013512  100002                          BPL     1$              ;BR IF NOT MINUS
013514  005037  001254                  CLR     WATCH           ;CLEAR WATCH DOG COUNTER
013520  000002                  1$:     RTI                     ;RETURN

                                        ;ROUTINE TO CALCULATE + 25% TIME TOLERANCE VALUES

013522  005746                  TOLER:  TST     -(SP)           ;MAKE ROOM ON THE STACK
013524  016616  000002                  MOV     2(SP),(SP)      ;SAVE STACK
013530  013546                          MOV     @(R5)+,-(SP)    ;GET TIME VALUE
013532  011666  000004                  MOV     (SP),4(SP)      ;MOVE TIME VALUE
013536  006216                          ASR     (SP)            ;DIVIDE BY 2
013540  006216                          ASR     (SP)            ;DIVIDE BY 2 AGAIN (FOR A TOTAL OF 4)
013542  062666  000002                  ADD     (SP)+,2(SP)     ;CALCULATE UPPER LIMIT FOR TIMEOUT
013546  000205                          RTS     R5              ;RETURN WITH TOLERANCES ON THE STACK
```

```
     1                                  .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
                                        ;*CALL
                                        ;*      SCOPE             ;;SCOPE=IOT

     013550                             $SCOPE:
     013550  104407                             CKSWR                       ;;TEST  FOR CHANGE IN SOFT-SWR
     013552  004737  014104                     JSR     PC,STOP
     013556  032777  040000  165354     1$:     BIT     #BIT14,@SWR         ;;LOOP ON PRESENT TEST?
     013564  001402                             BEQ     9$                  ;;NO IF SW14=0
     013566  000137  014066                     JMP     $OVER               ;;JUMP OVER SCOPE ROUTINE
     013572                             9$:
                                        ;#####START OF CODE FOR THE XOR TESTER#####
     013572  000416                     $XTSTR: BR      6$                  ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                            ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
     013574  013746  000004                     MOV     @#ERRVEC,-(SP)      ;;SAVE THE CONTENTS OF THE ERROR VECTOR
     013600  012737  013620  000004             MOV     #5$,@#ERRVEC        ;;SET FOR TIMEOUT
     013606  005737  177060                     TST     @#177060            ;;TIME OUT ON XOR?
     013612  012637  000004                     MOV     (SP)+,@#ERRVEC      ;;RESTORE THE ERROR VECTOR
     013616  000517                             BR      $SVLAD              ;;GO TO THE NEXT TEST
     013620  022626                     5$:     CMP     (SP)+,(SP)+         ;;CLEAR THE STACK AFTER A TIME OUT
     013622  012637  000004                     MOV     (SP)+,@#ERRVEC      ;;RESTORE THE ERROR VECTOR
     013626  000517                             BR      $OVER               ;;LOOP ON THE PRESENT TEST
     013630                             6$:;#####END OF CODE FOR THE XOR TESTER#####
     013630  105737  001103             2$:     TSTB    $ERFLG              ;;HAS AN ERROR OCCURRED?
     013634  001465                             BEQ     3$                  ;;BR IF NO
     013636  022737  177777  014454             CMP     #-1,CPSAVE          ;;SEE IF TIMEOUT WAS PREVIOUSLY RECORDED
     013644  001455                             BEQ     2003$               ;;KICK AROUND ROUTINE IF SO
     013646  013746  000004                     MOV     ERRVEC,-(SP)        ;;SAVE CONTENTS OF ERROR VECTOR
     013652  012737  013670  000004             MOV     #2000$,ERRVEC       ;;SETUP 'TRAP' RETURN ADDRESS
     013660  013737  177766  014454             MOV     177766,CPSAVE       ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
     013666  000406                             BR      2001$
     013670  012737  177777  014454     2000$:  MOV     #-1,CPSAVE          ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
     013676  012716  013704                     MOV     #2001$,(SP)         ;;SETUP RETURN ADDRESS
     013702  000002                             RTI
     013704  012637  000004             2001$:  MOV     (SP)+,ERRVEC        ;;RESTORE CONTENTS OF ERROR VECTOR

     013710  022737  177777  014454     2002$:  CMP     #-1,CPSAVE          ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
     013716  001430                             BEQ     2003$               ;;BRANCH IF SO
     013720  032737  000001  014454             BIT     #BIT00,CPSAVE       ;;SEE IF THE POWER MONITOR BIT IS ON
     013726  001424                             BEQ     2003$               ;;BRANCH TO CONTINUE ROUTINE IF CLEAR
     013730  042737  000001  177766             BIC     #BIT00,177766       ;;CLEAR THE BIT FOUND TO BE SET
     013736  013746  001140                     MOV     SWR,-(SP)           ;;SAVE SWR ADDRESS
     013742  017646  000000                     MOV     @(SP),-(SP)         ;;SAVE SWR VALUE
     013746  012737  000176  001140             MOV     #176,SWR            ;;GET SOFTWARE SWR ADDRESS
     013754  011677  165160                     MOV     (SP),@SWR           ;;GET CURRENT SWR VALUE
     013760  042777  001000  165152             BIC     #BIT09,@SWR         ;;DON'T ALLOW LOOP ON ERROR ON THIS ERROR
     013766  104177                             EMT     177                 ;;CALL SPECIAL POWER FAIL BIT ERROR CALL
     013770  012676  000000                     MOV     (SP)+,@(SP)         ;;RESTORE SWR TO ORIGINAL VALUE
     013774  012637  001140                     MOV     (SP)+,SWR           ;;RESTORE SWR ADDRESS
```

```
                                        2003$:
014000                                  4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
014000  105037  001103                        CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
014004  005037  001176
014010  032777  004000  165122        3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
014016  001011                                BNE     1$              ;;BR IF YES
014020  005737  001100                        TST     $PASS           ;;IF FIRST PASS OF PROGRAM
014024  001406                                BEQ     1$              ;;      INHIBIT ITERATIONS
014026  005237  001104                        INC     $ICNT           ;;INCREMENT ITERATION COUNT
014032  023737  001176  001104              CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
014040  002012                                BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
014042  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
014050  013737  014102  001176              MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
014056  105237  001102                $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
014062  011637  001106                        MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
014066  013777  001102  165046  $OVER:     MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
014074  013716  001106                        MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
014100  000002                                RTI                     ;;FIXES PS
014102  000005                        $MXCNT: 5.                      ;;MAX. NUMBER OF ITERATIONS
                                    ;DROP PRIORITY TO ALLOW CONSOLE INTERRUPT
                                    STOP:
014104                                          MOV     #PR3,-(SP)      ;;PUT NEW PS ON STACK
014104  012746  000140                          MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
014110  012746  014116                          RTI                     ;;POP NEW PC AND PS
014114  000002                          64$:
014116
                                    ;RAISE PRIORITY TO INHIBIT CONSOLE INTERRUPT
014116                                          MOV     #PR5,-(SP)      ;;PUT NEW PS ON STACK
014116  012746  000240                          MOV     #65$,-(SP)      ;;PUT NEW PC ON  STACK
014122  012746  014130                          RTI                     ;;POP NEW PC AND PS
014126  000002                          65$:
014130
014130  000207                                RTS     PC              ;RETURN
```

```
     1                                  .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
                                        ;*CALL
                                        ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER

014132  105037  014456          $ERROR: CLRB    IBSAVE          ;;CLEAR THE ITEM BYTE SAVE LOCATION
014136  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
014140  113737  001102  001242          MOVB    $TSTNM,TSTNUM
014146  105237  001103          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
014152  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
014154  013777  001102  164760          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
014162  032777  002000  164750          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
014170  001402                          BEQ     1$              ;;NO - SKIP
014172  104401  001202                  TYPE    ,$BELL          ;;RING BELL
014176  005237  001112          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
014202  011637  001116                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
014206  162737  000002  001116          SUB     #2,$ERRPC
014214  117737  164676  001114          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
014222  032777  001000  164710          BIT     #BIT09,@SWR     ;;SEE IF LOOP ON ERROR IS SET
014230  001060                          BNE     1004$           ;;BRANCH AROUND ROUTINE IF SO
014232  122737  000177  001114          CMPB    #177,$ITEMB     ;;SEE IF THIS IS THE POWER FAIL CALL
014240  001454                          BEQ     1004$           ;;BRANCH AROUND ROUTINE IF IT IS
014242  105737  014456                  TSTB    IBSAVE          ;;SEE IF THIS IS THE 2ND ERROR CALL IN THIS ROUTINE
014246  001047                          BNE     1003$           ;;BRANCH IF SO
014250  022737  177777  014454          CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
014256  001445                          BEQ     1004$           ;;BRANCH IF SO
014260  013746  000004                  MOV     ERRVEC,-(SP)    ;;SAVE CONTENTS OF ERROR VECTOR
014264  012737  014302  000004          MOV     #1000$,ERRVEC   ;;SETUP 'TRAP' RETURN ADDRESS
014272  013737  177766  014454          MOV     177766,CPSAVE   ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
014300  000406                          BR      1001$
014302  012737  177777  014454  1000$:  MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
014310  012716  014316                  MOV     #1001$,(SP)     ;;SETUP RETURN ADDRESS
014314  000002                          RTI
014316  012637  000004          1001$:  MOV     (SP)+,ERRVEC    ;;RESTORE CONTENTS OF ERROR VECTOR

014322  022737  177777  014454  1002$:  CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
014330  001420                          BEQ     1004$           ;;BRANCH IF SO
014332  032737  000001  014454          BIT     #BIT00,CPSAVE   ;;SEE IF POWER MONITOR BIT IS SET IN CPU ERR REG
014340  001414                          BEQ     1004$           ;;BRANCH IF OK
014342  042737  000001  177766          BIC     #BIT00,177766   ;;CLEAR THE BIT FOUND SET
014350  113737  001114  014456          MOVB    $ITEMB,IBSAVE   ;;MAKE IBSAVE NON-ZERO FOR DUAL ERROR CALL
014356  112737  000177  001114          MOVB    #177,$ITEMB     ;;SET $ITEMB TO SPECIAL POWER FAIL POINTER
014364  000402                          BR      1004$           ;;BRANCH OVER IBSAVE CLEARING

014366  105037  014456          1003$:  CLRB    IBSAVE          ;;CLEAR IBSAVE SO 2ND TIME THROUGH EXITS
014372                          1004$:
014372  032777  020000  164540          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
014400  001004                          BNE     20$             ;;SKIP TYPEOUTS
014402  004737  014460                  JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
```

ERROR HANDLER ROUTINE

```
014406  104401  001207                  TYPE    ,$CRLF
014412                          20$:
014412  105737  014456          2$:     TSTB    IBSAVE          ;;SEE IF IBSAVE IS LOADED
014416  001005                          BNE     3$              ;;BRANCH IF NOT - NO HALT ON PWR MON BIT ERROR
014420  005777  164514                  TST     @SWR            ;;HALT ON ERROR
014424  100002                          BPL     3$              ;;SKIP IF CONTINUE
014426  000000                          HALT                    ;;HALT ON ERROR!
014430  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
014432                          3$:
014432  022737  013316  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
014440  001001                          BNE     6$              ;;BRANCH IF NO
014442  000000                          HALT                    ;;YES
014444                          6$:
014444  105737  014456                  TSTB    IBSAVE          ;;SEE IF ITEM BYTE SAVE LOCATION HAS AN ERROR CALL
014450  001236                          BNE     7$              ;;BRANCH BACK TO CALL ORIGINAL ERROR
014452  000002                          RTI                     ;;RETURN
014454  000000          CPSAVE: .WORD   0               ;;LOCATION TO SAVE CPU ERROR REG CONTENTS
014456  000000          IBSAVE: .WORD   0               ;;LOCATION TO SAVE ITEM BYTE
```

ERROR MESSAGE TYPEOUT ROUTINE

```
                                .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.

014460                          $ERRTYP:
014460  104401  001207                TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
014464  010046                      MOV     R0,-(SP)        ;;SAVE R0
014466  005000                      CLR     R0              ;;PICKUP THE ITEM INDEX
014470  153700  001114              BISB    @#$ITEMB,R0
014474  001004                      BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                            ;;TYPE THE PC OF THE ERROR
014476  013746  001116              MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                            ;;ERROR ADDRESS
014502  104402                      TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
014504  000456                      BR      10$             ;;GET OUT
014506  122700  000177        1$:   CMPB    #177,R0         ;;SEE IF THIS ERROR CALL IS SPECIAL POWER FAIL CALL
014512  001006                      BNE     1000$           ;;BRANCH IF NOT
014514  113737  001102  015016      MOVB    $TSTNM,PFTSTN   ;;GET TEST NUMBER
014522  012700  014656              MOV     #PFECH,R0       ;;MOVE POWER FAIL ERROR CALL TABLE TO R0
014526  000406                      BR      1001$           ;;BRANCH TO CALL ERROR
014530  005300              1000$:  DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
014532  006300                      ASL     R0              ;;      WORK FOR THE ERROR TABLE
014534  006300                      ASL     R0
014536  006300                      ASL     R0
014540  062700  001276              ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
014544  012037  014554      1001$:  MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
014550  001404                      BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
014552  104401                      TYPE                    ;;TYPE THE "ERROR MESSAGE"
014554  000000              2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
014556  104401  001207              TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
014562  012037  014572      3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
014566  001404                      BEQ     5$              ;;SKIP TYPEOUT IF 0
014570  104401                      TYPE                    ;;TYPE THE "DATA HEADER"
014572  000000              4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
014574  104401  001207              TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
014600  010146              5$:     MOV     R1,-(SP)        ;;SAVE R1
014602  012001                      MOV     (R0)+,R1        ;;PICKUP "DATA TABLE" POINTER
014604  001415                      BEQ     9$              ;;BR IF NO DATA TO BE TYPED
014606  012000                      MOV     (R0)+,R0        ;;PICKUP "DATA FORMAT" POINTER
014610  105720              6$:     TSTB    (R0)+           ;;"OCTAL" OR "DECIMAL"
014612  001003                      BNE     7$              ;;BR IF DECIMAL
014614  013146                      MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
014616  104402                      TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
014620  000402                      BR      8$
014622                          7$:
014622  013146                      MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
014624  104405                      TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
014626  005711              8$:     TST     (R1)            ;;IS THERE ANOTHER NUMBER?
014630  001403                      BEQ     9$              ;;BR IF NO
014632  104401  014652              TYPE    ,11$            ;;TYPE TWO(2) SPACES
014636  000764                      BR      6$              ;;LOOP

014640  012601              9$:     MOV     (SP)+,R1        ;;RESTORE R1
014642  012600              10$:    MOV     (SP)+,R0        ;;RESTORE R0
```

ERROR MESSAGE TYPEOUT ROUTINE

```
014644  104401  001207                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
014650  000207                           RTS     PC              ;;RETURN
014652     040     040     000  11$:     .ASCIZ  / /             ;;TWO(2) SPACES
                                         .EVEN
014656  014666  014750  015002  PFECH:   PFECH1,PFECH2,PFECH3,PFECH4 ;;WORDS DEFINING TABLES BELOW
014666     120     117     127  PFECH1:  .ASCIZ  ?POWER MONITOR BIT IN CPU ERROR REGISTER FOUND SET?
014750     124     105     123  PFECH2:  .ASCIZ  ?TESTNO  ERR PC  CPUERREG?
                                         .EVEN
015002  015016  001116  014454  PFECH3:  .WORD   PFTSTN,$ERRPC,CPSAVE,0
015012     000     000     000  PFECH4:  .BYTE   0,0,0,0
015016  000000                   PFTSTN:  .WORD   0               ;;CONTAINS TEST NUMBER FOR PF BIT ERROR
```

```
                                .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
                                ;*

015020  105737  001157          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
015024  100002                         BPL     1$              ;;BR IF YES
015026  000000                         HALT                    ;;HALT HERE IF NO TERMINAL
015030  000407                         BR      3$              ;;LEAVE
015032  010046                  1$:    MOV     R0,-(SP)        ;;SAVE R0
015034  017600  000002                 MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
015040  112046                  2$:    MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
015042  001005                         BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
015044  005726                         TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
015046  012600                  60$:   MOV     (SP)+,R0        ;;RESTORE R0
015050  062716  000002          3$:    ADD     #2,(SP)         ;;ADJUST RETURN PC
015054  000002                         RTI                     ;;RETURN
015056  122716  000011          4$:    CMPB    #HT,(SP)        ;;BRANCH IF <HT>
015062  001430                         BEQ     8$
015064  122716  000200                 CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
015070  001006                         BNE     5$
015072  005726                         TST     (SP)+           ;;POP  <CR><LF> EQUIV
015074  104401                         TYPE                    ;;TYPE A CR AND LF
015076  001207                         $CRLF
015100  105037  015306                 CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
015104  000755                         BR      2$              ;;GET NEXT CHARACTER
015106  004737  015170          5$:    JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
015112  123726  001156          6$:    CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
015116  001350                         BNE     2$              ;;IF NO GO GET NEXT CHAR.
015120  013746  001154                 MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                               ;;AND THE NULL CHAR.
015124  105366  000001          7$:    DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
015130  002770                         BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
015132  004737  015170                 JSR     PC,$TYPEC       ;;GO TYPE A NULL
015136  105337  015306                 DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
015142  000770                         BR      7$              ;;LOOP

                                ;HORIZONTAL TAB PROCESSOR

015144  112716  000040          8$:    MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
015150  004737  015170          9$:    JSR     PC,$TYPEC       ;;TYPE A SPACE
015154  132737  000007  015306         BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
015162  001372                         BNE     9$              ;;TAB STOP
015164  005726                         TST     (SP)+           ;;POP SPACE OFF STACK
015166  000724                         BR      2$              ;;GET NEXT CHARACTER
```

```
015170
015170  105777  163750          $TYPEC:
                                        TSTB    @$TKS           ;;CHAR IN KYBD BUFFER?
015174  100022                          BPL     10$             ;;BR IF NOT
015176  017746  163744                  MOV     @$TKB,-(SP)     ;;GET CHAR
015202  042716  177600                  BIC     #177600,(SP)    ;;STRIP EXTRANEOUS BITS
015206  122716  000023                  CMPB    #$XOFF,(SP)     ;;WAS CHAR XOFF
015212  001012                          BNE     102$            ;;BR IF NOT
015214                          101$:
015214  105777  163724                  TSTB    @$TKS           ;;WAIT FOR CHAR
015220  100375                          BPL     101$
015222  117716  163720                  MOVB    @$TKB,(SP)      ;;GET CHAR
015226  042716  177600                  BIC     #177600,(SP)    ;;STRIP IT
015232  122716  000021                  CMPB    #$XON,(SP)      ;;WAS IT XON?
015236  001366                          BNE     101$            ;;BR IF NOT
015240                          102$:
015240  005726                          TST     (SP)+           ;;FIX STACK
015242                          10$:
015242  105777  163702                  TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
015246  100375                          BPL     10$
015250  116677  000002  163674          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
015256  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
015264  001003                          BNE     1$              ;;BRANCH IF NO
015266  105037  015306                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
015272  000406                          BR      $TYPEX          ;;EXIT
015274  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
015302  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
015304  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
015306  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
015310  000207          $TYPEX: RTS     PC
```

```
                                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

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

015312  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
015316  116637  000001  015535          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
015324  112637  015537                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
015330  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
015334  000406                          BR      $TYPON
015336  112737  000001  015535  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
015344  112737  000006  015537          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
015352  112737  000005  015534  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
015360  010346                          MOV     R3,-(SP)        ;;SAVE R3
015362  010446                          MOV     R4,-(SP)        ;;SAVE R4
015364  010546                          MOV     R5,-(SP)        ;;SAVE R5
015366  113704  015537                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
015372  005404                          NEG     R4
015374  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
015400  110437  015536                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
015404  113704  015535                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
015410  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
015414  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
015416  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
015420  000404                          BR      3$              ;;GO DO MSB
015422  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
015424  006105                          ROL     R5
015426  006105                          ROL     R5
015430  010503                          MOV     R5,R3
015432  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
015434  105337  015536                  DECB    $OMODE          ;;TYPE THIS DIGIT?
015440  100016                          BPL     7$              ;;BR IF NO
015442  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
015446  001002                          BNE     4$              ;;TEST FOR 0
015450  005704                          TST     R4              ;;SUPPRESS THIS 0?
015452  001403                          BEQ     5$              ;;BR IF YES
015454  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
015456  052703  000060          BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
015462  052703  000040    5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
015466  110337  015532          MOVB    R3,8$           ;;SAVE FOR TYPING
015472  104401  015532          TYPE    ,8$             ;;GO TYPE THIS DIGIT
015476  105337  015534    7$:   DECB    $OCNT           ;;COUNT BY 1
015502  003347                  BGT     2$              ;;BR IF MORE TO DO
015504  002402                  BLT     6$              ;;BR IF DONE
015506  005204                  INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
015510  000744                  BR      2$              ;;GO DO THE LAST DIGIT
015512  012605    6$:           MOV     (SP)+,R5        ;;RESTORE R5
015514  012604                  MOV     (SP)+,R4        ;;RESTORE R4
015516  012603                  MOV     (SP)+,R3        ;;RESTORE R3
015520  016666  000002  000004  MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
015526  012616                  MOV     (SP)+,(SP)
015530  000002                  RTI                     ;;RETURN
015532     000    8$:   .BYTE   0               ;;STORAGE FOR ASCII DIGIT
015533     000          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
015534     000    $OCNT:.BYTE   0               ;;OCTAL DIGIT COUNTER
015535     000    $OFILL:.BYTE  0               ;;ZERO FILL SWITCH
015536  000000    $OMODE:.WORD  0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

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

015540                          $TYPDS:
015540  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
015542  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
015544  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
015546  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
015550  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
015552  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
015556  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
015562  100004                          BPL     1$              ;;BR IF INPUT IS POS.
015564  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
015566  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
015574  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
015576  012703  015754                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
015602  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
015606  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
015610  016001  015744                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
015614  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
015616  002402                          BLT     4$              ;;BR IF DONE
015620  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
015622  000774                          BR      3$
015624  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
015626  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
015630  001002                          BNE     5$              ;;FALL THROUGH IF 0
015632  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
015634  100407                          BMI     7$              ;;BR IF YES
015636  106316                  5$:     ASLB    (SP)            ;;MSD?
015640  103003                          BCC     6$              ;;BR IF NO
015642  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
015650  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
015654  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
015660  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
015662  005720                          TST     (R0)+           ;;JUST INCREMENTING
015664  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
015670  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
015672  003002                          BGT     8$              ;;GO TO EXIT
015674  010502                          MOV     R5,R2           ;;GET THE LSD
015676  000764                          BR      6$              ;;GO CHANGE TO ASCII
015700  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
015702  100003                          BPL     9$              ;;BR IF NO
015704  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
015712  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
015714  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
015716  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
015720  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
015722  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
```

```
015724  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
015726  104401  015754                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
015732  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
015740  012616                          MOV     (SP)+,(SP)
015742  000002                          RTI                     ;;RETURN TO USER
015744  023420                  $DTBL:  10000.
015746  001750                          1000.
015750  000144                          100.
015752  000012                          10.
015754                          $DBLK:  .BLKW   4
```

```
                                .SBTTL  TTY INPUT ROUTINE

                                ;;*****************************************************************
                                .ENABL  LSB
015764  000000                  $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
015766  000000                  $TKQIN: .WORD   0               ;;INPUT POINTER
015770  000000                  $TKQOUT: .WORD  0               ;;OUTPUT POINTER
015772                          $TKQSRT: .BLKB  1               ;;TTY KEYBOARD QUEUE
        015773                  $TKQEND=.
                                .EVEN

                                ;*TK INITIALIZE ROUTINE
                                ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
                                ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
                                ;
                                ;*CALL:
                                ;*      JSR     PC,$TKINT
                                ;*      RETURN
                                ;
015774  005037  015764          $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
016000  012737  015772  015766          MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
016006  013737  015766  015770          MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
016014  012737  016044  000060          MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
016022  012737  000200  000062          MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
016030  005777  163112                  TST     @$TKB           ;;CLEAR DONE FLAG
016034  012777  000100  163102          MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
016042  000207                        RTS     PC              ;;RETURN TO CALLER

                                ;*TK SERVICE ROUTINE
                                ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
                                ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
                                ;*IT IN THE QUEUE.
                                ;*IF THE CHARACTER IS A "CONTROL-C" (^C) $TKINT IS CALLED AND
                                ;*UPON RETURN EXIT IS MADE TO THE "CONTROL-C" RESTART ADDRESS (START)
                                ;
016044  117746  163076          $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
016050  042716  177600                  BIC     #^C177,(SP)     ;;STRIP THE JUNK
016054  021627  000021                  CMP     (SP),#$XON      ;;IS IT A RANDOM XON?
016060  001002                        BNE     30$             ;;BRANCH IF NO
016062  005726                        TST     (SP)+           ;;CLEAN RANDOM XON OFF STACK
016064  000002                        RTI                     ;;RETURN
016066                          30$:
016066  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL C?
016072  001007                        BNE     1$              ;;BRANCH IF NO
016074  104401  017172                  TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
016100  004737  015774                  JSR     PC,$TKINT       ;;INIT THE KEYBOARD
016104  005726                        TST     (SP)+           ;;CLEAN UP STACK
016106  000137  001766                  JMP     START           ;;CONTROL C RESTART
016112  021627  000007          1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
016116  001004                        BNE     2$              ;;BRANCH IF NO
016120  022737  000176  001140          CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
016126  001500                        BEQ     6$              ;;GO TO SWR CHANGE

016130                          2$:
016130  022737  000001  015764          CMP     #1,$TKCNT       ;;IS THE QUEUE FULL?
016136  001004                        BNE     3$              ;;BRANCH IF NO
016140  104401  001202                  TYPE    ,$BELL          ;;RING THE TTY BELL
```

```
016144  005726                          TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
016146  000451                          BR      5$              ;;EXIT
016150  021627  000023          3$:     CMP     (SP),#23        ;;IS IT A CONTROL-S?
016154  001021                          BNE     32$             ;;BRANCH IF NO
016156  005077  162762                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
016162  005726                          TST     (SP)+           ;;CLEAN CHAR OFF STACK
016164  105777  162754          31$:    TSTB    @$TKS           ;;WAIT FOR A CHAR
016170  100375                          BPL     31$             ;;LOOP UNTIL ITS THERE
016172  117746  162750                  MOVB    @$TKB,-(SP)     ;;GET THE CHARACTER
016176  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
016202  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
016206  001366                          BNE     31$             ;;BRANCH IF NO
016210  012777  000100  162726          MOV     #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
016216  000002                          RTI                     ;;RETURN
016220  005237  015764          32$:    INC     $TKCNT          ;;COUNT THIS CHARACTER
016224  021627  000140                  CMP     (SP),#140       ;;IS IT UPPER CASE?
016230  002405                          BLT     4$              ;;BRANCH IF YES
016232  021627  000175                  CMP     (SP),#175       ;;IS IT A SPECIAL CHAR?
016236  003002                          BGT     4$              ;;BRANCH IF YES
016240  042716  000040                  BIC     #40,(SP)        ;;MAKE IT UPPER CASE
016244  112677  177516          4$:     MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
016250  005237  015766                  INC     $TKQIN          ;;UPDATE THE POINTER
016254  023727  015766  015773          CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
016262  001003                          BNE     5$              ;;BRANCH IF NO
016264  012737  015772  015766          MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
016272  000002                  5$:     RTI                     ;;RETURN

                        ;;**********************************************************************
                        ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                        ;*ROUTINE IS ENTERED  FROM THE TRAP HANDLER, AND WILL
                        ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
                        ;*CALL WHEN OPERATING IN TTY INTERRUPT MODE.
016274  022737  000176  001140  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
016302  001124                          BNE     15$             ;;EXIT IF NOT
016304  105777  162634                  TSTB    @$TKS           ;;IS A CHAR WAITING?
016310  100121                          BPL     15$             ;;IF NOT, EXIT
016312  117746  162630                  MOVB    @$TKB,-(SP)     ;;YES
016316  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT  7-BIT ASCII
016322  021627  000007                  CMP     (SP),#7         ;;IS IT A CONTROL-G?
016326  001300                          BNE     2$              ;;IF NOT, PUT IT IN THE TTY QUEUE
                                                                ;;AND EXIT

                        ;;**********************************************************************
                        ;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
                        ;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
                        ;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
016330  123727  001134  000001  6$:     CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
016336  001674                          BEQ     2$              ;;BRANCH IF YES
016340  005726                          TST     (SP)+           ;;CLEAR CONTROL-G OFF STACK
016342  004737  015774                  JSR     PC,$TKINT       ;;FLUSH THE TTY INPUT QUEUE
016346  005077  162572                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
016352  112737  000001  001135          MOVB    #1,$INTAG       ;;SET INTERRUPT MODE INDICATOR

016360  104401  017204                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
016364  104401  017211  $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
016370  013746  000176                  MOV     $WREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
016374  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
016376  104401  017222          TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
016402  005046          19$:    CLR     -(SP)           ;;CLEAR COUNTER
016404  005046                  CLR     -(SP)           ;;THE NEW SWR
016406  105777  162532          TSTB    @$TKS           ;;CHAR THERE?
016412  100375          7$:     BPL     7$              ;;IF NOT TRY AGAIN

016414  117746  162526          MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
016420  042716  177600          BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII

016424  021627  000003          CMP     (SP),#3         ;;IS IT A CONTROL-C?
016430  001015                  BNE     9$              ;;BRANCH IF NOT
016432  104401  017172          TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (^C)
016436  062706  000006          ADD     #6,SP           ;;CLEAN UP STACK
016442  123727  001135  000001  CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
016450  001003                  BNE     8$              ;;BRANCH IF NO
016452  012777  000100  162464  MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
016460  000137  001766  8$:     JMP     START           ;;CONTROL-C RESTART


016464  021627  000025  9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
016470  001005                  BNE     10$             ;;BRANCH IF NOT
016472  104401  017177          TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
016476  062706  000006  20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
016502  000737                  BR      19$             ;;LET'S TRY IT AGAIN


016504  021627  000015  10$:    CMP     (SP),#15        ;;IS IT A <CR>?
016510  001022                  BNE     16$             ;;BRANCH IF NO
016512  005766  000004          TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
016516  001403                  BEQ     11$             ;;BRANCH IF YES
016520  016677  000002  162412  MOV     2(SP),@SWR      ;;SAVE NEW SWR
016526  062706  000006  11$:    ADD     #6,SP           ;;CLEAR UP STACK
016532  104401  001207  14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
016536  123727  001135  000001  CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
016544  001003                  BNE     15$             ;;BRANCH IF NOT
016546  012777  000100  162370  MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
016554  000002          15$:    RTI                     ;;RETURN
016556  004737  015170  16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
016562  021627  000060          CMP     (SP),#60        ;;CHAR < 0?
016566  002420                  BLT     18$             ;;BRANCH IF YES
016570  021627  000067          CMP     (SP),#67        ;;CHAR > 7?
016574  003015                  BGT     18$             ;;BRANCH IF YES
016576  042726  000060          BIC     #60,(SP)+       ;;STRIP-OFF ASCII
016602  005766  000002          TST     2(SP)           ;;IS THIS THE FIRST CHAR
016606  001403                  BEQ     17$             ;;BRANCH IF YES
016610  006316                  ASL     (SP)            ;;NO, SHIFT PRESENT
016612  006316                  ASL     (SP)            ;;    CHAR OVER TO MAKE
016614  006316                  ASL     (SP)            ;;    ROOM FOR NEW ONE.
016616  005266  000002  17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
016622  056616  177776          BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
016626  000667                  BR      7$              ;;GET THE NEXT ONE
016630  104401  001206  18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
016634  000720                  BR      20$             ;;SIMULATE CONTROL-U
                        .DSABL  LSB

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

```
                                ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*CALL:
                                ;*      RDCHR                   ;;GET A CHARACTER FROM THE QUEUE
                                ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                ;*                              ;;WITH PARITY BIT STRIPPED OFF
                                ;
016636  011646                  $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
016640  016666  000004  000002          MOV     4(SP),2(SP)     ;;THE PS
016646  005066  000004                  CLR     4(SP)           ;;GET READY FOR A CHARACTER
016652  005046                          CLR     -(SP)           ;;PUT NEW PS ON STACK
016654  012746  016662                  MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
016660  000002                          RTI                     ;;POP NEW PC AND PS
016662                          64$:
016662  005737  015764          1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
016666  001775                          BEQ     1$
016670  005337  015764                  DEC     $TKCNT          ;;DECREMENT THE COUNTER
016674  117766  177070  000004        MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
016702  005237  015770                  INC     $TKQOUT         ;;UPDATE THE POINTER
016706  023727  015770  015773        CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
016714  001003                          BNE     2$              ;;BRANCH IF NO
016716  012737  015772  015770        MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
016724  000002                  2$:     RTI                     ;;RETURN
                                ;;**********************************************************************
                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                ;*CALL:
                                ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S

016726  010346                  $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
016730  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
016732  012703  017162          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
016736  022703  017172          2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
016742  101456                          BLOS    4$              ;;BR IF YES
016744  104410                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
016746  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
016750  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
016754  001022                          BNE     5$              ;;BR IF NO
016756  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
016760  001007                          BNE     6$              ;;BR IF NO
016762  112737  000134  017160        MOVB    #'\,9$          ;;TYPE A BACK SLASH
016770  104401  017160                  TYPE    ,9$
016774  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
017000  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
017002  020327  017162                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
017006  103434                          BLO     4$              ;;BR IF YES
017010  111337  017160                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
017014  104401  017160                  TYPE    ,9$             ;;GO TYPE
017020  000746                          BR      2$              ;;GO READ ANOTHER CHAR.
017022  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
017024  001406                          BEQ     7$              ;;BR IF NO
017026  112737  000134  017160        MOVB    #'\,9$          ;;TYPE A BACK SLASH
017034  104401  017160                  TYPE    ,9$
017040  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
017042  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
017046  001003                          BNE     8$              ;;BR IF NO
```

```
017050  104401  017177                  TYPE    ,$CNTLU         ;;TYPE A CONTROL 'U'
017054  000726                          BR      1$              ;;GO START OVER
017056  122713  000022          8$:     CMPB    #22,(R3)        ;;IS CHARACTER A '^R'?
017062  001011                          BNE     3$              ;;BRANCH IF NO
017064  105013                          CLRB    (R3)            ;;CLEAR THE CHARACTER
017066  104401  001207                  TYPE    ,$CRLF          ;;TYPE A 'CR' & 'LF'
017072  104401  017162                  TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
017076  000717                          BR      2$              ;;GO PICKUP ANOTHER CHACTER
017100  104401  001206          4$:     TYPE    ,$QUES          ;;TYPE A '?'
017104  000712                          BR      1$              ;;CLEAR THE BUFFER AND LOOP
017106  111337  017160          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
017112  104401  017160                  TYPE    ,9$
017116  122723  000015                  CMPB    #15,(R3)+       ;;CHECK FOR RETURN
017122  001305                          BNE     2$              ;;LOOP IF NOT RETURN
017124  105063  177777                  CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
017130  104401  001210                  TYPE    ,$LF            ;;TYPE A LINE FEED
017134  005726                          TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
017136  012603                          MOV     (SP)+,R3        ;;RESTORE R3
017140  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
017142  016666  000004  000002          MOV     4(SP),2(SP)     ;;       FIRST ASCII CHARACTER ON IT
017150  012766  017162  000004          MOV     #$TTYIN,4(SP)
017156  000002                          RTI                     ;;RETURN
017160     000          9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
017161     000                  .BYTE   0                       ;;TERMINATOR
017162          $TTYIN: .BLKB   8.                              ;;RESERVE 8 BYTES FOR TTY INPUT
017172     136  103  015  $CNTLC: .ASCIZ  /^C/<15><12>         ;;CONTROL 'C'
017177     136  125  015  $CNTLU: .ASCIZ  /^U/<15><12>         ;;CONTROL 'U'
017204     136  107  015  $CNTLG: .ASCIZ  /^G/<15><12>         ;;CONTROL 'G'
017211     015  012  123  $MSWR:  .ASCIZ  <15><12>/SWR = /
017222     040  040  116  $MNEW:  .ASCIZ  /  NEW = /
                        .EVEN
```

READ AN OCTAL NUMBER FROM THE TTY

```
                                .SBTTL  READ AN OCTAL NUMBER FROM THE TTY

                                ;;*************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
                                ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT

017234  011646                 $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
017236  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
017244  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
017246  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
017250  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
017252  104411                 1$:     RDLIN                   ;;READ AN ASCIZ LINE
017254  012600                         MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
017256  010037  017362                 MOV     R0,5$           ;;AND SAVE IT
017262  005001                         CLR     R1              ;;CLEAR DATA WORD
017264  005002                         CLR     R2
017266  112046                 2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
017270  001420                         BEQ     3$              ;;IF ZERO GET OUT
017272  122716  000060                 CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
017276  003026                         BGT     4$              ;;IS AN OCTAL DIGIT
017300  122716  000067                 CMPB    #'7,(SP)
017304  002423                         BLT     4$
017306  006301                         ASL     R1              ;;*2
017310  006102                         ROL     R2
017312  006301                         ASL     R1              ;;*4
017314  006102                         ROL     R2
017316  006301                         ASL     R1              ;;*8
017320  006102                         ROL     R2
017322  042716  177770                 BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
017326  062601                         ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
017330  000756                         BR      2$              ;;LOOP
017332  005726                 3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
017334  010166  000012                 MOV     R1,12(SP)       ;;SAVE THE RESULT
017340  010237  017372                 MOV     R2,$HIOCT
017344  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
017346  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
017350  012600                         MOV     (SP)+,R0        ;;POP STACK INTO R0
017352  000002                         RTI                     ;;RETURN
017354  005726                 4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
017356  105010                         CLRB    (R0)            ;;SET A TERMINATOR
017360  104401                         TYPE                    ;;TYPE UP THRU THE BAD CHAR.
017362  000000                 5$:     .WORD   0
017364  104401  001206                 TYPE    ,$QUES          ;;"?" "CR" & "LF"
017370  000730                         BR      1$              ;;TRY AGAIN
017372  000000                 $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
                                .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES

                                ;;**********************************************************************
                                ;*SAVE R0-R5
                                ;*CALL:
                                ;*      SAVREG
                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                ;*
                                ;*TOP---(+16)
                                ;* +2---(+18)
                                ;* +4---R5
                                ;* +6---R4
                                ;* +8---R3
                                ;*+10---R2
                                ;*+12---R1
                                ;*+14---R0

017374                          $SAVREG:
017374  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
017376  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
017400  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
017402  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
017404  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
017406  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
017410  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
017414  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
017420  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
017424  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
017430  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
017432                          $RESREG:
017432  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
017436  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
017442  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
017446  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
017452  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
017454  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
017456  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
017460  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
017462  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
017464  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
017466  000002                          RTI
2                               .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.

017470  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
017472  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
017476  005740                          TST     -(R0)           ;;BACKUP BY 2
017500  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
```

```
017502  006300                          ASL     R0              ;;POSITION FOR INDEXING
017504  016000  017524                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
017510  000200                          RTS     R0              ;;GO TO ROUTINE


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

017512  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
017514  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
017522  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
017524  017512                  $TRPAD: .WORD   $TRAP2
017526  015020                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
017530  015336                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
017532  015312                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
017534  015352                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
017536  015540                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

017540  016364                          $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

017542  016274                          $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
017544  016636                          $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
017546  016726                          $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
017550  017234                          $RDOCT  ;;CALL=RDOCT    TRAP+12(104412) READ AN OCTAL NUMBER FROM TTY
017552  017374                          $SAVREG ;;CALL=SAVREG   TRAP+13(104413) SAVE R0-R5 ROUTINE
017554  017432                          $RESREG ;;CALL=RESREG   TRAP+14(104414) RESTORE R0-R5 ROUTINE
```

```
                                .SBTTL  TELETYPE MESSAGES

                        
017556  200  105  116  ENTERA: .ASCIZ  <CRLF>/ENTER DRIVE ADDRESS: /
017605  040  077  111  ADRERR: .ASCIZ  / ?INVALID ADDRESS/<CRLF>
017630  200  120  117  PORTAIS: .ASCIZ <CRLF>/PORT 'A' ADDRESS IS: /
017657  200  120  117  PORTBIS: .ASCIZ <CRLF>/PORT 'B' ADDRESS IS: /
017706  200  123  131  NOCLOCK: .ASCIZ <CRLF>/SYSTEM MUST HAVE 'L' OR 'P' CLOCK/<CRLF><LF>
017753  012  105  116  TESTNO: .ASCIZ  <LF>/ENTER TEST #: /
017773  040  077  111  BADNO:  .ASCIZ  / ?INVALID TEST NUMBER/<CRLF>
020022  200  012  122  ADDRIS: .ASCIZ  <CRLF><LF>@RH/RM ADDRESS (RMCS1) IS: @
020057  012  105  116  NTRH:   .ASCIZ  <LF>@ENTER RH/RM ADDRESS: @
020106  200  122  105  SWTCHN: .ASCIZ  <CRLF>@RETURN 'PORT SELECT' SWITCH TO 'A/B'@
020154  200  123  127  SWTCHA: .ASCIZ  <CRLF>/SWITCH 'PORT SELECT' TO 'A'/
020211  200  123  127  SWTCHB: .ASCIZ  <CRLF>/SWITCH 'PORT SELECT' TO 'B'/
020246  200  124  110  CONTUE: .ASCIZ  <CRLF>/THEN PRESS 'CONTINUE' ON THE PROCESSOR/<CRLF>
020317  200  123  124  CYCLED: .ASCIZ  <CRLF>/STOP THE DRIVE/
020337  200  123  124  CYCLEU: .ASCIZ  <CRLF>/START THE DRIVE, THE PROGRAM WILL WAIT FOR 'MOL' TO SET/<CRLF>
```

```
                                .SBTTL  TEST ERROR MESSAGES

                        EM1:    .ASCIZ  /DRIVE IS NON-EXISTENT ('NED' BIT SET)/
                        EM2:    .ASCIZ  /WRONG DRIVE TYPE/
                        EM3:    .ASCIZ  @PORT SELECT SWITCH ON DRIVE NOT IN 'A/B'@
                        EM4:    .ASCIZ  /DRIVE NOT ON LINE/
                        EM5:    .ASCIZ  /SERIAL NUMBER READ THROUGH EACH PORT NOT THE SAME/
                        EM6:    .ASCIZ  /TIMEOUT HAS NOT OCCURRED WITHIN 2 SECONDS/
                        EM7:    .ASCIZ  /TIMEOUT ONE-SHOT IS LESS THAN 500 MS/
                        EM10:   .ASCIZ  /READ IN PRESET DOES NOT SET VOLUME VALID FOR THE PORT/
                        EM11:   .ASCIZ  /'GO' BIT RESET DURING UNLOAD COMMAND/
                        EM12:   .ASCIZ  /INCORRECT STATUS DURING UNLOAD COMMAND/
                        EM13:   .ASCIZ  /DRIVE DID NOT RETURN TO NEUTRAL AFTER UNLOAD COMMAND/
                        EM14:   .ASCIZ  /ATTENTION BIT SET ON 'OPPOSITE PORT' AFTER UNLOAD/
                        EM15:   .ASCIZ  /ATTENTION BIT NOT SET ON PORT WHICH ISSUED 'UNLOAD'/
                        EM16:   .ASCII  /DRIVE NOT IN NEUTRAL AFTER UNLOAD, WITH 'PORT/<CR><LF>
                                .ASCIZ  @SELECT' SWITCH MOVED FROM 'A/B' @
                        EM17:   .ASCIZ  /DRIVE LOCKED ON PORT 'A' BY SWITCH WHILE CYCLED UP/
                        EM20:   .ASCIZ  /DRIVE LOCKED ON PORT 'B' BY SWITCH WHILE CYCLED UP/
                        EM21:   .ASCIZ  /STATUS INCORRECT FOR PORT AFTER CYCLE UP/
                        EM22:   .ASCIZ  /REGISTER CONTENTS SEEN WHEN DRIVE SWITCHED ON 'OPPOSITE' PORT/
                        EM23:   .ASCIZ  /'NED' NOT SET WHEN RMDS ACCESSED THROUGH PORT NOT SWITCHED/
                        EM24:   .ASCIZ  /DRIVE SWITCHED TO LOCKED OUT PORT WHEN RELEASED/
                        EM25:   .ASCIZ  @RH/RM DIDN'T RESPOND TO ADDRESSING@
                        EM30:   .ASCIZ  /DRIVE NOT SEIZED BY PORT/
                        EM31:   .ASCIZ  /WRONG STATUS SEEN BY THE SEIZING PORT/
                        EM32:   .ASCIZ  /REGISTER CONTENTS WRONG/
                        EM33:   .ASCIZ  /CONTROL BUS PARITY ERROR READING INDICATED REGISTER/
                        EM34:   .ASCIZ  /CAN'T ACCESS DRIVE THROUGH EITHER PORT/
                        EM35:   .ASCIZ  /DRIVE NOT IN NEUTRAL AFTER RELEASE - REQUEST NOT SET/
                        EM36:   .ASCIZ  /DRIVE NOT IN NEUTRAL AFTER TIMEOUT - REQUEST NOT SET/
                        EM37:   .ASCIZ  /REGISTER CONTENTS WRONG AFTER RELEASE OR TIMEOUT/
                        EM40:   .ASCIZ  /DRIVE IN NEUTRAL AFTER RELEASE - REQUEST SET/
                        EM41:   .ASCIZ  /REGISTER WRONG AFTER RELEASE WITH REQUEST SET/
```

TEST ERROR MESSAGES

```
                                                DH1:    .ASCIZ  /TEST #  ERR PC  PORT #  REG ADR CONTENTS/
                                                DH2:    .ASCIZ  /TEST #  ERR PC  PORT #  REG ADR GOOD    BAD/
                                                DH5:    .ASCIZ  /TEST #  ERR PC  REG ADR PORT A  PORT B/
                                                DH6:    .ASCIZ  /TEST #  ERR PC  PORT #/
                                                DH7:    .ASCIZ  /TEST #  ERR PC  PORT #  TIME (IN MS)/
                                                DH13:   .ASCII  /                SEIZE/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #/
                                                DH14:   .ASCII  /                SEIZE   ERROR/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #  PORT #  REG ADR CONTENTS/
                                                DH17:   .ASCIZ  /TEST #  ERR PC/
                                                DH24:   .ASCII  /                LOCKED  SWITCHED TO/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #  PORT #/
                                                DH25:   .ASCIZ  /$RMADR/
                                                DH30:   .ASCII  /                SEIZE   ERROR/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #  PORT #  REG ADR GOOD    BAD/
                                                DH34:   .ASCII  /                PORT A  PORT B/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  RMDS    RMDS/
                                                DH35:   .ASCII  /                RELSNG  ERROR/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #  PORT #/
                                                DH37:   .ASCII  /                RELSNG  ERROR/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #  PORT #  REG ADR GOOD    BAD/
                                                DH40:   .ASCII  /                RELSNG  RQSTNG/<CRLF>
                                                        .ASCIZ  /TEST #  ERR PC  PORT #  PORT #/

                                                        .EVEN

                                                DT1:    .WORD   TSTNUM,$ERRPC,PTNBR,$BDADR,$BDDAT,0
                                                DT2:    .WORD   TSTNUM,$ERRPC,PTNBR,$BDADR,$GDDAT,$BDDAT,0
                                                DT5:    .WORD   TSTNUM,$ERRPC,$BDADR,$GDDAT,$BDDAT,0
                                                DT6:    .WORD   TSTNUM,$ERRPC,PTNBR,0
                                                DT7:    .WORD   TSTNUM,$ERRPC,PTNBR,TIME,0
                                                DT13:   .WORD   TSTNUM,$ERRPC,SEIZPT,0
                                                DT14:   .WORD   TSTNUM,$ERRPC,SEIZPT,PTNBR,$BDADR,$BDDAT,0
                                                DT17:   .WORD   TSTNUM,$ERRPC,0
                                                DT24:   .WORD   TSTNUM,$ERRPC,SEIZPT,PTNBR,0
                                                DT25:   .WORD   $RMADR,0
                                                DT30:   .WORD   TSTNUM,$ERRPC,SEIZPT,PTNBR,$BDADR,$GDDAT,$BDDAT,0
                                                DT34:   .WORD   TSTNUM,$ERRPC,$TMP2,$TMP3,0
                                                DT35:   .WORD   TSTNUM,$ERRPC,SEIZPT,PTNBR,0
                                                DT40:   .WORD   TSTNUM,$ERRPC,SEIZPT,OPPRT,0

                                                DF1:    .BYTE   0,0,1,0,0
                                                DF2:    .BYTE   0,0,1,0,0,0
                                                DF5:    .BYTE   0,0,0,0,0
                                                DF6:    .BYTE   0,0,1
                                                DF7:    .BYTE   0,0,1,1
                                                DF14:   .BYTE   0,0,1,1,0,0
                                                DF17:   .BYTE   0,0
                                                DF25:   .BYTE   0
                                                DF30:   .BYTE   0,0,1,1,0,0,0
                                                DF34:   .BYTE   0,0,0,0
                                                        .EVEN
```

```
                                .SBTTL  CONSTANTS, TABLES, ETC
                                ;TABLE OF TEST STARTING ADDRESSES

025040  003112  TSTADR: .WORD   TST1            ;STARTING ADDRESS OF TEST 1
025042  004424          .WORD   TST2            ;STARTING ADDRESS OF TEST 2
025044  005206          .WORD   TST3            ;STARTING ADDRESS OF TEST 3
025046  005770          .WORD   TST4            ;STARTING ADDRESS OF TEST 4
025050  006706          .WORD   TST5            ;STARTING ADDRESS OF TEST 5
025052  007624          .WORD   TST6            ;STARTING ADDRESS OF TEST 6
025054  010672          .WORD   TST7            ;STARTING ADDRESS OF TEST 7
025056  012002          .WORD   TST10           ;STARTING ADDRESS OF TEST 10

                                ;ATTENTION BIT TABLE

025060      001 ATABIT: .BYTE   1               ;ATTENTION BIT FOR DRIVE 0
025061      002         .BYTE   2               ;ATTENTION BIT FOR DRIVE 1
025062      004         .BYTE   4               ;ATTENTION BIT FOR DRIVE 2
025063      010         .BYTE   10              ;ATTENTION BIT FOR DRIVE 3
025064      020         .BYTE   20              ;ATTENTION BIT FOR DRIVE 4
025065      040         .BYTE   40              ;ATTENTION BIT FOR DRIVE 5
025066      100         .BYTE   100             ;ATTENTION BIT FOR DRIVE 6
025067      200         .BYTE   200             ;ATTENTION BIT FOR DRIVE 7

025070  000011  MAXTN:  .WORD   11              ;MAXIMUM TEST NUMBER

        000200  .END    200
```

SYMBOL TABLE

```
ADDRIS  020022
ADRERR  017605
AOE   = 001000
ASR1    001232
ATA   = 100000
ATABIT  025060
AT0   = 000001
AT1   = 000002
AT2   = 000004
AT3   = 000010
AT4   = 000020
AT5   = 000040
AT6   = 000100
AT7   = 000200
A16   = 000400
A17   = 001000
BADNO   017773
BADTMO  001706
BAI   = 000010
BIT0  = 000001
BIT00 = 000001
BIT01 = 000002
BIT02 = 000004
BIT03 = 000010
BIT04 = 000020
BIT05 = 000040
BIT06 = 000100
BIT07 = 000200
BIT08 = 000400
BIT09 = 001000
BIT1  = 000002
BIT10 = 002000
BIT11 = 004000
BIT12 = 010000
BIT13 = 020000
BIT14 = 040000
BIT15 = 100000
BIT2  = 000004
BIT3  = 000010
BIT4  = 000020
BIT5  = 000040
BIT6  = 000100
BIT7  = 000200
BIT8  = 000400
BIT9  = 001000
BPTVEC= 000014
CHANGE  002764
CHGADR  001270
CKCLK   013336
CKCLK1  013406
CKCLK2  013450
CKCLK3  013460
CKERR   001244
CKSWR = 104407
CLOCK   013470
CLR   = 000040
CONTUE  020246
CPSAVE  014454
CR    = 000015
CRLF  = 000200
CYCLED  020317
CYCLEU  020337
DCK   = 100000
DDISP = 177570
DE1   = 000040
DFF20 = 000002
DF1     024764
DF14    025013
DF17    025021
DF2     024771
DF25    025023
DF30    025024
DF34    025033
DF5     024777
DF6     025004
DF7     025007
DH1     023174
DH13    023464
DH14    023541
DH17    023660
DH2     023245
DH24    023677
DH25    024002
DH30    024011
DH34    024133
DH35    024227
DH37    024324
DH40    024446
DH5     023321
DH6     023370
DH7     023417
DIGB  = 000004
DISPLA  001142
DISPRE  000174
DLT   = 100000
DL64  = 000020
DMD   = 000001
DPE   = 000010
DPR   = 000400
DRQ   = 004000
DRY   = 000200
DSWR  = 177570
DTE   = 010000
DT00  = 000001
DT01  = 000002
DT02  = 000004
DT03  = 000010
DT04  = 000020
DT05  = 000040
DT06  = 000100
DT07  = 000200
DT08  = 000400
DT1     024544
DT13    024634
DT14    024644
DT17    024662
DT2     024560
DT24    024670
DT25    024702
DT30    024706
DT34    024726
DT35    024740
DT40    024752
DT5     024576
DT6     024612
DT7     024622
DVA   = 004000
DVC   = 000200
ECH   = 000100
ECI   = 004000
EMTVEC= 000030
EM1     020431
EM10    021014
EM11    021102
EM12    021147
EM13    021216
EM14    021303
EM15    021365
EM16    021451
EM17    021571
EM2     020477
EM20    021654
EM21    021737
EM22    022010
EM23    022106
EM24    022201
EM25    022261
EM3     020520
EM30    022324
EM31    022355
EM32    022423
EM33    022453
EM34    022537
EM35    022606
EM36    022673
EM37    022760
EM4     020571
EM40    023041
EM41    023116
EM5     020613
EM6     020675
EM7     020747
ENTERA  017556
ERR   = 040000
ERROR = 104000
ERRVEC= 000004
EXEC    002610
FER   = 000020
FMT16 = 010000
F0    = 000002
F1    = 000004
F2    = 000010
F3    = 000020
F4    = 000040
GO    = 000001
GRV   = 000010
GTSWR = 104406
HCE   = 000200
HCI   = 002000
HCRC  = 000400
HT    = 000011
IAE   = 002000
IBSAVE  014456
IE    = 000100
ILF   = 000001
ILR   = 000002
IOTVEC= 000020
IR    = 000100
IVC   = 010000
KYBCTL  001266
LBC   = 002000
LBT   = 002000
LF    = 000012
LSC   = 004000
MAXTN   025070
MCPE  = 020000
MDPE  = 000400
MOH   = 020000
MOL   = 010000
MXF   = 001000
NBA   = 100000
NED   = 010000
NEM   = 004000
NOATA = 000000
NOCLOC  017706
NOSEIZ  001246
NTRH    020057
OFD   = 000200
OPE   = 020000
OPI   = 020000
OPPRT   001240
OR    = 000200
PAR   = 000010
PAT   = 000020
PFECH   014656
PFECH1  014666
PFECH2  014750
PFECH3  015002
PFECH4  015012
PFTSTN  015016
PGE   = 002000
PGM   = 001000
PIP   = 020000
PIRQ  = 177772
PIRQVE= 000240
PORTA   001224
PORTAI  017630
PORTB   001226
PORTBI  017657
PORTC   001230
PR0   = 000000
PR1   = 000040
PR2   = 000100
PR3   = 000140
PR4   = 000200
PR5   = 000240
PR6   = 000300
PR7   = 000340
PS    = 177776
PSEL  = 002000
PSW   = 177776
PTNBR   001234
PWRVEC= 000024
RDCHR = 104410
RDLIN = 104411
RDOCT = 104412
RDY   = 000200
RELERR  001250
RELOK = 000001
RESREG= 104414
RESVEC= 000010
RMAS  = 000016
RMBA  = 000004
RMCS1 = 000000
RMCS2 = 000010
RMDA  = 000006
RMDB  = 000022
RMDC  = 000034
RMDS  = 000012
RMDT  = 000026
RMEC1 = 000044
RMEC2 = 000046
RMER1 = 000014
RMER2 = 000042
RMLA  = 000020
RMMR1 = 000024
RMMR2 = 000040
RMOF  = 000032
RMR   = 000004
RMSN  = 000030
RMWC  = 000002
R6    =%000006
R7    =%000007
SAVREG= 104413
SC    = 100000
SCOPE = 000004
SC0   = 000100
SC1   = 000200
SC2   = 000400
SC3   = 001000
SC4   = 002000
SEIZPT  001236
SKI   = 100000
STACK = 001100
START   001766
```

SYMBOL TABLE

```
START1  001776      TEST3   005244      WCE    = 040000      $GTSWR  016364      $SVPC  = 000210
START2  002004      TEST4   006026      WCF    = 000040      $GT42P  013302      $SWR   = 166000
STKLMT= 177774      TEST5   006744      WLE    = 004000      $HD    = 000000      $SWRMK= 000000
STOP    014104      TEST6   007662      WRL    = 004000      $HIOCT  017372      $TIMES  001176
SWR     001140      TEST7   010730      $AUTOB  001134      $ICNT   001104      $TKB    001146
SWREG   000176      TIME    001252      $BDADR  001122      $INTAG  001135      $TKCNT  015764
SWTCHA  020154      TIMEA   001256      $BDDAT  001126      $ITEMB  001114      $TKINT  015774
SWTCHB  020211      TIMEAP  001260      $BELL   001202      $LF     001210      $TKQEN= 015773
SWTCHN  020106      TIMEB   001262      $CHARC  015306      $LKCSB  001214      $TKQIN  015766
SW0    = 000001     TIMEBP  001264      $CKSWR  016274      $LKCSR  001212      $TKQOU  015770
SW00   = 000001     TKVEC  = 000060      $CMTAG  001100      $LKS    001220      $TKQSR  015772
SW01   = 000002     TOLER   013522      $CM1   = 000001      $LLVEC  001222      $TKS    001144
SW02   = 000004     TPVEC  = 000064      $CM2   = 000002      $LPADR  001106      $TKSRV  016044
SW03   = 000010     TRAPVE= 000034      $CM3   = 000001      $LPERR  001110      $TMP0   001164
SW04   = 000020     TRE    = 040000      $CM4   = 000005      $LPVEC  001216      $TMP1   001166
SW05   = 000040     TRTVEC= 000014      $CNTLC  017172      $MNEW   017222      $TMP2   001170
SW06   = 000100     TSTADR  025040      $CNTLG  017204      $MSWR   017211      $TMP3   001172
SW07   = 000200     TSTNUM  001242      $CNTLU  017177      $MXCNT  014102      $TMP4   001174
SW08   = 000400     TST1    003112      $CRLF   001207      $NULL   001154      $TN    = 000012
SW09   = 001000     TST1AA  003074      $DBLK   015754      $NWTST= 000000      $TPB    001152
SW1    = 000002     TST10   012002      $DOAGN  013326      $OCNT   015534      $TPFLG  001157
SW10   = 002000     TST11   013106      $DTBL   015744      $OMODE  015536      $TPS    001150
SW11   = 004000     TST2    004424      $ENDAD  013316      $OVER   014066      $TRAP   017470
SW12   = 010000     TST3    005206      $ENDCT  013154      $PASS   001100      $TRAP2  017512
SW13   = 020000     TST4    005770      $ENULL  013332      $QUES   001206      $TRP   = 000015
SW14   = 040000     TST5    006706      $EOP    013110      $RDCHR  016636      $TRPAD  017524
SW15   = 100000     TST6    007624      $EOPCT  013146      $RDLIN  016726      $TSTNM  001102
SW2    = 000004     TST7    010672      $ERFLG  001103      $RDOCT  017234      $TTYIN  017162
SW3    = 000010     TYPDS  = 104405      $ERMAX  001115      $RDSZ  = 000010      $TYPDS  015540
SW4    = 000020     TYPE   = 104401      $ERROR  014132      $REGAD  001160      $TYPE   015020
SW5    = 000040     TYPOC  = 104402      $ERRPC  001116      $REGO   001162      $TYPEC  015170
SW6    = 000100     TYPON  = 104404      $ERRTB  001276      $RESRE  017432      $TYPEX  015310
SW7    = 000200     TYPOS  = 104403      $ERRTY  014460      $RMADR  001272      $TYPOC  015336
SW8    = 000400     UNS    = 040000      $ERTTL  001112      $RMVEC  001274      $TYPON  015352
SW9    = 001000     UPE    = 020000      $ESCAP  001200      $RTNAD  013330      $TYPOS  015312
TAP    = 040000     U0     = 000001      $FILLC  001156      $SAVRE  017374      $XOFF  = 000023
TBITVE= 000014      U1     = 000002      $FILLS  001155      $SCOPE  013550      $XON   = 000021
TESTNO  017753      U3     = 000004      $GDADR  001120      $SETUP= 000127      $XTSTR  013572
TEST1   003150      VV     = 000100      $GDDAT  001124      $STUP  = 177777      $$GET4= 000000
TEST10  012040      VVSET  = 000001      $GET42  013306      $SVLAD  014056      $OFILL  015535
TEST2   004462      WATCH   001254

. ABS.  025072      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  54784 WORDS  ( 214 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  71 PAGES
,A:CZRNIA/C=A:CZRNIA.DOC,CZRNIA,SYSMAC/M
```

CROSS REFERENCE TABLE (CREF V04.00)

```
$$GET4  10-1      10-1#
$OFILL  16-1      16-1#     16-1*     16-1*
$40CAT  12-1      13-1
$AUTOB   6-0#      9-28*    18-1      18-1      18-1
$BDADR   6-0#      9-150*    9-150*    9-150*    9-150*    9-157*    9-157*    9-157*    9-157*    9-165*    9-165*    9-165*    9-165*    9-165*
         9-165*    9-165*    9-165*    9-215*    9-215*    9-215*    9-215*    9-216*    9-216*    9-216*    9-216*    9-274*    9-274*    9-274*
         9-274*    9-275*    9-275*    9-275*    9-275*    9-302*    9-302*    9-307*    9-307*    9-439*    9-439*    9-439*    9-439*    9-439*
         9-439*    9-439*    9-439*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*   23-27     23-28     23-29
        23-33     23-37
$BDDAT   6-0#      9-150     9-150     9-150     9-150     9-150*    9-150*    9-157     9-157     9-157*    9-157*    9-165     9-165     9-165
         9-165     9-165     9-165     9-165     9-165     9-165*    9-165*    9-165*    9-165*    9-172*    9-173     9-215     9-215     9-215*
         9-215*    9-215*    9-215*    9-215*    9-216     9-216     9-216*    9-216*    9-216*    9-216*    9-216*    9-274     9-274     9-274*
         9-274*    9-274*    9-274*    9-274*    9-274*    9-275     9-275     9-275*    9-275*    9-275*    9-275*    9-275*    9-275*    9-302*
         9-302*    9-302*    9-302*    9-307*    9-307*    9-307*    9-307*    9-439     9-439     9-439     9-439     9-439     9-439     9-439
         9-439     9-439*    9-439*    9-439*    9-439*    9-440     9-440     9-440     9-440     9-440     9-440     9-440     9-440     9-440*
         9-440*    9-440*    9-440*   23-27     23-28     23-29     23-33     23-37
$BELL    6-0#      13-1      13-1      13-1      18-1      18-1      18-1
$CHARC  15-1      15-1#     15-1*     15-1*     15-1*
$CKSWR  18-1#     20-2      20-2
$CM1     6-0       6-0       6-0#      6-0#
$CM2     6-0       6-0       6-0#      6-0#
$CM3     6-0       6-0       6-0#
$CM4     6-0       6-0       6-0       6-0       6-0       6-0       6-0       6-0       6-0       6-0       6-0#      6-0#      6-0#      6-0#
         6-0#      6-0#
$CMTAG   6-0#      9-23      9-23      9-23      9-23      9-23      9-23      9-23
$CNTLC  18-1      18-1      18-1      18-1      18-1#
$CNTLG  18-1      18-1#
$CNTLU  18-1      18-1      18-1#
$CRLF    6-0#      9-48      9-67      9-104     10-1      13-1      13-1      13-1      14-1      14-1      14-1      14-1      15-1      15-1
        15-1      18-1      18-1      18-1      18-1      19-1      19-1
$DBLK   17-1      17-1      17-1#
$DOAGN  10-1      10-1      10-1#
$DTBL   17-1      17-1#
$ENDAD   5-5       9-28      10-1#     13-1
$ENDCT   9-23      10-1#
$ENULL  10-1#
$EOP     9-440     10-1#
$EOPCT   9-23*     10-1      10-1#
$ERFLG   6-0#      9-439     9-439*    9-440     9-440*    12-1      12-1      12-1      12-1      12-1*     13-1      13-1      13-1*
$ERMAX   6-0#      9-23*     9-75*     12-1      12-1
$ERROR   9-23      13-1#
$ERRPC   6-0#      13-1      13-1      13-1      13-1*     13-1*     14-1      14-1      23-27     23-28     23-29     23-30     23-31     23-32
        23-33     23-34     23-35     23-37     23-38     23-39     23-40
$ERRTB   8-0#      14-1
$ERRTY  13-1      14-1#
$ERTTL   6-0#      10-1      10-1      10-1*     13-1      13-1      13-1*
$ESCAP   6-0#      9-23*
$FILLC   6-0#      15-1      15-1      15-1
$FILLS   6-0#      15-1      15-1
$GDADR   6-0#
$GDDAT   6-0#      9-150     9-150     9-150*    9-150*    9-150*    9-150*    9-157     9-157     9-157*    9-157*    9-165     9-165     9-165
         9-165     9-165*    9-165*    9-165*    9-165*    9-165*    9-165*    9-165*    9-165*    9-170*    9-173     9-215     9-215     9-215
         9-215*    9-215*    9-215*    9-216     9-216     9-216     9-216*    9-216*    9-216*    9-274     9-274     9-274     9-274     9-274
         9-274*    9-274*    9-274*    9-275     9-275     9-275     9-275     9-275     9-275*    9-275*    9-275*    9-302     9-302     9-302*
         9-307     9-307     9-307*    9-439     9-439     9-439     9-439     9-439*    9-439*    9-439*    9-439*    9-439*    9-439*    9-439*
         9-439*    9-440     9-440     9-440     9-440     9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    23-28
```

CROSS REFERENCE TABLE (CREF V04.00)

```
        23-29   23-37
$GET42  10-1#
$GT42P  10-1    10-1#
$GTSWR  18-1#   20-2    20-2
$HD      4-510   4-510    4-510
$HIOCT  19-1#   19-1*
$ICNT    6-0#    9-92*   12-1    12-1    12-1    12-1*   12-1*
$INTAG   6-0#   18-1     18-1    18-1    18-1    18-1*
$ITEMB   6-0#   13-1     13-1    13-1    13-1    13-1*   13-1*   14-1
$LF      6-0#   13-1     13-1    15-1    15-1    18-1    18-1    18-1    19-1    19-1
$LKCSB   7-0#   11-11*
$LKCSR   7-0#   11-7     11-12*
$LKS     7-0#   11-16    11-20*
$LLVEC   7-0#   11-17
$LPADR   6-0#    9-23*    9-76*   9-137*  9-215*  9-216*  9-274*  9-275*  9-295*  9-439*  9-440*  12-1    12-1    12-1
        12-1*
$LPERR   6-0#    9-23*    9-77*   9-137*  9-215*  9-216*  9-274*  9-275*  9-295*  9-439   9-439*  9-440   9-440*
$LPVEC   7-0#   11-8
$MAIL    9-23    9-28     12-1    13-1    15-1
$MNEW   18-1    18-1#
$MSWR   18-1    18-1#
$MXCNT  12-1    12-1     12-1    12-1#
$NULL    6-0#   15-1     15-1    15-1
$NWTST   9-137   9-137    9-137#  9-137#  9-215   9-215   9-215#  9-215#  9-216   9-216   9-216#  9-216#  9-274   9-274
         9-274#  9-274#   9-275   9-275   9-275#  9-275#  9-295   9-295   9-295#  9-295#  9-439   9-439   9-439#  9-439#
         9-440   9-440    9-440#  9-440#  9-444#
$OCNT   16-1#   16-1*    16-1*
$OMODE  16-1    16-1#    16-1*   16-1*   16-1*   16-1*
$OVER   12-1    12-1     12-1    12-1#
$PASS    6-0#    9-74*   10-1    10-1    10-1    10-1*   10-1*   12-1    12-1    12-1
$QUES    6-0#   13-1     13-1    15-1    15-1    18-1    18-1    18-1    18-1    19-1    19-1    19-1
$R2A    20-2
$RDCHR  18-1#   20-2     20-2
$RDDEC  20-2
$RDLIN  18-1#   20-2     20-2
$RDOCT  19-1#   20-2     20-2
$RDSZ   18-1    18-1#
$REGO    6-0#
$REGAD   6-0#
$RESRE  20-1#   20-2
$RMADR   7-0#    9-68     9-102   9-109*  9-112   9-134   23-36
$RMVEC   7-0#
$RTNAD  10-1#
$SAVRE  20-1#   20-2     20-2
$SCOPE   9-23   12-1#
$SETUP   4-699   4-699    4-699   4-699   4-699   4-699#  4-699#  4-699#  4-699#  4-699#  4-699#  9-23    9-23    9-23
         9-23    9-23     9-23    9-23    9-23    9-23    9-23    9-23    9-23    9-28    9-28    9-28    10-1    10-1
        12-1    13-1     13-1    13-1    13-1    18-1    18-1    18-1    18-1    18-1
$STUP    4-699   4-699    4-699   4-699   4-699   4-699#  4-699#  4-699#  4-699#  4-699#  4-699#  4-699#  4-699#  4-699#
         4-699#
$SVLAD  12-1    12-1#
$SVPC    5-5     5-5#
$SWR     4-506#  4-510    4-511   4-511   4-511   4-511   4-511   4-511   4-511   4-511   6-0     6-0     6-0     9-23
         9-23    9-23     9-23    9-23    9-137   9-215   9-216   9-274   9-275   9-295   9-439   9-440   9-444   10-1
        10-1    10-1     10-1    10-1    11-48#  12-1    12-1    12-1    12-1    12-1    12-1    12-1    12-1    12-1
        12-1    12-1     12-1    12-1    12-1    12-1    12-1    12-1    13-1    13-1    13-1    13-1    13-1    13-1
```

CROSS REFERENCE TABLE (CREF V04.00)

```
        13-1      13-1      13-1      13-1      13-1
$SWRMK  12-1
$TESTN  14-1
$TIMES   6-0#      9-23*     9-137*    9-215*    9-216*    9-274*    9-275*    9-295*    9-439*    9-439*    9-440*    9-440*    10-1*     12-1
        12-1      12-1      12-1*     12-1*
$TKB     6-0#      15-1      15-1      18-1      18-1      18-1      18-1      18-1      18-1      18-1
$TKCNT  18-1      18-1      18-1#     18-1*     18-1*     18-1*
$TKINT   9-29      9-72      18-1      18-1      18-1#
$TKQEN  18-1      18-1      18-1#
$TKQIN  18-1      18-1      18-1#     18-1*     18-1*     18-1*     18-1*
$TKQOU  18-1      18-1      18-1#     18-1*     18-1*     18-1*
$TKQSR  18-1      18-1      18-1      18-1#
$TKS     6-0#      15-1      15-1      18-1      18-1      18-1      18-1      18-1      18-1*     18-1*     18-1*     18-1*     18-1*     18-1*
$TKSRV  18-1      18-1#
$TMP0    6-0#      9-150     9-150     9-150*    9-150*    9-150*    9-150*    9-165     9-165     9-165     9-165     9-165*    9-165*    9-165*
        9-165*    9-165*    9-165*    9-165*    9-165*    9-215     9-215     9-215     9-215     9-215*    9-215*    9-215*    9-215*    9-216
        9-216     9-216     9-216     9-216*    9-216*    9-216*    9-216*    9-274     9-274     9-274     9-274     9-274*    9-274*    9-274*
        9-274*    9-275     9-275     9-275     9-275     9-275*    9-275*    9-275*    9-275*    9-302     9-302     9-302     9-302*    9-302*
        9-307     9-307     9-307     9-307*    9-307*    9-439     9-439     9-439     9-439     9-439*    9-439*    9-439*    9-439*    9-439*
        9-439*    9-439*    9-439*    9-440     9-440     9-440     9-440     9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*
        9-440*
$TMP1    6-0#      9-215     9-215     9-215*    9-215*    9-216     9-216     9-216*    9-216*    9-274     9-274     9-274     9-274*    9-274*
        9-274*    9-274*    9-275     9-275     9-275     9-275*    9-275*    9-275*    9-275*    9-302     9-302     9-302*    9-302*    9-307
        9-307     9-307*    9-307*
$TMP2    6-0#      9-215     9-215     9-215     9-215     9-215*    9-215*    9-216     9-216     9-216     9-216     9-216*    9-216*    9-274
        9-274     9-274     9-274     9-274*    9-274*    9-275     9-275     9-275     9-275     9-275*    9-275*    9-302     9-302     9-302
        9-302     9-302*    9-302*    9-307     9-307     9-307     9-307     9-307*    9-307*    23-38
$TMP3    6-0#      9-215     9-215     9-215     9-215     9-215*    9-215*    9-216     9-216     9-216     9-216     9-216*    9-216*    9-274
        9-274     9-274     9-274     9-274*    9-274*    9-275     9-275     9-275     9-275     9-275*    9-275*    9-302     9-302     9-302
        9-302     9-302*    9-302*    9-307     9-307     9-307     9-307     9-307*    9-307*    23-38
$TMP4    6-0#      9-150     9-150     9-150*    9-150*    9-150*    9-150*    9-165     9-165     9-165     9-165     9-165*    9-165*    9-165*
        9-165*    9-165*    9-165*    9-165*    9-165*    9-215     9-215*    9-215*    9-216     9-216*    9-216*    9-439     9-439     9-439
        9-439     9-439*    9-439*    9-439*    9-439*    9-439*    9-439*    9-439*    9-439*    9-440     9-440     9-440     9-440     9-440*
        9-440*    9-440*    9-440*    9-440*    9-440*    9-440*    9-440*
$TN      4-507#    4-510     9-137     9-137     9-137     9-137#    9-215     9-215     9-215     9-215#    9-216     9-216     9-216     9-216#
        9-274     9-274     9-274     9-274#    9-275     9-275     9-275     9-275#    9-295     9-295     9-295     9-295#    9-439     9-439
        9-439     9-439     9-439#    9-440     9-440     9-440     9-440#    9-444     9-444     9-444#    24-20
$TPB     6-0#      15-1      15-1      15-1*
$TPFLG   6-0#      15-1      15-1      15-1
$TPS     6-0#      15-1      15-1      15-1
$TRAP    9-23      20-2#
$TRAP2  20-2      20-2#
$TRP    20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2
        20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2
        20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2      20-2
        20-2      20-2      20-2      20-2      20-2      20-2      20-2#     20-2#     20-2#     20-2#     20-2#     20-2#     20-2#     20-2#
        20-2#     20-2#     20-2#     20-2#     20-2#
$TRPAD  20-2      20-2#
$TSTNM   6-0#      9-137*    9-215*    9-216*    9-274*    9-275*    9-295*    9-439*    9-440*    10-1*     12-1      12-1      12-1      12-1
        12-1*     13-1      13-1      13-1      13-1      14-1
$TTYIN  18-1      18-1      18-1      18-1      18-1      18-1#
$TYPBN  20-2
$TYPDS  17-1#     20-2      20-2
$TYPE   15-1#     20-2      20-2
$TYPEC  15-1      15-1      15-1      15-1#     18-1
$TYPEX  15-1      15-1      15-1#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
$TYPOC  16-1#   20-2    20-2
$TYPON  16-1    16-1#   20-2
$TYPOS  16-1#   20-2
$XOFF   15-1    15-1
$XON    15-1    15-1    18-1
$XTSTR  12-1#
A16      4-521#
A17      4-522#
ADDRIS   9-101  21-10#
ADRERR   9-36   21-4#
AOE      4-598#
ASR1     7-0#    9-53*
AT0      4-612#
AT1      4-613#
AT2      4-614#
AT3      4-615#
AT4      4-616#
AT5      4-617#
AT6      4-618#
AT7      4-619#
ATA      4-585#  9-215   9-215   9-215   9-215   9-216   9-216   9-216   9-216   9-274   9-274   9-274   9-274   9-275
         9-275   9-275   9-275   9-302   9-302   9-302   9-302   9-307   9-307   9-307   9-307   9-439   9-440
ATABIT   9-53    24-11#
BADNO    9-87    21-9#
BADTMO   9-3#    9-25
BAI      4-539#
BIT0     4-513#
BIT00    4-513   4-513#  12-1    12-1    13-1    13-1
BIT01    4-513   4-513#
BIT02    4-513   4-513#
BIT03    4-513   4-513#
BIT04    4-513   4-513#
BIT05    4-513   4-513#
BIT06    4-513   4-513#
BIT07    4-513   4-513#
BIT08    4-513   4-513#
BIT09    4-513   4-513#  12-1    13-1
BIT1     4-513#
BIT10    4-513#  13-1
BIT11    4-513#  12-1
BIT12    4-513#
BIT13    4-513#  13-1
BIT14    4-513#  12-1
BIT15    4-513#
BIT2     4-513#
BIT3     4-513#
BIT4     4-513#
BIT5     4-513#
BIT6     4-513#
BIT7     4-513#
BIT8     4-513#
BIT9     4-513#
BPTVEC   4-513#
CHANGE   9-30    9-98#
CHGADR   7-0#    9-15*   9-17*   9-98    9-100*
CKCLK    9-57    9-70    11-5#
```

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

```
EM4       8-25     22-6#
EM40      8-217    22-33#
EM41      8-224    22-34#
EM5       8-32     22-7#
EM6       8-39     22-8#
EM7       8-46     22-9#
EMTVEC    4-513#    9-23*    9-23*
ENTERA    9-31     21-3#
ERR       4-584#
ERROR     4-513#
ERRVEC    4-513#    9-23     9-23*    9-23*    9-25*    9-26*    11-5*    11-6*    11-15*   11-24*   12-1     12-1     12-1*    12-1*
         12-1*    12-1*    12-1*    13-1     13-1*    13-1*
EXEC      9-58      9-65#    9-137    9-215    9-216    9-274    9-275    9-295    9-439    9-440    10-1
F0        4-561#
F1        4-562#
F2        4-563#
F3        4-564#
F4        4-565#
FER       4-593#
FMT16     4-663#    9-215    9-216    9-439    9-439    9-440    9-440
GNS       5-1       5-1      9-6      9-28     10-1     10-1     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2
         20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2     20-2
         20-2     20-2
GO        4-560#
GRV       4-573#
GTSWR     9-28     20-2#
HCE       4-596#
HCI       4-661#
HCRC      4-597#
HT        4-513#   15-1     15-1
IAE       4-599#
IBSAVE    13-1     13-1     13-1     13-1     13-1     13-1#    13-1*    13-1*    13-1*
IE        4-519#
ILF       4-589#
ILR       4-590#
IOTVEC    4-513#    9-23*    9-23*
IR        4-542#
IVC       4-654#
KYBCTL    7-0#      9-73*    9-91*    9-137    9-137*   9-215    9-215*   9-216    9-216*   9-274    9-274*   9-275    9-275*   9-295
         9-295*   9-308    9-439    9-439    9-439*   9-440    9-440*   10-1
LBC       4-652#
LBT       4-580#
LF        4-513#   15-1     15-1     21-7     21-8     21-10    21-11    22-16
LSC       4-653#
MAXTN     9-85     24-22#
MCPE      4-524#
MDPE      4-544#
MOH       4-636#
MOL       4-582#    9-165    9-165    9-215    9-215    9-216    9-216    9-274    9-274    9-275    9-275    9-302    9-307    9-439
         9-439    9-439    9-439    9-439    9-440    9-440    9-440    9-440    9-440
MXF       4-545#
NBA       4-638#
NED       4-548#   9-150    9-150    9-150    9-150    9-439    9-439    9-439    9-440    9-440    9-440
NEM       4-547#
NOATA     8-232#    9-215    9-215    9-216    9-216    9-274    9-274    9-274    9-274    9-275    9-275    9-275    9-275    9-302
         9-302    9-302    9-302    9-307    9-307    9-307    9-307
```

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)

CROSS REFERENCE TABLE (CREF V04.00)