RM02/03/05 RM05/3/2 DSKLS TST 2 AH-F934B-MC AUG 1981
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MADE IN USA

IDENTIFICATION

PRODUCT CODE: AC-F933B-MC

PRODUCT NAME: CZRMQB0 RM05/3/2 DISKLESS TEST, PT 2

PRODUCT DATE: APRIL 1981

MAINTAINER: CX DIAGNOSTIC GROUP

AUTHOR: MIKE LEAVITT

CONTENTS

1.0 INTRODUCTION

1.1 ABSTRACT

THE RM05/3/2 DISKLESS DIAGNOSTIC IS A STAND ALONE PROGRAM WHICH USES FUNCTIONAL AND DIAGNOSTIC MEANS TO VERIFY THE OPERABILITY OF THE DISK SUBSYSTEM EXCLUDING AND INDEPENDENTLY OF THE STORAGE MODULE DRIVE. IN PARTICULAR, THE PROGRAM SERVES THE FOLLOWING PURPOSES:

TO DETECT ERRORS AND FAULTS IN THE RM MASSBUS ADAPTER;

TO RESOLVE HARDWARE FAILURES IN RM TO A FIELD REPLACEABLE MODULE OR MODULES.

1.2 UNIT UNDER TEST

THE UNIT UNDER TEST (UUT) IS THE RM05/3/2 DISK SUBSYSTEM, EXCLUDING THE STORAGE MODULE DISK DRIVE AND THE MASSBUS CONTROLLER.

2.0 OPERATING REQUIREMENTS

2.1 HARDWARE REQUIREMENTS

THE FOLLOWING MINIMUM HARDWARE CONFIGURATION, ASSUMED TO BE OPERATIONAL, IS REQUIRED TO LOAD AND EXECUTE THE RM05/3/2 DISKLESS DIAGNOSTIC:

PDP-11 PROCESSOR
12K MEMORY
KW11-L OR LW11-P CLOCK
PROGRAM LOADING DEVICE
TERMINAL
RH11 OR RH70 CONTROLLER
1 TO 8 DISK DRIVES (ANY COMBINATION OF RM05'S, RM03'S OR RM02'S)

2.2 MEDIA REQUIREMENTS

NONE

2.3 PREREQUISITE DIAGNOSTIC PROGRAMS

RM05/3/2 DISKLESS TEST, PT 1

3.0 OPERATING PROCEDURE

3.1 LOADING

THE PROGRAM MAY BE LOADED BY EITHER PAPER TAPE, USING THE STANDARD PAPER TAPE LOADING PROCEDURE, OR XXDP MEDIA, USING THE APPROPRIATE LOADING DEVICE.

3.2 SWITCH OPTIONS

THE FOLLOWING SWITCH OPTIONS ARE INVOKED WHEN THE APPROPRIATE SWITCH IS ON.

SW15 HALT ON ERROR
SW14 LOOP ON TEST (CURRENTLY BEING EXECUTED)
SW13 INHIBIT ERROR TYPEOUTS
SW12 UNUSED
SW11 INHIBIT TEST ITERATIONS
SW10 BELL ON ERROR
SW09 LOOP ON ERROR
SW08 LOOP ON TEST IN SW07-00

THE LOW ORDER 8 SWITCHES ARE USED IN CONJUNCTION WITH SW08 TO SPECIFY THE OCTAL NUMBER OF THE TEST WHICH THE PROGRAM WILL LOOP ON.

3.3 STARTING

THE PROGRAM MAY BE STARTED AT LOCATION 200 OR 204. STARTING AT 200 WILL BE THE NORMAL STARTING ADDRESS. STARTING AT 204 WILL ENABLE THE RH/RM BASE ADDRESS TO BE CHANGED. IF RUNNING IN A STAND-ALONE ENVIRONMENT, THE PROGRAM USES CONSOLE DIALOGUE TO ALLOW THE OPERATOR TO CONTROL TEST CONDITIONS.

3.4 HALTING

THE PROGRAM CAN BE HALTED BY TYPING CONTROL C FROM THE CONSOLE OR BY PRESSING THE HALT SWITCH ON THE PROCESSOR FRONT PANEL.

3.5 RESTARTING

THE PROGRAM CAN BE RESTARTED AT ADDRESS 200 OR 204. (SEE SECTION 3.3)

4.0 OPERATOR INTERFACE

4.1 PROGRAM ID

THE PROGRAM TYPES ITS NAME AND MAINDEC NUMBER THE FIRST TIME IT IS STARTED AFTER BEING LOADED.

4.2 CONSOLE DIALOGUE

WHEN THE PROGRAM IS RUNNING IN STAND ALONE MODE, IT ENTERS A CONSOLE DIALOGUE SEQNENCE AFTER TYPING THE PROGRAM I.D..

THE FIRST QUESTION TYPED OUT IS: ''TYPE HELP TEXT (L) N ?''. IF THE OPERATOR RESPONDS WITH A ''Y'', THE PROGRAM WILL TYPE A BRIEF HELP MESSAGE WHICH WILL LIST SWITCH OPTIONS, ETC. ANY OTHER RESPONSE TO THE QUESTION IS CONSIDERED A 'N'' AND NO HELP TEXT IS TYPED. THIS QUESTION IS ONLY ASKED ON THE INITIAL PROGRAM START AND NOT ON SUBSEQUENT START-UP'S.

ON THE PROGRAM INITIAL START AND WHEN RESTARTING AT LOCATION 204, THE OPERATOR MAY CHANGE THE RH/RM BASE ADDRESSES WITH THE FOLLOWING DIALOGUE.

EXAMPLE 1

```
RMCS1=176700 <CR>        ;NO CHANGE IN ADDRESS
RMVEC=000254 <CR>        ;NO CHANGE IN ADDRESS
```

EXAMPLE 2

```
RMCS1=176700 177200<CR> ;CHANGE BASE ADDRESS TO 177200
RMVEC=000254 260<CR>    ;CHANGE VECTOR ADDRESS TO 260
```

ON THE INITIAL START, THE NEXT QUESTION TYPED IS, 'TYPE ''A'' TO TEST ALL DRIVES, OR TYPE DRIVE NUMBER(S) AND TERMINATE INPUT WITH A CARRIAGE RETURN'. THEN, 'DRIVE(S):' IS TYPED AND WAITS FOR THE OPERATOR TO TYPE AN ''A'', TO TEST ALL POSSIBLE DRIVES OR TYPE ANY STRING OF DRIVE NUMBER(S) TO BE TESTED AND TERMINATE THE INPUT WITH A ''CARRIAGE RETURN''. NO COMMAS OR ANY OTHER SEPARATORS ARE NEEDED WHEN ENTERING THE DRIVE NUMBERS AS A STRING. THE PROGRAM ENTERS THE COMMA SEPARTOR AUTOMATICALLY AFTER TYPING EACH NUMBER. ON ALL SUBSEQUENT STARTS, ONLY THE 'DRIVE(S):' PROMPT IS TYPED.

THE DIAGNOSTIC THEN INITIALIZES AND REPORTS THE STATUS OF THE DRIVES WHICH WHERE PREVIOUSLY SPECIFIED FOR TESTING. THE FOLLOWING IS AN EXAMPLE PRINTOUT:

```
'UNIT STATUS:
  0    ONLINE   RM03
  1    LOAD DEVICE
  2    OFFLINE  RM05
  3    NOT PRESENT
  4    NOT PRESENT
  5    NOT AN RM05/3/2
  6    NOT PRESENT
  7    NOT PRESENT'
```

THE ABOVE UNIT STATUS SHOWS THAT DRIVE 0 & 2 WILL BE TESTED, WHILE DRIVES 1, & 3 - 7 WILL NOT BE TESTED.

THE DIAGNOSTIC THEN TYPES THE FOLLOWING MESSAGE, BASED ON THE STATUS OF THE DRIVE:

'DRIVE(S) TO BE TESTED, 0, 2'

IF NO DRIVES ARE AVAILABLE FOR TESTING, THE FOLLOWING MESSAGE WILL BE TYPED TO THE OPERATOR:

'DRIVE(S) TO BE TESTED, NONE'

THE PROGRAM WILL THEN, EITHER START TESTING THE DRIVES AVAILABLE FOR TESTING OR RETURN TO THE BEGINNING OF THE PROGRAM AND WAIT.

ONCE THE DRIVES START TESTING, THE FOLLOWING MESSAGE WILL OCCUR AS EACH DRIVE BEGINS TO BE TESTED:

'DRIVE 0
 DRIVE 2'

AFTER ALL THE DRIVES ARE COMPLETELY TESTED, THE END OF PASS MESSAGE WILL BE TYPED (SEE SECTION 4.3) AND THE PROGRAM WILL START TESTING ALL THE DRIVES AGAIN. THIS WILL CONTINUE UNTIL THE PROGRAM IS HALTED BY THE OPERATOR.

NOTE: THE LETTER LOCATED WITHIN THE BRACKETS () INDICATES THE TYPE OF RESPONSE REQUIRED BY THE USER, D=DECIMAL, O=OCTAL AND L=LETTER.

4.3 PROGRESS REPORTS

AN END OF PASS REPORT OCCURS EACH TIME THE PROGRAM IS EXECUTED FOR ALL DEVICES IN THE TEST QUE. THE END OF PASS REPORT IS AS FOLLOWS.

'END OF PASS 1'

THE FOLLOWING MESSAGE WILL ALSO OCCUR IF THERE WERE ERRORS SINCE THE LAST END OF PASS REPORT.

'TOTAL ERRORS SINCE LAST REPORT 0'

4.4 PERFORMANCE REPORT

NO PERFORMANCE REPORTS ARE GIVEN DURING THE EXECUTION OF THE PROGRAM.

4.5 PROGRAM HALTS

THERE ARE NO SCHEDULED HALTS DURING THE EXECUTION OF THE PROGRAM. PROCESSOR HALTS ARE DUE TO THE TRAP CATCHER.

4.6 ERROR REPORTS

THE RM05/3/2 DISKLESS DIAGNOSTIC PROVIDES COMPREHENSIVE ERROR REPORTS INTENDED TO (1) AID IN FAULT RESOLUTION AND (2) MINIMIZE

REFERENCES TO PROGRAM LISTINGS.

THE FIRST LINE OF THE ERROR REPORT CONTAINS THE NUMBER OF THE UNIT (DRIVE) BEING TESTED, DRIVE TYPE, THE TEST NUMBER, THE ERROR NUMBER AND THE VALUE OF THE PROGRAM COUNTER WHERE THE ERROR WAS CALLED. THIS LINE IS FOLLOWED BY THE ERROR MESSAGE: SEVERAL LINES OF TEXT WHICH GIVE A COMPREHENSIVE DESCRIPTION OF THE ERROR, AND A LIST OF FAILING MODULES IN ORDER OF DECREASING PROBABILITY. THE ERROR MESSAGE IS NORMALLY FOLLOWED BY ONE OR MORE PAIRS OF LINES CONTAINING DATA HEADERS AND DATA PERTININENT TO THE ERROR, INCLUDING EXPECTED AND ACTUAL TEST RESULTS.

THE FOLLOWING PRINTOUT IS AN ERROR MESSAGE IN THIS PROGRAM:

```
DRV# 0 - RM03, TEST# 23, ERR# 61, PC=017724
INCORRECT ECC PATTERN GENERATED DURING WRITE
        PROBABLE FAULT(S):
        (NOT INCLUDING CABLES OR CONNECTORS)
        IF MODULE, M8685,

EXPECTED   ECC     RECEIVED  ECC
13117    175154    017677   003402
```

4.7 EXECUTION TIME

PASS 1 OF THE PROGRAM TAKES ABOUT 2 SECONDS. PASS 2 AND SUBSEQUENT PASSES TAKE 12 SECONDS.

5.0 ENVIRONMENTAL SUPPORT

5.1 PROCESSOR COMPATIBILITY

THE RM05/3/2 DISKLESS DIAGNOSTIC IS EXECUTABLE ON ANY PDP-11 PROCESSOR, PROVIDING PREVIOUSLY MENTIONED HARDWARE REQUIREMENTS ARE MET.

5.2 DUAL PORT CONFIGURATIONS

THE RM05/3/2 DISKLESS DIAGNOSTIC IS NOT EXECUTABLE ON RM05/3/2 SUBSYSTEMS HAVING THE DUAL PORT OPTION UNLESS THE DUAL PORT SWITCH IS SET TO THE APPROPRIATE PORT (A OR B) AND NOT TO THE PROGRAMMABLE POSITION (A/B).

5.3 MEMORY PARITY HARDWARE

MEMORY PARITY HARDWARE WILL NOT BE USED DURING THE EXECUTION OF THE RM05/3/2 DISKLESS DIAGNGOSTIC.

5.4 MEMORY MANAGEMENT HARDWARE

MEMORY MANAGEMENT HARDWARE WILL NOT BE USED DURING THE RM05/3/2 DISKLESS DIAGNOSTIC.

5.5 ACT11, APT11 COMPATIBILITY

THE RM05/3/2 DISKLESS DIAGNOSTIC PROGRAM IS COMPATIBLE WITH ACT11 AND APT11 IN BOTH DUMP AND AUTOMATIC MODES. FURTHER, THE PROGRAM WILL EXECUTE A QUICK PASS DURING THE FIRST PASS IN SUPPORT OF QUICK VERIFY MODE.

5.6 XXDP COMPATIBILITY

THE RM05/3/2 DISKLESS DIAGNOSTIC PROGRAM IS COMPATIBLE WITH XXDP IN DUMP AND CHAIN MODES.

5.7 OPERATING SYSTEM COMPATIBILITY

THE PROGRAM IS NOT REQUIRED TO BE COMPATIBLE WITH ANY OPERATING SYSTEM.

6.0 TEST DESCRIPTION

THE PROGRAM IS DESIGNED IN A BOTTOM UP MANNER SUCH THAT EACH TEST GENERALLY USES A MORE COMPLEX SUBSET OF HARDWARE THAN THE PREVIOUS TEST.

MODULE CALLOUT IS PREDICATED ON THE ASSUMPTION THAT EARLIER TESTS HAVE BEEN COMPLETED WITHOUT ERROR AND THAT ERRORS ARE DUE TO SINGLE, NONTRANSIENT HARDWARE FAILURES.

THE RM05/3/2 DISKLESS DIAGNOSTIC CAN BE EXECUTED USING AN RH70 OR AN RH11 MASSBUS CONTROLLER.

UNLESS SPECIFIED BY THE OPERATOR OR BY THE ENVIRONMENT TABLE THE TEST IS REPEATED FOR EACH POSSIBLE DEVICE STARTING WITH DEVICE 0.

THE MODULES WHICH MAY BE CALLED OUT DURING THE EXECUTION OF THE TEST ARE AS FOLLOWS:

IF
CS
DS
MASSBUS MODULE

THE RADIAL MODULE (RD) IS NOT TESTED BY THIS PROGRAM.

TEST 1 TRANSFER TEST

PURPOSE:

TO VERIFY THAT THE RM05/3/2 CAN COMPLETE A REGISTER TRANSFER ON THE MASSBUS, AND IN PARTICULAR, TO VERIFY THAT ''TRANSFER'' IS NOT STUCK IN AN INACTIVE STATE.

PROCEDURE:

THE PROGRAM WRITES AND READS REMOTE REGISTERS FOR THE SELECTED DEVICE. REGISTER CONTENTS AND PARITY ERRORS ARE IGNORED, AND THE TEST FAILS IF A 'NONEXISTENT DEVICE ERROR'' OR BUS TIMEOUT OCCURRS FOR EVERY REGISTER ACCESS. IF THE TFST FAILS THE PROGRAM JUMPS TO THE END OF PASS HANDLER WHICH SELECTS THE NEXT DEVICE TO BE TESTED.

PROBABLE FAULT:

THE TEST FAILS IF THE SELECTED DEVICE IS NONEXISTENT OR IS SWITCHED TO THE PROGRAMMABLE POSITION OR TO THE ALTERNATE PORT. THE FOLLOWING FAULTS ARE APPLICABLE ONLY WHEN THE DEVICE IS PRESENT AND IS SWITCHED TO THE APPROPRIATE PORT.

1. IF MODULE

2. ASYNCHRONOUS MASSBUS MODULE

3. CS MODULE

TEST 2 CTOD TEST

PURPOSE:

TO VERIFY THAT DATA CAN BE TRANSFERRED TO AND FROM THE RM05/3/2 USING THE CONTROL BUS AND, IN PARTICULAR, TO VERIFY THAT ''CONTROLLER TO DEVICE'' HAS NOT FAILED.

PROCEDURE:

THE TEST WRITES ONES IN REMOTE REGISTERS THEN READS EACH REGISTER WHICH WILL WRITE ZEROS IN THE REGISTER IF ''IF3 CTOD HOLD H'' IS STUCK AT ONE. THE TEST THEN READS AS MANY REMOTE REGISTERS AS ARE NECESSARY TO OBTAIN ONE OR MORE ONE BITS.

PROBABLE FAULT:

1. IF MODULE

2. ASYNCHRONOUS MASSBUS MODULE

TEST 3 MASSBUS INITIALIZE TEST

PURPOSE:

TO VERIFY THAT THE MASSBUS ADAPTER IS BEING INITIALIZED BY THE MASS BUS.

PROCEDURE:

USING CONTROLLER CLEAR TO INITIALIZE THE SELECTED UNIT, THIS TEST THEN READS MASSBUS ADAPTER REGISTERS TO VERIFY THAT AT LEAST ONE BIT IS CLEARED. MASSBUS ADAPTER REGISTERS ARE PRESET TO A NON ZERO VALUE PRIOR TO CONTROLLER CLEAR.

PROBABLE FAULT:

1. ASYNCHRONOUS MASSBUS MODULE

2. IF MODULE

3. CS MODULE

TEST 4 CLEAR STUCK ACTIVE TEST

PURPOSE:

TO VERIFY THAT 'MBA CLR L'' ON THE CS MODULE IS NOT STUCK IN AN ACTIVE STATE.

PROCEDURE:

CONTROLLER CLEAR IS USED TO INITIALIZE THE SELECTED UNIT, AFTER WHICH 1'S ARE WRITTEN IN ERROR REGISTERS 1 AND 2 AND MAINTENANCE REGISTER 1. IF ANY 1 BITS CAN BE READ BACK THE TEST IS OK, ELSE, 'MBA CLR L'' IS PROBABLY STUCK ACTIVE.

PROBABLE FAULT:

1. CS MODULE

2. IF MODULE

3. ASYNCHRONOUS MASSBUS MODULE

TEST 5 TRISTATE TRANSFER TEST

PURPOSE:

TO VERIFY THAT THE PATH TO AND FROM THE MASSBUS ADAPTER TRI-STATE REGISTER BUS IS NOT STUCK AT ONE OR ZERO AND THAT EACH BIT POSITION IS INDEPENDENT.

PROCEDURE:

THIS TEST PRESETS MASSBUS ADAPTER REGISTERS TO A NONZERO VALUE. THEN, ASSUMING THE REGISTERS ARE PRESET, IT CLEARS THEM USING A MOVE INSTRUCTION. THE TEST THEN READS AS MANY REGISTERS AS IS NECESSARY TO OBTAIN ONE OR MORE ZEROS FROM EACH BIT POSITION.

THE TEST CLEARS MASSBUS ADAPTER REGISTERS, THEN, ASSUMING THE REGISTERS ARE CLEARED, IT LOADS THEM WITH ONES AND READS AS MANY REGISTERS AS IS NECESSARY TO OBTAIN ONE OR MORE ONE BITS IN EACH BIT POSITION.

FINALLY, THE TEST WRITES A SINGLE ONE BIT PATTERN IN BIT 0 OF SELECTED REMOTE REGISTERS AND VERIFIES THAT THE PATTERN CAN BE READ BACK. THE ONE BIT IS SHIFTED AND THE TEST REPEATED FOR ALL BIT POSITIONS.

PROBABLE FAULT:

1. ASYNCHRONOUS MASSBUS MODULE

2. IF MODULE

3. CS MODULE

4. DS MODULE

TEST 6 REGISTER SELECT TEST

PURPOSE:

TO VERIFY THAT THE REGISTER SELECT LINES ARE NOT IN A STUCK POSITION.

PROCEDURE:

EACH REGISTER SELECT LINE IS TESTED BY WRITING ZEROS IN THOSE DEVICE REGISTERS FOR WHICH THE LINE MUST BE ZERO, THEN WRITING ONES IN THOSE DEVICE REGISTERS FOR WHICH THE LINE MUST BE ONE. THE ZERO REGISTER IS READ BACK AND IF THE SELECT LINE IS STUCK AT ZERO, THE ZERO REGISTER WILL CONTAIN ONES. THE PROCESS IS REPEATED TO DETECT A STUCK AT ONE FAULT, EXCEPT IN THIS CASE, THE ONES REGISTER IS WRITTEN FIRST.

```
514                         REGISTER SELECT LINES 1, 2, 4  AND  8  ARE  TESTED  IN  THIS
515                     MANNER;  SELECT LINE 16 IS EXPLICITLY TESTED IN THE ''ILR TEST''.
516
517                     PROBABLE FAULT:
518
519                     1.  IF MODULE
520
521                     2.  ASYNCHRONOUS MASSBUS MODULE
522
523
524
525
526
527                 TEST 7  DRIVE TYPE TEST
528
529                     PURPOSE:
530
531                         TO TEST THE 'DRIVE TYPE'' REGISTER, RMDT.
532
533                     PROCEDURE:
534
535                         THE PROGRAM READS RMDT AND VERIFIES THAT THE RESULT
536                     CORRESPONDS TO A SINGLE PORT OR DUAL PORT RM05, RM03 OR RM02 DRIVE.
537
538                     PROBABLE FAULT:
539
540                     1. IF MOULE
541
542
543
544
545
546                 TEST 10 DEVICE AVAILABLE TEST
547
548                     PURPOSE:
549
550                         TO VERIFY THAT DEVICE AVAILABLE STATUS IS SET.
551
552                     PROCEDURE:
553
554                         THE PROGRAM TESTS ''DVA'',BIT 11 OF RMCS1.
555
556                     PROBABLE FAULT:
557
558                     1. IF MODULE
559
560
561
562
563
564                 TEST 11 SEARCH TIMEOUT TEST
565
566                     PURPOSE:
567
568                         TO VERIFY THAT THE SEARCH TIMEOUT ONE SHOT SETS ''DPI'',
569                     EXCEPT WHEN ''SEARCH TO DISABLE'' IS ACTIVE.
570
```

```
                                PROCEDURE:

                                     WITH SEARCH TIMEOUT DISABLED, THE TEST EXECUTES A DATA
                                COMMAND TO THE POINT WHERE 'P ENABLE SEARCH'' IS ASSERTED.
                                AFTER WAITING A SUFFICIENT PERIOD AND VERIFYING THAT OPI
                                IS NOT SET, THE TEST ENABLES SEARCH TIMEOUT AND VERIFIES
                                THAT OPI SETS.

                                PROBABLE FAULT:

                                1.  CS MODULE

                                NOTE:       IT IS ASSUMED THAT THE ''SET OPI TEST'' HAS
                                            ALREADY PASSED, THUS MAKING THE IF MODULE
                                            AN IMPROBABLE FAULT.




                           TEST 12 SET DTE TEST

                                PURPOSE:

                                     IN ADDITION TO VERIFYING THAT 'DRIVE TIMING ERROR'' CAN
                                BE SET BY THE CS MODULE, THIS TEST ALSO VERIFIES

                                *   THAT 'MAINTENANCE SECTOR COMPARE'' IS NOT STUCK AT ONE
                                OR ZERO.

                                *   THAT ''ENABLE SEARCH'' IS NOT STUCK AT ONE OR ZERO.

                                PROCEDURE:

                                     (1)  INITIALIZE AND VERIFY THAT ''DTE'' IS RESET, THEN
                                SET MAINTENANCE INDEX PULSE AND VERIFY THAT DTE IS STILL
                                RESET.  THIS TEST WILL INSURE THAT THE SECTOR COMPARE FLOP
                                IS NOT STUCK AT ONE.

                                     (2)  EXECUTE A DATA COMMAND IN MAINTENANCE MODE TO
                                THE POINT WHERE SEARCH IS ENABLED, I.E., P EN SEARCH H IS
                                IS ACTIVE.  SET AND RESET THE SECTOR PULSE TO SET ''CS3 EN
                                SEARCH'' FLOP, AND CLOCK ''CSS SECTOR COMPARE'' FLOP WHICH
                                SHOULD NOT SET.  SET SECTOR PULSE AND VERIFY THAT DTE IS
                                RESET.  THIS TEST FAILS IF J INPUT TO SECTOR COMPARE FLOP
                                IS STUCK AT ONE.

                                     REPEAT, BUT SET MAINTENANCE SECTOR COMPARE AND VERIFY
                                THAT DTE SETS.  THIS TEST FAILS IF MAINTENANCE SECTOR
                                COMPARE IS STUCK AT ZERO.

                                PROBABLE FAULT:

                                1.  CS MODULE

                                2.  DS MODULF
```

TEST 13 FORMAT CHANGE TEST

PURPOSE:

TO VERIFY THAT A CHANGE IN FORMAT INHIBITS SFARCH ENABLE UNTIL THE NEXT INDEX PULSE.

PROCEDURE:

THE TEST WILL USE 'DTE'' FOR VISIBILITY OF ''CS3 EN SEARCH H''.

THE FOLLOWING STEPS ARE EXECUTED:

(1) INITIALIZE AND SET THE FORMAT TO 18 BIT MODE TO SET ''CS3 FMT CHANGE'' FLOP.

(2) EXECUTE A DATA COMMAND TO THE POINT WHERE SEARCH IS ENABLED BY THE SEQUENCER.

(3) SET 'MAINTENANCE SECTOR COMPARE'', THEN SET 'MAINTENANCE SECTOR PULSE'' TO CLOCK ''CS3 EN SEARCH'' FLOP WHICH SHOULD NOT SET BECAUSE OF THE FORMAT CHANGE.

(4) RESET SECTOR PULSE TO CLOCK ''CS5 SECTOR COMPARE'' FLOP WHICH WILL NOT SET IF ''CS3 EN SEARCH H'' IS INACTIVE.

(5) SET SECTOR PULSE AND VERIFY THAT DRIVE TIMING ERROR IS RESET.

(6) SET AND RESET INDEX PULSE TOCLEAR THE FORMAT CHANGE FLOP.

(7) SET AND RESET SECTOR PULSE TO SET ''CS3 EN SEARCH'' FLOP AND ''CS5 SECTOR COMPARE'' FLOP.

(8) SET SECTOR COMPARE AND VERIFY THAT DTE IS SET.

REPEAT THE TEST WITH A FORMAT CHANGE FROM 18 BIT MODE TO 16 BIT MODE.

PROBABLE FAULT:

1. CS MODULE

TEST 14 PROM STROBE TEST

PURPOSE:

TO VERIFY THAT WORD CLOCK AND PROM STROBE CAN BE MANIPULATED IN MAINTENANCE MODE.

PROCEDURE:

INITIALIZE AND SET 16 BIT MODE, THEN SEQUENCE THE MAINTENANCE CLOCK UNTIL PROM STROBE SETS. ISSUE -- MORE MAINTENANCE CLOCK PULSES AND VERIFY THAT PROM STROBE RESETS.

PROBABLE FAULT:

1. CS MODULE

2. DS MODULE

TEST 15 SYNC WORD COUNT INHIBIT TEST

PURPOSE:

TO VERIFY THE FOLLOWING DURING READ COMMAND:

* THAT ''CS4 P LFS'' (LOOKING FOR SYNC) GOES ACTIVE.

* THAT ''LOOKING FOR SYNC'' INHIBITS THE WORD COUNT

PROCEDURE:

A READ COMMAND IS SETUP AND EXECUTED TO THE POINT WHERE ''LOOKING FOR SYNC'' SHOULD BE ACTIVE, WITH THE PROGRAM VERIFYING THE TRANSITION OF THE SIGNAL. THE PROGRAM THEN SUPPLIES A SERIES OF BIT CLOCKS AND VERIFIES THAT ''PROM STROBE'' NEVER GOES ACTIVE.

PROBABLE FAULT:

1. CS MODULE IF LFS FAILS,

2. DS MODULE IF PROM STROBE FAILS.

TEST 16 SYNC DETECTION TEST

PURPOSE:

TO VERIFY THAT THE APPROPRIATE SYNC PATTERN IS RECOGNIZED.

PROCEDURE:

THE TEST EXECUTES A READ COMMAND IN MAINTENANCE MODE,

```
                        USING BIT 10 OF THE MAINTENANCE REGISTER (RMMR1) TO SIMULATE
                        THE SYNC BIT STREAM, AND USING PROM STROBE TO DETERMINE
                        IF THE SYNC PATTERN HAS BEEN DETECTED.

                             THE SYNC PATTERN IS 00011001, WITH THE LEFT MOST
                        BIT REPRESENTING THE LAST BIT OF THE STREAM.

                        PROBABLE FAULT:

                        1.  DS MODULE

                        2.  CS MODULE



                TEST 17 ABORT SYNC DETECTION TEST

                        PURPOSE:

                             TO VERIFY THAT 'WORD COUNT INHIBIT'' IS RESET IF A
                        'DRIVE TIMING ERROR'' OCCURS DURING SYNC DETECTION.

                        PROCEDURE:

                             A READ COMMAND IS INITIATED IN MAINTENANCE MODE.  WHEN
                        'LOOKING FOR SYNC'' GOES ACTIVE, THE TEST FORCES A DRIVE
                        TIMING ERROR AND USES PROM STROBE TO VERIFY THAT 'WORD
                        COUNT INHIBIT'' HAS BEEN RESET.

                        PROBABLE FAULT:

                        1.  DS MODULE



                TEST 20 SYNC GENERATION TEST

                        PURPOSE:

                             TO VERIFY THAT THE APPROPRIATE SYNC PATTERN IS
                        GENERATED DURING A FORMAT OPERATION.

                        PROCEDURE:

                             THE TEST EXECUTES A WRITE HEADER AND DATA COMMAND
                        IN MAINTENANCE MODE, AND VERIFIES THAT THE CORRECT SYNC
                        PATTERN IS GENERATED BY MONITORING WRITE DATA AT THE MAIN-
                        TENANCE REGISTER (RMMR1).

                        PROBABLE FAULT:

                        1.  DS MODULE
```

TEST 21 WRITE HEADER TEST

PURPOSE:

TO TEST THE OPERATION OF (1) THE DATA BUFFER AND SHIFT REGISTER AS WELL AS (2) THE ECC GENERATION DURING WRITE.

PROCEDURE:

A WRITE HEADER AND DATA COMMAND IS EXECUTED IN MAINTENANCE MODE. THE TEST VERIFIES HEADER WORDS ONE AND TWO AND THE CRC CHARACTER USING THE WRITE DATA BIT OF THE MAINTENANCE REGISTER.

AN RM02/3 USES CYLINDER 822., TRACK 4., SECTOR 31. AND 16 BIT FORMAT FOR THE TEST, WHICH CORRESPONSE TO THE FOLLOWING:

HEADER:

WORD 1 - 1101001100110110

WORD 2 - 0000010000011111

AN RM05 USES CYLINDER 822., TRACK 18., SECTOR 31. AND 16 BIT FORMAT FOR THIS TEST, WHICH CORRESPONSE TO THE FOLLOWING:

HEADER:

WORD 1 - 1101001100110110

WORD 2 - 0001001000011111

PROBABLE FAULT:

1. DS MODULE OR MASSBUS MODULE

TEST 22 HEADER COMPARE TEST

PURPOSE:

TO CHECK THE OPERATION OF (1) THE SHIFT REGISTER AND DATA BUFFER AS WELL AS THE (2) CRC GENERATOR DURING READ.

PROCEDURE:

THE TEST EXECUTES A READ HEADER AND DATA COMMAND IN MAINTENANCE MODE USING BIT 10 OF THE MAINTENANCE REGISTER (RMMR1) TO SIMULATE THE DATA BITS FOR THE FIRST AND SECOND

HEADER WORDS AS WELL AS THE CRC CHARACTER. THE CRC CHARACTER IS
IS FAULTED, AND THE TEST VERIFIES THAT A CRC ERROR IS DETECTED.
ADDITIONALLY, THE TEST VERIFIES THAT HEADER WORDS ONE AND TWO
ARE CORRECTLY TRANSFERD TO MEMORY.
THE TEST USES THE SAME HEADER AS IN THE PREVIOUS TEST EXCEPT
THAT BIT 15 IS INVERTED.

PROBABLE FAULT:

1. DS OR IF MODULE IF CRC ERROR NOT DETECTED;

2. DS OR MASSBUS MODULE IF DATA INCORRECT

TEST 23 ECC GENERATION TEST

PURPOSE:

TO CHECK ECC OPERATION DURING WRITE.

PROCEDURE:

A WRITE DATA COMMAND IS EXECUTED IN MAINTENANCE
MODE. ALL ONES DATA FIELD IS USED, AND THE TEST VERIFIES
THE ECC CHARACTER VIA THE WRITE DATA BIT OF THE MAINTENANCE
REGISTER. THE DATA FIELD IS NOT VERIFIED.

PROBABLE FAULT:

1. DS MODULE

TEST 24 ECC DETECTION TEST

PURPOSE:

TO CHECK THE ECC GENERATION DURING READ.

PROCEDURE:

THE TEST EXECUTES A READ DATA COMMAND IN MAINTENANCE
MODE, AN ALL ONES DATA FIELD IS USED, HOWEVER THE LAST DATA
WORD IS FAULTED.

THE TEST VERIFIES (1) THAT AN ECC ERROR IS DETECTED
AND THAT (2) THE POSITION AND PATTERN REGISTERS ARE VALID.

PROBABLE FAULT:

1. DS MODULE

```
                        ;*LAST REVISION 04-APR-81
677
678                     .TITLE  CZRMQB0 RM05/3/2 DSKLS TST 2
                        ;*COPYRIGHT (C) 1981
                        ;*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
                        ;*
679                     .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        14            LOOP ON TEST
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        11            INHIBIT ITERATIONS
                        ;*        10            BELL ON ERROR
                        ;*         9            LOOP ON ERROR
                        ;*         8            LOOP ON TEST IN SWR<7:0>
680                     ;*         7            TN128
                        ;*         6            TN64
                        ;*         5            TN32
                        ;*         4            TN16
                        ;*         3            TN8
                        ;*         2            TN4
                        ;*         1            TN2
                        ;*         0            TN1
681
682                     .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
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
    683
    684                         .SBTTL  RM REGISTER BIT DEFINITIONS
    685
    686                         ;*RMCS1 CONTROL STATUS REGISTER
    687
    688         004000          DVA     = BIT11                 ;DEVICE AVAILABLE-READ ONLY
    689         000040          F4      = BIT05                 ;FUNCTION CODE
    690         000020          F3      = BIT04                 ;FUNCTION CODE
    691         000010          F2      = BIT03                 ;FUNCTION CODE
    692         000004          F1      = BIT02                 ;FUNCTION CODE
    693         000002          F0      = BIT01                 ;FUNCTION CODE
    694         000001          GO      = BIT00                 ;GO BIT
    695         000077          FNCMSK  = 000077                ;FUNCTION CODE MASK
    696
    697                         ;FUNCTION CODES (BITS 01-05 OF RMCS1)
    698         000000          NOP     = 000000                ;NOP COMMAND
    699         000002          ILF02   = 000002                ;ILLEGAL COMMAND
    700         000004          SEEK    = 000004                ;SEEK COMMAND
    701         000006          RECAL   = 000006                ;RECALIBRATE COMMAND
    702         000010          DRVCLR  = 000010                ;DRIVE CLEAR COMMAND
    703         000012          RLEASE  = 000012                ;RELEASE COMMAND
    704         000014          OFFSET  = 000014                ;OFFSET COMMAND
    705         000016          RTC     = 000016                ;RETURN TO CENTERLINE COMMAND
    706         000020          RIP     = 000020                ;READ IN PRESET COMMAND
    707         000022          PAKACK  = 000022                ;PACK ACKNOWLEDGE COMMAND
    708         000022          PACACK  = PAKACK
    709         000024          ILF24   = 000024                ;ILLEGAL COMMAND
    710         000026          ILF26   = 000026                ;ILLEGAL COMMAND
    711         000030          SEARCH  = 000030                ;SEARCH COMMAND
```

RM REGISTER BIT DEFINITIONS

```
714     000030          ILF30   = 000030        ;ILLEGAL COMMAND
        000032          ILF32   = 000032        ;ILLEGAL COMMAND
        000034          ILF34   = 000034        ;ILLEGAL COMMAND
        000036          ILF36   = 000036        ;ILLEGAL COMMAND
        000040          ILF40   = 000040        ;ILLEGAL COMMAND
        000042          ILF42   = 000042        ;ILLEGAL COMMAND
        000044          ILF44   = 000044        ;ILLEGAL COMMAND
        000046          ILF46   = 000046        ;ILLEGAL COMMAND
715     000050          WCD     = 000050        ;WRITE CHECK DATA COMMAND
716     000052          WCH     = 000052        ;WRITE CHECK HEADER AND DATA
717     000054          ILF54   = 000054        ;ILLEGAL COMMAND
718     000056          ILF56   = 000056        ;ILLEGAL COMMAND
719     000060          WD      = 000060        ;WRITE DATA COMMAND
720     000062          WH      = 000062        ;WRITE HEADER AND DATA COMMAND
721     000064          ILF64   = 000064        ;ILLEGAL COMMAND
722     000066          ILF66   = 000066        ;ILLEGAL COMMAND
723     000070          RD      = 000070        ;READ DATA COMMAND
724     000072          RH      = 000072        ;READ HEADER AND DATA COMMAND
725     000074          ILF74   = 000074        ;ILLEGAL COMMAND
726     000076          ILF76   = 000076        ;ILLEGAL COMMAND
727
728                     ;*RMDA  DISK ADDRESS REGISTER
729
730                     ;TRACK ADDRESS DEFINITIONS
731     010000          TA16    = BIT12         ;TRACK ADDRESS 16.
732     004000          TA8     = BIT11         ;TRACK ADDRESS 8.
733     002000          TA4     = BIT10         ;TRACK ADDRESS 4
734     001000          TA2     = BIT09         ;TRACK ADDRESS 2
735     000400          TA1     = BIT08         ;TRACK ADDRESS 1
736
737                     ;SECTOR ADDRESS DEFINITIONS
738     000020          SA16    = BIT04         ;SECTOR ADDRESS 16.
739     000010          SA8     = BIT03         ;SECTOR ADDRESS 8.
740     000004          SA4     = BIT02         ;SECTOR ADDRESS 4
741     000002          SA2     = BIT01         ;SECTOR ADDRESS 2
742     000001          SA1     = BIT00         ;SECTOR ADDRESS 1
743
744                     ;TRACK & SECTOR MASKS
745     177400          TADMSK  = 177400        ;TRACK ADDRESS MASK
746     000377          SADMSK  = 000377        ;SECTOR ADDRESS MASK
747
748                     ;*RMDS  DRIVE STATUS REGISTER
749
750     100000          ATA     = BIT15         ;ATTENTION ACTIVE
751     040000          ERR     = BIT14         ;COMPOSITE ERROR
752     020000          PIP     = BIT13         ;POSITIONING IN PROGRESS
753     010000          MOL     = BIT12         ;MEDIUM ON LINE
754     004000          WRL     = BIT11         ;WRITE LOCK
755     002000          LBT     = BIT10         ;LAST BLOCK TRANSFERRED
756     001000          PGM     = BIT09         ;PROGRAMMABLE
757     000400          DPR     = BIT08         ;DRIVE PRESENT
758     000200          DRY     = BIT07         ;DRIVE READY
759     000100          VV      = BIT06         ;VOLUME VALID
760     000001          OM      = BIT00         ;OFFSET MODE ACTIVE
761
762                     ;*RMER1 ERROR REGISTER #1
763
```

```
                        DCK     = BIT15                 ;DATA CHECK ERROR
                        UNS     = BIT14                 ;DRIVE UNSAFE
                        OPI     = BIT13                 ;OPERATION INCOMPLETE
                        DTE     = BIT12                 ;DRIVE TIMING ERROR
                        WLE     = BIT11                 ;WRITE LOCK ERROR
                        IAE     = BIT10                 ;INVALID ADDRESS ERROR
                        AOE     = BIT09                 ;ADDRESS OVERFLOW ERROR
                        HCRC    = BIT08                 ;HEADER CRC ERROR
                        HCE     = BIT07                 ;HEADER COMPARE ERROR
                        ECH     = BIT06                 ;ECC "HARD" ERROR
                        WCF     = BIT05                 ;WRITE CLOCK FAILURE
                        FER     = BIT04                 ;FORMAT ERROR
                        PAR     = BIT03                 ;PARITY ERROR
                        RMR     = BIT02                 ;REGISTER MODIFICATION REFUSED
                        ILR     = BIT01                 ;ILLEGAL REGISTER
                        ILF     = BIT00                 ;ILLEGAL FUNCTION

000000 115760           NDTMSK  = DCK!DTE!WLE!AOE!HCRC!HCE!ECH!WCF!FER
                        ;"NDTMSK" IS USED TO MASK ERROR REGISTER 1 DURING NON - DATA
                        ;COMMANDS, I.E., HOUSEKEEPING AND POSITIONING COMMANDS

                        ;*RMAS  ATTENTION SUMMARY REGISTER

000000 000377           ATNMSK  = 377                   ;MASK FOR ATTENTION BITS

                        ;*RMLA  LOOK AHEAD REGISTER

                        SC4     = BIT10                 ;SECTOR COUNT = 16
                        SC3     = BIT09                 ;SECTOR COUNT = 8
                        SC2     = BIT08                 ;SECTOR COUNT = 4
                        SC1     = BIT07                 ;SECTOR COUNT = 2
                        SC0     = BIT06                 ;SECTOR COUNT = 1

000000 003700           SCTMSK  = 003700                ;SECTOR COUNT MASK

                        ;*RMMR1 MAINTENANCE REGISTER #1

                        ;WRITE ONLY BITS
                        DBCK    = BIT15                 ;DEBUG CLOCK
                        DBEN    = BIT14                 ;DEBUG CLOCK ENABLE
                        DEBL    = BIT13                 ;DIAGNOSTIC END OF BLOCK
                        MSEN    = BIT12                 ;SEARCH TIMEOUT ENABLE
                        MCLK    = BIT11                 ;MAINTENANCE CLOCK
                        MRD     = BIT10                 ;READ DATA
                        MUR     = BIT09                 ;UNIT READY
                        MOC     = BIT08                 ;ON CYLINDER
                        MSER    = BIT07                 ;SEEK ERROR
                        MDF     = BIT06                 ;DRIVE FAULT
                        MS      = BIT05                 ;SECTOR PULSE
                        MWP     = BIT03                 ;WRITE PROTECT
                        MI      = BIT02                 ;INDEX PULSE
                        MSC     = BIT01                 ;SECTOR COMPARE
                        DMD     = BIT00                 ;DIAGNOSTIC MODE

                        ;READ ONLY BITS
                        OCC     = BIT15                 ;OCCUPIED
                        RG      = BIT14                 ;RUN AND GO
```

```
821          020000          EBL     = BIT13                 ;END OF BLOCK
822          010000          REX     = BIT12                 ;EXCEPTION
823          004000          ESRC    = BIT11                 ;ENABLE SEARCH
824          002000          PLFS    = BIT10                 ;LOOKING FOR SYNC
825          001000          ECRC    = BIT09                 ;ENABLE CRC OUT
826          000400          PDA     = BIT08                 ;DATA AREA
827          000200          PHA     = BIT07                 ;HEADER AREA
828          000100          CONT    = BIT06                 ;CONTINUE
829          000040          WC      = BIT05                 ;WORD CLOCK
830          000020          EECC    = BIT04                 ;ENABLE ECC OUT
831          000010          MWD     = BIT03                 ;WRITE DATA BIT
832          000004          LS      = BIT02                 ;LAST SECTOR
833          000002          LST     = BIT01                 ;LAST SECTOR AND TRACK
834          000001          DMD     = BIT00                 ;DIAGNOSTIC MODE
835          051401          MR1AAA  = DMD!MUR!DBEN!MOC!MSEN
836
837                          ;*RMDT  DRIVE TYPE REGISTER
838
839          100000          NSA     = BIT15                 ;NOT SECTOR ADDRESSED = 0
840          040000          TAP     = BIT14                 ;TAPE DRIVE = 0
841          020000          MOH     = BIT13                 ;MOVING HEAD = 1
842          004000          DRQ     = BIT11                 ;DRIVE REQUEST REQUIRED
843
844          020024          SNGPRT  = 020024                ;SINGLE PORT DRIVE TYPE
845          024024          DULPRT  = 024024                ;DUAL PORT DRIVE TYPE
846
847                          ;*RMOF  OFFSET REGISTER
848
849          010000          FMT16   = BIT12                 ;16 BIT WORD FORMAT
850          004000          ECI     = BIT11                 ;ECC INHIBIT
851          002000          HCI     = BIT10                 ;HEADER COMPARE INHIBIT
852          000200          OFD     = BIT07                 ;OFFSET FORWARD
853          161577          XNUOF   = 161577                ;UNSED BITS OF RMOF
854
855                          ;*RMDC  DESIRED CYLINDER ADDRESS REGISTER
856
857          001777          CYLMSK  = 001777                ;MASK FOR CYLINDER ADDRESS
858          176000          XNUDC   = 176000                ;UNSED BITS OF RMDC
859
860                          ;*RMMR2 MAINTENANCE REGISTER #2
861
862                          ;READ ONLY BITS
863          100000          RQA     = BIT15                 ;PORT A REQUEST
864          040000          RQB     = BIT14                 ;PORT B REQUEST
865          020000          TAG     = BIT13                 ;TAG CONTROL
866          010000          TST     = BIT12                 ;COMMAND SEQUENCE TEST BIT
867          004000          CC      = BIT11                 ;CONTROL OR CYLINDER TAG
868          002000          CH      = BIT10                 ;CONTROL OR HEAD TAG
871          001000          BB09    = BIT09                 ;TAG BUS
             000400          BB08    = BIT08                 ;TAG BUS
             000200          BB07    = BIT07                 ;TAG BUS
             000100          BB06    = BIT06                 ;TAG BUS
             000040          BB05    = BIT05                 ;TAG BUS
             000020          BB04    = BIT04                 ;TAG BUS
             000010          BB03    = BIT03                 ;TAG BUS
             000004          BB02    = BIT02                 ;TAG BUS
             000002          BB01    = BIT01                 ;TAG BUS
```

```
                000001          BB00    = BIT00                 ;TAG BUS
872
873                             ;*RMER2 ERROR REGISTER 2
874
875             100000          BSE     = BIT15                 ;BAD SECTOR ERROR
876             040000          SKI     = BIT14                 ;SEEK INCOMPLETE
877             020000          OPE     = BIT13                 ;OPERATOR PLUG ERROR
878             010000          IVC     = BIT12                 ;INVALID COMMAND ERROR
879             004000          LSC     = BIT11                 ;LOSS OF SYSTEM CLOCK
880             002000          LBC     = BIT10                 ;LOSS OF BIT CLOCK
881             000200          DVC     = BIT07                 ;DEVICE CHECK
882             000010          DPF     = BIT03                 ;DATA PARITY ERROR
883             001567          XNUER2  = 001567                ;UNSED BITS OF RMER2
884
885                             .SBTTL  PROGRAM MNEMONICS
886
887             100000          MSE     = BIT15                 ;MANUFACTURING DETECTED SECTOR ERROR
888             040000          JSE     = BIT14                 ;USER DETECTED SECTOR ERROR
889
890                             .SBTTL  RM REGISTER INDEX VALUES
891
892             000000          RMCS1   = 00                    ;CONTROL STATUS REGISTER #1
893             000006          RMDA    = 06                    ;DISK ADDRESS REGISTER
894             000012          RMDS    = 12                    ;DRIVE STATUS REGISTER
895             000014          RMER1   = 14                    ;ERROR REGISTER #1
896             000016          RMAS    = 16                    ;ATTENTION SUMMARY REGISTER
897             000020          RMLA    = 20                    ;LOOK AHEAD REGISTER
898             000024          RMMR1   = 24                    ;MAINTENANCE REGISTER
899             000026          RMDT    = 26                    ;DRIVE TYPE REGISTER
900             000030          RMSN    = 30                    ;SERIAL NUMBER REGISTER
901             000032          RMOF    = 32                    ;OFFSET REGISTER
902             000034          RMDC    = 34                    ;DESIRED CYLINDER REGISTER
903             000036          RMHR    = 36                    ;HOLDING REGISTER
904             000040          RMMR2   = 40                    ;MAINTENANCE REGISTER #2
905             000042          RMER2   = 42                    ;ERROR REGISTER #2
906             000044          RMEC1   = 44                    ;ECC POSITION REGISTER
907             000046          RMEC2   = 46                    ;ECC PATTERN REGISTER
910             000050          ILRG50  = 50                    ;ILLEGAL REGISTER 50
                000052          ILRG52  = 52                    ;ILLEGAL REGISTER 52
                000054          ILRG54  = 54                    ;ILLEGAL REGISTER 54
                000056          ILRG56  = 56                    ;ILLEGAL REGISTER 56
                000060          ILRG60  = 60                    ;ILLEGAL REGISTER 60
                000062          ILRG62  = 62                    ;ILLEGAL REGISTER 62
                000064          ILRG64  = 64                    ;ILLEGAL REGISTER 64
                000066          ILRG66  = 66                    ;ILLEGAL REGISTER 66
                000070          ILRG70  = 70                    ;ILLEGAL REGISTER 70
                000072          ILRG72  = 72                    ;ILLEGAL REGISTER 72
                000074          ILRG74  = 74                    ;ILLEGAL REGISTER 74
                000076          ILRG76  = 76                    ;ILLEGAL REGISTER 76
911
912
913             000077          IDXMSK  = 77                    ;MASK FOR REGISTER INDEX NUMBER
914
915                             .SBTTL  RH CONTROLLER REGISTER BIT DEFINITIONS
916
917                             ;*RMCS1 CONTROL STATUS REGISTER #1
918
```

```
                        SC      = BIT15                 ;SPECIAL CONDITION-READ ONLY
                        TRE     = BIT14                 ;TRANSFER ERROR
                        MCPE    = BIT13                 ;MASSBUS CONTROL BUS PARITY ERROR-READ ONLY
                        PSEL    = BIT10                 ;PORT B SELECT
                        A17     = BIT09                 ;ADDRESS EXTENSION
                        A16     = BIT08                 ;ADDRESS EXTENSION
                        RDY     = BIT07                 ;READY-READ ONLY
                        IE      = BIT06                 ;INTERRUPT ENABLE

                        ;*RMCS2 RH CONTROL STATUS REGISTER #2

                        DLT     = BIT15                 ;DATA LATE-READ ONLY
                        WCE     = BIT14                 ;WRITE CHECK ERROR-READ ONLY
                        UPE     = BIT13                 ;UNIBUS PARITY ERROR
                        NED     = BIT12                 ;NONEXISTANT DRIVE-READ ONLY
                        NEM     = BIT11                 ;NONEXISTANT MEMORY-READ ONLY
                        PGE     = BIT10                 ;PROGRAM ERROR-READ ONLY
                        MXF     = BIT09                 ;MISSED TRANSFER
                        MDPE    = BIT08                 ;MASSBUS DATA BUS PARITY ERROR-READ ONLY
                        OR      = BIT07                 ;OUTPUT READY-READ ONLY
                        IR      = BIT06                 ;INPUT READY-READ ONLY
                        CLR     = BIT05                 ;CONTROLLER CLEAR
                        PAT     = BIT04                 ;PARITY TEST
                        BAI     = BIT03                 ;UNIBUS ADDRESS INCREMENT INHIBIT
                        U2      = BIT02                 ;UNIT SELECT
                        U1      = BIT01                 ;UNIT SELECT
                        U0      = BIT00                 ;UNIT SELECT

                        ;UNIT SELECT MASK

000007                  UNTMSK  = 7                     ;UNIT SELECT MASK

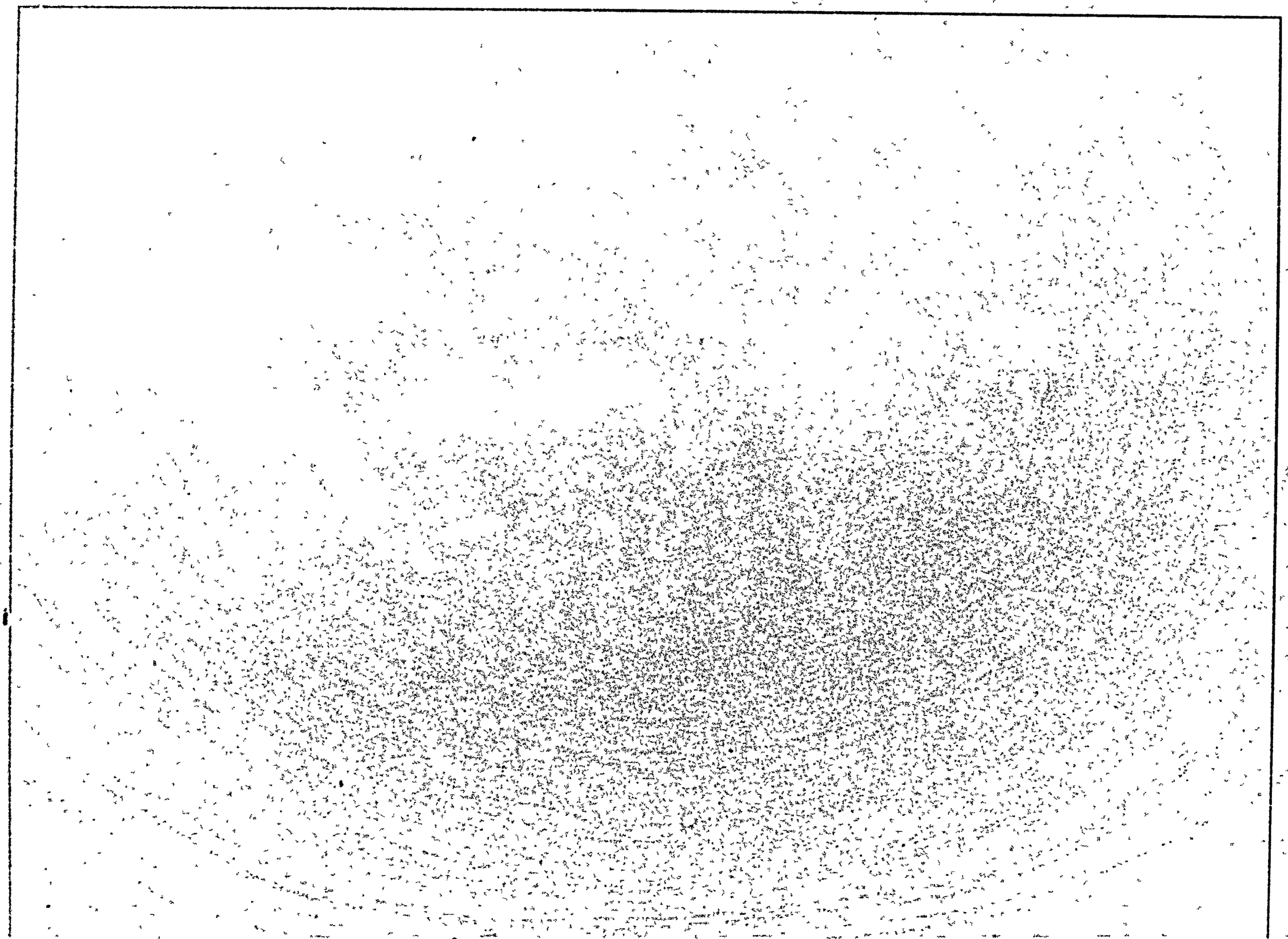
                        ;*RMCS3 RH70 CONTROL STATUS REGISTER #3

                        APE     = BIT15                 ;ADDRESS PARITY ERROR
                        DPEHI   = BIT14                 ;DATA PARITY ERROR HIGH WORD
                        DPELO   = BIT13                 ;DATA PARITY ERROR LOW WORD
                        WCEHI   = BIT12                 ;WRITE CHECK ERROR HIGH WORD
                        WCELO   = BIT11                 ;WRITE CHECK ERROR LOW WORD
                        DBL     = BIT10                 ;DOUBLE WORD TRANSFER
                        IE      = BIT06                 ;INTERRUPT ENABLE
                        IPCK3   = BIT03                 ;INVERT PARITY CHECK
                        IPCK2   = BIT02                 ;INVERT PARITY CHECK
                        IPCK1   = BIT01                 ;INVERT PARITY CHECK
                        IPCK0   = BIT00                 ;INVERT PARITY CHECK

                        .SBTTL  RH CONTROLLER REGISTER INDEX VALUES

000000                  RMCS1   = 00                    ;CONTROL, STATUS REGISTER #1
000002                  RMWC    = 02                    ;WORD COUNT REGISTER
000004                  RMBA    = 04                    ;BUS ADDRESS REGISTER
000010                  RMCS2   = 10                    ;CONTROL, STATUS REGISTER #2
000022                  RMDB    = 22                    ;DATA BUFFER
000050                  RMBAE   = 50                    ;BUS ADDRESS EXTENSION
000052                  RMCS3   = 52                    ;CONTROL, STATUS REGISTER #3

176700                  ABASE   = 176700                ;UNIBUS ADDRESS
```



```
                                .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  002732               JMP     @#START         ;;JUMP TO STARTING ADDRESS OF PROGRAM
2
3 000204  000137  002722               JMP     @#START1        ;CHANGE RH/RM BUS ADDRESS
4
5                               .SBTTL  ACT11 HOOKS

                                ;;**************************************************************
                                ;HOOKS REQUIRED BY ACT11
                000210                  $SVPC=.                 ;SAVE PC
                000046          .=46
  000046  021530                $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                000052          .=52
  000052  000000                .WORD   0                       ;;2)SET LOC.52 TO ZERO
                000210          .=$SVPC                         ;; RESTORE PC
6
7               001100          .=1100
8                               .SBTTL  APT PARAMETER BLOCK

                                ;;**************************************************************
                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                ;;**************************************************************
                001100                  .$X=.   ;;SAVE CURRENT LOCATION
                000024          .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
  000024  000200                200     ;;FOR APT START UP
                000044          .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
  000044  001100                $APTHDR ;;POINT TO APT HEADER BLOCK
                001100          .=.$X   ;;RESET LOCATION COUNTER
                                ;;**************************************************************
                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                ;INTERFACE SPEC.

  001100                        $APTHD:
  001100  000000                $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
  001102  001222                $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
  001104  000002                $TSTM:  .WORD   2       ;;RUN TIM OF LONCEST TEST
  001106  000002                $PASTM: .WORD   2       ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
  001110  000002                $UNITM: .WORD   2       ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDED UNIT
  001112  000042                        .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
9               001114          TAGADR=.
```

```
      0                                 .SBTTL  COMMON TAGS

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

            001114                              .=TAGADR
  001114                        $CMTAG:                         ;;START OF COMMON TAGS
  001114    000000                      .WORD   0
  001116       000              $TSTNM: .BYTE   0                ;;CONTAINS THE TEST NUMBER
  001117       000              $ERFLG: .BYTE   0                ;;CONTAINS ERROR FLAG
  001120    000000              $ICNT:  .WORD   0                ;;CONTAINS SUBTEST ITERATION COUNT
  001122    000000              $LPADR: .WORD   0                ;;CONTAINS SCOPE LOOP ADDRESS
  001124    000000              $LPERR: .WORD   0                ;;CONTAINS SCOPE RETURN FOR ERRORS
  001126    000000              $ERTTL: .WORD   0                ;;CONTAINS TOTAL ERRORS DETECTED
  001130       000              $ITEMB: .BYTE   0                ;;CONTAINS ITEM CONTROL BYTE
  001131       001              $ERMAX: .BYTE   1                ;;CONTAINS MAX. ERRORS PER TEST
  001132    000000              $ERRPC: .WORD   0                ;;CONTAINS PC OF LAST ERROR INSTRUCTION
  001134    000000              $GDADR: .WORD   0                ;;CONTAINS ADDRESS OF 'GOOD' DATA
  001136    000000              $BDADR: .WORD   0                ;;CONTAINS ADDRESS OF 'BAD' DATA
  001140    000000              $GDDAT: .WORD   0                ;;CONTAINS 'GOOD' DATA
  001142    000000              $BDDAT: .WORD   0                ;;CONTAINS 'BAD' DATA
  001144    000000                      .WORD   0                ;;RESERVED--NOT TO BE USED
  001146    000000                      .WORD   0
  001150       000              $AUTOB: .BYTE   0                ;;AUTOMATIC MODE INDICATOR
  001151       000              $INTAG: .BYTE   0                ;;INTERRUPT MODE INDICATOR
  001152    000000                      .WORD   0
  001154    177570              SWR:    .WORD   DSWR             ;;ADDRESS OF SWITCH REGISTER
  001156    177570              DISPLAY: .WORD  DDISP            ;;ADDRESS OF DISPLAY REGISTER
  001160    177560              $TKS:   177560                   ;;TTY KBD STATUS
  001162    177562              $TKB:   177562                   ;;TTY KBD BUFFER
  001164    177564              $TPS:   177564                   ;;TTY PRINTER STATUS REG. ADDRESS
  001166    177566              $TPB:   177566                   ;;TTY PRINTER BUFFER REG. ADDRESS
  001170       000              $NULL:  .BYTE   0                ;;CONTAINS NULL CHARACTER FOR FILLS
  001171       002              $FILLS: .BYTE   2                ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
  001172       012              $FILLC: .BYTE   12               ;;INSERT FILL CHARS. AFTER A 'LINE FEED"
  001173       000              $TPFLG: .BYTE   0                ;;"TERMINAL AVAILABLE" FLAG (BIT<07>-0=YES)
  001174    000000              $TMP0:  .WORD   0                ;;USER DEFINED
  001176    000000              $TMP1:  .WORD   0                ;;USER DEFINED
  001200    000000              $TMP2:  .WORD   0                ;;USER DEFINED
  001202    000000              $TMP3:  .WORD   0                ;;USER DEFINED
  001204    000000              $TMP4:  .WORD   0                ;;USER DEFINED
  001206    000000              $TIMES: 0                        ;;MAX. NUMBER OF ITERATIONS
  001210    000000              $ESCAPE:0                        ;;ESCAPE ON ERROR ADDRESS
  001212       207      377      377 $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
  001216       077              $QUES:  .ASCII  /?/              ;;QUESTION MARK
  001217       015              $CRLF:  .ASCII  <15>             ;;CARRIAGE RETURN
  001220       012      000     $LF:    .ASCIZ  <12>             ;;LINE FEED
                                        ;;*****************************************************************
                                        .SBTTL  APT MAILBOX-ETABLE

                                        ;;*****************************************************************
                                        .EVEN
  001222                        $MAIL:                          ;;APT MAILBOX
  001222    000000              $MSGTY: .WORD   AMSGTY           ;;MESSAGE TYPE CODE
  001224    000000              $FATAL: .WORD   AFATAL           ;;FATAL ERROR NUMBER
  001226    000000              $TESTN: .WORD   ATESTN           ;;TEST NUMBER
```

```
001230  000000          $PASS:  .WORD   APASS   ;;PASS COUNT
001232  000000          $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
001234  000000          $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
001236  000000          $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001240  000000          $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001242                  $ETABLE:                ;;APT ENVIRONMENT TABLE
001242      000         $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
001243      000         $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
001244  000000          $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
001246  000000          $USWR:  .WORD   AUSWR   ;;USER SWITCHES
001250  000000          $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
                        ;*                      BITS 15-11=CPU TYPE
                        ;*                              11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                        ;*                              11/70=06,PDQ=07,Q=10
                        ;*                      BIT 10=REAL TIME CLOCK
                        ;*                      BIT  9=FLOATING POINT PROCESSOR
                        ;*                      BIT  8=MEMORY MANAGEMENT
001252      000         $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
001253      000         $MTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
                        ;*                      MEM.TYPE BYTE   --  (HIGH BYTE)
                        ;*                              900 NSEC CORE=001
                        ;*                              300 NSEC BIPOLAR=002
                        ;*                              500 NSEC MOS=003
001254  000000          $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                        ;*                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
001256      000         $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
001257      000         $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
001260  000000          $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
001262      000         $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
001263      000         $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
001264  000000          $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
001266      000         $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
001267      000         $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
001270  000000          $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
001272  120254          $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
001274  000000          $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
001276  176700          $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001300  000000          $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
001302  000000          $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
001304  000000          $CDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
001306  000000          $DDW0:  .WORD   ADDW0   ;;DEVICE DESCRIPTOR WORD#0
001310  000000          $DDW1:  .WORD   ADDW1   ;;DEVICE DESCRIPTOR WORD#1
001312  000000          $DDW2:  .WORD   ADDW2   ;;DEVICE DESCRIPTOR WORD#2
001314  000000          $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
001316  000000          $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
001320  000000          $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
001322  000000          $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
001324  000000          $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
001326                  $ETEND:
                        .MEXIT
```

```
                        .SBTTL  USER DEFINED TAGS

001326  000000  AUTSIZ: .WORD   0       ;ALLOW AUTO DRIVE SIZING = 0, USE MANUALLY INPUT DRIVES = 1
001330  000000  CHGADR: .WORD   0       ;CHANGE RH/RM BUS ADDRESS = -1, NO CHANGE = 0
001332  000000  XXDP:   .WORD   0       ;THE LOW BYTE CONTAINS THE DRIVE NUMBER FROM WHICH
                                        ;THE PROGRAM WAS LOADED. THE HIGH BYTE CONTAINS THE
                                        ;'XXDP' DEVICE CODE FOR THE RM05/3/2.
001334      000 LSTRK:  .BYTE   0       ;LO BYTE = 0
001335      000         .BYTE   0       ;HI BYTE, CONTAINS LAST TRACK ADDRESS OF UNIT
                                        ;UNDER TEST. RM02/3 = 4., RM05 = 18.

                        ;THE REGISTER INPUT BUFFER IS USED FOR
                        ;STORING DRIVE STATUS

001336                  GETBUF:

                        ;REGISTER INPUT BUFFER
001336  000000  RMCS1I: .WORD   0       ;CONTROL, STATUS REGISTER #1
001340  000000  RMWCI:  .WORD   0       ;WORD COUNT REGISTER
001342  000000  RMBAI:  .WORD   0       ;BUS ADDRESS REGISTER
001344  000000  RMDAI:  .WORD   0       ;DISK ADDRESS REGISTER
001346  000000  RMCS2I: .WORD   0       ;CONTROL, STATUS REGISTER #2
001350  000000  RMDSI:  .WORD   0       ;DRIVE STATUS REGISTER
001352  000000  RMER1I: .WORD   0       ;ERROR REGISTER #1
001354  000000  RMASI:  .WORD   0       ;ATTENTION SUMMARY REGISTER
001356  000000  RMLAI:  .WORD   0       ;LOOK AHEAD REGISTER
001360  000000  RMDBI:  .WORD   0       ;DATA BUFFER
001362  000000  RMMR1I: .WORD   0       ;MAINTENANCE REGISTER #1
001364  000000  RMDTI:  .WORD   0       ;DRIVE TYPE REGISTER
001366  000000  RMSNI:  .WORD   0       ;SERIAL NUMBER REGISTER
001370  000000  RMOFI:  .WORD   0       ;OFFSET REGISTER
001372  000000  RMDCI:  .WORD   0       ;DESIRED CYLINDER REGISTER
001374  000000  RMHRI:  .WORD   0       ;HOLDING REGISTER
001376  000000  RMMR2I: .WORD   0       ;MAINTENANCE REGISTER #2
001400  000000  RMER2I: .WORD   0       ;ERROR REGISTER #2
001402  000000  RMEC1I: .WORD   0       ;ECC POSITION REGISTER
001404  000000  RMEC2I: .WORD   0       ;ECC PATTERN REGISTER
001406  000000  RMBAEI: .WORD   0       ;BUS ADDRESS EXTENSION REGISTER
001410  000000  RMCS3I: .WORD   0       ;CONTROL, STATUS REGISTER #3

                        ;THE REGISTER OUTPUT BUFFER IS USED FOR
                        ;ASSEMBLING DATA GOING TO REGISTER

001412                  PUTBUF:

                        ;REGISTER OUTPUT BUFFER
001412  000000  RMCS1O: .WORD   0       ;CONTROL, STATUS REGISTER #1
001414  000000  RMWCO:  .WORD   0       ;WORD COUNT REGISTER
001416  000000  RMBAO:  .WORD   0       ;BUS ADDRESS REGISTER
001420  000000  RMDAO:  .WORD   0       ;DISK ADDRESS REGISTER
001422  000000  RMCS2O: .WORD   0       ;CONTROL, STATUS REGISTER #2
001424  000000  RMDSO:  .WORD   0       ;DRIVE STATUS REGISTER
001426  000000  RMER1O: .WORD   0       ;ERROR REGISTER #1
001430  000000  RMASO:  .WORD   0       ;ATTENTION SUMMARY REGISTER
001432  000000  RMLAO:  .WORD   0       ;LOOK AHEAD REGISTER
001434  000000  RMDBO:  .WORD   0       ;DATA BUFFER
001436  000000  RMMR1O: .WORD   0       ;MAINTENANCE REGISTER #1
```

```
001440  000000          RMDTO:  .WORD   0       ;DRIVE TYPE REGISTER
001442  000000          RMSNO:  .WORD   0       ;SERIAL NUMBER REGISTER
001444  000000          RMOFO:  .WORD   0       ;OFFSET REGISTER
001446  000000          RMDCO:  .WORD   0       ;DESIRED CYLINDER REGISTER
001450  000000          RMHRO:  .WORD   0       ;HOLDING REGISTER
001452  000000          RMMR20: .WORD   0       ;MAINTENANCE REGISTER #2
001454  000000          RMER20: .WORD   0       ;ERROR REGISTER #2
001456  000000          RMEC10: .WORD   0       ;ECC POSITION REGISTER
001460  000000          RMEC20: .WORD   0       ;ECC PATTERN REGISTER
001462  000000          RMBAE0: .WORD   0       ;BUS ADDRESS EXTENSION REGISTER
001464  000000          RMCS30: .WORD   0       ;CONTROL, STATUS REGISTER #3

                        ;EACH WORD OF THE TEST QUE CONTAINS THE DEVICE NUMBER IN
                        ;THE LOW BYTE AND THE ATTENTION BIT IN THE HIGH BYTE. THE
                        ;FIRST WORD CONTAINS THE ADDRESS OF THE DEVICE UNDER TEST
                        ;IN THE TABLE. A ZERO WORD IS A BLANK AND REPRESENTS THE
                        ;END OF THE QUE.

001466  000000          TSTQUE: .WORD   0               ;CONTAINS DEVICE POINTER
001470                          .BLKW   8.              ;TEST QUE FOR DEVICES UNDER TEST
001510  000000                  .WORD   0               ;TABLE TERMINATOR GOES HERE WHEN
                                                        ;ALL 8. DEVICES ARE UNDER TEST.

001512  172540          $LPCSR: .WORD   172540          ;KW11-P CONTROL + STATUS REGISTER
001514  172542          $LPCSB: .WORD   172542          ;KW11-P COUNT SET BUFFER
001516  000104          $LPVEC: .WORD   104             ;KW11-P INTERRUPT VECTOR
001520  000106                  .WORD   106
001522  177546          $LLCSR: .WORD   177546          ;KW11-L CONTROL + STATUS REGISTER
001524  000100          $LLVEC: .WORD   100             ;KW11-L INTERRUPT VECTOR
001526  000102                  .WORD   102
001530  000000          $PSW:   .WORD                   ;STORAGE FOR PRIORITY
001532  000000          TIME:   .WORD                   ;STORAGE FOR ELAPSED TIME
001534  000000          WATCH:  .WORD                   ;STORAGE FOR REMAINING TIME
001536  000000          CLOCK:  .WORD                   ;ADDRESS OF START CLOCK SUB
001540  000000          STOPCL: .WORD                   ;ADDRESS OF STOP CLOCK SUB

                        ;PUT TAGS HERE
```

```
                                .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


  001542                        $ERRTB:
  1
  2
  3
  001542  032460                        EMT1
  001544  040364                        EHT1
  001546  040500                        EDT1
  001550  040534                        EFT1

  4
  5                             ;ERROR  2       CANNOT READ OR WRITE ANY DEVICE REG WITHOUT NED
  6
  001552  032466                        EMT2
  001554  040370                        EHT2
  001556  040502                        EDT2
  001560  040536                        EFT2

  7
  8                             ;ERROR  3       CANNOT WRITE/READ ONES TO ANY DEVICE REGISTER
  9
  001562  032514                        EMT3
  001564  000000                        0
  001566  000000                        0
  001570  000000                        0

 10
 11                             ;ERROR  4       CANNOT CLEAR ANY DEVICE REGISTER BITS W/MASSBUS INIT
 12
  001572  032534                        EMT4
  001574  000000                        0
  001576  000000                        0
  001600  000000                        0

 13
 14                             ;ERROR  5       CANNOT WRITE/READ ZEROS TO ALL BIT POSITIONS
 15
  001602  032556                        EMT5
  001604  040374                        EHT5
  001606  040504                        EDT5
  001610  040540                        EFT5

 16
 17                             ;ERROR  6       CANNOT WRITE/READ ONES TO ALL BIT POSITIONS
```

```
 18
   001612  032602                        EMT6
   001614  040374                        EHT5
   001616  040504                        EDT5
   001620  040540                        EFT5

 19
 20                              ;ERROR  7       CANNOT WRITE/READ SHIFTING ONE BIT TO ALL BIT POSITIONS
 21                              ;               OF DEVICE REGISTERS
 22
   001622  032624                        EMT7
   001624  040400                        EHT7
   001626  040504                        EDT5
   001630  040540                        EFT5

 23
 24                              ;ERROR  10      REGISTER SELECT 1 APPEARS S-A-0
 25
   001632  032646                        EMT10
   001634  000000                        0
   001636  000000                        0
   001640  000000                        0

 26
 27                              ;ERROR  11      REGISTER SELECT 1 APPEARS S-A-1
 28
   001642  032664                        EMT11
   001644  000000                        0
   001646  000000                        0
   001650  000000                        0

 29
 30                              ;ERROR  12      REGISTER SELECT 2 APPEARS S-A-0
 31
   001652  032702                        EMT12
   001654  000000                        0
   001656  000000                        0
   001660  000000                        0

 32
 33                              ;ERROR  13      REGISTER SELECT 2 APPEARS S-A-1
 34
   001662  032720                        EMT13
   001664  000000                        0
   001666  000000                        0
   001670  000000                        0

 35
 36                              ;ERROR  14      REGISTER SELECT 4 APPEARS S-A-0
 37
   001672  032736                        EMT14
   001674  000000                        0
   001676  000000                        0
   001700  000000                        0

 38
 39                              ;ERROR  15      REGISTER SELECT 4 APPEARS S-A-1
```

```
 40
    001702  032754                          EMT15
    001704  000000                          0
    001706  000000                          0
    001710  000000                          0

 41
 42                             ;ERROR  16      REGISTER SELECT 8 APPEARS S-A-0
 43
    001712  032772                          EMT16
    001714  000000                          0
    001716  000000                          0
    001720  000000                          0

 44
 45                             ;ERROR  17      REGISTER SELECT 8 APPEARS S-A-1
 46
    001722  033010                          EMT17
    001724  000000                          0
    001726  000000                          0
    001730  000000                          0

 47
 48                             ;ERROR  20      OPI SET WITH SEACH TIMOUT DISABLED
 49
    001732  033026                          EMT20
    001734  040364                          EHT1
    001736  040500                          EDT1
    001740  040534                          EFT1

 50
 51                             ;ERROR  21      OPI SET WITH SECTOR PULSE,SECTOR COMPARE WAS RESET
 52
    001742  033050                          EMT21
    001744  040364                          EHT1
    001746  040500                          EDT1
    001750  040534                          EFT1

 53
 54                             ;ERROR  22      DTE SET WITH INDEX PULSE,SEARCH WAS NOT ENABLED
 55
    001752  033072                          EMT22
    001754  040364                          EHT1
    001756  040500                          EDT1
    001760  040534                          EFT1

 56
 57                             ;ERROR  23      DTE SET WITH SECTOR PULSE,SECTOR COMPARE WAS RESET
 58
    001762  033116                          EMT23
    001764  040364                          EHT1
    001766  040500                          EDT1
    001770  040534                          EFT1

 59
 60                             ;ERROR  24      DTE DID NOT SET WITH SECTOR PULSE,SECTOR COMPARE WAS SET
 61
```

```
001772  033142                          EMT24
001774  040364                          EHT1
001776  040500                          EDT1
002000  040534                          EFT1

62
63                              ;ERROR  25      DTE SET WITH SECTOR PULSE DURING FORMAT CHANGE
64
002002  033166                          EMT25
002004  040364                          EHT1
002006  040500                          EDT1
002010  040534                          EFT1

65
66                              ;ERROR  26      MBA CLR L IS STUCK ACTIVE
67
002012  033206                          EMT26
002014  000000                          0
002016  000000                          0
002020  000000                          0

68
69                              ;ERROR  27      COULD NOT SET DTE AFTER FORMAT CHANGE
70
002022  033240                          EMT27
002024  040364                          EHT1
002026  040500                          EDT1
002030  040534                          EFT1

71
72                              ;ERROR  30      CANNOT SET PROM STROBE WITH BIT CLOCK
73
002032  033260                          EMT30
002034  040364                          EHT1
002036  040500                          EDT1
002040  040534                          EFT1

74
75                              ;ERROR  31      CANNOT CLEAR RMER1,DTE
76
002042  033300                          EMT31
002044  040364                          EHT1
002046  040500                          EDT1
002050  040534                          EFT1

77
78                              ;ERROR  32      PROM STROBE RESET EARLY
79
002052  033314                          EMT32
002054  040364                          EHT1
002056  040500                          EDT1
002060  040534                          EFT1

80
81                              ;ERROR  33      PROM STROBE SET EARLY
82
002062  033326                          EMT33
```

```
002064  040364                          EHT1
002066  040500                          EDT1
002070  040534                          EFT1

 83
 84                             ;ERROR  34      LOOKING FOR SYNC SET EARLY
 85
002072  033340                          EMT34
002074  040364                          EHT1
002076  040500                          EDT1
002100  040534                          EFT1

 86
 87                             ;ERROR  35      LOOKING FOR SYNC DID NOT SET
 88
002102  033352                          EMT35
002104  040364                          EHT1
002106  040500                          EDT1
002110  040534                          EFT1

 89
 90                             ;ERROR  36      PROM STROBE  SET WHILE LOOKING FOR SYNC
 91
002112  033364                          EMT36
002114  040364                          EHT1
002116  040500                          EDT1
002120  040534                          EFT1

 92
 93                             ;ERROR  37      SYNC DETECTED WITH WRONG PATTERN
 94
002122  033404                          EMT37
002124  040440                          EHT115
002126  040524                          EDT115
002130  040552                          EFT115

 95
 96                             ;ERROR  40      SYNC NOT DETECTED
 97
002132  033434                          EMT40
002134  040364                          EHT1
002136  040500                          EDT1
002140  040534                          EFT1

 98
 99                             ;ERROR  41      DRIVE TIMING ERROR DID NOT CLEAR LOOKING FOR SYNC
100
002142  033456                          EMT41
002144  040364                          EHT1
002146  040500                          EDT1
002150  040534                          EFT1

101
102                            ;ERROR  42      WRITE GATE DID NOT COME ON OR RESET EARLY
103
002152  033504                          EMT42
002154  040364                          EHT1
```

```
                002156  040500                          EDT1
                002160  040534                          EFT1

    104
    105                                 ;ERROR  43      INCORRECT SYNC PATTERN DURING HEADER
    106
                002162  033522                          EMT43
                002164  000000                          0
                002166  000000                          0
                002170  000000                          0

    107
    108                                 ;ERROR  44      INCORRECT SYNC PATTERN DURING HEADER
    109
                002172  033522                          EMT43
                002174  040400                          EHT7
                002176  040504                          EDT5
                002200  040540                          EFT5

    110
    111                                 ;ERROR  45      HEADER AREA DID NOT COME ON OR RESET EARLY
    112
                002202  033554                          EMT45
                002204  040364                          EHT1
                002206  040500                          EDT1
                002210  040534                          EFT1

    113
    114                                 ;ERROR  46      CRC ENABLE DID NOT SET
    115
                002212  033570                          EMT46
                002214  040364                          EHT1
                002216  040500                          EDT1
                002220  040534                          EFT1

    116
    117                                 ;ERROR  47      INCORRECT HEADER GENERATED DURING WRITE
    118
                002222  033604                          EMT47
                002224  040404                          EHT47
                002226  040506                          EDT47
                002230  040534                          EFT1

    119
    120                                 ;ERROR  50      READ GATE INCORRECT DURING HEADER AREA
    121
                002232  033622                          EMT50
                002234  040364                          EHT1
                002236  040500                          EDT1
                002240  040534                          EFT1

    122
    123                                 ;ERROR  51      UNEXPECTED HEADER ERROR DURING DIAGNOSTIC MODE
    124
                002242  033640                          EMT51
                002244  040364                          EHT1
                002246  040500                          EDT1
```

```
        002250  040534                          EFT1

    125
    126                                 ;ERROR  52      INCORRECT HEADER READ IN DIAGNOSTIC MODE
    127
        002252  033654                          EMT52
        002254  040410                          EHT52
        002256  040510                          EDT52
        002260  040542                          EFT57

    128
    129                                 ;ERROR  53      INCORRECT TAG BUS DURING DATA COMMAND
    130
        002262  040242                          EMT276
        002264  040364                          EHT1
        002266  040500                          EDT1
        002270  040534                          EFT1

    131
    132                                 ;ERROR  54      DATA TIMING SEQUENCER CONTROLS INCORRECT DURING DATA COMMAND
    133
        002272  033706                          EMT54
        002274  040364                          EHT1
        002276  040500                          EDT1
        002300  040534                          EFT1

    134
    135                                 ;ERROR  55      DATA AREA DID NOT COME ON OR RESET EARLY
    136
        002302  033724                          EMT55
        002304  040364                          EHT1
        002306  040500                          EDT1
        002310  040534                          EFT1

    137
    138                                 ;ERROR  56      ECC ENABLE DID NOT SET
    139
        002312  033742                          EMT56
        002314  040364                          EHT1
        002316  040500                          EDT1
        002320  040534                          EFT1

    140
    141                                 ;ERROR  57      DEVICE IS NOT AN RM05/3/2
    142
        002322  033756                          EMT57
        002324  040414                          EHT57
        002326  040512                          EDT57
        002330  040542                          EFT57

    143
    144                                 ;ERROR  60      DEVICE AVAILABLE IS NOT SET
    145
        002332  033772                          EMT60
        002334  040364                          EHT1
        002336  040500                          EDT1
        002340  040534                          EFT1
```

```
                                ;ERROR  61      INCORRECT ECC PATTERN GENERATED DURING WRITE
002342  034006                          EMT61
002344  040420                          EHT61
002346  040514                          EDT61
002350  040542                          EFT57

                                ;ERROR  62      CANNOT CLEAR PROM STROBE WITH BIT CLOCK
002352  034024                          EMT62
002354  040364                          EHT1
002356  040500                          EDT1
002360  040534                          EFT1

                                ;ERROR  63      DATA AREA DID NOT RESET
002362  034042                          EMT63
002364  040364                          EHT1
002366  040500                          EDT1
002370  040534                          EFT1

                                ;ERROR  64      UNEXPECTED ECC ERROR IN DIAGNOSTIC MODE
002372  034054                          EMT64
002374  040364                          EHT1
002376  040500                          EDT1
002400  040534                          EFT1

                                ;ERROR  65      INCORRECT DATA TRANSFERRED TO MEMORY
002402  034070                          EMT65
002404  040364                          EHT1
002406  040500                          EDT1
002410  040534                          EFT1

                                ;ERROR  66
002412  034102                          EMT66
002414  000000                          0
002416  000000                          0
002420  000000                          0

                                ;ERROR 67
002422  034116                          EMT67
002424  000000                          0
002426  000000                          0
002430  000000                          0
```

```
167
168                                     ;ERROR 70
169
002432  034134                                  EMT70
002434  000000                                  0
002436  000000                                  0
002440  000000                                  0

170
171                                     ;ERROR 71
172
002442  034154                                  EMT71
002444  000000                                  0
002446  000000                                  0
002450  000000                                  0

173
174                                     ;ERROR 72
175
002452  034200                                  EMT72
002454  000000                                  0
002456  000000                                  0
002460  000000                                  0

176
177                                     ;ERROR 73
178
002462  034224                                  EMT73
002464  000000                                  0
002466  000000                                  0
002470  000000                                  0

179
180                                     ;ERROR 74
181
002472  034244                                  EMT74
002474  000000                                  0
002476  000000                                  0
002500  000000                                  0

182
183                                     ;ERROR 75
184
002502  034254                                  EMT75
002504  000000                                  0
002506  000000                                  0
002510  000000                                  0

185
186                                     ;ERROR 76
187
002512  034266                                  EMT76
002514  000000                                  0
002516  000000                                  0
002520  000000                                  0

188
```

```
189                                     ;ERROR 77
190
    002522  034302                              EMT77
    002524  000000                              0
    002526  000000                              0
    002530  000000                              0

191
192                                     ;ERROR  100     CANT SET VOLUME VALID
193
    002532  036110                              EMT170
    002534  040464                              EHT150
    002536  040524                              EDT115
    002540  040552                              EFT115

194
195                                     ;ERROR  101     RUN AND GO WONT SET
196
    002542  040222                              EMT275
    002544  040364                              EHT1
    002546  040500                              EDT1
    002550  040534                              EFT1

197
198                                     ;ERROR  102     SEARCH ENABLE WONT SET
199
    002552  034356                              EMT102
    002554  040364                              EHT1
    002556  040500                              EDT1
    002560  040534                              EFT1

200
201                                     ;ERROR  103     OCCUPIED IS INCORRECT FOR FUNCTION CODE
202
    002562  036154                              EMT173
    002564  040464                              EHT150
    002566  040524                              EDT115
    002570  040552                              EFT115

203
204                                     ;ERROR  104     READ IN PRESET DIDNT CLEAR RMDA, RMDC OR RMOF
205
    002572  036176                              EMT174
    002574  000000                              0
    002576  000000                              0
    002600  000000                              0

206
207                                     ;ERROR  105     READ IN PRESET DIDNT CLEAR RMOF
208
    002602  036224                              EMT175
    002604  040364                              EHT1
    002606  040500                              EDT1
    002610  040534                              EFT1

209
210                                     ;ERROR  106     READ IN PRESET DIDNT CLEAR RMDA
```

```
211
     002612  036242                          EMT176
     002614  040364                          EHT1
     002616  040500                          EDT1
     002620  040534                          EFT1

212
213                                  ;ERROR  107     READ IN PRESET DIDNT CLEAR RMDC
214
     002622  040346                          EMT302
     002624  040364                          EHT1
     002626  040500                          EDT1
     002630  040534                          EFT1

215
216                                  ;ERROR  110     CANT SET OFFSET MODE BY OFFSET COMMAND
217
     002632  036260                          EMT200
     002634  040364                          EHT1
     002636  040500                          EDT1
     002640  040534                          EFT1

218
219                                  ;PUT ERROR TABLE HERE
```

```
                                        ;THIS ROUTINE HANDLES UNEXPECTED TIMEOUTS

002642  011600                  BADTMO: MOV     (SP),R0         ;SAVE PC WHERE THE TIME OUT OCCURED
002644  005740                          TST     -(R0)           ;ADJUST PC -2
002646  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
002650  104401  002656                  TYPE    ,65$            ;;TYPE ASCIZ STRING
002654  000417                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF>/UNEXPECTED BUS TIMEOUT, PC=/
002714                          64$:
002714  010046                          MOV     R0,-(SP)        ;SETUP FOR TYPING OUT PC
002716  104402                          TYPOC
002720  000240                          NOP                     ;PUT 'HALT(0)' INSTRUCTION HERE IF YOU WISH
                                                                ;TO STOP ON UNEXPECTED TIMEOUT.


                                .SBTTL  START OF PROGRAM

002722  012737  177777  001330  START1: MOV     #-1,CHGADR      ;CHANGE RH/RM BUS ADDRESS
002730  000402                          BR      START2

002732  005037  001330          START:  CLR     CHGADR          ;NO CHANGE IN ADDRESS
002736  000240                  START2: NOP
002740  005227  000000                  INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
002744  001375                          BNE     .-4             ;OF WORD
002746  000005                          RESET                   ;RESET THE WORLD


                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
002750  012706  001114                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
002754  005026                  1$:     CLR     (R6)+           ;;CLEAR MEMORY LOCATION
002756  022706  001154                  CMP     #SWR,R6         ;;DONE?
002762  001374                          BNE     1$              ;;LOOP BACK IF NO
002764  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;.INITIALIZE A FEW VECTORS
002770  012737  025222  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
002776  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
003004  012737  025752  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
003012  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
003020  012737  031006  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
003026  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
003034  012737  031114  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
003042  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
003050  013737  021366  021360          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
003056  005037  001206                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
003062  005037  001210                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
003066  112737  000001  001131          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
003074  012737  003074  001122          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
003102  012737  003102  001124          MOV     #.,$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.
003110  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
003114  012737  003150  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
003122  012737  177570  001154          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
003130  012737  177570  001156          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
003136  022777  177777  176010          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
003144  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT  -1
003146  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
```

```
:NITIALIZE THE COMMON TAGS

 003150  012706  003156          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
 003154  000002                  RTI
 003156  012737  000176  001154  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
 003164  012737  000174  001156          MOV     #DISPREG,DISPLAY
 003172  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

 003176  005037  001230                  CLR     $PASS           ;;CLEAR PASS COUNT
 003202  132737  000200  001243          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
 003210  001403                          BEQ     67$             ;;YES,USE NON-APT SWITCH
 003212  012737  001244  001154          MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
 003220                          67$:
  24
  25 003220  012737  002642  000004      MOV     #BADTMO,ERRVEC  ;SETUP FOR UNEXPECTED TIMEOUT
  26 003226  012737  000300  000006      MOV     #PR6,ERRVEC+2   ;LEVEL 6
  27
  28                              .SBTTL  TYPE PROGRAM NAME
                                  ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
 003234  005227  177777                  INC     #-1             ;;FIRST TIME?
 003240  001034                          BNE     68$             ;;BRANCH IF NO
 003242  022737  021530  000042          CMP     #$ENDAD,@#42    ;;ACT-11?
 003250  001430                          BEQ     68$             ;;BRANCH IF YES
 003252  104401  003260                  TYPE    ,69$            ;;TYPE ASCIZ STRING
 003256  000425                          BR      68$             ;;GET OVER THE ASCIZ
                                  ;;69$:  .ASCIZ  <CRLF>@CZRMQB0 - RM05/3/2 DISKLESS TEST, PT 2@<CRLF>
 003332                          68$:
                                  .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
 003332  005737  000042                  TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
 003336  001012                          BNE     70$             ;;BRANCH IF YES
 003340  123727  001242  000001          CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
 003346  001406                          BEQ     70$             ;;BRANCH IF YES
 003350  023727  001154  000176          CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
 003356  001005                          BNE     71$             ;;BRANCH IF NO
 003360  104407                          GTSWR                   ;;GET SOFT-SWR SETTINGS
 003362  000403                          BR      71$
 003364  112737  000001  001150  70$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
 003372                          71$:
  29
  30                              ;THE FOLLOWING FINDS OUT THE PROGRAM CONTROL MODE:
  31                              ;PAPER TAPE (MANUAL), ACT11, XXDP CHAIN OR DUMP
  32
  33 003372  005037  001332              CLR     XXDP            ;CLEAR 'XXDP' LOAD DEVICE STORAGE
  34 003376  122737  000016  000041      CMPB    #16,@#41        ;LOADED FROM AN RM05/3/2 ?
  35 003404  001160                      BNE     5$              ;BRANCH IF NOT
  36 003406  013737  000040  001332      MOV     @#40,XXDP       ;GET DEVICE INDICATOR AND NUMBER
  37 003414  122737  000007  001332      CMPB    #7,XXDP         ;IS IT A VALID NUMBER ?
  38 003422  103002                      BHIS    1$              ;YES
  39 003424  105037  001332              CLRB    XXDP            ;NO, DEFAULT TO DRIVE 0
  40 003430  005737  000042      1$:     TST     @#42            ;CHAIN MODE OR ACT11 AUTO ACCEPT ?
  41 003434  001425                      BEQ     3$              ;BR IF NEITHER
  42 003436  104401  003444              TYPE    ,73$            ;;TYPE ASCIZ STRING
 003442  000412                          BR      72$             ;;GET OVER THE ASCIZ
                                  ;;73$:  .ASCIZ  <CRLF>/NOT TESTING DRIVE /
 003470                          72$:
  43 003470  005046                      CLR     -(SP)           ;CLEAR WORD ON STACK
  44 003472  113716  001332              MOVB    XXDP,(SP)       ;GET DRIVE ADDRESS
  45 003476  104403                      TYPOS                   ;TYPE THE ADDRESS
  46 003500     001                      .BYTE   1               ;ONLY 1 CHARACTER
```

SET VALUE FOR SOFTWARE SWITCH REGISTER

```
 47 003501     000                        .BYTE   0                ;SUPRESS LEADING ZEROS
 48 003502  104401  001217                TYPE    ,$CRLF           ;CR-LF
 49 003506  000517                        BR      5$               ;GET NUMBER OF DRIVES
 50
 51 003510  005227  177777          3$:   INC     #-1              ;FIRST TIME THRU HERE ?
 52 003514  001114                        BNE     5$               ;NO
 53 003516  104401  003524                TYPE    ,7$              ;;TYPE ASCIZ STRING
    003522  000410                        BR      7$               ;;GET OVER THE ASCIZ
                                    ;;7$:  .ASCIZ  <CRLF>/TO TEST DRIVE /
    003544                          7$:
 54 003544  005046                        CLR     -(SP)            ;CLEAR WORD ON STACK
 55 003546  113716  001332                MOVB    XXDP,(SP)        ;GET DRIVE ADDRESS
 56 003552  104403                        TYPOS                    ;TYPE DRIVE ADDRESS
 57 003554     001                        .BYTE   1                ;ONLY 1 CHARACTER
 58 003555     000                        .BYTE   0                ;SUPRESS LEADING ZEROS
 59 003556  104401  003564                TYPE    ,77$             ;;TYPE ASCIZ STRING
    003562  000431                        BR      76$              ;;GET OVER THE ASCIZ
                                    ;;77$: .ASCIZ  /, HALT PROGRAM, REMOVE RRDP PACK AND REPLACE IT/<CRLF>
    003646                          76$:
 60 003646  104401  003654                TYPE    ,78$             ;;TYPE ASCIZ STRING
    003652  000435                        BR      5$               ;;GET OVER THE ASCIZ
                                    ;;78$: .ASCIZ  /WITH A WORK PACK, CLEAR LOCATION 40 AND RESTART PROGRAM./<CRLF>
    003746                          5$:
 64                                 ;CHECK FOR AUTO MODE OR STANDALONE
 65 003746  005037  001326                CLR     AUTSIZ           ;LET AUTO DRIVE SIZING OCCUR
 66 003752  105737  001150                TSTB    $AUTOB           ;RUNNING IN AUTO MODE ?
 67 003756  001561                        BEQ     STANDALONE       ;BR IF NO
 68 003760  012737  000377  001300        MOV     #377,$DEVM       ;SET DEVICE MAP FOR ALL DRIVES
 69
 70                                 ;PROGRAM IS RUNNING IN AUTO MODE - SEE IF SIZING IS ALLOWED
 71 003766                          XSIZ:
 72 003766  132737  000200  001243        BITB    #BIT7,$ENVM      ;SIZING ALLOWED ?
 73 003774  001146                        BNE     12$              ;NO
 74
 75 003776  005001                        CLR     R1               ;START FROM DRIVE 0
 76 004000  013700  001276                MOV     $BASE,R0         ;LOAD THE BASE ADDRESS
 77 004004  104401  032166                TYPE    ,SYSTAT          ;TYPE 'UNIT STATUS:'
 78
 79 004010  136137  032450  001300  1$:   BITB    ATNTBL(R1),$DEVM        ;IS DEVICE PRESENT IN MAP ?
 80 004016  001531                        BEQ     11$              ;BR IF NO
 81 004020  104401  001217                TYPE    ,$CRLF           ;CR-LF
 82 004024  010146                        MOV     R1,-(SP)         ;;SAVE R1 FOR TYPEOUT
    004026  104403                        TYPOS                    ;;GO TYPE--OCTAL ASCII
    004030     002                        .BYTE   2                ;;TYPE 2 DIGIT(S)
    004031     000                        .BYTE   0                ;;SUPPRESS LEADING ZEROS
 83 004032  104401  032342                TYPE    ,BLNKS4          ;TYPE 4 BLANKS
 84
 85 004036  012760  000040  000010        MOV     #CLR,RMCS2(R0)   ;CLEAR MASS BUS
 86 004044  010160  000010                MOV     R1,RMCS2(R0)     ;LOAD THE DRIVE ADDRESS
 87 004050  005760  000012                TST     RMDS(R0)         ;ACCESS DRIVE REGISTER
 88 004054  032760  010000  000010        BIT     #NED,RMCS2(R0)   ;IS DRIVE PRESENT ?
 89 004062  001051                        BNE     3$               ;BR IF NO
 90 004064  032760  004000  000000        BIT     #DVA,RMCS1(R0)   ;IS DRIVE AVAILABLE ?
 91 004072  001450                        BEQ     4$               ;BR IF NO
 92 004074  012737  032204  004300        MOV     #$RM02,10$       ;ASSUME RM02 DEVICE
 93 004102  016002  000026                MOV     RMDT(R0),R2      ;SAVE DRIVE TYPE REGISTER IN R2
 94 004106  022702  020025                CMP     #20025,R2        ;SINGLE PORT RM02 ?
```

```
 95 004112  001430                    BEQ     2$                  ;BR IF YES
 96 004114  022702  024025             CMP     #24025,R2           ;DUAL PORT RM02 ?
 97 004120  001425                    BEQ     2$                  ;BR IF YES
 98 004122  012737  032211  004300     MOV     #$RM03,10$          ;ASSUME RM03 DEVICE
 99 004130  022702  020024             CMP     #20024,R2           ;SINGLE PORT RM03 ?
100 004134  001417                    BEQ     2$                  ;BR IF YES
101 004136  022702  024024             CMP     #24024,R2           ;DUAL PORT RM03 ?
102 004142  001414                    BEQ     2$                  ;BR IF YES
103 004144  012737  032216  004300     MOV     #$RM05,10$          ;ASSUME RM05 DEVICE
104 004152  022702  020027             CMP     #20027,R2           ;SINGLE PORT RM05 ?
105 004156  001406                    BEQ     2$                  ;BR IF YES
106 004160  022702  024027             CMP     #24027,R2           ;DUAL PORT RM05 ?
107 004164  001403                    BEQ     2$                  ;BR IF YES
108 004166  104401  032223             TYPE    ,NOTRM              ;DRIVE NOT AN RM05/3/2
109 004172  000443                    BR      11$                 ;CHECK NEXT DRIVE
110 004174  032760  010000  000012  2$: BIT     #MOL,RMDS(R0)       ;IS MEDIUM ON LINE ?
111 004202  001415                    BEQ     6$                  ;BR IF NO
112 004204  000417                    BR      7$
113
114 004206  104401  032261          3$: TYPE    ,NOTPRS             ;DRIVE NOT PRESENT
115 004212  000402                    BR      5$                  ;CHECK NEXT DRIVE
116
117 004214  104401  032276          4$: TYPE    ,NOTAVL             ;DRIVE NOT AVAILABLE
118 004220  005737  001326          5$: TST     AUTSIZ              ;AUTO SIZING ON ?
119 004224  001026                    BNE     11$                 ;BR IF NO
120 004226  146137  032450  001300     BICB    ATNTBL(R1),$DEVM        ;CLEAR DEVICE FROM BIT MAP
121 004234  000422                    BR      11$                 ;CHECK NEXT DRIVE
122
123 004236  104401  032315          6$: TYPE    ,UNTOFF             ;DRIVE OFFLINE
124 004242  000413                    BR      9$                  ;PRINT DRIVE TYPE
125
126 004244  005737  001332          7$: TST     XXDP                ;LOADED FROM RM80 ?
127 004250  001406                    BEQ     8$                  ;NO
128 004252  123701  001332             CMPB    XXDP,R1             ;IS THIS THE DRIVE ?
129 004256  001360                    BNE     5$                  ;BR IF NO
130 004260  104401  032244             TYPE    ,LODEV              ;DRIVE IS LOAD DEVICE
131 004264  000755                    BR      5$
132
133 004266  104401  032326          8$: TYPE    ,UNTON              ;DRIVE ONLINE
134 004272  104401  032344          9$: TYPE    ,BLNKS2             ;TYPE 2 BLANKS
135 004276  104401                    TYPE                        ;PRINT DRIVE TYPE
136 004300  000000                 10$: .WORD   0                   ;MESSAGE ADDRESS HERE
137
138 004302  005201                 11$: INC     R1                  ;INCREMENT THE DRIVE ADDRESS
139 004304  020127  000007             CMP     R1,#7               ;ALL DRIVES ARE CHECKED ?
140 004310  003637                    BLE     1$                  ;BRANCH IF NOT
141
142 004312  104401  001217          12$: TYPE   ,$CRLF              ;CR-LF
143 004316  000137  005004             JMP     CMNSTART            ;JUMP TO COMMON START
```

```
                        .SBTTL  STANDALONE INPUT ROUTINES
                        
004322                  STANDALONE:
004322  004737  027422          JSR     PC,$TKINT       ;INITIALIZE CONSOLE
                        
004326  005227  177777          INC     #-1             ;FIRST TIME THRU HERE ?
004332  001023              BNE     2$              ;BR IF NO
                        
                        ;SEE IF OPERATOR WANTS HELP TEXT
                        
004334  104401  031556          TYPE    ,MSHELP         ;WANT HELP ?
004340  104411              RDCHR                   ;GET RESPONSE
004342  012637  001176          MOV     (SP)+,$TMP1     ;SAVE AND ECHO RESPONSE
004346  123727  001176  000131      CMPB    $TMP1,#'Y       ;WAS IT A YES RESPONSE ?
004354  001005              BNE     1$              ;NO
004356  104401  001176          TYPE    ,$TMP1          ;TYPE 'Y'
004362  104401  054636          TYPE    ,HELP           ;YES - TYPE HELP TEXT
004366  000414              BR      3$
004370  104401  032336      1$: TYPE    ,N              ;TYPE 'N'
004374  104401  001217          TYPE    ,$CRLF          ;CR-LF
004400  000407              BR      3$
                        
                        ;SEE IF USER WANTS TO CHANGE UNIBUS ADDRESS
004402                  2$:
004402  005737  001330          TST     CHGADR          ;CHANGE RH/RM BUS ADDRESS ?
004406  001457              BEQ     7$              ;BR IF NO
004410  005037  001330          CLR     CHGADR          ;NO CHANGE NEXT TIME
004414  104401  001217          TYPE    ,$CRLF          ;CR-LF
                        
                        ;DIALOGUE TO CHANGE THE UNIBUS ADDRESS, VECTOR ADDRESS AND INTERRUPT PRIORITY
004420                  3$:
004420  104401  031607          TYPE    ,CNSL01         ;TYPE CURRENT BUS ADDRESS
004424  013746  001276          MOV     $BASE,-(SP)     ;;SAVE $BASE FOR TYPEOUT
004430  104402              TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
004432  104401  032344          TYPE    ,BLNKS2         ;TYPE 2 BLANKS
004436  104413              RDOCT                   ;GET NEW BUS ADDRESS
004440  012637  001176          MOV     (SP)+,$TMP1     ;CARRIAGE RETURN ?
004444  001412              BEQ     5$              ;YES-SKIP TO NEXT ENTRY
004446  022737  160000  001176      CMP     #160000,$TMP1   ;BASE ADDRESS IN I/O PAGE ?
004454  101403              BLOS    4$              ;YES
004456  104401  031617          TYPE    ,CNSL02         ;TYPE WARNING MESSAGE
004462  000756              BR      3$              ;TRY AGAIN
004464  013737  001176  001276  4$: MOV     $TMP1,$BASE     ;STORE NEW BUS ADDRESS
                        
004472  104401  031661      5$: TYPE    ,CNSL03
004476  005046              CLR     -(SP)
004500  113716  001272          MOVB    $VECT1,(SP)     ;GET CURRENT VECTOR ADDRESS
004504  104402              TYPOC
004506  104401  032344          TYPE    ,BLNKS2         ;TYPE 2 BLANKS
004512  104413              RDOCT                   ;GET NEW VECTOR ADDRESS
004514  012637  001176          MOV     (SP)+,$TMP1     ;CARRIAGE RETURN?
004520  001412              BEQ     7$              ;YES-SKIP TO NEXT ENTRY
004522  022737  001000  001176      CMP     #1000,$TMP1     ;VECTOR ADDRESS < 1000 ?
004530  101003              BHI     6$              ;YES!!
004532  104401  031670          TYPE    ,CNSL04         ;TYPE WARNING MESSAGE
004536  000755              BR      5$              ;RETRY
004540  113737  001176  001272  6$: MOVB    $TMP1,$VECT1    ;STORE NEW VECTOR ADDRESS
```

```
                                        ;DIALOGUE TO INPUT DEVICE NUMBERS
004546  005227  177777          7$:   INC     #-1             ;FIRST TIME THRU ?
004552  001002                        BNE     8$              ;BR IF NO
004554  104401  031724                TYPE    ,CNSL07         ;TYPE INPUT INSTRUCTIONS
004560  104401  001217          8$:   TYPE    ,$CRLF          ;CR-LF
004564  005037  001300          9$:   CLR     $DEVM           ;CLEAR DEVICE MAP
004570  104401  032144                TYPE    ,MSDRVS         ;TYPE 'DRIVE(S): '
004574  104411                        RDCHR
004576  012637  001176                MOV     (SP)+,$TMP1     ;GET RESPONSE
004602  023727  001176  000101        CMP     $TMP1,#'A       ;IS INPUT ''A'' ?
004610  001007                        BNE     10$             ;NO
004612  104401  031542                TYPE    ,ALL            ;YES, TYPE ''ALL'' AND GO
004616  012737  000377  001300        MOV     #377,$DEVM      ;SET DEVICE MAP FOR ALL DRIVES
004624  000137  003766                JMP     XSIZ            ;AUTO SIZE.

004630  023727  001176  000015  10$:  CMP     $TMP1,#CR       ;CARRIAGE RETURN ?
004636  001436                        BEQ     12$             ;YES
004640  104401  001176                TYPE    ,$TMP1          ;ECHO RESPONSE
004644  023727  001176  000060        CMP     $TMP1,#'0       ;NUMBER < 0 ?
004652  002430                        BLT     12$             ;YES
004654  023727  001176  000067        CMP     $TMP1,#'7       ;NUMBER > 7 ?
004662  003427                        BLE     13$             ;NO
004664  000423                        BR      12$             ;ILLEGAL INPUT

004666  104411                11$:    RDCHR
004670  012637  001176                MOV     (SP)+,$TMP1     ;GET RESPONSE
004674  023727  001176  000015        CMP     $TMP1,#CR       ;CARRIAGE RETURN ?
004702  001432                        BEQ     14$             ;YES
004704  104401  031553                TYPE    ,COMMA          ;TYPE ', '
004710  104401  001176                TYPE    ,$TMP1          ;ECHO RESPONSE
004714  023727  001176  000060        CMP     $TMP1,#'0       ;NUMBER < 0 ?
004722  002404                        BLT     12$             ;YES
004724  023727  001176  000067        CMP     $TMP1,#'7       ;NUMBER > 7 ?
004732  003403                        BLE     13$             ;NO
004734  104401  032066          12$:  TYPE    ,CNSL08         ;TYPE '' ?ILLEGAL INPUT''
004740  000711                        BR      9$              ;RETRY

004742  013701  001176          13$:  MOV     $TMP1,R1        ;R1 = DRIVE NUMBER
004746  042701  177770                BIC     #^C7,R1
004752  156137  032450  001300        BISB    ATNTBL(R1),$DEVM        ;SET DEVICE IN MAP
004760  122737  000377  001300        CMPB    #377,$DEVM      ;DONE ?
004766  101337                        BHI     11$             ;NO
004770  005237  001326          14$:  INC     AUTSIZ          ;DO NOT AUTO SIZE WHEN TYPING DRIVE STATUS
004774  104401  001217                TYPE    ,$CRLF          ;CR-LF
005000  000137  003766                JMP     XSIZ            ;GO SIZE DEVICES
```

```
                                        ;ASSEMBLE TEST QUE FROM DEVICE MAP
005004                                  MNSTART:
005004  104401  032110                        TYPE    ,DRIVES         ;TYPE 'DRIVE(S) TO BE TESTED'
005010  013700  001300                        MOV     $DEVM,R0        ;R0 = DEVICE MAP
005014  001004                                BNE     1$              ;BR IF DRIVES TO TEST
005016  104401  031553                        TYPE    ,COMMA          ;TYPE ', '
005022  104401  032137                        TYPE    ,NONE           ;TYPE 'NONE'
005026  012701  001470                1$:     MOV     #TSTQUE+2,R1    ;R1 = ADDRESS OF FIRST ENTRY IN QUE
005032  010137  001466                        MOV     R1,TSTQUE       ;INITIALIZE ENTRY POINTER
005036  012702  000001                        MOV     #1,R2           ;R2 = DEVICE POINTER
005042  005003                                CLR     R3              ;R3 = DEVICE NUMBER
005044  030200                        2$:     BIT     R2,R0           ;IS THIS DEVICE IN MAP ?
005046  001413                                BEQ     3$              ;NO !
005050  104401  031553                        TYPE    ,COMMA          ;TYPE ', '
005054  010311                                MOV     R3,(R1)         ;YES - ENTER DEVICE NUMBER IN QUE
005056  010346                                MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
005060  104403                                TYPOS                   ;;GO TYPE--OCTAL ASCII
005062     001                                .BYTE   1               ;;TYPE 1 DIGIT(S)
005063     000                                .BYTE   0               ;;SUPPRESS LEADING ZEROS
005064  116361  032450  000001                MOVB    ATNTBL(R3),1(R1);ENTER ATTENTION BIT IN QUE
005072  062701  000002                        ADD     #2,R1           ;ADVANCE ENTRY POINTER
005076  006302                        3$:     ASL     R2              ;ADVANCE DEVICE POINTER
005100  105702                                TSTB    R2              ;DONE ALL DEVICES ?
005102  001402                                BEQ     4$              ;YES
005104  005203                                INC     R3              ;ADVANCE DEVICE NUMBER
005106  000756                                BR      2$              ;ENTER NEXT DEVICE
005110  005011                        4$:     CLR     (R1)            ;TERMINATE TEST QUE
005112  104401  001217                        TYPE    ,$CRLF          ;TYPE CR-LF

                                        ;SIZE FOR CLOCK
005116  004737  021550                        JSR     PC,SIZCLK       ;SEE IF CLOCK PRESENT
005122  000425                                BR      6$              ;YES - CLOCK IS PRESENT
005124  104401  005132                        TYPE    ,65$            ;;TYPE ASCIZ STRING
005130  000413                                BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <CRLF>/NO 'L' OR 'P' CLOCK/
005160                                  64$:
005160  005737  000042                        TST     @#42            ;ANY MONITOR PRESENT ?
005164  001002                                BNE     5$              ;BR IF YES
005166  000137  002732                        JMP     START           ;JUMP TO START
005172  000137  021520                5$:     JMP     $GET42          ;RETURN CONTROL TO MONITOR
005176  000413                        6$:     BR      READY1

005200  000240                        READY:  NOP                     ;READY TO START TEST
005202  105737  001300                        TSTB    $DEVM           ;ANY DRIVES IN MAP ?
005206  001007                                BNE     2$              ;BR IF YES
005210  005737  000042                        TST     @#42            ;ANY MONITOR PRESENT ?
005214  001002                                BNE     1$              ;BR IF YES
005216  000137  002732                        JMP     START           ;JUMP TO START
005222  000137  021520                1$:     JMP     $GET42          ;RETURN CONTROL TO MONITOR
005226                                  2$:

005226  105037  001116                READY1: CLRB    $TSTNM          ;RESET TEST NUMBER
005232  005037  001206                        CLR     $TIMES          ;INITIALIZE NUMBER OF ITERATIONS
005236  004737  027422                        JSR     PC,$TKINT       ;INITIALIZE TTY
005242  012746  000000                        MOV     #PR0,-(SP)      ;;PUT NEW PS ON STACK
005246  012746  005254                        MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
005252  000002                                RTI                     ;;POP NEW PC AND PS
```

```
    005254                              64$:
 50 005254  117737  174206  001234             MOVB    @TSTQUE,$UNIT   ;LOAD DRIVE NUMBER
 51
 52                                     ;CLEAR MASSBUS CONTROLLER, SELECT DRIVE AND DETERMINE THE LAST TRACK
 53                                     ;OF THE DIFFERENT DRIVE TYPES
 54
 55 005262  012737  002000  001334         MOV     #TA4,LSTRK      ;ASSUME LAST TRACK FOR RM02/3 = 4.
 56 005270  013700  001276                 MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
 57 005274  012760  000040  000010         MOV     #CLR,RMCS2(R0)  ;CLEAR MASSBUS
 58 005302  117760  174160  000010         MOVB    @TSTQUE,RMCS2(R0)       ;SELECT DEVICE UNDER TEST
 59 005310  016002  000026                 MOV     RMDT(R0),R2     ;GET RMDT AND
 60 005314  042702  177770                 BIC     #177770,R2      ;SAVE DRIVE TYPE BITS
 61 005320  022702  000007                 CMP     #7,R2           ;IS IT AN RM05 ?
 62 005324  001003                         BNE     3$              ;NO, MUST BE AN RM02 OR RM03
 63 005326  012737  011000  001334         MOV     #TA16!TA2,LSTRK ;YES--SET LAST TRACK = 18.
 64
 65                                     ;TYPE DRIVE NUMBER TO BE TESTED($UNIT)
 66
 67 005334  104401  001217         3$:     TYPE    ,$CRLF          ;CR-LF
 68 005340  104401  032160                 TYPE    ,MSGDRV         ;TYPE 'DRIVE'
 69 005344  013746  001234                 MOV     $UNIT,-(SP)     ;;SAVE $UNIT FOR TYPEOUT
                                                                   ;;TYPE DRIVE NUMBER
    005350  104403                         TYPOS                   ;;GO TYPE--OCTAL ASCII
    005352     002                         .BYTE   2               ;;TYPE 2 DIGIT(S)
    005353     000                         .BYTE   0               ;;SUPPRESS LEADING ZEROS
 70 005354  005004                         CLR     R4              ;THESE TWO LOOPS ARE ADDED TO
 71 005356  005304                         DEC     R4              ;WAIT FOR TTY
 72 005360  001376                         BNE     .-2
 73 005362  005304                         DEC     R4
 74 005364  001376                         BNE     .-2
```

```
                        .SBTTL  REGISTER AND STORAGE USAGE

                        ;REGISTER ASSIGNMENTS
                        ;
                        ;R0     =       UNIBUS ADDRESS OF RH CONTROLLER
                        ;R1     =       ADDRESS OF ENTRY IN TEST QUE CORRESPONDING TO THE
                        ;               UNIT UNDER TEST
                        ;R2,R3  =       WORKING REGISTERS FOR TEST IN PROGRESS, MUST BE
                        ;               SAVED BY SUBROUTINES
                        ;R4,R5  =       GENERAL WORKING REGISTERS, ARE NOT SAVED BY
                        ;               SUBROUTINES
                        ;R6     =       STACK POINTER
                        ;R7     =       LINKAGE REGISTER TO SUBROUTINES

                        ;STORAGE ASSIGNMENTS
                        ;
                        ;$TMP0-$TMP4    TEMPORARY STORAGE, NOT SAVED BY SUBROUTINES
                        ;$GDDAT,$BDDAT  EXPECTED AND RRECEIVED STATUS FOR ERROR TYPEOUT
                        ;$GDADR,$BDADR  ADDRESS OF EXPECTED AND RECEIVED STATUS IF APPLICABLE,
                        ;               ALSO THE ADDRESS OF A REGISTER ERROR
                        ;
                        ;$TSTN  =       TEST NUMBER
                        ;$UNIT  =       NUMBER OF DEVICE BEING TESTED
                        ;RGINBF =       THE REGISTER INPUT BUFFER HAS A STORAGE LOCATION FOR
                        ;               EACH REGISTER, AND IS USED WHEN READING STATUS AND
                        ;               CONTROL DATA
                        ;RGOTBF =       THE REGISTER OUTPUT BUFFER HAS A STORAGE LOCATION FOR
                        ;               EACH REGISTER, AND IS USED FOR ASSEMBLING DATA TO BE
                        ;               WRITTEN IN REGISTERS
```

```
                                        ;*TEST            RANSFER TEST

                                        ;;*****************************************************************
    005366                              TST1:
    005366  000004                              SCOPE                   ;SCOPE CALL
    005370  000240                              NOP
    005372  012706  001100                      MOV     #STACK,SP       ;LOAD THE STACK POINTER
    005376  013700  001276                      MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
    005402  013701  001466                      MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
    005406  012737  000001  001226              MOV     #1,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
  2
  3 005414  012702  000000                      MOV     #0,R2           ;R2 = REGISTER INDEX.
  4
  5                                     ;CLEAR THE MASSBUS AND VERIFY THAT NONEXISTANT DEVICE ERROR IS RESE
  6 005420                              10$:
  7 005420  004737  022404                      JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
  8 005424  016037  000010  001142              MOV     RMCS2(R0),$BDDAT        ;STORE RMCS2 AT $BDDAT
  9 005432  032737  010000  001142              BIT     #NED,$BDDAT
 10 005440  001417                              BEQ     20$
 11 005442  111137  001140                      MOVB    (R1),$GDDAT
 12 005446  042737  177770  001140              BIC     #^CUNTMSK,$GDDAT
 13 005454  052737  000100  001140              BIS     #IR,$GDDAT
 14 005462  010037  001136                      MOV     R0,$BDADR
 15 005466  062737  000010  001136              ADD     #RMCS2,$BDADR
 16 005474  104001                              EMT     1
 17 005476  000475                              BR      60$
 18
 19                                     ;READ THE REGISTER WHOSE INDEX IS IN R2 AND EXIT TEST IF THE READ
 20                                     ;DOES NOT SET 'NED' ERROR
 21 005500                              20$:
 22 005500  010003                              MOV     R0,R3           ;R3 = REGISTER ADDRESS
 23 005502  060203                              ADD     R2,R3
 24 005504  011304                              MOV     (R3),R4         ;READ REGISTER
 25 005506  032760  010000  000010              BIT     #NED,RMCS2(R0)  ;IS 'NED' SET??
 26 005514  001470                              BEQ     70$             ;NO!!
 27
 28 005516  004737  022404                      JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 29 005522  016037  000010  001142              MOV     RMCS2(R0),$BDDAT        ;STORE RMCS2 AT $BDDAT
 30 005530  032737  010000  001142              BIT     #NED,$BDDAT
 31 005536  001417                              BEQ     30$
 32 005540  111137  001140                      MOVB    (R1),$GDDAT
 33 005544  042737  177770  001140              BIC     #^CUNTMSK,$GDDAT
 34 005552  052737  000100  001140              BIS     #IR,$GDDAT
 35 005560  010037  001136                      MOV     R0,$BDADR
 36 005564  062737  000010  001136              ADD     #RMCS2,$BDADR
 37 005572  104001                              EMT     1
 38 005574  000436                              BR      60$
 39
 40                                     ;WRITE THE REGISTER WHOSE INDEX IS IN R2 AND EXIT TEST IF THE WRITE
 41                                     ;DOES NOT SET 'NED' ERROR
 42 005576                              30$:
 43 005576  012713  000000                      MOV     #0,(R3)         ;WRITE REGISTER
 44 005602  032760  010000  000010              BIT     #NED,RMCS2(R0)  ;IS 'NED' SET??
 45 005610  001432                              BEQ     70$             ;NO!!
 46
 47                                     ;COULD NOT READ OR WRITE THE REGISTER WITHOUT SETING 'NED' ERROR -
```

```
                                        ;ADVANCE THE REGISTER INDEX AND REPEAT THE TEST FOR THE NEXT
                                        ;AVAILABLE DEVICE REGISTER
005612                                  40$:
005612  062702  000002                        ADD     #2,R2           ;ADVANCE TO NEXT REGISTER
005616  022702  000002                        CMP     #RMWC,R2        ;IS THIS RMWC??
005622  001773                              BEQ     40$             ;YES - TRY NEXT REGISTER
005624  022702  000004                        CMP     #RMBA,R2        ;IS THIS RMBA??
005630  001770                              BEQ     40$             ;YES - TRY NEXT REGISTER
005632  022702  000010                        CMP     #RMCS2,R2       ;IS THIS RMCS2??
005636  001765                              BEQ     40$             ;YES - TRY ANOTHER REGISTER
005640  022702  000016                        CMP     #RMAS,R2        ;IS THIS RMAS ??
005644  001762                              BEQ     40$             ;YES - TRY ANOTHER REGISTER
005646  022702  000022                        CMP     #RMDB,R2        ;IS THIS RMDB??
005652  001757                              BEQ     40$             ;YES - TRY ANOTHER REGISTER
005654  022702  000046                        CMP     #RMEC2,R2       ;IS THIS A LEGAL REGISTER
005660  103257                              BHIS    10$             ;YES - TRY THIS REGISTER

                                        ;GOT 'NONEXISTENT DEVICE' ERROR FOR EVERY REMOTE REGISTER ADDRESS
005662                                  50$:
005662  013737  001276  001136                MOV     $BASE,$BDADR    ;STORE BASE ADDRESS
005670  104002                              EMT     2
005672  000137  021274                60$:    JMP     $EOSP           ;GO SELECT NEXT DEVICE

005676                                  70$:

                                        ;;*******************************************************************
                                        ;*TEST 2        CTOD TEST

                                        ;;*******************************************************************
005676                                  TST2:
005676  000004                              SCOPE                   ;SCOPE CALL
005700  000240                              NOP
005702  012706  001100                        MOV     #STACK,SP       ;LOAD THE STACK POINTER
005706  013700  001276                        MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
005712  013701  001466                        MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
005716  012737  000002  001226                MOV     #2,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX

005724  004737  022404                        JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER

                                        ;WRITE ONES IN REMOTE REGISTERS
005730  012760  000076  000000                MOV     #ILF76,RMCS1(R0)        ;LOAD RMCS1
005736  012760  177777  000006                MOV     #-1,RMDA(R0)    ;LOAD RMDA
005744  012760  001777  000034                MOV     #CYLMSK,RMDC(R0)        ;LOAD RMDC
005752  012760  016200  000032                MOV     #^CXNUOF,RMOF(R0)       ;LOAD RMOF

                                        ;READ REMOTE REGISTERS TWICE
005760  012702  000001                        MOV     #1,R2
005764                                  10$:
005764  016037  000000  001336                MOV     RMCS1(R0),RMCS1I        ;STORE RMCS1 IN INPUT BUFFER
005772  016037  000006  001344                MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
006000  016037  000034  001372                MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
006006  016037  000032  001370                MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
006014  005302                              DEC     R2
006016  100362                              BPL     10$

                                        ;SEE IF ANY ONE BITS CAME BACK
006020  042737  177701  001336                BIC     #^CILF76,RMCS1I ;IS RMCS1 0??
```

```
 94 006026  001014                    BNE     20$             ;NO!!
 95 006030  005737  001344            TST     RMDAI           ;IS RMDA 0??
 96 006034  001011                    BNE     20$             ;NO!!
 97 006036  042737  176000  001372    BIC     #XNUDC,RMDCI    ;IS RMDC 0??
 98 006044  001005                    BNE     20$             ;NO!!
 99 006046  042737  161577  001370    BIC     #XNUOF,RMOFI    ;IS RMOF 0 ??
100 006054  001001                    BNE     20$             ;NO!!
101
102                                 ;CANNOT READ/WRITE A ONE FROM ANY REMOTE REGISTER
103 006056  104003                    EMT     3
104 006060                          20$:
105
106                                 ;;*****************************************************************
                                    ;*TEST 3        MASSBUS INITIALIZE TEST

                                    ;;*****************************************************************
    006060                          TST3:
    006060  000004                      SCOPE                   ;SCOPE CALL
    006062  000240                      NOP
    006064  012706  001100              MOV     #STACK,SP       ;LOAD THE STACK POINTER
    006070  013700  001276              MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
    006074  013701  001466              MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
    006100  012737  000003  001226      MOV     #3,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
107
108 006106  004737  022404              JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
109
110                                 ;WRITE ONES IN SELECTED REGISTERS
111 006112  012760  000076  000000      MOV     #ILF76,RMCS1(R0)        ;LOAD RMCS1
112 006120  012760  177777  000014      MOV     #-1,RMER1(R0)   ;LOAD RMER1
113 006126  012760  177777  000042      MOV     #-1,RMER2(R0)   ;LOAD RMER2
114
115                                 ;INITIALIZE MASSBUS WITH A CLEAR
116 006134  004737  022404              JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
117
118                                 ;READ THE REGISTERS THAT WERE WRITTEN
119 006140  016037  000000  001336      MOV     RMCS1(R0),RMCS1I        ;STORE RMCS1 IN INPUT BUFFER
120 006146  016037  000014  001352      MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
121 006154  016037  000042  001400      MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER
122
123                                 ;SEE IF ANY REGISTER BITS WERE CLEARED
124 006162  052737  177701  001336      BIS     #^CILF76,RMCS1I ;SET ANY BIT NOT WRITTEN
125 006170  052737  001567  001400      BIS     #XNUER2,RMER2I
126 006176  022737  177777  001336      CMP     #-1,RMCS1I      ;ANY ZEROS IN RMCS1??
127 006204  001011                      BNE     10$             ;YES!!
128 006206  022737  177777  001352      CMP     #-1,RMER1I      ;ANY ZEROS IN RMER1??
129 006214  001005                      BNE     10$             ;YES!!
130 006216  022737  177777  001400      CMP     #-1,RMER2I      ;ANY ZEROS IN RMER2??
131 006224  001001                      BNE     10$
132
133                                 ;NONE OF THE BITS WERE CLEARED
134 006226  104004                      EMT     4
135 006230                          10$:
136
137                                 ;;*****************************************************************
                                    ;*TEST 4        CLEAR STUCK ACTIVE TEST

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

```
                                        TST4:
006230                                          SCOPE                   ;SCOPE CALL
006230  000004                                    NOP
006232  000240                                    MOV     #STACK,SP       ;LOAD THE STACK POINTER
006234  012706  001100                            MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
006240  013700  001276                            MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
006244  013701  001466                            MOV     #4,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
006250  012737  000004  001226
*38
139 006256  004737  022404                        JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
140
141                                     ;WRITE ONES IN TEST REGISTERS
142 006262  012760  177777  000014                MOV     #-1,RMER1(R0)   ;LOAD RMER1
143 006270  012760  177777  000042                MOV     #-1,RMER2(R0)   ;LOAD RMER2
144 006276  012760  000001  000024                MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
145
146                                     ;READ TEST REGISTERS AND SEE IF ANY BITS ARE ON
147 006304  016037  000014  001352                MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
148 006312  016037  000042  001400                MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER
149 006320  016037  000024  001362                MOV     RMMR1(R0),RMMR1I        ;STORE RMMR1 IN INPUT BUFFER
150 006326  042737  040000  001352                BIC     #UNS,RMER1I     ;DONT ACCEPT UNSAFE
151 006334  001011                                BNE     10$             ;BRANCH IF ANY OTHER BITS ON
152 006336  042737  040200  001400                BIC     #SKI!DVC,RMER2I ;DONT ACCEPT SKI OR DVC
153 006344  001005                                BNE     10$             ;BRANCH IF ANY OTHER BITS ON
154 006346  032737  000001  001362                BIT     #DMD,RMMR1I     ;BRANCH IF DMD IS ON
155 006354  001001                                BNE     10$
156 006356  104026                                EMT     26
157 006360                                      10$:
*58
159                                     ;;**************************************************
                                        ;*TEST 5        TRISTATE TRANSFER TEST
                                        ;;**************************************************
006360                                  TST5:
006360  000004                                  SCOPE                   ;SCOPE CALL
006362  000240                                  NOP
006364  012706  001100                          MOV     #STACK,SP       ;LOAD THE STACK POINTER
006370  013700  001276                          MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
006374  013701  001466                          MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
006400  012737  000005  001226                  MOV     #5,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
160
161 006406  005002                              CLR     R2              ;CLEAR ERROR FLAGS
162 006410  004737  022404                      JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
163
164                                     ;WRITE ONES IN SELECTED REGISTERS
165 006414  012760  000076  000000                MOV     #ILF76,RMCS1(R0)        ;LOAD RMCS1
166 006422  012760  177777  000006                MOV     #-1,RMDA(R0)    ;LOAD RMDA
167 006430  012760  177777  000014                MOV     #-1,RMER1(R0)   ;LOAD RMER1
168 006436  012760  177777  000032                MOV     #-1,RMOF(R0)    ;LOAD RMOF
169 006444  012760  177777  000042                MOV     #-1,RMER2(R0)   ;LOAD RMER2
170
171                                     ;WRITE ZEROS IN SELECTED REGISTERS
172 006452  012760  000000  000000                MOV     #0,RMCS1(R0)    ;LOAD RMCS1
173 006460  012760  000000  000006                MOV     #0,RMDA(R0)     ;LOAD RMDA
174 006466  012760  000000  000014                MOV     #0,RMER1(R0)    ;LOAD RMER1
175 006474  012760  000000  000032                MOV     #0,RMOF(R0)     ;LOAD RMOF
176 006502  012760  000000  000034                MOV     #0,RMDC(R0)     ;LOAD RMDC
177 006510  012760  000000  000042                MOV     #0,RMER2(R0)    ;LOAD RMER2
```

```
                                        ;READ BACK ALL REGISTERS
006516  016037  000000  001336            MOV     RMCS1(R0),RMCS1I        ;STORE RMCS1 IN INPUT BUFFER
006524  016037  000006  001344            MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
006532  016037  000014  001352            MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
006540  016037  000032  001370            MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
006546  016037  000034  001372            MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
006554  016037  000042  001400            MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER

                                        ;CHECK EACH REGISTER CONTENT FOR ZERO BITS WRITTEN & READ
006562  012702  177777                    MOV     #-1,R2          ;ACCUMULATE ZEROS IN R2
006566  052737  177701  001336            BIS     #^CILF76,RMCS1I ;SET ALL BITS NOT WRITTEN
006574  052737  161577  001370            BIS     #XNUOF,RMOFI
006602  052737  176000  001372            BIS     #XNUDC,RMDCI
006610  052737  001567  001400            BIS     #XNUER2,RMER2I
006616  005137  001336                    COM     RMCS1I          ;COMPLEMENT REGISTER CONTENTS
006622  005137  001344                    COM     RMDAI
006626  005137  001352                    COM     RMER1I
006632  005137  001370                    COM     RMOFI
006636  005137  001372                    COM     RMDCI
006642  005137  001400                    COM     RMER2I
006646  043702  001336                    BIC     RMCS1I,R2               ;ACCUMULATE ALL ZERO BITS
006652  043702  001344                    BIC     RMDAI,R2
006656  043702  001352                    BIC     RMER1I,R2
006662  043702  001370                    BIC     RMOFI,R2
006666  043702  001372                    BIC     RMDCI,R2
006672  043702  001400                    BIC     RMER2I,R2
006676  001407                            BEQ     10$             ;BRANCH IF EACH BIT IS ZERO

                                        ;ONE OR MORE BIT POSITIONS ARE NOT ZERO
006700  010237  001142                    MOV     R2,$BDDAT               ;SAVE RESULT FOR TYPE
006704  005037  001140                    CLR     $GDDAT          ;LOAD EXPECTED RESULT
006710  104005                            EMT     5
006712  052702  000001                    BIS     #BIT0,R2        ;SET ERROR FLAG

006716                                  10$:
006716  004737  022404                    JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER

                                        ;PRESET SELECTED REGISTERS TO ZEROS
                                        ;(ASSUME RMCS1, RMER1, RMER2 WERE CLEARED BY INIT)
006722  012760  000000  000006            MOV     #0,RMDA(R0)     ;LOAD RMDA
006730  012760  000000  000032            MOV     #0,RMOF(R0)     ;LOAD RMOF
006736  012760  000000  000034            MOV     #0,RMDC(R0)     ;LOAD RMDC

                                        ;WRITE ONES IN SELECTED REGISTERS
006744  012760  000076  000000            MOV     #ILF76,RMCS1(R0)        ;LOAD RMCS1
006752  012760  177777  000006            MOV     #-1,RMDA(R0)    ;LOAD RMDA
006760  012760  016200  000032            MOV     #^CXNUOF,RMOF(R0)       ;LOAD RMOF
006766  012760  001777  000034            MOV     #^CXNUDC,RMDC(R0)       ;LOAD RMDC
006774  012760  177777  000014            MOV     #-1,RMER1(R0)   ;LOAD RMER1
007002  012760  176210  000042            MOV     #^CXNUER2,RMER2(R0)     ;LOAD RMER2

                                        ;READ ALL REGISTERS
007010  016037  000000  001336            MOV     RMCS1(R0),RMCS1I        ;STORE RMCS1 IN INPUT BUFFER
007016  016037  000006  001344            MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
007024  016037  000032  001370            MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
007032  016037  000034  001372            MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
```

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                                        MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
                                        MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER

                                ;CHECK EACH REGISTER CONTENT FOR ONE BITS WRITTEN & READ
                                        BIC     #^CILF76,RMCS1I         ;CLEAR ALL BITS NOT WRITTEN
                                        BIC     #XNUOF,RMOFI
                                        BIC     #XNUDC,RMDCI
                                        BIC     #XNUER2,RMER2I
                                        CLR     R2                      ;ACCUMULATE ONES IN R2
                                        BIS     RMCS1I,R2               ;ACCUMULATE ALL ONE BITS
                                        BIS     RMDAI,R2
                                        BIS     RMOFI,R2
                                        BIS     RMDCI,R2
                                        BIS     RMER1I,R2
                                        BIS     RMER2I,R2
                                        CMP     #-1,R2                  ;SEE IF EACH BIT POSITION WAS ONE
                                        BEQ     20$                     ;BRANCH IF NONE STUCK

                                ;ONE OR MORE BIT POSITIONS ARE NOT ONE
                                        MOV     R2,$BDDAT               ;SAVE RESULT FOR TYPE
                                        MOV     #-1,$GDDAT              ;EXPECTED RESULT
                                        EMT     6
                                        BIS     #BIT1,R2                ;SET ERROR FLAG
                                20$:
                                        TST     R2                      ;ANY ERRORS DETECTED ??
                                        BNE     30$                     ;YES - DONT DO BIT TEST
                                        MOV     #1,R2                   ;R2=BIT POSITION

                                25$:
                                        JSR     PC,CNTCLR               ;GO CLEAR CONTROLLER

                                ;WRITE THE BIT PATTERN IN SELECTED DEVICE REGISTERS
                                        MOV     R2,RMDA(R0)             ;LOAD RMDA
                                        MOV     R2,RMOF(R0)             ;LOAD RMOF
                                        MOV     R2,RMDC(R0)             ;LOAD RMDC
                                        MOV     R2,RMER1(R0)            ;LOAD RMER1
                                        MOV     R2,RMER2(R0)            ;LOAD RMER2

                                ;READ BACK THE REGISTERS
                                        MOV     RMDA(R0),RMDAI          ;STORE RMDA IN INPUT BUFFER
                                        MOV     RMOF(R0),RMOFI          ;STORE RMOF IN INPUT BUFFER
                                        MOV     RMDC(R0),RMDCI          ;STORE RMDC IN INPUT BUFFER
                                        MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
                                        MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER

                                ;CHECK REGISTER CONTENTS FOR CORRECT PATTERN
                                        CLR     R3                      ;R3=ACCUMULATED ONE BIT
                                        MOV     #-1,R4                  ;R4=ACCUMULATED ZERO BITS
                                        MOV     RMDAI,R5                ;GET ANY GOOD BITS FROM RMDA
                                        BIS     R5,R3
                                        COM     R5
                                        BIC     R5,R4
                                        MOV     RMOFI,R5                ;GET GOOD BITS FROM RMOF
                                        BIC     #XNUOF,R5
                                        BIS     R5,R3
                                        COM     R5
                                        BIC     #XNUOF,R5
```

```
 290 007322  040504                    BIC     R5,R4
 291 007324  013705  001372            MOV     RMDC1,R5            ;GET GOOD BITS FROM RMDC
 292 007330  042705  176000            BIC     #XNUDC,R5
 293 007334  050503                    BIS     R5,R3
 294 007336  005105                    COM     R5
 295 007340  042705  176000            BIC     #XNUDC,R5
 296 007344  040504                    BIC     R5,R4
 297 007346  013705  001352            MOV     RMER11,R5           ;GET GOOD BITS FROM RMER1
 298 007352  050503                    BIS     R5,R3
 299 007354  005105                    COM     R5
 300 007356  040504                    BIC     R5,R4
 301 007360  013705  001400            MOV     RMER21,R5           ;GET GOOD BITS FROM RMER2
 302 007364  042705  001567            BIC     #XNUER2,R5
 303 007370  050503                    BIS     R5,R3
 304 007372  005105                    COM     R5
 305 007374  042705  001567            BIC     #XNUER2,R5
 306 007400  040504                    BIC     R5,R4
 307 007402  010205                    MOV     R2,R5           ;RESET ALL ONES IN R3 EXCEPT
 308 007404  005105                    COM     R5              ;FOR THE TEST BIT
 309 007406  040503                    BIC     R5,R3
 310 007410  040204                    BIC     R2,R4           ;RESET TEST BIT IN R4
 311 007412  050403                    BIS     R4,R3           ;COMBINE ACCUMULATED 1'S + 0'S
 312 007414  020302                    CMP     R3,R2           ;IS PATTERN OK??
 313 007416  001406                    BEQ     26$             ;YES!!
 314 007420  010237  001140            MOV     R2,$GDDAT               ;SAVE TEST PATTERN
 315 007424  010337  001142            MOV     R3,$BDDAT               ;SAVE RESULT
 316 007430  104007                    EMT     7
 317 007432  000404                    BR      30$             ;SKIP TO NEXT
 318
 319                                   ;ADVANCE R2 TO THE NEXT PATTERN AND REPEAT TEST
 320 007434                            26$:
 321 007434  006302                            ASL     R2              ;SHIFT THE BIT
 322 007436  001402                            BEQ     30$             ;EXIT IF DONE
 323 007440  000137  007174                    JMP     25$
 324 007444                            30$:
 325
 326                                   ;;*****************************************************************
                                       ;*TEST 6         REGISTER SELECT TEST
                                       ;;*****************************************************************
     007444                            TST6:
     007444  000004                            SCOPE                   ;SCOPE CALL
     007446  000240                            NOP
     007450  012706  001100                    MOV     #STACK,SP       ;LOAD THE STACK POINTER
     007454  013700  001276                    MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     007460  013701  001466                    MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     007464  012737  000006  001226            MOV     #6,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
 327
 328                                   ;THE FOLLOWING TABLE GIVES MASSBUS REGISTER SELECT VALUES FOR
 329                                   ;EACH DEVICE REGISTER
 330
 331                                   ;       REGISTER        REG SFL
 332                                   ;       NAME            (16,8,4,2,1)
 333                                   ;
 334                                   ;       RMCS1           00000
 335                                   ;       RMDS            00001
 336                                   ;       RMER1           00010
```

```
                                ;       RMMR1           00011
                                ;       RMAS            00100
                                ;       RMDA            00101
                                ;       RMDT            00110
                                ;       RMLA            00111
                                ;       RMSN            01000
                                ;       RMOF            01001
                                ;       RMDC            01010
                                ;       RMHR            01011
                                ;       RMMR2           01100
                                ;       RMER2           01101
                                ;       RMEC1           01110
                                ;       RMEC2           01111

                               ;EACH REGISTER SELECT LINE IS TESTED FOR A STUCK AT ONE,
                               ;STUCK AT ZERO FAULT. AS AN EXAMPLE, TO TEST REG SEL 1,
                               ;FOR S-A-0, RMER1 IS WRITTEN WITH ZEROS. THEN THE REGISTER
                               ;THAT HAS THE SAME SELECT VALUE, EXCEPT FOR THE SELECT LINE
                               ;BEING TESTED, IS WRITTEN WITH ONES. IN THIS EXAMPLE,
                               ;RMMR1 IS WRITTEN WITH ONES. IF SELECT LINE 1 IS S-A-0,
                               ;THE ALL ONES WORD WILL BE WRITTEN IN RMER1, AND RMER1
                               ;WILL NOT BE 0 WHEN READ BACK.

007472  005002                         CLR     R2              ;R2= ZEROS SOURCE
007474  012703  177777                 MOV     #-1,R3          ;R3= ONES  SOURCE

                               ;TEST REG SEL 1 FOR S-A-0

007500  004737  022404                 JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
007504  010260  000014                 MOV     R2,RMER1(R0)    ;LOAD RMER1
007510  010260  000034                 MOV     R2,RMDC(R0)     ;LOAD RMDC
007514  010360  000024                 MOV     R3,RMMR1(R0)    ;LOAD RMMR1
007520  010360  000036                 MOV     R3,RMHR(R0)     ;LOAD RMHR
007524  016037  000014  001352         MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
007532  016037  000034  001372         MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
007540  020337  001352                 CMP     R3,RMER1I
007544  001007                         BNE     10$
007546  052737  176000  001372         BIS     #XNUDC,RMDCI
007554  020337  001372                 CMP     R3,RMDCI
007560  001001                         BNE     10$
007562  104010                         EMT     10

                               ;TEST REG SEL 1 FOR S-A-1
007564                         10$:
007564  004737  022404                 JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
007570  010260  000006                 MOV     R2,RMDA(R0)     ;LOAD RMDA
007574  010260  000032                 MOV     R2,RMOF(R0)     ;LOAD RMOF
007600  010260  000042                 MOV     R2,RMER2(R0)    ;LOAD RMER2
007604  010360  000016                 MOV     R3,RMAS(R0)     ;LOAD RMAS
007610  010360  000030                 MOV     R3,RMSN(R0)     ;LOAD RMSN
007614  010360  000040                 MOV     R3,RMMR2(R0)    ;LOAD RMMR2
007620  016037  000006  001344         MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
007626  016037  000032  001370         MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
007634  016037  000042  001400         MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER
007642  020337  001344                 CMP     R3,RMDAI
007646  001015                         BNE     20$
007650  052737  161577  001370         BIS     #XNUOF,RMOFI
```

```
 394 007656  020337  001370                  CMP     R3,RMOFI
 395 007662  001007                          BNE     20$
 396 007664  052737  001567  001400          BIS     #XNUER2,RMER2I
 397 007672  020337  001400                  CMP     R3,RMER2I
 398 007676  001001                          BNE     20$
 399 007700  104011                          EMT     11
 400
 401                                  ;TEST REG SEL 2 FOR S-A-0
 402 007702                           20$:
 403 007702  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 404 007706  010260  000006                  MOV     R2,RMDA(R0)     ;LOAD RMDA
 405 007712  010260  000032                  MOV     R2,RMOF(R0)     ;LOAD RMOF
 406 007716  010260  000042                  MOV     R2,RMER2(R0)    ;LOAD RMER2
 407 007722  010360  000020                  MOV     R3,RMLA(R0)     ;LOAD RMLA
 408 007726  010360  000036                  MOV     R3,RMHR(R0)     ;LOAD RMHR
 409 007732  010360  000046                  MOV     R3,RMEC2(R0)    ;LOAD RMEC2
 410 007736  016037  000006  001344          MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
 411 007744  016037  000032  001370          MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
 412 007752  016037  000042  001400          MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER
 413 007760  020337  001344                  CMP     R3,RMDAI
 414 007764  001015                          BNE     30$
 415 007766  052737  161577  001370          BIS     #XNUOF,RMOFI
 416 007774  020337  001370                  CMP     R3,RMOFI
 417 010000  001007                          BNE     30$
 418 010002  052737  001567  001400          BIS     #XNUER2,RMER2I
 419 010010  020337  001400                  CMP     R3,RMER2I
 420 010014  001001                          BNE     30$
 421 010016  104012                          EMT     12
 422
 423                                  ;TEST REG SEL 2 FOR S-A-1
 424 010020                           30$:
 425 010020  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 426 010024  010260  000014                  MOV     R2,RMER1(R0)    ;LOAD RMER1
 427 010030  010260  000034                  MOV     R2,RMDC(R0)     ;LOAD RMDC
 428 010034  012760  000076  000000          MOV     #ILF76,RMCS1(R0)        ;LOAD RMCS1
 429 010042  010360  000030                  MOV     R3,RMSN(R0)     ;LOAD RMSN
 430 010046  016037  000014  001352          MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
 431 010054  016037  000034  001372          MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
 432 010062  052737  177701  001352          BIS     #^CILF76,RMER1I
 433 010070  020337  001352                  CMP     R3,RMER1I
 434 010074  001007                          BNE     40$
 435 010076  052737  176000  001372          BIS     #XNUDC,RMDCI
 436 010104  020337  001372                  CMP     R3,RMDCI
 437 010110  001001                          BNE     40$
 438 010112  104013                          EMT     13
 439
 440                                  ;TEST REG SEL 4 FOR S-A-0
 441 010114                           40$:
 442 010114  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 443 010120  010260  000014                  MOV     R2,RMER1(R0)    ;LOAD RMER1
 444 010124  010260  000032                  MOV     R2,RMOF(R0)     ;LOAD RMOF
 445 010130  010260  000034                  MOV     R2,RMDC(R0)     ;LOAD RMDC
 446 010134  010360  000026                  MOV     R3,RMDT(R0)     ;LOAD RMDT
 447 010140  010360  000042                  MOV     R3,RMER2(R0)    ;LOAD RMER2
 448 010144  010360  000044                  MOV     R3,RMEC1(R0)    ;LOAD RMEC1
 449 010150  016037  000014  001352          MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
 450 010156  016037  000032  001370          MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
```

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 451 010164  016037  000034  001372          MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
 452 010172  020337  001352                  CMP     R3,RMER1I
 453 010176  001015                          BNE     50$
 454 010200  052737  161577  001370          BIS     #XNUOF,RMOFI
 455 010206  020337  001370                  CMP     R3,RMOFI
 456 010212  001007                          BNE     50$
 457 010214  052737  176000  001372          BIS     #XNUDC,RMDCI
 458 010222  020337  001372                  CMP     R3,RMDCI
 459 010226  001001                          BNE     50$
 460 010230  104014                          EMT     14
 461
 462                                  ;TEST REG SEL 4 FOR S-A-1
 463 010232                           50$:
 464 010232  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 465 010236  010260  000006                  MOV     R2,RMDA(R0)     ;LOAD RMDA
 466 010242  010260  000042                  MOV     R2,RMER2(R0)    ;LOAD RMER2
 467 010246  010360  000012                  MOV     R3,RMDS(R0)     ;LOAD RMDS
 468 010252  010360  000032                  MOV     R3,RMOF(R0)     ;LOAD RMOF
 469 010256  016037  000006  001344          MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
 470 010264  016037  000042  001400          MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER
 471 010272  020337  001344                  CMP     R3,RMDAI
 472 010276  001007                          BNE     60$
 473 010300  052737  001567  001400          BIS     #XNUER2,RMER2I
 474 010306  020337  001400                  CMP     R3,RMER2I
 475 010312  001001                          BNE     60$
 476 010314  104015                          EMT     15
 477
 478                                  ;TEST REG SEL 8 FOR S-A-0
 479 010316                           60$:
 480 010316  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 481 010322  010260  000014                  MOV     R2,RMER1(R0)    ;LOAD RMER1
 482 010326  010260  000006                  MOV     R2,RMDA(R0)     ;LOAD RMDA
 483 010332  010360  000034                  MOV     R3,RMDC(R0)     ;LOAD RMDC
 484 010336  010360  000042                  MOV     R3,RMER2(R0)    ;LOAD RMER2
 485 010342  016037  000014  001352          MOV     RMER1(R0),RMER1I        ;STORE RMER1 IN INPUT BUFFER
 486 010350  016037  000006  001344          MOV     RMDA(R0),RMDAI  ;STORE RMDA IN INPUT BUFFER
 487 010356  020337  001352                  CMP     R3,RMER1I
 488 010362  001004                          BNE     70$
 489 010364  020337  001344                  CMP     R3,RMDAI
 490 010370  001001                          BNE     70$
 491 010372  104016                          EMT     16
 492
 493                                  ;TEST REG SEL 8 FOR S-A-1
 494 010374                           70$:
 495 010374  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 496 010400  010260  000032                  MOV     R2,RMOF(R0)     ;LOAD RMOF
 497 010404  010260  000034                  MOV     R2,RMDC(R0)     ;LOAD RMDC
 498 010410  010260  000042                  MOV     R2,RMER2(R0)    ;LOAD RMER2
 499 010414  010360  000012                  MOV     R3,RMDS(R0)     ;LOAD RMDS
 500 010420  010360  000014                  MOV     R3,RMER1(R0)    ;LOAD RMER1
 501 010424  010360  000006                  MOV     R3,RMDA(R0)     ;LOAD RMDA
 502 010430  016037  000032  001370          MOV     RMOF(R0),RMOFI  ;STORE RMOF IN INPUT BUFFER
 503 010436  016037  000034  001372          MOV     RMDC(R0),RMDCI  ;STORE RMDC IN INPUT BUFFER
 504 010444  016037  000042  001400          MOV     RMER2(R0),RMER2I        ;STORE RMER2 IN INPUT BUFFER
 505 010452  052737  161577  001370          BIS     #XNUOF,RMOFI
 506 010460  001015                          BNE     80$
 507 010462  022737  176000  001372          CMP     #XNUDC,RMDCI
```

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                                                                L 5
 508 010470  020337  001372                    CMP     R3,RMDCI
 509 010474  001007                            BNE     80$
 510 010476  052737  001567  001400            BIS     #XNUER2,RMER2I
 511 010504  020337  001400                    CMP     R3,RMER2I
 512 010510  001001                            BNE     80$
 513 010512  104017                            EMT     17
 514 010514                              80$:
 515
 516                                     ;REGISTER SELECT 16 IS TESTED BY THE ILR TEST
 517
 518                                     ;;*************************************************************
                                         ;*TEST 7         DRIVE TYPE TEST
                                         ;;*************************************************************
     010514                              TST7:
     010514  000004                      SCOPE                   ;SCOPE CALL
     010516  000240                      NOP
     010520  012706  001100              MOV     #STACK,SP       ;LOAD THE STACK POINTER
     010524  013700  001276              MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     010530  013701  001466              MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     010534  012737  000007  001226      MOV     #7,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX
 519
 520 010542  016002  000026              MOV     RMDT(R0),R2     ;STORE RMDT AT R2
 521 010546  022702  020024              CMP     #SNGPRT,R2      ;SINGLE PORT RM03 ?
 522 010552  001431                      BEQ     10$             ;YES !!
 523 010554  022702  024024              CMP     #DULPRT,R2      ;DUAL PORT RM03 ?
 524 010560  001426                      BEQ     10$             ;YES !!
 525
 526 010562  022702  020025              CMP     #SNGPRT!BIT0,R2 ;SINGLE PORT RM02 ?
 527 010566  001423                      BEQ     10$             ;YES !!
 528 010570  022702  024025              CMP     #DULPRT!BIT0,R2 ;DUAL PORT RM02 ?
 529 010574  001420                      BEQ     10$             ;YES !!
 530
 531 010576  022702  020027              CMP     #SNGPRT!BIT1!BIT0,R2    ;SINGLE PORT RM05 ?
 532 010602  001415                      BEQ     10$                     ;YES !!
 533 010604  022702  024027              CMP     #DULPRT!BIT1!BIT0,R2    ;DUAL PORT RM05 ?
 534 010610  001412                      BEQ     10$
 535
 536 010612  010237  001142              MOV     R2,$BDDAT       ;GET RECIEVED DRIVE TYPE
 537 010616  010037  001136              MOV     R0,$BDADR       ;LOAD BAD ADDRESS
 538 010622  062737  000026  001136      ADD     #RMDT,$BDADR
 539 010630  104057                      EMT     57
 540 010632  000137  021274              JMP     $EOSP           ;GO TO NEXT DEVICE
 541 010636                              10$:
 542
 543                                     ;;*************************************************************
                                         ;*TEST 10        DEVICE AVAILABLE TEST
                                         ;;*************************************************************
     010636                              TST10:
     010636  000004                      SCOPE                   ;SCOPE CALL
     010640  000240                      NOP
     010642  012706  001100              MOV     #STACK,SP       ;LOAD THE STACK POINTER
     010646  013700  001276              MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     010652  013701  001466              MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     010656  012737  000010  001226      MOV     #10,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
 544
```

```
                                    JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
                                    MOV     RMCS1(R0),$BDDAT        ;STORE RMCS1 AT $BDDAT
                                    BIC     #^CDVA,$BDDAT   ;CLEAR ALL BUT DVA
                                    BNE     10$             ;BRANCH IF DVA SET
                                    MOV     #DVA,$GDDAT     ;SETUP EXPECTED
                                    MOV     R0,$BDADR       ;SETUP REG ADDRESS
                                    EMT     60
                            10$:

                            ;;*******************************************************************
                            ;*TEST 11        SEARCH TIMEOUT TEST

                            ;;*******************************************************************
                            TST11:
                                    SCOPE                   ;SCOPE CALL
                                    NOP
                                    MOV     #STACK,SP       ;LOAD THE STACK POINTER
                                    MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
                                    MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
                                    MOV     #11,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

                            ;LOAD REGISTER OUTPUT BUFFER WITH COMMAND PARAMETERS
                                    MOV     #0,RMDA0        ;SECTOR=0=TRACK
                                    MOV     #0,RMDC0        ;CYLINDER=0
                                    MOV     #FMT16,RMOF0    ;16 BIT FORMAT
                                    MOV     #BUFFER,RMBA0   ;STARTING BUFFER ADDRESS
                                    MOV     #-1,RMWC0       ;WORD COUNT
                                    MOV     #WD!GO,RMCS10   ;WRITE DATA COMMAND

                                    JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                            ;SEARCH IS ENABLED USING SUBROUTINE.
                                    BR      10$             ;BRANCH TO 10$ IF NO ERROR
                                    EMT
                                    BR      50$             ;SLOC REST PF TEST

                            ;START THE CLOCK AND WAIT FOR 100 MS
                            10$:
                                    MOV     #100.,WATCH     ;SET WATCHDOG TIMER VALUE
                                    JSR     PC,@CLOCK       ;START THE CLOCK
                            20$:    TST     WATCH
                                    BNE     20$
                                    JSR     PC,@STOPCL      ;STOP THE CLOCK

                            ;VERIFY THAT OPI IS NOT SET (SEARCH TIMEOUT IS DISABLED)
                                    MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
                                    MOV     R0,$BDADR       ;SET UP FOR ERROR MSG
                                    ADD     #RMER1,$BDADR
                                    BIC     #^COPI,$BDDAT
                                    BEQ     30$             ;BRANCH IF NO ERROR
                                    CLR     $GDDAT
                                    EMT     20
                                                            ;DISABLED
                                    BR      50$             ;SKIP

                            ;ENABLE SEARCH TIMEOUT, THEN WAIT 100 MS
                            30$:
                                    MOV     #DMD!MUR!DBEN!MOC,RMMR1(R0)     ;LOAD RMMR1
```

```
 588 011120  012737  000144  001534          MOV     #100.,WATCH     ;SET WATCHDOG TIMER VALUE
     011126  004777  170404                  JSR     PC,@CLOCK       ;START THE CLOCK
 589 011132  005737  001534          40$:    TST     WATCH
 590 011136  001375                          BNE     40$
 591 011140  004777  170374                  JSR     PC,@STOPCL      ;STOP THE CLOCK
 592
 593                                 ;OPI SHOULD NOW BE SET (SEARCH TIMEOUT IS ENABLED)
 594 011144  016037  000014  001142          MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
 595 011152  042737  157777  001142          BIC     #^COPI,$BDDAT
 596 011160  001004                          BNE     50$
 597 011162  012737  020000  001140          MOV     #OPI,$GDDAT
 598 011170  104021                          EMT     21
 599 011172                          50$:
 600
 601                                 ;;*****************************************************************
                                     ;*TEST 12        SET DTE TEST

                                     ;;*****************************************************************
     011172                          TST12:
     011172  000004                          SCOPE                   ;SCOPE CALL
     011174  000240                          NOP
     011176  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
     011202  013700  001276                  MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     011206  013701  001466                  MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     011212  012737  000012  001226          MOV     #12,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
 602
 603 011220  010037  001136                  MOV     R0,$BDADR       ;SETUP ERROR MSG
 604 011224  062737  000014  001136          ADD     #RMER1,$BDADR
 605 011232  005037  001140                  CLR     $GDDAT
 606
 607                                 ;INITILAIZE AND VERIFY THAT DRIVE TIMING ERROR IS RESET
 608 011236  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 609
 610 011242  016037  000014  001142          MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
 611 011250  042737  167777  001142          BIC     #^CDTE,$BDDAT
 612 011256  001402                          BEQ     10$             ;BRANCH IF DTE=0
 613 011260  104031                          EMT     31
 614 011262  000517                          BR      50$             ;SKIP REST OF TEST
 615
 616                                 ;SET MAINTENANCE INDEX PULSE AND VERIFY DTE REMAINS RESET
 617 011264                          10$:
 618 011264  012760  000001  000024          MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
 619 011272  012760  000005  000024          MOV     #DMD!MI,RMMR1(R0)       ;LOAD RMMR1
 620 011300  016037  000014  001142          MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
 621 011306  042737  167777  001142          BIC     #^CDTE,$BDDAT
 622 011314  001402                          BEQ     20$
 623 011316  104000                          EMT
 624 011320  000500                          BR      50$             ;COMPARE SHOULD BE RESET
 625
 626                                 ;EXECUTE DUMMY DATA COMMAND TO ENABLE SEARCH
 627 011322                          20$:
 628 011322  012737  000000  001420          MOV     #0,RMDA0
 629 011330  012737  000005  001446          MOV     #5,RMDC0
 630 011336  012737  010000  001444          MOV     #FMT16,RMOF0
 631 011344  012737  054636  001416          MOV     #BUFFER,RMBA0
 632 011352  012737  177777  001414          MOV     #-1,RMWC0
 633 011360  012737  000061  001412          MOV     #WD.GO,RMCS10
```

```
635 011366  004737  022432                  JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                    ;SEARCH IS ENABLED USING SUBROUTINE.
    011372  000402                          BR      30$             ;BRANCH TO 30$ IF NO ERROR
    011374  104000                          EMT
636 011376  000451                          BR      50$
637
638                                 ;WITH SEARCH ENABLED, SET AND RESET SECTOR PULSE TO SET ENABLE
639                                 ;SEARCH FLOP.
640 011400                          30$:
641 011400  012760  051441  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MS,RMMR1(R0)     ;LOAD RMMR1
642 011406  012760  051401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
643
644                                 ;SET SECTOR PULSE AND VERIFY DTE DOES NOT SET
645                                 ;       PUTMR1  #DMD!MUR!DBEN!MOC!MSEN!MS
646                                 ;       PUTMR1  #DMD!MUR!DBEN!MOC!MSEN
647
648 011414  016037  000014  001142          MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
649 011422  042737  167 ,'  001142          BIC     #^CDTE,$BDDAT
650 011430  001402                          BEQ     40$
651 011432  104023                          EMT     23
652 011434  001432                          BEQ     50$             ;COMPARE SHOULD BE RESET
653
654                                 ;FORCE SECTOR COMPARE
655 011436                          40$:
656 011436  012760  051403  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1
657 011444  012760  051443  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC!MS,RMMR1(R0) ;LOAD RMMR1
658 011452  012760  051403  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1
659
660                                 ;SET SECTOR PULSE AND VERIFY DTE SETS
661 011460  012760  051441  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MS,RMMR1(R0)     ;LOAD RMMR1
662 011466  012760  051401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
663 011474  016037  000014  001142          MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
664 011502  042737  167777  001142          BIC     #^CDTE,$BDDAT
665 011510  001004                          BNE     50$
666 011512  012737  010000  001142          MOV     #DTE,$BDDAT
667 011520  104024                          EMT     24
668                                                                 ;SECTOR COMPARE SET
669 011522                          50$:
670
671                                 ;;**********************************************************************
                                    ;*TEST 13        FORMAT CHANGE TEST

                                    ;;**********************************************************************
    011522                          TST13:
    011522  000004                          SCOPE                   ;SCOPE CALL
    011524  000240                          NOP
    011526  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
    011532  013700  001276                  MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
    011536  013701  001466                  MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
    011542  012737  000013  001226          MOV     #13,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
672
673 011550  012702  012100                  MOV     #50$,R2         ;R2=TABLE POINTER
674
675                                 ;INITILAIZE AND SET THE FORMAT BIT, USE INDEX PULSE TO CLEAR FORMAT CHANGE
676 011554                          10$:
677 011554  004737  022404                  JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
```

```
                                ;SETUP AND EXECUTE DUMMY DATA COMMAND USING OPPOSITE FORMAT
011560  011260  000032          MOV     (R2),RMOF(R0)   ;LOAD FORMAT MODE IN RMOF
011564  012760  000001  000024  MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
011572  012760  000005  000024  MOV     #DMD!MI,RMMR1(R0)       ;LOAD RMMR1

011600  012737  000000  001420  MOV     #0,RMDAO
011606  012737  000005  001446  MOV     #5,RMDCO
011614  016237  000002  001444  MOV     2(R2),RMOFO
011622  012737  054636  001416  MOV     #BUFFER,RMBAO
011630  012737  177777  001414  MOV     #-1,RMWCO
011636  012737  000061  001412  MOV     #WD!GO,RMCS1O

011644  004737  022432          JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                        ;SEARCH IS ENABLED USING SUBROUTINE.
011650  000402                  BR      20$             ;BRANCH TO 20$ IF NO ERROR
011652  104000                  EMT
011654  000514                  BR      60$

                                ;FORMAT CHANGE FLOP SHOULD BE SET - VERIFY BY TRYING TO FORCE A
                                ;DRIVE TIMING ERROR WHICH SHOULD NOT SET.
011656                          20$:
011656  012760  051403  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1
011664  012760  051443  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC!MS,RMMR1(R0) ;LOAD RMMR1
011672  012760  051403  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1
011700  012760  051401  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1

                                ;VERIFY THAT DRIVE TIMING ERROR DIDNT SET
011706  016037  000014  001142  MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
011714  042737  167777  001142  BIC     #^CDTE,$BDDAT
011722  001416                  BEQ     30$
011724  010037  001136          MOV     R0,$BDADR       ;SETUP ERROR MESSAGE
011730  062737  000014  001136  ADD     #RMER1,$BDADR
011736  005037  001140          CLR     $GDDAT
011742  011237  001174          MOV     (R2),$TMP0
011746  016237  000002  001176  MOV     2(R2),$TMP1
011754  104025                  EMT     25
011756  000453                  BR      60$             ;A FORMAT CHANGE

                                ;CLEAR THE FORMAT CHANGE FLOP W/INDEX PULSE
011760                          30$:
011760  012760  051405  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MI,RMMR1(R0)      ;LOAD RMMR1

                                ;ENABLE SEARCH AND FORCE SECTOR COMPARE
011766  012760  051403  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1
011774  012760  051443  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC!MS,RMMR1(R0) ;LOAD RMMR1
012002  012760  051403  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1

                                ;SET DTE W/ANOTHER SECTOR PULSE - VERIFY DTE IS SET
012010  012760  051441  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN!MS,RMMR1(R0)      ;LOAD RMMR1
012016  012760  051401  000024  MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)         ;LOAD RMMR1
012024  016037  000014  001142  MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
012032  042737  167777  001142  BIC     #^CDTE,$BDDAT
012040  001012                  BNE     40$
012042  010037  001136          MOV     R0,$BDADR       ;SETUP ERROR MESSAGE
012046  062737  000014  001136  ADD     #RMER1,$BDADR
012054  012737  010000  001140  MOV     #DTE,$GDDAT
012062  104027                  EMT     27
```

>EQ 0068

```
 732 012064  000410                        BR      60$
 733
 734                                ;DO TEST W/18 TO 16 FORMAT CHANGE DURING SECOND EXECUTION
 735 012066                         40$:
 736 012066  022702  012100                CMP     #50$,R2
 737 012072  001005                        BNE     60$             ;BRANCH IF DONE TEST
 738 012074  005722                        TST     (R2)+           ;MOVE POINTER
 739 012076  000626                        BR      10$             ;REPEAT TEST
 740
 741 012100  010000                 50$:   .WORD   FMT16           ;16-18 FORMAT CHANGE
 742 012102  000000                        .WORD   0               ;18-16 FORMAT CHANGE
 743 012104  010000                        .WORD   FMT16
 744 012106                         60$:                           ;END OF TEST
 745
 746                                ;;*****************************************************************
                                    ;*TEST 14       PROM STROBE TEST
                                    ;;*****************************************************************
     012106                         TST14:
     012106  000004                        SCOPE                   ;SCOPE CALL
     012110  000240                        NOP
     012112  012706  001100                MOV     #STACK,SP       ;LOAD THE STACK POINTER
     012116  013700  001276                MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     012122  013701  001466                MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     012126  012737  000014  001226        MOV     #14,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
 747
 748 012134  004737  022404                JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
 749 012140  010037  001136                MOV     R0,$BDADR       ;SETUP ERROR MESSAGE
 750 012144  062737  000024  001136        ADD     #RMMR1,$BDADR
 751
 752                                ;SET DIAGNOSTIC MODE AND TRY TO RESET PROM STROBE
 753 012152  012760  000001  000024        MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
 754 012160  012702  000021                MOV     #17.,R2         ;R2=MAXIMUM # CLOCK PULSES
 755 012164                         5$:
     012164  012760  004001  000024        MOV     #DMD!MCLK,RMMR1(R0)     ;LOAD RMMR1
 756 012172  012760  000001  000024        MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
 757 012200  016037  000024  001142        MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
 758 012206  042737  177737  001142        BIC     #^CWC,$BDDAT
 759 012214  001406                        BEQ     6$
 760 012216  005302                        DEC     R2
 761 012220  001361                        BNE     5$
 762 012222  005037  001140                CLR     $GDDAT
 763 012226  104000                        EMT
 764 012230  000501                        BR      60$
 765 012232  012702  000021         6$:    MOV     #17.,R2
 766 012236                         10$:
     012236  012760  004001  000024        MOV     #DMD!MCLK,RMMR1(R0)     ;LOAD RMMR1
 767 012244  012760  000001  000024        MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
 768 012252  016037  000024  001142        MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
 769 012260  042737  177737  001142        BIC     #^CWC,$BDDAT
 770 012266  001007                        BNE     20$             ;EXIT LOOP WHEN PROM STROBE ON
 771 012270  005302                        DEC     R2
 772 012272  001361                        BNE     10$
 773 012274  012737  000040  001140        MOV     #WC,$GDDAT
 774 012302  104030                        EMT     30
 775 012304  000453                        BR      60$
 776
```

```
                                        ;VERIFY PROM STROBE IS ON FOR 3 BIT CLOCKS
                                        20$:
012306                                          MOV     #3.,R2
                                        25$:
012312  012760  004001  000024                MOV     #DMD!MCLK,RMMR1(R0)     ;LOAD RMMR1
012320  012760  000001  000024                MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
012326  016037  000024  001142                MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
012334  042737  177737  001142                BIC     #^CWC,$BDDAT
012342  001005                                BNE     30$             ;BRANCH IF PROM STORBE DID NOT
                                                                        ;DROP EARLY
012344  012737  000040  001140                MOV     #WC,$GDDAT
012352  104032                                EMT     32
012354  000427                                BR      60$
012356  005302                        30$:    DEC     R2
012360  001354                                BNE     25$

                                        ;VERIFY PROM STROBE IS OFF FOR 8 BIT CLOCKS
012362  012702  000010                        MOV     #8..R2
012366                                  40$:
C12366  012760  0C4001  000024                MOV     #DMD!MCLK,RMMR1(R0)     ;LOAD RMMR1
012374  012760  000001  000024                MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
012402  016037  000024  001142                MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
012410  042737  177737  001142                BIC     #^CWC,$BDDAT
012416  001404                                BEQ     50$             ;BRANCH IF PROM STROBE
012420  005037  001140                        CLR     $GDDAT          ;DID NOT SET EARLY
012424  104033                                EMT     33
012426  000402                                BR      60$
012430  005302                        50$:    DEC     R2
012432  001355                                BNE     40$
012434                                  60$:

                                        ;;*****************************************************************
                                        ;*TEST 15       SYNC WORD COUNT INHIBIT TEST

                                        ;;*****************************************************************
012434                                  TST15:
012434  000004                                SCOPE                   ;SCOPE CALL
012436  000240                                NOP
012440  012706  001100                        MOV     #STACK,SP       ;LOAD THE STACK POINTER
012444  013700  001276                        MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
012450  013701  001466                        MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
012454  012737  000015  001226                MOV     #15,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX

                                        ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
012462  012737  000005  001446                MOV     #5,RMDCO        ;CYLINDER=5
012470  012737  000000  001420                MOV     #0,RMDAO        ;SECTOR=0, TRACK=0
012476  012737  010000  001444                MOV     #FMT16,RMOFO    ;16 BIT FORMAT
012504  012737  054636  001416                MOV     #BUFFER,RMBAO   ;STARTING BUFFER ADDRESS
012512  012737  177777  001414                MOV     #-1,RMWCO       ;WORD COUNT
012520  012737  000061  001412                MOV     #WD!GO,RMCS10   ;WRITE DATA COMMAND

012526  004737  022432                        JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                        ;SEARCH IS ENABLED USING SUBROUTINE.
012532  000402                                BR      10$             ;BRANCH TO 10$ IF NO ERROR
012534  104000                                EMT
012536  000562                                BR      120$            ;SKIP IF FAILURE
012540                                  10$:
```

```
819 012540  004737  023304                  JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
    012544  000402                          BR      20$             ;BRANCH TO 20$ IF NO ERROR
    012546  104000                          EMT
820 012550  000555                          BR      120$
821
822                                 ;CAN NOW STEP DATA TIMING SEQUENCER WITH SECTOR COMPARE SET
823
824                                 ;STEP THE SEQUENCER TO LOCATION 10(10) WHILE CHECKING 'PLFS'
825 012552  012702  000000          20$:    MOV     #0,R2           ;R2=SEQUENCER ADDRESS
826
827                                 ;PULSE MAINTENANCE CLOCK UNTIL PROM STROBE SETS
828 012556                          30$:
829 012556  012760  055401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MCLK,RMMR1(R0)   ;LOAD RMMR1
830 012564  012760  051401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
831
832                                 ;SEE IF PROM STROBE IS SET
833 012572  016003  000024          MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
834 012576  032703  000040          BIT     #WC,R3
835 012602  001765                  BEQ     30$             ;ISSUE NEXT BIT CLOCK
836 012604  005202                  INC     R2              ;INCREMENT SEQUENCER ADDRESS
837
838                                 ;CHECK 'LOOKING FOR SYNC' - SHOULD BE ZERO UNTIL LOCATION 11
839 012606  010337  001142          MOV     R3,$BDDAT
840 012612  042737  175777  001142  BIC     #^CPLFS,$BDDAT
841 012620  001413                  BEQ     50$             ;BRANCH IF PLFS IS ZERO
842 012622  005037  001140          CLR     $GDDAT
843 012626  010037  001136          MOV     R0,$BDADR
844 012632  062737  000024  001136  ADD     #RMMR1,$BDADR
845 012640  010237  001174          MOV     R2,$TMP0
846 012644  104034                  EMT     34
847 012646  000516                  BR      120$            ;SKIP REST OF TEST
848
849                                 ;EXIT LOOP IF SEQUENCER NOW AT LOCATION 10
850 012650                          50$:
851 012650  022702  000012          CMP     #10.,R2
852 012654  001414                  BEQ     70$
853
854                                 ;PULSE MAINTENANCE CLOCK UNTIL PROM STROBE RESETS
855 012656                          60$:
856 012656  012760  055401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MCLK,RMMR1(R0)   ;LOAD RMMR1
857 012664  012760  051401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
858
859                                 ;SEE IF PROM STROBE IS RESET
860 012672  016003  000024          MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
861 012676  032703  000040          BIT     #WC,R3
862 012702  001365                  BNE     60$
863 012704  000724                  BR      30$             ;GO STEP SEQUENCER TO NEXT LOC
864
865                                 ;THE NEXT PROM STROBE SHOULD SET 'PLFS' AT LOCATION 11(10) OF THE
866                                 ;DATA TIMING SEQUENCER.
867 012706                          70$:
868 012706  012702  000020          MOV     #16.,R2         ;R2=NUMBER OF BIT CLOCKS
869
870                                 ;ISSUE 16 BIT CLOCKS TO GET NEXT PROM STROBE
871 012712                          80$:
872 012712  012760  055401  000024          MOV     #DMD.MUR.DBEN!MOC!MSEN.MCLK,RMMR1(R0)   ;LOAD RMMR1
873 012720  012760  051401  000024          MOV     #DMD.MUR.DBEN.MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
```

```
 874 012726  005302                        DEC     R2
 875 012730  001370                        BNE     80$
 876
 877                                ;VERIFY THAT 'PLFS' IS NOW SET
 878 012732  016037  000024  001142        MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
 879 012740  042737  175777  001142        BIC     #^CPLFS,$BDDAT
 880 012746  001012                        BNE     90$                     ;BRANCH IF PLFS IS SET
 881 012750  012737  002000  001140        MOV     #PLFS,$GDDAT            ;SETUP ERROR MESSAGE
 882 012756  010037  001136                MOV     R0,$BDADR
 883 012762  062737  000024  001136        ADD     #RMMR1,$BDADR
 884 012770  104035                        EMT     35
 885 012772  000444                        BR      120$                    ;SKIP REST OF TEST
 886
 887                                ;ISSUE 3 MORE BIT CLOCKS TO RESET PROM STROBE
 888 012774                         90$:
 889 012774  012702  000003                MOV     #3,R2
 890 013000                         95$:
     013000  012760  055401  000024        MOV     #DMD!MUR!DBEN!MOC!MSEN!MCLK,RMMR1(R0)   ;LOAD RMMR1
 891 013006  012760  051401  000024        MOV     #DMD.MUR.DBEN!MOC'MSEN,RMMR1(R0)        ;LOAD RMMR1
 892 013014  005302                        DEC     R2
 893 013016  001370                        BNE     95$
 894
 895                                ;WITH 'LOOKING FOR SYNC SET, FURTHER BIT CLOCKS SHOULD NOT SET
 896                                ;PROM STROBE
 897 013020  012702  000040                MOV     #32.,R2                 ;R2=NUMBER OF BIT CLOCKS
 898
 899                                ;PULSE BIT CLOCK AND VERIFY PROM STROBE DOES NOT SET
 900 013024                         100$:
 901 013024  012760  055401  000024        MOV     #DMD!MUR!DBEN!MOC!MSEN!MCLK,RMMR1(R0)   ;LOAD RMMR1
 902 013032  012760  051401  000024        MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
 903 013040  016003  000024                MOV     RMMR1(R0),R3            ;STORE RMMR1 AT R3
 904 013044  042703  177737                BIC     #^CWC,R3
 905 013050  001413                        BEQ     110$                    ;BRANCH IF PROM STROBE IS 0
 906 013052  005037  001140                CLR     $GDDAT                  ;SETUP ERROR MESSAGE
 907 013056  010337  001142                MOV     R3,$BDDAT
 908 013062  010037  001136                MOV     R0,$BDADR
 909 013066  062737  000024  001136        ADD     #RMMR1,$BDADR
 910 013074  104036                        EMT     36
 911 013076  000402                        BR      120$
 912 013100  005302                 110$:  DEC     R2                      ;CONTINUE FOR 32 BIT CLOCKS
 913 013102  001350                        BNE     100$
 914
 915 013104                         120$:                                  ;END OF TEST
 916
 917                                ;;*****************************************************************
                                    ;*TEST 16        SYNC DETECTION TEST

                                    ;;*****************************************************************
     013104                         TST16:
     013104  000004                        SCOPE                           ;SCOPE CALL
     013106  000240                        NOP
     013110  012706  001100                MOV     #STACK,SP               ;LOAD THE STACK POINTER
     013114  013700  001276                MOV     $BASE,R0                ;R0 = UNIBUS ADDRESS
     013120  013701  001466                MOV     TSTQUE,R1               ;R1 = POINTER TO DEVICE
     013124  012737  000016  001226        MOV     #16,$TESTN              ;;SET TEST NUMBER IN APT MAIL BOX
 918
 919                                ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
```

```
 920 013132  012737  000000  001420          MOV     #0,RMDAO        ;SECTOR 0,TRACK 0
 921 013140  012737  000005  001446          MOV     #5,RMDCO        ;CYLINDER 5
 922 013146  012737  010000  001444          MOV     #FMT16,RMOFO    ;16 BIT MODE
 923 013154  012737  054636  001416          MOV     #BUFFER,RMBAO   ;BUFFER ADDRESS
 924 013162  012737  177777  001414          MOV     #-1,RMWCO       ;WORD COUNT
 925 013170  012737  000071  001412          MOV     #RD.GO,RMCS10   ;READ DATA COMMAND
 926
 927 013176  004737  022432                  JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                     ;SEARCH IS ENABLED USING SUBROUTINE.
     013202  000402                          BR      10$             ;BRANCH TO 10$ IF NO ERROR
     013204  104000                          EMT
 928 013206  000550                          BR      100$
 929 013210                          10$:
 930 013210  004737  023304                  JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
     013214  000402                          BR      20$             ;BRANCH TO 20$ IF NO ERROR
     013216  104000                          EMT
 931 013220  000543                          BR      100$
 932 013222                          20$:
 933 013222  004737  023412                  JSR     PC,SETLFS       ;SET 'LOOKING FOR SYNC' USING SUBROUTINE
     013226  000402                          BR      30$             ;BRANCH TO 30$ IF NO ERROR
     013230  104000                          EMT
 934 013232  000536                          BR      100$
 935
 936                                 ;CLOCK ALL ONES SYNC PATTERN AND VERIFY SYNC IS NOT DETECTED
 937                                 ;(USING PROM STORBE AS INDICATION)
 938 013234                          30$:
 939 013234  012702  000020                  MOV     #16.,R2         ;NUMBER OF ONE BITS
 940 013240  010037  001136                  MOV     R0,$BDADR       ;SETUP ERROR MESSAGE
 941 013244  062737  000024  001136          ADD     #RMMR1,$BDADR
 942 013252  005037  001140                  CLR     $GDDAT
 943 013256  012760  053401  000024          MOV     #MR1AAA!MRD,RMMR1(R0)   ;LOAD RMMR1
 944 013264                          40$:
 945 013264  012760  057401  000024          MOV     #MR1AAA!MRD!MCLK,RMMR1(R0)      ;LOAD RMMR1
 946 013272  012760  053401  000024          MOV     #MR1AAA!MRD,RMMR1(R0)   ;LOAD RMMR1
 947 013300  016037  000024  001142          MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
 948 013306  042737  177737  001142          BIC     #^CWC,$BDDAT
 949 013314  001405                          BEQ     50$
 950 013316  012737  177777  001174          MOV     #177777,$TMP0
 951 013324  104037                          EMT     37
 952 013326  000500                          BR      100$
 953 013330                          50$:
 954 013330  005302                          DEC     R2              ;REPEAT FOR 16 BITS
 955 013332  001354                          BNE     40$
 956 013334  012702  000020                  MOV     #16.,R2         ;NUMBER OF ZERO BITS
 957
 958                                 ;CLOCK ALL ZERO SYNC PATTERN AND VERIFY SYNC IS NOT DETECTED
 959 013340                          60$:
 960 013340  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
 961 013346  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
 962 013354  016037  000024  001142          MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
 963 013362  042737  177737  001142          BIC     #^CWC,$BDDAT    ;MAKE SURE SYNC NOT DETECTED
 964 013370  001404                          BEQ     70$
 965 013372  005037  001174                  CLR     $TMP0
 966 013376  104037                          EMT     37
 967 013400  000453                          BR      100$            ;SKIP IF FAILURE
 968 013402                          70$:
 969 013402  005302                          DEC     R2              ;REPEAT FOR 16 BITS
```

```
013404  001355                            BNE     60$
013406  012702  000040                    MOV     #32.,R2             ;R2=NUMBER OF BITS
013412  012703  000031                    MOV     #000031,R3          ;R3=SYNC PATTERN FOR LEFT SHIFT

                                  ;CLOCK THE BINARY SYNC PATTERN (10011000) AND VERIFY THAT SYNC IS
                                  ;DETECTED
013416  012737  051401  001436    80$:    MOV     #MR1AAA,RMMR10      ;GENERATE VALUE OF RMMR1
013424  000241                            CLC                         ;CLEAR THE CARR
013426  006003                            ROR     R3                  ;SHIFT RIGHT
013430  103003                            BCC     90$                 ;BRANCH IF C BIT CLEAR
013432  052737  002000  001436            BIS     #MRD,RMMR10         ;SET MRD IF PATTER BIT SETS
013440                            90$:
013440  013760  001436  000024            MOV     RMMR10,RMMR1(R0)            ;LOAD RMMR1
013446  052737  004000  001436            BIS     #MCLK,RMMR10                ;SET THE MAINTENANCE DATA CLK
013454  013760  001436  000024            MOV     RMMR10,RMMR1(R0)            ;LOAD RMMR1
013462  042737  004000  001436            BIC     #MCLK,RMMR10                ;RESET BIT CLOCK
013470  013760  001436  000024            MOV     RMMR10,RMMR1(R0)            ;LOAD RMMR1
013476  016037  000024  001142            MOV     RMMR1(R0),$BDDAT            ;STORE RMMR1 AT $BDDAT
013504  042737  177737  001142            BIC     #^CWC,$BDDAT
013512  001006                            BNE     100$                ;BRANCH IF PROM STROBE IS SET
013514  005302                            DEC     R2                  ;CONTINME FOR 16 BIT CLOCKS
013516  001337                            BNE     80$
013520  012737  000040  001140            MOV     #WC,$GDDAT
013526  104040                            EMT     40
013530                            100$:                               ;END OF TEST

                                  ;;*****************************************************************
                                  ;*TEST 17        ABORT SYNC DETECTION TEST

                                  ;;*****************************************************************
013530                            TST17:
013530  000004                            SCOPE                       ;SCOPE CALL
013532  000240                            NOP
013534  012706  001100                    MOV     #STACK,SP           ;LOAD THE STACK POINTER
013540  013700  001276                    MOV     $BASE,R0            ;R0 = UNIBUS ADDRESS
013544  013701  001466                    MOV     TSTQUE,R1           ;R1 = POINTER TO DEVICE
013550  012737  000017  001226            MOV     #17,$TESTN          ;;SET TEST NUMBER IN APT MAIL BOX

                                  ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
013556  012737  000000  001420            MOV     #0,RMDA0            ;SECTOR 0, TRACK 0
013564  012737  000005  001446            MOV     #5,RMDC0            ;CYLINDER 5
013572  012737  010000  001444            MOV     #FMT16,RMOF0        ;16 BIT FORMAT
013600  012737  054636  001416            MOV     #BUFFER,RMBA0       ;STARTING BUFFER ADDRESS
013606  012737  177777  001414            MOV     #-1,RMWC0           ;WORD COUNT
013614  012737  000071  001412            MOV     #RD!GO,RMCS10       ;READ DATA COMMAND

013622  004737  022432                    JSR     PC,ENBSCH           ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                      ;SEARCH IS ENABLED USING SUBROUTINE.
013626  000402                            BR      10$                 ;BRANCH TO 10$ IF NO ERROR
013630  104000                            EMT
013632  000447                            BR      50$
013634                            10$:
013634  004737  023304                    JSR     PC,SCTCMP           ;FORCE SECTOR COMPARE USING SUBROUTINE
013640  000402                            BR      20$                 ;BRANCH TO 20$ IF NO ERROR
013642  104000                            EMT
013644  000442                            BR      50$
013646                            20$:
```

```
1011 013646  004737  023412              JSR     PC,SETLFS       ;SET ''LOOKING FOR SYNC'' USING SUBROUTINE
     013652  000402                      BR      30$             ;BRANCH TO 30$ IF NO ERROR
     013654  104000                      EMT
1012 013656  000435                      BR      50$
1013
1014                                 ;LOOKING FOR SYNC INHIBITS WORD CLOCK,HOWEVER, ''DRIVE TIMING ERROR''
1015                                 ;SHOULD RESET ''LFS WORD COUNT INHIBIT'' FLOP
1016                                 ;FORCE DRIVE TIMING ERROR
1017 013660                         30$:
1018 013660  012760  051441  000024        MOV     #MR1AAA!MS,RMMR1(R0)    ;LOAD RMMR1
1019
1020                                 ;PULSE BIT CLOCK AND VERIFY PROM STROBE SETS
1021 013666  012702  000020              MOV     #16.,R2         ;R2, NUMBER OF BIT CLOCKS
1022 013672                         40$:
1023 013672  012760  055441  000024        MOV     #MR1AAA!MS!MCLK,RMMR1(R0)       ;LOAD RMMR1
1024 013700  012760  051441  000024        MOV     #MR1AAA!MS,RMMR1(R0)    ;LOAD RMMR1
1025 013706  016037  000024  001142        MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
1026 013714  042737  177737  001142        BIC     #^CWC,$BDDAT
1027 013722  001013                      BNE     50$
1028 013724  005302                      DEC     R2
1029 013726  001361                      BNE     40$
1030 013730  012737  000040  001140        MOV     #WC,$GDDAT
1031 013736  010037  001136              MOV     R0,$BDADR
1032 013742  062737  000024  001136        ADD     #RMMR1,$BDADR
1033 013750  104041                      EMT     41
1034 013752                         50$:
1035
1036
1037                                 ;;*****************************************************************
                                     ;*TEST 20        SYNC GENERATION TEST
                                     ;;*****************************************************************
     013752                          ;;*****************************************************************
1038                                 TST20:
     013752  000004                      SCOPE                   ;SCOPE CALL
     013754  000240                      NOP
     013756  012706  001100              MOV     #STACK,SP       ;LOAD THE STACK POINTER
     013762  013700  001276              MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     013766  013701  001466              MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     013772  012737  000020  001226        MOV     #20,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
1039
1040 014000  012737  000000  001420  ;SETUP REGISTER OUTPUT BUFFER FOR SUBROUTINES
1041 014006  012737  000005  001446        MOV     #0,RMDAO                ;SECTOR 0, TRACK 0
1042 014014  012737  010000  001444        MOV     #5,RMDCO                ;CYL 5
1043 014022  012737  054636  001416        MOV     #FMT16,RMOFO            ;16 BIT MODE
1044 014030  012737  177776  001414        MOV     #BUFFER,RMBAO           ;BUFFER ADDRESS
1045 014036  012737  000063  001412        MOV     #-2,RMWCO               ;WORD COUNT
1046                                       MOV     #WH!GO,RMCS10           ;WHITE HEAD AND DATA COM
1047 014044  004737  022432              JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                 ;SEARCH IS ENABLED USING SUBROUTINE.
     014050  000403                      BR      10$             ;BRANCH TO 10$ IF NO ERROR
     014052  104000                      EMT
1048 014054  000137  014444              JMP     160$
1049 014060                         10$:
1050 014060  004737  023304              JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
     014064  000402                      BR      20$             ;BRANCH TO 20$ IF NO ERROR
     014066  104000                      EMT
```

```
1051 014070  000565                        BR      160$
1052
1053                                ;WRITE PROM OF DATA TIMING SEQUENCER SHOULD NOW BE ENABLED
1054                                ;FIRST, VERIFY THAT WRITE GATE IS ON, INDICATING THAT
1055                                ;SECTOR COMPARE SET
1056 014072                        20$:
1057 014072  016037  000040  001142        MOV     RMMR2(R0),$BDDAT        ;STORE RMMR2 AT $BDDAT
1058 014100  042737  177776  001142        BIC     #^CBB00,$BDDAT          ;BUS BIT 0 IS WRITE GATE
1059 014106  001011                        BNE     30$                     ;
1060 014110  005037  001140                CLR     $GDDAT
1061 014114  010037  001136                MOV     R0,$BDADR
1062 014120  062737  000040  001136        ADD     #RMMR2,$BDADR
1063 014126  104042                        EMT     42
1064 014130  000545                        BR      160$                    ;FORMAT-CS FAILURE
1065
1066                                ;STEP THE DATA TIMING SEQUENCER TO LOCATION 16 AND VERIFY WRITE
1067                                ;GATE STAYS ON
1068 014132                        30$:
1069 014132  012702  000016                MOV     #14.,R2                 ;MAXMUM NUMBER OF CLOCK
1070 014136                        40$:
1071 014136  016037  000040  001142        MOV     RMMR2(R0),$BDDAT        ;STORE RMMR2 AT $BDDAT
1072 014144  032737  000001  001142        BIT     #BB00,$BDDAT            ;
1073 014152  001014                        BNE     50$                     ;BRANCH IF WRITE GATE ON
1074 014154  005302                        DEC     R2
1075 014156  001367                        BNE     40$
1076 014160  010037  001136                MOV     R0,$BDADR
1077 014164  062737  000040  001136        ADD     #RMMR2,$BDADR
1078 014172  012737  000001  001140        MOV     #BB00,$GDDAT
1079 014200  104042                        EMT     42
1080 014202  000520                        BR      160$                    ;FORMAT - CS FAILURE
1081 014204                        50$:
1082
1083 014204                        60$:
1084 014204  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1085 014212  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1086 014220  016003  000024                MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1087 014224  032703  000040                BIT     #WC,R3
1088 014230  001765                        BEQ     60$
1089
1090                                ;PROM STROBE CAME ON-DECREMENT PROM STROBE COUNT
1091 014232  005302                        DEC     R2
1092 014234  001414                        BEQ     80$
1093
1094                                ;WAIT FOR PROM STROBE TO GO OFF, THEN REPEAT LOOP
1095 014236                        70$:
1096 014236  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1097 014244  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1098 014252  016003  000024                MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1099 014256  032703  000040                BIT     #WC,R3
1100 014262  001725                        BEQ     40$
1101 014264  000764                        BR      70$
1102
1103                                ;VERIFY HEADER SYNC GENERATION
1104                                ;WRITE DATA BIT IS INVERTED AT MAINTENANCE REGISTER
1105                                ;FIRST,COUNT NUMBER OF ZERO BITS UNTIL FIRST ONE BIT
1106 014266                        80$:
1107 014266  012702  000020                MOV     #16.,R2         ;MAX TIMES THRU LOOP
```

```
1108 014272  005003                        CLR     R3
1109 014274                          90$:
     014274  016004  000024                MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
1110 014300  032704  000010                BIT     #MWD,R4
1111 014304  001414                        BEQ     110$            ;JUMP OUT OF LOOP WITH FIRST 1
1112 014306  005203                        INC     R3              ;INCREMENT ZERO COUNT
1113 014310  005302                        DEC     R2              ;DECREMENT MAX LOOP COUNT
1114 014312  001002                        BNE     100$
1115 014314  104043                        EMT     43
1116 014316  000452                        BR      160$            ;HEADER SYNC ,CANT GET FIRST 1
1117 014320                          100$:
1118 014320  012760  055401  000024        MOV     #MR1AAA.MCLK,RMMR1(R0)  ;LOAD RMMR1
1119 014326  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1120 014334  000757                        BR      90$
1121
1122                                 ;MAKE SURE THERE WERE AT LEAST 8 ZERO BITS IN HEADER SYNC
1123 014336                          110$:
1124 014336  020327  000010                CMP     R3,#8.
1125 014342  103002                        BHIS    120$
1126 014344  104043                        EMT     43
1127 014346  000436                        BR      160$            ;HEADER SYNC
1128
1129                                 ;SAMPLE AND STORE THE REST OF THE HEADER SYNC
1130 014350                          120$:
1131 014350  012702  000010                MOV     #8.,R2          ;NUMBER OF SAMPLES
1132 014354  005003                        CLR     R3              ;HEADER SYNC
1133 014356                          130$:
1134 014356  016004  000024                MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
1135 014362  006303                        ASL     R3
1136 014364  032704  000010                BIT     #MWD,R4         ;SHIFT SAMPLE,IF SYNC BIT IS 1
1137 014370  001002                        BNE     140$            ;THEN SET SAMPLE INPUT
1138 014372  052703  000001                BIS     #BIT0,R3
1139 014376  005302                  140$: DEC     R2
1140 014400  001407                        BEQ     150$
1141 014402  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1142 014410  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1143 014416  000757                        BR      130$            ;DO LOOP TIL R2=0
1144
1145                                 ;VERIFY THE SYNC BIT STREAM IS 0000000010011000
1146 0144c                           150$:
1147 014420  012737  000230  001140        MOV     #000230,$GDDAT
1148 014426  010337  001142                MOV     R3,$BDDAT
1149 014432  023737  001140  001142        CMP     $GDDAT,$BDDAT
1150 014440  001401                        BEQ     160$
1151 014442  104044                        EMT     44
1152 014444                          160$:
1153
1154                                 ;;*****************************************************************
                                     ;*TEST 21        WRITE HEADER TEST
                                     ;;*****************************************************************
     014444                          TST21:
     014444  000004                        SCOPE                   ;SCOPE CALL
     014446  000240                        NOP
     014450  012706  001100                MOV     #STACK,SP       ;LOAD THE STACK POINTER
     014454  013700  001276                MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     014460  013701  001466                MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
```

```
                014464  012737  000021  001226          MOV     #21,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
1155
1156                                                ;SETUP THE REGISTER OUTPUT BUFFER FOR SUBROUTINES
1157 014472  012737  001466  001446                  MOV     #822.,RMDCO     ;LAST CYLINDER
1158 014500  013737  001334  001420                  MOV     LSTRK,RMDAO     ;SET LAST TRACK AND
1159 014506  112737  000036  001420                  MOVB    #30.,RMDAO      ;LAST SECTOR
1160 014514  012737  010000  001444                  MOV     #FMT16,RMOFO    ;IN 16 BIT FORMAT
1161 014522  012702  054636                          MOV     #BUFFER,R2      ;BUFFER ADDRESS
1162 014526  010237  001416                          MOV     R2,RMBAO        ;BUFFER STARTS
1163                                                                        ;STORE FIRST HEADER WORD
1164 014532  012712  150000                          MOV     #150000,(R2)    ;SET MF/UF BITS GOOD, 16 BIT FORMAT AND
1165 014536  052722  001466                          BIS     #822.,(R2)+     ;LAST CYLINDER
1166                                                                        ;STORE SECOND HEADER WORD
1167 014542  013712  001334                          MOV     LSTRK,(R2)      ;SET LAST TRACK ADDRESS AND
1168 014546  112712  000036                          MOVB    #30.,(R2)       ;SECTOR ADDRESS.
1169 014552  012737  177776  001414                  MOV     #-2,RMWCO       ;2 WORDS (2'S COMP)
1170 014560  012737  000063  001412                  MOV     #WH!GO,RMCS10   ;WRITE HEADER COMMAND
1171
1172 014566  004737  022432                          JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                            ;SEARCH IS ENABLED USING SUBROUTINE.
                014572  000403                      BR      10$             ;BRANCH TO 10$ IF NO ERROR
                014574  104000                      EMT
1173 014576  000137  015432                          JMP     160$
1174 014602                                     10$:
1175 014602  004737  023304                          JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
                014606  000403                      BR      20$             ;BRANCH TO 20$ IF NO ERROR
                014610  104000                      EMT
1176 014612  000137  015432                          JMP     160$
1177
1178                                                ;STEP THE DATA TIMING SEQUENCER UNTIL 'HEADER AREA' COMES ON
1179 014616                                     20$:
1180 014616  012702  000017                          MOV     #15.,R2         ;ALLOW 15 MORE PROM STROBES
1181 014622  012704  000041                  30$:    MOV     #33.,R4         ;ALLOW 33 BIT CLOCKS PER PROM STROBE
1182
1183                                                ;PULSE BIT CLOCK UNTIL PROM STROBE IS ON
1184 014626                                     40$:
1185 014626  012760  055401  000024                  MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1186 014634  012760  051401  000024                  MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1187 014642  016003  000024                          MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1188 014646  032703  000040                          BIT     #WC,R3
1189 014652  001004                                  BNE     50$
1190 014654  005304                                  DEC     R4
1191 014656  001363                                  BNE     40$
1192 014660  000137  015432                          JMP     160$            ;COUNT EXHAUSTED
1193
1194                                                ;SEE IF HEADER AREA CAME ON
1195 014664                                     50$:
1196 014664  032703  000200                          BIT     #PHA,R3
1197 014670  001062                                  BNE     80$
1198 014672  005302                                  DEC     R2
1199 014674  001015                                  BNE     60$
1200
1201                                                ;ERROR-HEADER AREA NEVER CAME ON
1202 014676  012737  000200  001140                  MOV     #PHA,$GDDAT     ;SETUP ERROR MESSAGE
1203 014704  005037  001142                          CLR     $BDDAT
1204 014710  010037  001136                          MOV     R0,$BDADR
1205 014714  062737  000024  001136                  ADD     #RMMR1,$BDADR
```

```
1206 014722  104045                        EMT     45
1207 014724  000137  015432                JMP     160$            ;SKIP REST OF TEST
1208
1209                                ;WAIT FOR PROM STROBE TO GO OFF
1210 014730                         60$:
1211 014730  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1212 014736  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1213 014744  016003  000024                MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1214 014750  032703  000040                BIT     #WC,R3
1215 014754  001404                        BEQ     70$
1216 014756  005304                        DEC     R4
1217 014760  001363                        BNE     60$
1218 014762  000137  015432                JMP     160$            ;COUNT EXHAUSTED
1219
1220                                ;VERIFY THE TAG BUS ONCE EVERY PROM STROBE
1221 014766                         70$:
1222 014766  016037  000040  001142        MOV     RMMR2(R0),$BDDAT        ;STORE RMMR2 AT $BDDAT
1223 014774  042737  176000  001142        BIC     #^C1777,$BDDAT
1224 015002  022737  000001  001142        CMP     #BB00,$BDDAT    ;WRITE GATE SHOULD BE ON
1225 015010  001704                        BEQ     30$             ;ALL ELSE OFF
1226 015012  010037  001136                MOV     R0,$BDADR       ;
1227 015016  062737  000040  001136        ADD     #RMMR2,$BDADR
1228 015024  012737  000001  001140        MOV     #BB00,$GDDAT
1229 015032  104042                        EMT     42
1230 015034  000576                        BR      160$
1231
1232                                ;HEADER AREA IS NOW ON CAN START SAMPLE
1233                                ;DATA AFTER 5 MORE BIT CLOCKS
1234 015036                         80$:
1235 015036  012702  000005                MOV     #5,R2
1236 015042                         81$:
     015042  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1237 015050  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1238 015056  005302                        DEC     R2
1239 015060  001370                        BNE     81$
1240
1241                                ;SAMPLE AND STORE THE TWO HEADER WORDS
1242 015062  005037  001174                CLR     $TMP0
1243 015066  005037  001176                CLR     $TMP1
1244 015072  012702  001174                MOV     #$TMP0,R2       ;R2 NUMBER OF WORDS/ADDRESS
1245 015076  012703  000020        90$:    MOV     #16.,R3         ;NUMBER OF BITS
1246 015102  005004                        CLR     R4              ;WORD STORAGE
1247 015104                         100$:
1248 015104  016005  000024                MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
1249 015110  006304                        ASL     R4              ;SHIFT WORD SAMPLE
1250 015112  032705  000010                BIT     #MWD,R5         ;SET BIT 0 IF WRITE BIT ON
1251 015116  001002                        BNE     110$
1252 015120  052704  000001                BIS     #BIT0,R4
1253 015124                         110$:
     015124  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1254 015132  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1255 015140  005303                        DEC     R3
1256 015142  001360                        BNE     100$
1257 015144  010422                        MOV     R4,(R2)+        ;STORE WORD SAMPLE
1258 015146  022702  001200                CMP     #$TMP0+4,R2     ;DONE ?
1259 015152  101415                        BLOS    120$            ;YES
1260
```

```
1261
1262 015154  042705  177577              ;HEADER AREA  SHOULD STILL BE ON FOR SECOND HEADER WORD
                      BIC     #^C<PHA>,R5
1263 015160  001346                       BNE     90$                 ;BRANCH IF ON
1264 015162  010037  001136               MOV     R0,$BDADR
1265 015166  062737  000024  001136       ADD     #RMMR1,$BDADR
1266 015174  012737  000200  001140       MOV     #PHA,$GDDAT
1267 015202  104045                       EMT     45
1268 015204  000512                       BR      160$
1269
1270                                      ;WAIT UNTIL ECRC SETS
1271 015206                               120$:
1272 015206  005003                       CLR     R3                  ;CHECK NUMBER BITS DIFFER BET PHA AND ECRC
1273
1274 015210                               125$:
     015210  016005  000024               MOV     RMMR1(R0),R5        ;STORE RMMR1 AT R5
1275 015214  042705  176777               BIC     #^C<ECRC>,R5        ;CHECK OUT THE REST BITS
1276 015220  001026                       BNE     127$                ;BRANCH IF ECRC ON
1277 015222  012760  055401  000024       MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1278 015230  012760  051401  000024       MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1279 015236  005203                       INC     R3                  ;TOTAL NUMBER OF BIT DIFF
1280 015240  022703  000020               CMP     #16.,R3             ;OVER ONE WORD ?
1281 015244  101361                       BHI     125$                ;BRANCH IF NOT
1282 015246  010037  001136               MOV     R0,$BDADR
1283 015252  062737  000024  001136       ADD     #RMMR1,$BDADR
1284 015260  012737  001000  001140       MOV     #ECRC,$GDDAT
1285 015266  005037  001142               CLR     $BDDAT              ;CLEAR THE EXP
1286 015272  104046                       EMT     46
1287 015274  000456                       BR      160$                ;EXIT
1288
1289                                      ;SAMPLE AND STORE CRC WORD
1290 015276                               127$:
1291 015276  012703  000020               MOV     #16.,R3
1292 015302  005004                       CLR     R4
1293 015304                               130$:
     015304  016005  000024               MOV     RMMR1(R0),R5        ;STORE RMMR1 AT R5
1294 015310  006304                       ASL     R4                  ;SHIFT WORD SAMPLE
1295 015312  032705  000010               BIT     #MWD,R5             ;SET BIT 0 IF WRITE BIT ON
1296 015316  001002                       BNE     140$
1297 015320  052704  000001               BIS     #BIT0,R4
1298 015324                               140$:
     015324  012760  055401  000024       MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1299 015332  012760  051401  000024       MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1300 015340  005303                       DEC     R3
1301 015342  001360                       BNE     130$
1302 015344  010422                       MOV     R4,(R2)+
1303
1304                                      ;VERIFY 3 HEADER WORDS
1305                                      ;NOTE THAT DATA WAS STORED IN THE REVERSE
1306                                      ;ORDER FROM WHICH IT WAS WRITTEN
1307 015346  022737  066313  001174       CMP     #066313,$TMP0       ;CORRECT FIRST HDR WRD ?
1308 015354  001025                       BNE     150$                ;NO !!
1309
1310                                      ;VERIFY 2ND AND 3RD HEADER WORDS FOR AN RM05
1311 015356  032737  010000  001334       BIT     #TA16,LSTRK         ;IS DEVICE AN RM05 ?
1312 015364  001411                       BEQ     145$                ;NO !!
1313 015366  022737  074110  001176       CMP     #074110,$TMP1       ;CORRECT SECOND HDR WRD ?
1314 015374  001015                       BNE     150$                ;NO !.
```

```
1315 015376  022737  167073  001200          CMP     #167073,$TMP2   ;CORRECT HEADER CRC ?
1316 015404  001011                          BNE     150$            ;NO ..
1317 015406  000411                          BR      160$
1318
1319                                  ;VERIFY 2ND AND 3RD HEADER WORDS FOR AN RM03
1320 015410                           145$:
1321 015410  022737  074040  001176          CMP     #074040,$TMP1   ;CORRECT SECOND HDR WRD ?
1322 015416  001004                          BNE     150$            ;NO !!
1323 015420  022737  067510  001200          CMP     #067510,$TMP2   ;CORRECT HEADER CRC ?
1324 015426  001401                          BEQ     160$            ;YES .!
1325 015430                           150$:
1326 015430  104047                          EMT     47
1327 015432                           160$:                           ;END OF SUB TEST
1328
1329                                  ;;*****************************************************************
                                      ;*TEST 22        HEADER COMPARE TEST
                                      ;;*****************************************************************
     015432                           TST22:
     015432  000004                          SCOPE                   ;SCOPE CALL
     015434  000240                          NOP
     015436  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
     015442  013700  001276                  MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
     015446  013701  001466                  MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
     015452  012737  000022  001226          MOV     #22,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
1330
1331                                  ;LOAD REGISTER OUTPUT BUFFER FOR READ HEADER COMMAND
1332 015460  012737  001466  001446          MOV     #822.,RMDC0     ;LAST CYLINDER
1333 015466  013737  001334  001420          MOV     LSTRK,RMDA0     ;SET LAST TRACK AND
1334 015474  112737  000036  001420          MOVB    #30.,RMDA0      ;LAST SECTOR
1335 015502  012737  054636  001416          MOV     #BUFFER,RMBA0   ;DATA ADDRESS
1336 015510  012737  177776  001414          MOV     #-2,RMWC0       ;2 WORDS (2'S COMP)
1337 015516  012737  010000  001444          MOV     #FMT16,RMOF0    ;16 BIT MODE
1338 015524  012737  000073  001412          MOV     #RH!GO,RMCS10   ;READ HEADER AND DATA FUN
1339
1340 015532  004737  022432                  JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                      ;SEARCH IS ENABLED USING SUBROUTINE.
     015536  000403                          BR      10$             ;BRANCH TO 10$ IF NO ERROR
     015540  104000                          EMT
1341 015542  000137  016700                  JMP     230$            ;SKIP REST OF TEST IF ERROR
1342 015546                           10$:
1343 015546  004737  023304                  JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
     015552  000403                          BR      20$             ;BRANCH TO 20$ IF NO ERROR
     015554  104000                          EMT
1344 015556  000137  016700                  JMP     230$
1345
1346                                  ;READ GATE SHOULD BE OFF FOR 3 PROM STROBES
1347 015562                           20$:
1348 015562  010037  001136                  MOV     R0,$BDADR       ;SETUP ERROR MESSAGE
1349 015566  062737  000040  001136          ADD     #RMMR2,$BDADR
1350 015574  012702  000004                  MOV     #4,R2           ;R2=NUMBER OF PROM STROBES
1351 015600  012704  000021           30$:   MOV     #17.,R4         ;MAX BIT CLOCKS
1352
1353                                  ;CLOCK BIT CLOCK UNTIL PROM STROBE COMES ON
1354 015604                           40$:
1355 015604  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1356 015612  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
```

```
 1357 015620  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
 1358 015624  032703  000040                  BIT     #WC,R3
 1359 015630  001004                          BNE     50$             ;BRANCH WHEN PROM STROBE ON
 1360 015632  005304                          DEC     R4
 1361 015634  001363                          BNE     40$
 1362 015636  000137  016700                  JMP     230$
 1363
 1364                                 ;VERIFY READ GATE IS OFF AND TAG BUS IS ZERO
 1365 015642                          50$:
 1366 015642  016003  000040                  MOV     RMMR2(R0),R3    ;STORE RMMR2 AT R3
 1367 015646  042703  176000                  BIC     #^C1777,R3
 1368 015652  001407                          BEQ     60$             ;BRANCH IF TAG BUS ZERO
 1369 015654  010337  001142                  MOV     R3,$BDDAT
 1370 015660  005037  001140                  CLR     $GDDAT
 1371 015664  104050                          EMT     50
 1372 015666  000137  016700                  JMP     230$            ;READ HEADER FUNCTION
 1373
 1374                                 ;CLOCK BIT CLOCK TIL PROM STROBE GOES OFF
 1375 015672                          60$:
 1376 015672  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
 1377 015700  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
 1378 015706  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
 1379 015712  032703  000040                  BIT     #WC,R3
 1380 015716  001404                          BEQ     70$             ;BRANCH IF PROM STROBE OFF
 1381 015720  005304                          DEC     R4
 1382 015722  001363                          BNE     60$
 1383 015724  000137  016700                  JMP     230$
 1384
 1385                                 ;CONTINUE FOR 3 BIT CYCLE TOTAL (LOC 0 NOT SAMPLED)
 1386 015730                          70$:
 1387 015730  005302                          DEC     R2
 1388 015732  001322                          BNE     30$
 1389
 1390                                 ;READ GATE SHOULD COME ON WITH NEXT PROM STROBE AND STAY
 1391                                 ;ON FOR 7 CYCLES (AND MORE)
 1392
 1393 015734  012702  000006                  MOV     #6,R2
 1394 015740  012703  000021          80$:    MOV     #17.,R3
 1395
 1396                                 ;CLOCK BIT CLOCK TIL PROM STROBE SETS
 1397 015744                          90$:
 1398 015744  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
 1399 015752  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
 1400 015760  016004  000024                  MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
 1401 015764  032704  000040                  BIT     #WC,R4
 1402 015770  001004                          BNE     100$            ;BRANCH WHEN PROM STROBE ON
 1403 015772  005303                          DEC     R3
 1404 015774  001363                          BNE     90$
 1405 015776  000137  016700                  JMP     230$
 1406
 1407                                 ;VERIFY READ GATE ON AND REST OF TAG BUS OFF
 1408 016002                          100$:
 1409 016002  016004  000040                  MOV     RMMR2(R0),R4    ;STORE RMMR2 AT R4
 1410 016006  042704  176000                  BIC     #^C1777,R4
 1411 016012  022704  000002                  CMP     #BB01,R4
 1412 016016  001410                          BEQ     110$            ;BRANCH IF READ GATE ON
 1413 016020  010437  001142                  MOV     R4,$BDDAT
```

```
1414 016024  012737  000002  001140          MOV     #BB01,$GDDAT
1415 016032  104050                          EMT     50
1416 016034  000137  016700                  JMP     230$            ;READ HEADER FUNCTION
1417
1418                                 ;CLOCK BIT CLOCK TIL PROM STROBE GOES OFF
1419 016040                          110$:
1420 016040  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1421 016046  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1422 016054  016004  000024                  MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
1423 016060  032704  000040                  BIT     #WC,R4
1424 016064  001404                          BEQ     120$            ;BRANCH WHEN PROM STROBE OFF
1425 016066  005303                          DEC     R3
1426 016070  001363                          BNE     110$
1427 016072  000137  016700                  JMP     230$
1428
1429                                 ;CONTINUE FOR TOTAL OF 7 CYCLES
1430 016076                          120$:
1431 016076  005302                          DEC     R2
1432 016100  001317                          BNE     80$
1433
1434                                 ;LOOKING FOR SYNC SHOULD SET WITH NEXT PROM STORBE
1435 016102  012702  000021                  MOV     #17.,R2         ;MAX BIT CLOCKS
1436
1437                                 ;CLOCK BIT CLOCK TIL PROM STROBE SETS
1438 016106                          130$:
1439 016106  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1440 016114  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1441 016122  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1442 016126  032703  000040                  BIT     #WC,R3
1443 016132  001004                          BNE     140$            ;BRANCH WHEN PROM STROBE ON
1444 016134  005302                          DEC     R2
1445 016136  001363                          BNE     130$
1446 016140  000137  016700                  JMP     230$
1447
1448                                 ;VERIFY 'PLFS' IS NOW ON
1449 016144                          140$:
1450 016144  042703  175777                  BIC     #^CPLFS,R3
1451 016150  001015                          BNE     150$
1452 016152  010337  001142                  MOV     R3,$BDDAT
1453 016156  012737  002000  001140          MOV     #PLFS,$GDDAT
1454 016164  010037  001136                  MOV     R0,$BDADR
1455 016170  062737  000024  001136          ADD     #RMMR1,$BDADR
1456 016176  104035                          EMT     35
1457 016200  000137  016700                  JMP     230$
1458 016204                          150$:
1459 016204  012703  000005                  MOV     #5,R3
1460
1461                                 ;WITH PLFS ON, WORD COUNT INHIBIT WILL SET IN 5 BIT CLOCKS
1462 016210                          155$:
1463 016210  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1464 016216  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1465 016224  005303                          DEC     R3
1466 016226  001370                          BNE     155$
1467
1468                                 ;SIMULATE THE SYNC PATTERN BEING READ
1469 016230  012702  000031                  MOV     #31,R2          ;SYNC PATTERN=00011001
1470 016234  012703  000010                  MOV     #8.,R3          ;8 BITS IN PATTERN
```

```
 1471 016240                                160$:
 1472 016240  012737  055401  001436              MOV     #MR1AAA.MCLK,RMMR10
 1473 016246  000241                              CLC
 1474 016250  006002                              ROR     R2
 1475 016252  103003                              BCC     165$
 1476 016254  052737  002000  001436              BIS     #MRD,RMMR10
 1477 016262                                165$:
 1478 016262  013760  001436  000024              MOV     RMMR10,RMMR1(R0)        ;LOAD RMMR1
 1479 016270  042737  004000  001436              BIC     #MCLK,RMMR10
 1480 016276  013760  001436  000024              MOV     RMMR10,RMMR1(R0)        ;LOAD RMMR1
 1481 016304  005303                              DEC     R3                  ;CONTINUE TIL SHIFT COUNT
 1482 016306  001354                              BNE     160$                ;IS ZERO
 1483
 1484                                       ;SIMULATE THE HEADER BEING READ
 1485 016310  012702  001174                      MOV     #$TMP0,R2
 1486 016314  012737  150000  001174              MOV     #150000,$TMP0   ;SET MF/UF BITS GOOD, 16 BIT FORMAT AND
 1487 016322  052737  001466  001174              BIS     #822.,$TMP0     ;LAST CYLINDER
 1488 016330  013737  001334  001176              MOV     LSTRK,$TMP1     ;SET LAST TRACK AND
 1489 016336  112737  000036  001176              MOVB    #30.,$TMP1      ;LAST SECTOR
 1490 016344  012737  011366  001200              MOV     #011366,$TMP2   ;GET CRC PATTERN
 1491 016352  032737  010000  001334              BIT     #TA16,LSTRK     ;IS DEVICE AN RM05 ?
 1492 016360  001403                              BEQ     170$            ;NO !!
 1493 016362  012737  156167  001200              MOV     #156167,$TMP2   ;YES, ADJUST CRC PATTERN
 1494 016370                                170$:
 1495 016370  012703  000020                      MOV     #16.,R3         ;NUMBER OF BITS EACH WORD
 1496 016374  012204                              MOV     (R2)+,R4        ;HEADER WORD 1,2 OR 3
 1497 016376                                175$:
 1498 016376  012737  055401  001436              MOV     #MR1AAA!MCLK,RMMR10
 1499 016404  000241                              CLC
 1500 016406  006004                              ROR     R4
 1501 016410  103003                              BCC     180$
 1502 016412  052737  002000  001436              BIS     #MRD,RMMR10
 1503 016420                                180$:
      016420  013760  001436  000024              MOV     RMMR10,RMMR1(R0)        ;LOAD RMMR1
 1504 016426  042737  004000  001436              BIC     #MCLK,RMMR10
 1505 016434  013760  001436  000024              MOV     RMMR10,RMMR1(R0)        ;LOAD RMMR1
 1506 016442  005303                              DEC     R3                  ;SHIFT OUT 16 BITS
 1507 016444  001354                              BNE     175$
 1508 016446  020227  001200                      CMP     R2,#$TMP0+4     ;ALL DONE ?
 1509 016452  101746                              BLOS    170$            ;BRANCH IF NOT
 1510
 1511                                       ;LOOKING FOR SYNC SHOULD COME ON WITHIN 6 STROBES
 1512 016454  012702  000006                      MOV     #6,R2
 1513 016460  012703  000021                185$: MOV     #17.,R3
 1514
 1515                                       ;CLOCK UNTIL PROM STROBE ON
 1516 016464                                190$:
 1517 016464  012760  055401  000024              MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
 1518 016472  012760  051401  000024              MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
 1519 016500  016004  000024                      MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
 1520 016504  032704  000040                      BIT     #WC,R4
 1521 016510  001003                              BNE     195$
 1522 016512  005303                              DEC     R3
 1523 016514  001363                              BNE     190$
 1524 016516  000470                              BR      230$
 1525
 1526                                       ;SEE IF "PLFS" IS ON
```

```
1527 016520                          195$:
1528 016520  042704  175777                BIC     #^CPLFS,R4
1529 016524  001034                        BNE     210$
1530
1531                                 ;CONTINUE IF LESS THAN 6 PROM STROBES
1532 016526  005302                        DEC     R2
1533 016530  001014                        BNE     200$
1534 016532  010437  001142                MOV     R4,$BDDAT       ;SETUP ERROR
1535 016536  012737  002000  001140        MOV     #PLFS,$GDDAT
1536 016544  010037  001136                MOV     R0,$BDADR
1537 016550  062737  000024  001136        ADD     #RMMR1,$BDADR
1538 016556  104035                        EMT     35
1539 016560  000447                        BR      230$            ;HEADER
1540
1541                                 ;CLOCK UNTIL PROM STROBE OFF
1542 016562                          200$:
1543 016562  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1544 016570  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1545 016576  016004  000024                MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
1546 016602  032704  000040                BIT     #WC,R4
1547 016606  001724                        BEQ     185$
1548 016610  005303                        DEC     R3
1549 016612  001363                        BNE     200$
1550 016614  000431                        BR      230$
1551
1552                                 ;VERIFY NO HEADER ERROR IS SET
1553 016616                          210$:
1554 016616  016037  000014  001142        MOV     RMER1(R0),$BDDAT        ;STORE RMER1 AT $BDDAT
1555 016624  042737  177157  001142        BIC     #^C<HCRC!HCE!FER>,$BDDAT
1556 016632  001411                        BEQ     220$
1557 016634  005037  001140                CLR     $GDDAT
1558 016640  010037  001136                MOV     R0,$BDADR
1559 016644  062737  000014  001136        ADD     #RMER1,$BDADR
1560 016652  104051                        EMT     51
1561 016654  000411                        BR      230$            ;HEADER ERROR SET
1562
1563                                 ;VERIFY DATA IN MEMORY OK
1564 016656                          220$:
1565 016656  023737  054636  001174        CMP     BUFFER,$TMP0    ;COMPARE 1ST HEADER WORD
1566 016664  001004                        BNE     225$
1567 016666  023737  054640  001176        CMP     BUFFER+2,$TMP1  ;COMPARE 2ND HEADER WORD
1568 016674  001401                        BEQ     230$
1569
1570                                 ;REPORT ERROR IN ONE OR MORE HEADER WORDS
1571 016676                          225$:
1572 016676  104052                        EMT     52
1573 016700                          230$:
1574
1575                                 ;;*******************************************************************
                                     ;*TEST 23        ECC GENERATION TEST

                                     ;;*******************************************************************
     016700                          TST23:
     016700  000004                        SCOPE                   ;SCOPE CALL
     016702  000240                        NOP
     016704  012706  001100                MOV     #STACK,SP       ;LOAD THE STACK POINTER
     016710  013700  001276                MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
```

```
        016714  013701  001466                  MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
        016720  012737  000023  001226          MOV     #23,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
 1576
 1577                                    ;SETUP REGISTER OUTPUT BUFFER FOR WRITE DATA CAMOMMAND
 1578 016726  012737  001466  001446          MOV     #822.,RMDCO     ;LAST CYLINDER
 1579 016734  013737  001334  001420          MOV     LSTRK,RMDAO     ;SET LAST TRACK AND
 1580 016742  112737  000036  001420          MOVB    #30.,RMDAO      ;LAST SECTOR
 1581 016750  012737  012000  001444          MOV     #FMT16!HCI,RMOFO        ;16 BIT FORMAT,IGNORE HEADER
 1582 016756  012702  054636                  MOV     #BUFFER,R2
 1583 016762  010237  001416                  MOV     R2,RMBAO        ;DATA ADDRESS
 1584 016766  012703  177400                  MOV     #-256.,R3       ;256. WORDS (2'S COMP)
 1585 016772  010337  001414                  MOV     R3,RMWCO
 1586 016776  012737  000061  001412          MOV     #WD!GO,RMCS10   ;WRITE DATA COMMAND
 1587
 1588                                    ;FILL THE DATA BUFFER WITH ALL ONES
 1589 017004  012704  177777                  MOV     #177777,R4      ;DATA PATTERN ALL ONES
 1590 017010  012703  000400                  MOV     #256.,R3        ;ONE SECTOR DATA FIELD
 1591 017014  010422                  10$:    MOV     R4,(R2)+
 1592 017016  005303                          DEC     R3
 1593 017020  001375                          BNE     10$
 1594
 1595 017022  004737  022432                  JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                      ;SEARCH IS ENABLED USING SUBROUTINE.
        017026  000403                          BR      20$             ;BRANCH TO 20$ IF NO ERROR
        017030  104000                          EMT                     '
 1596 017032  000137  020066                  JMP     400$
 1597 017036                          20$:
 1598 017036  004737  023304                  JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
        017042  000403                          BR      30$             ;BRANCH TO 30$ IF NO ERROR
        017044  104000                          EMT
 1599 017046  000137  020066                  JMP     400$
 1600 017052                          30$:
 1601 017052  004737  023412                  JSR     PC,SETLFS       ;SET 'LOOKING FOR SYNC'' USING SUBROUTINE
        017056  000403                          BR      40$             ;BRANCH TO 40$ IF NO ERROR
        017060  104000                          EMT
 1602 017062  000137  020066                  JMP     400$
 1603 017066                          40$:
 1604 017066  004737  023574                  JSR     PC,CLKSNC       ;CLOCK THE SYNC PATTERN USING SUBROUTINE
        017072  000403                          BR      50$             ;BR TO 50$ IF NO ERROR
        017074  104000                          EMT
 1605 017076  000137  020066                  JMP     400$
 1606
 1607                                    ;HEADER COMPARE IS INHIBITED FOR THIS TEST
 1608                                    ;CLOCK THE DATA TIMING SEQUENCER AND VERIFY THE FOLLOWING WAVEFORMS
 1609                                    ;FOR EACH LEADING EDGD OF PROM STROBE
 1610                                    ;       HEADER ARES, READ GATE (DATA TIMING SEQUENCER=200 OCTAL)
 1611                                    ;       ENABLE CRC OUT
 1612                                    ;       WRITE GATE
 1613
 1614 017102  012702  017634          50$:    MOV     #230$,R2        ;POINTER TO WAVE FORM TABLE
 1615
 1616                                    ;CLOCK BIT CLOCK (MCLK) UNTIL PROM STROBE COMES ON
 1617 017106                          70$:
 1618 017106  004737  017654                  JSR     PC,300$
 1619
 1620                                    ;PROM STROBE IS ON - VERIFY WAVEFORM
 1621 017112                          80$:
```

```
1622 017112  016037  000024  001142          MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
1623 017120  042737  176157  001142          BIC     #^C<ECRC.PDA.PHA.EECC>,$BDDAT
1624 017126  012237  001140                  MOV     (R2)+,$GDDAT
1625 017132  023737  001140  001142          CMP     $GDDAT,$BDDAT
1626 017140  001410                          BEQ     90$             ;BRANCH IF RMMR1 OK
1627
1628                                  ;ERROR - THE DATA TIMING SEQUENCER OUTPUT IS ONCORRECT
1629 017142  010037  001136                  MOV     R0,$BDADR
1630 017146  062737  000024  001136          ADD     #RMMR1,$BDADR
1631 017154  104054                          EMT     54
1632 017156  000137  020066                  JMP     400$
1633
1634                                  ;VERIFY THE TAB BUS
1635 017162                           90$:
1636 017162  016037  000040  001142          MOV     RMMR2(R0),$BDDAT        ;STORE RMMR2 AT $BDDAT
1637 017170  042737  176000  001142          BIC     #^C1777,$BDDAT
1638 017176  012237  001140                  MOV     (R2)+,$GDDAT
1639 017202  023737  001140  001142          CMP     $GDDAT,$BDDAT
1640 017210  001410                          BEQ     100$            ;BRANCH IF TAG BUS OK
1641
1642                                  ;ERROR- TAG BUS IS WRONG
1643 017212  010037  001136                  MOV     R0,$BDADR
1644 017216  062737  000040  001136          ADD     #RMMR2,$BDADR
1645 017224  104053                          EMT     53
1646 017226  000137  020066                  JMP     400$
1647
1648                                  ;CLOCK BIT CLOCK TIL PROM STROBE RESETS
1649 017232                           100$:
1650 017232  004737  017762                  JSR     PC,350$
1651
1652                                  ;CONTINUE CHECKING THROUGH 4 PROM CYCLES
1653 017236                           110$:
1654 017236  020227  017652                  CMP     R2,#230$+16
1655 017242  103721                          BLO     70$
1656
1657                                  ;VERIFY THAT DATA AREA COMES ON WITHIN  9 PROM STROBES
1658 017244  012702  000011                  MOV     #9.,R2          ;R2=9 STROBES
1659
1660                                  ;CLOCK PROM STROBE ON
1661 017250                           130$:
1662 017250  004737  017654                  JSR     PC,300$
1663
1664                                  ;PROM STROBE ON CKECK IF DATA AREA ON
1665 017254                           140$:
1666 017254  016004  000024                  MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
1667 017260  042704  177377                  BIC     #^CPDA,R4
1668 017264  001020                          BNE     160$
1669
1670                                  ;CLOCK PROM STROBE OFF
1671 017266                           150$:
1672 017266  004737  017762                  JSR     PC,350$
1673 017272  005302                          DEC     R2
1674 017274  001365                          BNE     130$
1675
1676                                  ;ERROR-DATA AREA DIDN'T COME ON
1677 017276  012737  000400  001140          MOV     #PDA,$GDDAT     ;SETUP ERROR MESSAGE
1678 017304  005037  001142                  CLR     $BDDAT
```

```
1679 017310  010037  001136                  MOV     R0,$BDADR
1680 017314  062737  000024  001136          ADD     #RMMR1,$BDADR
1681 017322  104055                          EMT     55
1682 017324  000541                          BR      220$
1683
1684                                 ;VERIFY THAT DATA AREA IS ON FOR 256 CYCLES
1685 017326                          160$:
1686 017326  012702  000400                  MOV     #256.,R2
1687
1688                                 ;VERIFY THAT DATA AREA IS ON AND ECC IS OFF
1689 017332                          170$:
1690 017332  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1691 017336  042703  177357                  BIC     #^C<PDA!EECC>,R3
1692 017342  022703  000400                  CMP     #PDA,R3
1693 017346  001414                          BEQ     180$            ;DATA AREA IS ON
1694 017350  010337  001142                  MOV     R3,$BDDAT
1695 017354  012737  000400  001140          MOV     #PDA,$GDDAT
1696 017362  010037  001136                  MOV     R0,$BDADR
1697 017366  062737  000024  001136          ADD     #RMMR1,$BDADR
1698 017374  104055                          EMT     55
1699 017376  000514                          BR      220$
1700
1701                                 ;CLOCK PROM STROBE OFF
1702 017400                          180$:
1703 017400  004737  017762                  JSR     PC,350$
1704
1705                                 ;CLOCK PROM STROBE ON
1706 017404  004737  017654                  JSR     PC,300$
1707
1708                                 ;CONTINUE TIL COUNT ZERO
1709 017410  005302                          DEC     R2
1710 017412  001347                          BNE     170$
1711
1712                                 ;ECC SHOULD  BE ENABLED WITHIN 4 CLOCK BITS
1713 017414  005002                          CLR     R2
1714 017416                          182$:
     017416  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
1715 017422  042703  177357                  BIC     #^C<PDA!EECC>,R3
1716 017426  022703  000020                  CMP     #EECC,R3
1717 017432  001426                          BEQ     190$
1718 017434  005202                          INC     R2
1719 017436  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1720 017444  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1721 017452  022702  000007                  CMP     #7,R2
1722 017456  101357                          BHI     182$
1723 017460  010337  001142                  MOV     R3,$BDDAT
1724 017464  012737  000020  001140          MOV     #EECC,$GDDAT
1725 017472  010037  001136                  MOV     R0,$BDADR
1726 017476  062737  000024  001136          ADD     #RMMR1,$BDADR
1727 017504  104056                          EMT     56
1728 017506  000450                          BR      220$
1729
1730                                 ;SAMPLE ECC CHARACTER FOR 32 BITS
1731 017510                          190$:
1732 017510  012702  001174                  MOV     #$TMP0,R2
1733 017514  005003                  195$:   CLR     R3
1734 017516  012704  000020                  MOV     #16.,R4
```

```
1735 017522                                  200$:
     017522  016005  000024                        MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
1736 017526  006303                                ASL     R3
1737 017530  032705  000010                        BIT     #MWD,R5
1738 017534  001002                                BNE     205$            ;BRANCH IF ECC BIT OFF (MWD INVERTED)
1739 017536  052703  000001                        BIS     #BIT0,R3
1740 017542                                  205$:
1741 017542  012760  055401  000024                MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1742 017550  012760  051401  000024                MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1743 017556  005304                                DEC     R4
1744 017560  001360                                BNE     200$
1745 017562  010322                                MOV     R3,(R2)+
1746 017564  022702  001200                        CMP     #$TMP0+4,R2
1747 017570  101351                                BHI     195$
1748
1749                                         ;VERIFY ECC CHARACTER GENERATED
1750 017572  022737  131177  001174                CMP     #131177,$TMP0
1751 017600  001004                                BNE     210$
1752 017602  022737  175154  001176                CMP     #175154,$TMP1
1753 017610  001407                                BEQ     220$
1754 017612  012737  131177  001200  210$:        MOV     #131177,$TMP2
1755 017620  012737  175154  001202                MOV     #175154,$TMP3
1756 017626  104061                                EMT     61
1757
1758 017630  000137  020066          220$:        JMP     400$            ;GREAT ESCAPE
1759
1760 017634  000200                230$:        .WORD   PHA
1761 017636  000002                             .WORD   BB01
1762 017640  000200                             .WORD   PHA
1763 017642  000002                             .WORD   BB01
1764 017644  000000                             .WORD   0
1765 017646  000002                             .WORD   2
1766 017650  000000                             .WORD   0
1767 017652  000000                             .WORD   0
1768
1769 017654  012737  000021  017756  300$:        MOV     #17.,320$       ;CLOCK PROM STROBE ON
1770 017662                                  305$:
     017662  012760  055401  000024                MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1771 017670  012760  051401  000024                MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1772 017676  016037  000024  017760                MOV     RMMR1(R0),330$  ;STORE RMMR1 AT 330$
1773 017704  042737  177737  017760                BIC     #^CWC,330$
1774 017712  001020                                BNE     310$            ;EXIT IF PROM STROBE ON
1775 017714  005337  017756                        DEC     320$
1776 017720  001360                                BNE     305$
1777 017722  013737  017756  001142                MOV     320$,$BDDAT     ;SETUP ERROR MESSAGE
1778 017730  012737  000040  001140                MOV     #WC,$GDDAT
1779 017736  010037  001136                        MOV     R0,$BDADR
1780 017742  062737  000024  001136                ADD     #RMMR1,$BDADR
1781 017750  104030                                EMT     30
1782 017752  000445                                BR      400$            ;
1783 017754  000207                310$:        RTS     PC
1784 017756  000000                320$:        .WORD   0               ;MAX BIT COUNT
1785 017760  000000                330$:        .WORD   0               ;RMMR1 CONTENTS
1786
1787 017762  012737  000021  020062  350$:        MOV     #17.,370$
1788                                                                     ;CLOCK PROM STROBE OFF
1789 017770                                  355$:
```

```
        017770  012760  055401  000024          MOV     #MR1AAA.MCLK,RMMR1(R0)  ;LOAD RMMR1
  1790  017776  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
  1791  020004  016037  000024  020064          MOV     RMMR1(R0),380$  ;STORE RMMR1 AT 380$
  1792  020012  042737  177737  020064          BIC     #^CWC,380$
  1793  020020  001417                          BEQ     360$
  1794  020022  005337  020062                  DEC     370$
  1795  020026  001360                          BNE     355$
  1796  020030  013737  020064  001142          MOV     380$,$BDDAT
  1797  020036  005037  001140                  CLR     $GDDAT
  1798  020042  010037  001136                  MOV     R0,$BDADR
  1799  020046  062737  000024  001136          ADD     #RMMR1,$BDADR
  1800  020054  104062                          EMT     62
  1801  020056  000403                          BR      400$
  1802  020060  000207              360$:       RTS     PC
  1803
  1804  020062  000000              370$:       .WORD   0               ;MAX BIT COUNT
  1805  020064  000000              380$:       .WORD   0               ;CONTENTS OF RMMR1
  1806
  1807  020066                      400$:                               ;SUB-TEST EXIT POINT
  1808  020066  000240                          NOP
  1809
  1810                              ;;*************************************************************
                                    ;*TEST 24        ECC DETECTION TEST
                                    ;;*************************************************************
        020070                      TST24:
        020070  000004                          SCOPE                   ;SCOPE CALL
        020072  000240                          NOP
        020074  012706  001100                  MOV     #STACK,SP       ;LOAD THE STACK POINTER
        020100  013700  001276                  MOV     $BASE,R0        ;R0 = UNIBUS ADDRESS
        020104  013701  001466                  MOV     TSTQUE,R1       ;R1 = POINTER TO DEVICE
        020110  012737  000024  001226          MOV     #24,$TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
  1811
  1812                          ;SETUP REGISTER OUTPUT BUFFER FOR READ DATA COMMAND
  1813  020116  012737  001466  001446          MOV     #822.,RMDCO     ;LAST CYLINDER
  1814  020124  013737  001334  001420          MOV     LSTRK,RMDAO     ;SET LAST TRACK AND
  1815  020132  112737  000036  001420          MOVB    #30.,RMDAO      ;LAST SECTOR
  1816  020140  012737  012000  001444          MOV     #FMT16!HCI,RMOFO        ;INHIBIT HEADER COMPARE
  1817  020146  012702  054636                  MOV     #BUFONE,R2
  1818  020152  010237  001416                  MOV     R2,RMBAO
  1819  020156  012737  177400  001414          MOV     #-256.,RMWCO    ;256 WORDS (2'S COMP)
  1820  020164  012737  000071  001412          MOV     #RD!GO,RMCS10   ;READ DATA COMMAND
  1821
  1822  020172                      20$:
        020172  004737  022432                  JSR     PC,ENBSCH       ;EXECUTE DATA COMMAND TO POINT WHERE
                                                                        ;SEARCH IS ENABLED USING SUBROUTINE.
        020176  000403                          BR      30$             ;BRANCH TO 30$ IF NO ERROR
        020200  104000                          EMT
  1823  020202  000137  021054                  JMP     190$
  1824
  1825  020206                      30$:
        020206  004737  023304                  JSR     PC,SCTCMP       ;FORCE SECTOR COMPARE USING SUBROUTINE
        020212  000403                          BR      40$             ;BRANCH TO 40$ IF NO ERROR
        020214  104000                          EMT
  1826  020216  000137  021054                  JMP     190$
  1827
  1828  020222                      40$:
```

```
                020222  004737  023412                  JSR     PC,SETLFS       ;SET 'LOOKING FOR SYNC'' USING SUBROUTINE
                020226  000403                          BR      50$             ;BRANCH TO 50$ IF NO ERROR
                020230  104000                          EMT
     1829       020232  000137  021054                  JMP     190$
     1830
     1831       020236                          50$:
                020236  004737  023574                  JSR     PC,CLKSNC       ;CLOCK THE SYNC PATTERN USING SUBROUTINE
                020242  000403                          BR      55$             ;BR TO 55$ IF NO ERROR
                020244  104000                          EMT
     1832       020246  000137  021054                  JMP     190$
     1833
     1834                                   ;HEADER COMPARE IS INHIBITED FOR THIS TEST
     1835                                   ;''LOOKING FOR SYNC'' SHOULD GO OFF WITHIN ONE CYCLE
     1836       020252  012702  000002      55$:        MOV     #2,R2           ;ALLOW 2 PASSES THRU LOOP
     1837       020256  000405                          BR      70$
     1838       020260  004737  021166      60$:        JSR     PC,350$         ;RESET PROM STROBE
     1839       020264  004737  021060                  JSR     PC,300$         ;SET PROM STROBE
     1840       020270  000240                          NOP
     1841       020272                          70$:
                020272  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
     1842       020276  032703  002000                  BIT     #PLFS,R3
     1843       020302  001421                          BEQ     80$             ;BRANCH IF LOOKING FOR SYNC OFF
     1844       020304  005302                          DEC     R2
     1845       020306  001364                          BNE     60$
     1846
     1847                                   ;ERROR-LOOKING FOR SYNC DID NOT RESET DURING HEADER
     1848       020310  010337  001142                  MOV     R3,$BDDAT               ;SETUP ERROR MESSAGE
     1849       020314  042737  175777  001142          BIC     #^CPLFS,$BDDAT
     1850       020322  005037  001140                  CLR     $GDDAT
     1851       020326  010037  001136                  MOV     R0,$BDADR
     1852       020332  062737  000024  001136          ADD     #RMMR1,$BDADR
     1853       020340  104040                          EMT     40
     1854       020342  000137  021054                  JMP     190$
     1855
     1856                                   ;LOOKING FOR SYNC SHOULD COME ON FOR DATA AREA WITHIN 9 PROM CYCLES
     1857       020346                          80$:
     1858       020346  012702  000011                  MOV     #9.,R2
     1859       020352  004737  021166      85$:        JSR     PC,350$         ;SET STROBE OFF
     1860       020356  004737  021060                  JSR     PC,300$         ;SET PROM STROBE
     1861       020362  016003  000024                  MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
     1862       020366  032703  002000                  BIT     #PLFS,R3        ;
     1863       020372  001022                          BNE     90$             ;BRANCH IF SYNC ENABLED
     1864       020374  005302                          DEC     R2
     1865       020376  001365                          BNE     85$
     1866
     1867                                   ;ERROR-CAN'T LOOKING FOR SYNC DURING DATA AREA
     1868       020400  012737  002000  001140          MOV     #PLFS,$GDDAT
     1869       020406  010337  001142                  MOV     R3,$BDDAT
     1870
     1871       020412  042737  175777  001142          BIC     #^CPLFS,$BDDAT
     1872       020420  010037  001136                  MOV     R0,$BDADR
     1873       020424  062737  000024  001136          ADD     #RMMR1,$BDADR
     1874       020432  104035                          EMT     35
     1875       020434  000137  021054                  JMP     190$
     1876       020440                          90$:
     1877       020440  004737  021166                  JSR     PC,350$         ;RESET PROM STROBE
     1878       020444  004737  023574                  JSR     PC,CLKSNC       ;CLOCK THE SYNC PATTERN USING SUBROUTINE
```

```
        020450  000402                          BR      100$            ;BR TO 100$ IF NO ERROR
        020452  104000                          EMT
  1879  020454  000577                          BR      190$
  1880
  1881                                  ;SIMULATE READ DATA
  1882  020456                          100$:
  1883  020456  012702  000400                 MOV     #256.,R2        ;WORD COUNT
  1884  020462  012703  000020          110$:  MOV     #16.,R3         ;BIT COUNT
  1885  020466                          115$:
        020466  012760  057401  000024        MOV     #MR1AAA!MRD!MCLK,RMMR1(R0)      ;LOAD RMMR1
  1886  020474  012760  053401  000024        MOV     #MR1AAA!MRD,RMMR1(R0)   ;LOAD RMMR1
  1887  020502  005303                         DEC     R3
  1888  020504  001370                         BNE     115$
  1889  020506  005302                         DEC     R2
  1890  020510  001364                         BNE     110$
  1891
  1892                                  ;SIMULATE ECC PATTERN
  1893  020512  012737  177446  001174        MOV     #177446,$TMP0           ;FIRST ECC WORD
  1894  020520  012737  015457  001176        MOV     #015457,$TMP1           ;SECOND ECC WORD
  1895  020526  012702  001174                 MOV     #$TMP0,R2
  1896  020532  012703  000020          120$:  MOV     #16.,R3
  1897  020536  012704  051401          125$:  MOV     #MR1AAA,R4
  1898  020542  000241                         CLC
  1899  020544  006012                         ROR     (R2)
  1900  020546  103002                         BCC     130$
  1901  020550  052704  002000                 BIS     #MRD,R4
  1902  020554                          130$:
        020554  010460  000024                MOV     R4,RMMR1(R0)    ;LOAD RMMR1
  1903  020560  052704  004000                 BIS     #MCLK,R4
  1904  020564  010460  000024                 MOV     R4,RMMR1(R0)    ;LOAD RMMR1
  1905  020570  042704  004000                 BIC     #MCLK,R4
  1906  020574  010460  000024                 MOV     R4,RMMR1(R0)    ;LOAD RMMR1
  1907  020600  005303                         DEC     R3
  1908  020602  001355                         BNE     125$            ;CLOCK  A WORD
  1909  020604  062702  000002                 ADD     #2,R2
  1910  020610  022702  001176                 CMP     #$TMP1,R2
  1911  020614  001746                         BEQ     120$            ;CLOCK THE NEXT WORD
  1912
  1913                                  ;VERIFY DATA AREA AND READ GATE RESET
  1914  020616  012702  000005                 MOV     #5,R2
  1915
  1916  020622  004737  021060          140$:  JSR     PC,300$         ;SET PROM STROBE
  1917  020626  004737  021166                 JSR     PC,350$         ;CLEAR PROM STROBE
  1918  020632  016003  000024                 MOV     RMMR1(R0),R3    ;STORE RMMR1 AT R3
  1919  020636  032703  000400                 BIT     #PDA,R3
  1920  020642  001417                         BEQ     150$
  1921  020644  005302                         DEC     R2
  1922  020646  001365                         BNE     140$
  1923  020650  042703  177377                 BIC     #^CPDA,R3       ;SETUP ERROR MESSAGE
  1924  020654  010337  001142                 MOV     R3,$BDDAT
  1925  020660  005037  001140                 CLR     $GDDAT
  1926  020664  010037  001136                 MOV     R0,$BDADR
  1927  020670  062737  000024  001136        ADD     #RMMR1,$BDADR
  1928  020676  104063                         EMT     63
  1929  020700  000465                         BR      190$
  1930  020702                          150$:
  1931  020702  016003  000040                 MOV     RMMR2(R0),R3    ;STORE RMMR2 AT R3
```

```
1932 020706  042703  176000                    BIC     #^C1777,R3
1933 020712  001413                            BEQ     160$
1934 020714  010337  001142                    MOV     R3,$BDDAT
1935 020720  005037  001140                    CLR     $GDDAT
1936 020724  010037  001136                    MOV     R0,$BDADR
1937 020730  062737  000040  001136            ADD     #RMMR2,$BDADR
1938 020736  104053                            EMT     53
1939 020740  000445                            BR      190$
1940
1941                                    ;VERIFY THERE ARE NO  ECC ERRORS
1942 020742                             160$:
1943 020742  016003  000014                    MOV     RMER1(R0),R3    ;STORE RMER1 AT R3
1944 020746  042703  077677                    BIC     #^C<DCK!ECH>,R3
1945 020752  012737  000000  001140            MOV     #000000,$GDDAT
1946 020760  023703  001140                    CMP     $GDDAT,R3
1947 020764  001411                            BEQ     170$
1948 020766  010337  001142                    MOV     R3,$BDDAT
1949 020772  010037  001136                    MOV     R0,$BDADR
1950 020776  062737  000014  001136            ADD     #RMER1,$BDADR
1951 021004  104064                            EMT     64
1952 021006  000422                            BR      190$
1953
1954                                    ;VERIFY DATA BUFFER
1955 021010                             170$:
1956 021010  012702  054636                    MOV     #BUFONE,R2      ;DATA WAS STORED HERE
1957 021014  012703  177777                    MOV     #177777,R3      ;EACH WORD ALL ONES
1958 021020  012704  000400                    MOV     #256.,R4
1959 021024  022203                     180$:  CMP     (R2)+,R3
1960 021026  001003                            BNE     185$
1961 021030  005304                            DEC     R4
1962 021032  001374                            BNE     180$
1963 021034  000407                            BR      190$            ;EXIT IF ALL THE LOCATIONS CHECKED
1964 021036  014237  001142             185$:  MOV     -(R2),$BDDAT    ;SETUP ERROR MESSAGE
1965 021042  010337  001140                    MOV     R3,$GDDAT
1966 021046  010237  001136                    MOV     R2,$BDADR
1967 021052  104065                            EMT     65
1968 021054  000137  021272             190$:  JMP     400$            ;GREAT ESCAPE
1969 021060  012737  000021  021162     300$:  MOV     #17.,320$
1970                                    ;CLOCK PROM STROBE ON
1971 021066                             305$:
     021066  012760  055401  000024            MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
1972 021074  012760  051401  000024            MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
1973 021102  016037  000024  021164            MOV     RMMR1(R0),330$  ;STORE RMMR1 AT 330$
1974 021110  042737  177737  021164            BIC     #^CWC,330$
1975 021116  001020                            BNE     310$            ;EXIT IF PROM STROBE ON
1976 021120  005337  021162                    DEC     320$
1977 021124  001360                            BNE     305$
1978 021126  013737  021162  001142            MOV     320$,$BDDAT     ;SETUP ERROR MESSAGE
1979 021134  012737  000040  001140            MOV     #WC,$GDDAT
1980 021142  010037  001136                    MOV     R0,$BDADR
1981 021146  062737  000024  001136            ADD     #RMMR1,$BDADR
1982 021154  104030                            EMT     30
1983 021156  000445                            BR      400$
1984 021160  000207                     310$:  RTS     PC
1985 021162  000000                     320$:  .WORD   0
1986
1987 021164  000000                     330$:  .WORD   0
```

```
 1988
 1989 021166  012737  000021  021266  350$:   MOV     #17.,370$       ;CLOCK THE STROBE OFF
 1990 021174                          355$:
      021174  012760  055401  000024          MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
 1991 021202  012760  051401  000024          MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
 1992 021210  016037  000024  021270          MOV     RMMR1(R0),380$  ;STORE RMMR1 AT 380$
 1993 021216  042737  177737  021270          BIC     #^CWC,380$
 1994 021224  001417                          BEQ     360$
 1995 021226  005337  021266                  DEC     370$
 1996 021232  001360                          BNE     355$
 1997 021234  013737  021270  001142          MOV     380$,$BDDAT
 1998 021242  005037  001140                  CLR     $GDDAT
 1999 021246  010037  001136                  MOV     R0,$BDADR
 2000 021252  062737  000024  001136          ADD     #RMMP1,$BDADR
 2001 021260  104062                          EMT     62
 2002 021262  000403                          BR      400$
 2003 021264  000207                  360$:   RTS     PC
 2004 021266  000000                  370$:   .WORD   0
 2005 021270  000000                  380$:   .WORD   0
 2006 021272  000240                  400$:   NOP             ;SUB-TEST EXIT POINT
```

```
                                        .SBTTL  END OF SUB-PASS ROUTINE
                                        ;THIS IS THE END OF SUB-PASS ROUTINE. THIS ROUTINE IS USED TO
                                        ;TERMINATE THE OPERATION OF THE CURRENT DEVICE UNDER TEST AND
                                        ;SELECT THE NEXT DEVICE FOR TEST. IF THERE ARE NO MORE DEVICES
                                        ;TO TEST, EXIT IS MADE TO '$EOP' ROUTINE. OTHERWISE, RETURN
                                        ;IS MADE TO 'READY' ROUTINE.
021274  000004                  $EOSP:  SCOPE
021276  000240                          NOP
021300  013700  001466                  MOV     TSTQUE,R0       ;GET POINTER TO TSTQUE
021304  062700  000002                  ADD     #2,R0           ;ADJUST POINTER TO NEXT DEVICE
021310  010037  001466                  MOV     R0,TSTQUE       ;SAVE POINTER TO TSTQUE
021314  005710                          TST     (R0)            ;ANY MORE DEVICES FOR TEST ?
021316  001402                          BEQ     1$              ;BR IF NO
021320  000137  005200                  JMP     READY           ;YES, JUMP TO 'READY' ROUTINE
021324  012737  001470  001466  1$:     MOV     #TSTQUE+2,TSTQUE        ;INITIALIZE POINTER TO FIRST DEVICE IN
                                                                ;TEST QUE TABLE
                                        .SBTTL  END OF PASS ROUTINE
                                        ;;*****************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*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 READY
021332                          $EOP:
021332  000240                          NOP
021334  005037  001116                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
021340  005037  001206                  CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
021344  005237  001230                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
021350  042737  100000  001230          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
021356  005327                          DEC     (PC)+           ;;LOOP?
021360  000001                  $EOPCT: .WORD   1
021362  003066                          BGT     $DOAGN          ;;YES
021364  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
021366  000001                  $ENDCT: .WORD   1
021370  021360                          $EOPCT
021372  104401  021400                  TYPE    ,65$            ;;TYPE ASCIZ STRING
021376  000407                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <12><15>/END PASS #/
021416                          64$:
021416  013746  001230                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                                                ;;TYPE PASS NUMBER
021422  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
021424  005737  001126                  TST     $ERTTL          ;;SEE IF ANY ERRORS THIS PASS
021430  001431                          BEQ     $GT42P          ;;BR IF NO ERRORS TO REPORT
021432  104401  021440                  TYPE    ,67$            ;;TYPE ASCIZ STRING
021436  000421                          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
021502                          66$:
021502  013746  001126                  MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
                                                                ;;TOTAL NUMBER OF ERRORS
021506  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
021510  005037  001126                  CLR     $ERTTL          ;;CLEAR ERROR TOTAL
```

```
021514  104401  001217          $GT42P: TYPE    ,$CRLF          ;;TYPE CARRIAGE RETURN  LINE FEED
021520  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
021524  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
021526  000005                          RESET                   ;;CLEAR THE WORLD
021530  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
021532  000240                          NOP                     ;;SAVE ROOM
021534  000240                          NOP                     ;;FOR
021536  000240                          NOP                     ;;ACT11
021540                          $DOAGN:
021540  000137                          JMP     @(SP)+          ;;RETURN
021542  005200                  $RTNAD: .WORD   READY
021544     377     377     000  $ENULL: .BYTE   -1,-1,0          ;;NULL CHARACTER STRING
                                        .EVEN
```

```
                                        .SBTTL  CLOCK SUBROUTINES

                                        ;ROUTINE TO SIZE FOR CLOCKS (KW11-L OR KW11-P)

021550  000240                  SIZCLK: NOP
021552  013746  000004                  MOV     ERRVEC,-(SP)    ;;PUSH ERRVEC ON STACK
021556  013746  000006                  MOV     ERRVEC+2,-(SP)          ;;PUSH ERRVEC+2 ON STACK
021562  012737  021646  000004          MOV     #10$,ERRVEC     ;LOAD 04 TRAP VECTORS
021570  012737  000300  000006          MOV     #PR6,ERRVEC+2

                                        ;SEE IF A KW11-P CLOCK IS PRESENT - GO TO 10$ IF NOT PRESENT
021576  005777  157710                  TST     @$LPCSR         ;TEST FOR P CLOCK
021602  012737  022010  001536          MOV     #PCLOCK,CLOCK   ;LOAD SUBROUTINE ADDRESS
021610  012737  022132  001540          MOV     #PSTOP,STOPCL   ;LOAD STOP ADDRESS
021616  012777  022076  157672          MOV     #PCOUNT,@$LPVEC ;LOAD P CLOCK INTERRUPT VECTOR
021624  012777  000300  157666          MOV     #PR6,@$LPVEC+2
021632  013777  001526  157664          MOV     $LLVEC+2,@$LLVEC;CLEAR L CLOCK INTERRUPT VECTOR
021640  005077  157662                  CLR     @$LLVEC+2
021644  000454                          BR      30$
021646  012716  021654          10$:    MOV     #15$,(SP)       ;DUMMY RTI ADDRESS
021652  000002                          RTI                     ;RESTORE PRIORITY

                                        ;NO P CLOCK-SEE IF L CLOCK IS PRESENT-GO TO 20$ IF NOT PRESET
021654                          15$:
021654  012737  021732  000004          MOV     #20$,ERRVEC     ;CHANGE 04 TRAP VECTOR
021662  005777  157634                  TST     @$LLCSR         ;TEST FOR L CLOCK
021666  012737  022026  001536          MOV     #LCLOCK,CLOCK   ;LOAD SUBROUTINE ADDRESS
021674  012737  022140  001540          MOV     #LSTOP,STOPCL   ;LOAD STOP ADDRESS
021702  012777  022076  157614          MOV     #LCOUNT,@$LLVEC ;LOAD L CLOCK INTERRUPT VECTOR
021710  012777  000300  157610          MOV     #PR6,@$LLVEC+2
021716  013777  001520  157572          MOV     $LPVEC+2,@$LPVEC;CLEAR P CLOCK INTERRUPT VECTOR
021724  005077  157570                  CLR     @$LPVEC+2
021730  000422                          BR      30$
021732  012716  021740          20$:    MOV     #25$,(SP)       ;DUMMY RTI ADDRESS
021736  000002                          RTI                     ;RESTORE PRIORITY

                                        ;NO CLOCK AVAILABLE - AUGMENT RETURN ADDRESS
021740                          25$:
021740  005037  001536                  CLR     CLOCK           ;CLEAR SUBROUTINE ADDRESS
021744  012737  001520  001516          MOV     #$LPVEC+2,$LPVEC;CLEAR P CLOCK INTERRUPT VECTOR
021752  005037  001520                  CLR     $LPVEC+2
021756  012737  001526  001524          MOV     #$LLVEC+2,$LLVEC;CLEAR L CLOCK INTERRUPT VECTOR
021764  005037  001526                  CLR     $LLVEC+2
021770  062766  000002  000004          ADD     #2,4(SP)        ;CHANGE RETURN ADDRESS

021776                          30$:
021776  012637  000006                  MOV     (SP)+,ERRVEC+2          ;;POP STACK INTO ERRVEC+2
022002  012637  000004                  MOV     (SP)+,ERRVEC    ;;POP STACK INTO ERRVEC
022006  000207                          RTS     PC

                                        ;ROUTINES TO START THE CLOCK (KW11-L OR KW11-P)

022010  012777  177777  157476  PCLOCK: MOV     #-1,@$LPCSB     ;LOAD COUNT SET BUFFER
022016  012777  000135  157466          MOV     #135,@$LPCSR    ;LOAD CONTROL REGISTER
022024  000403                          BR      PLCLK           ;GO TO COMMON CODE

022026  012777  000100  157466  LCLOCK: MOV     #100,@$LLCSR    ;LOAD CONTROL REGISTER
```

```
                        
022034  005037  001532         PLCLK:  CLR     TIME            ;CLEAR TIMER COUNT
022040  104400                 TRAP                            ;;PUSH OLD PSW AND PC ON STACK
022042  012605                 MOV     (SP)+,R5                ;;SAVE THE PSW IN R5
022044  010537  001530         MOV     R5,$PSW                 ;SAVE PRIORITY
022050  042705  177437         BIC     #^CPR7,R5               ;MASK X
022054  022705  000300         CMP     #PR6,R5                 ;IS PRIORITY TOO HIGH??
022060  101005                 BHI     40$                     ;NO!!
022062  012746  000240         MOV     #PR5,-(SP)              ;;PUT NEW PS ON STACK
022066  012746  022074         MOV     #30$,-(SP)              ;;PUT NEW PC ON  STACK
022072  000002                 RTI                             ;;POP NEW PC AND PS
022074                 30$:
022074  000207         40$:    RTS     PC
                        
                        ;ROUTINES TO HANDLE CLOCK INTERRUPTS (KW11-L OR KW11-P)
                        
022076                 PCOUNT:
022076                 LCOUNT:
022076  062737  000021  001532         ADD     #17.,TIME       ;ADD 17MS TO ELAPSED TIME
022104  103003                 BCC     10$                     ;BRANCH IF NO OVERFLOW
022106  012737  177777  001532         MOV     #-1,TIME        ;RESTORE MAXIMUM COUNT
022114  162737  000021  001534 10$:    SUB     #17.,WATCH      ;DECREMENT REMAINING TIME
022122  100002                 BPL     20$                     ;BRANCH IF POSITIVE
022124  005037  001534         CLR     WATCH                   ;CLEAR REMAINING TIME
022130  000002         20$:    RTI                             ;RETURN TO USER
                        
                        ;ROUTINES TO STOP THE CLOCK (KW11-L OR KW11-P)
                        
022132  005077  157354 PSTOP:  CLR     @$LPCSR         ;STOP P CLOCK
022136  000402                 BR      PLSTP           ;GO TO COMMON STOP CODE
                        
022140  005077  157356 LSTOP:  CLR     @$LLCSR         ;STOP L CLOCK
                        
022144                 PLSTP:
022144  013746  001530         MOV     $PSW,-(SP)              ;;PUT NEW PS ON STACK
022150  012746  022156         MOV     #10$,-(SP)              ;;PUT NEW PC ON  STACK
022154  000002                 RTI                             ;;POP NEW PC AND PS
022156                 10$:
022156  000207                 RTS     PC
```

```
                        .SBTTL  SET VOLUME VALID SUBROUTINE

                        ;THIS SUBROUTINE INITIALIZES THE SUBSYSTEM AND SETS VOLUME VALID,
                        ;RETURNING WITH THE DRIVE STILL IN DIAGNOSTIC MODE.  THE SUBROUTINE
                        ;RETURNS TO THE WORD FOLLOWING THE CALL, EXCEPT WHEN AN ERROR IS
                        ;DETECTED, IN WHICH CASE IT RETURNS TO THE SECOND WORD FOLLOWING THE
                        ;CALL.
                        ;
                        ;CALL:  JSR     PC,SETVV        JUMP TO SUBROUTINE
                        ;       BR      ??              RETURN HERE IF NO ERROR
                        ;       ERROR                   RETURN HERE IF ERROR

022160                  SETVV:
022160  004737  022404          JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
022164  012760  000001  000024  MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
022172  012760  001001  000024  MOV     #DMD!MUR,RMMR1(R0)      ;LOAD RMMR1
022200  012760  000000  000014  MOV     #0,RMER1(R0)    ;LOAD RMER1
022206  012760  000000  000042  MOV     #0,RMER2(R0)    ;LOAD RMER2
022214  012760  000023  000000  MOV     #PACACK!GO,RMCS1(R0)    ;LOAD RMCS1
022222  016037  000012  001142  MOV     RMDS(R0),$BDDAT ;STORE RMDS AT $BDDAT
022230  042737  177677  001142  BIC     #^CVV,$BDDAT
022236  001020                  BNE     10$             ;BRANCH IF VOLUME VALID SET
022240  010037  001136          MOV     R0,$BDADR       ;SETUP FOR ERROR MSG
022244  062737  000012  001136  ADD     #RMDS,$BDADR
022252  012737  000100  001140  MOV     #VV,$GDDAT
022260  062716  000002          ADD     #2,(SP)         ;MOVE RETURN ADDRESS TO ERROR
022264  112776  000100  000000  MOVB    #100,@(SP)      ;WRITE ERROR NUMBER
022272  012737  000022  001174  MOV     #PACACK,$TMP0
022300  000207          10$:    RTS     PC              ;RETURN
```

```
                                        .SBTTL  SET OFFSET MODE SUBROUTINE
                                        ;
                                        ;THIS SUBROUTINE EXECUTES AN OFFSET COMMAND AND VERIFIES THAT OFFSET
                                        ;MODE SETS.  THE DRIVE SHOULD BE IN DIAGNOSTIC MODE WHEN CALLING THE
                                        ;SUBROUTINE, WHICH WILL LEAVE DMD ON.  THE SUBROUTINE RETURNS TO THE
                                        ;WORD FOLLOWING THE CALL UNLESS THERE IS AN ERROR, IN WHICH CASE IT
                                        ;RETURNS TO THE SECOND WORD FOLLOWING THE CALL
                                        ;
                                        ;CALL:  JSR     PC,SETOM        JUMP TO SUBROUTINE
                                        ;       BR      ??              RETURN HERE IF NO ERROR
                                        ;       ERROR                   RETURN HERE IF ERROR
                                        ;
022302                                  SETOM:
022302  012760  001001  000024                MOV     #DMD!MUR,RMMR1(R0)      ;LOAD RMMR1
022310  012760  000000  000014                MOV     #0,RMER1(R0)    ;LOAD RMER1
022316  012760  000000  000042                MOV     #0,RMER2(R0)    ;LOAD RMER2
022324  012760  000015  000000                MOV     #OFFSET!GO,RMCS1(R0)    ;LOAD RMCS1
022332  016037  000012  001142                MOV     RMDS(R0),$BDDAT ;STORE RMDS AT $BDDAT
022340  042737  177776  001142                BIC     #^COM,$BDDAT
022346  001015                                BNE     10$             ;BRANCH IF OFFSET ON
022350  012737  000001  001140                MOV     #OM,$GDDAT
022356  010037  001136                        MOV     R0,$BDADR
022362  062737  000012  001136                ADD     #RMDS,$BDADR
022370  062716  000002                        ADD     #2,(SP)         ;MOVE RETURN ADDRESS TO ERROR
022374  112776  000111  000000                MOVB    #111,@(SP)      ;WRITE ERROR NUMBER
022402                                  10$:
022402  000207                                RTS     PC              ;RETURN TO USER
```

SEQ 0100

```
                                .SBTTL  CLEAR CONTROLLER SUBROUTINE

                                ;THIS SUBROUTINE CLEARS THE MASSBUS CONTROLLER, MASSBUS ADAPTERS,
                                ;AND DRIVES, THEN SELECTS THE DRIVE.
                                ;CALL:
                                ;       JSR     PC,CNTCLR       ;CALL TO ROUTINE
                                
 022404                         CNTCLR:
 022404  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 022406  013700  001276                MOV     $BASE,R0        ;R0 = UNIBUS BASE ADDRESS
 022412  012760  000040  000010        MOV     #CLR,RMCS2(R0)  ;CLEAR MASSBUS
 022420  117760  157042  000010        MOVB    @TSTQUE,RMCS2(R0)       ;SELECT DEVICE UNDER TEST
 022426  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
 022430  000207                        RTS     PC              ;RETURN
```

```
                                .SBTTL  ENABLE SEARCH SUBROUTINE
                                
022432                          ENBSCH:
                                
                                ;THE REGISTER OUTPUT BUFFER  SHOULD CONTAIN:
                                ;       RMDA0   = DESIRED SECTOR AND TRACK ADDRESS
                                ;       RMDC0   = DESIRED CYLINDER ADDRESS
                                ;       RMOF0   = FORMAT, ECI, HCI
                                ;       RMBA0   = BUFFER ADDRESS
                                ;       RMWC0   = WORD COUNT
                                ;       RMCS10  = FUNCTION CODE
                                
                                ;NOTE:  OFFSET IS NOT ENABLED WHEN USING THIS SUBROUTINE
                                
                                ;SET VOLUME VALID
                                ;FIRST,CLEAR -SET DIAGNOSTIC MODE-SYNCHRONIZE
                                ;PROM STROBE
                                
022432  004737  022404                      JSR     PC,CNTCLR       ;GO CLEAR CONTROLLER
022436  012760  000001  000024              MOV     #DMD,RMMR1(R0)  ;LOAD RMMR1
022444  012704  000041                      MOV     #33.,R4         ;ALLOW UP TO 33 BIT CLOCKS
                                                                    ;TO SYNC PROM STROBE
022450                          5$:
022450  012760  005001  000024              MOV     #DMD!MUR!MCLK,RMMR1(R0) ;LOAD RMMR1
022456  012760  001001  000024              MOV     #DMD!MUR,RMMR1(R0)      ;LOAD RMMR1
022464  016005  000024                      MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
022470  032705  000040                      BIT     #WC,R5  ;WAIT FOR PROM STROBE TO COME ON
022474  001023                              BNE     6$
022476  005304                              DEC     R4
022500  001363                              BNE     5$
022502  010037  001136                      MOV     R0,$BDADR       ;PROM STROBE WONT SET
022506  062737  000024  001136              ADD     #RMMR1,$BDADR
022514  005037  001142                      CLR     $BDDAT
022520  012737  000040  001140              MOV     #WC,$GDDAT
022526  062716  000002                      ADD     #2,(SP)
022532  112776  000030  000000              MOVB    #30,@(SP)
022540  000137  023302                      JMP     60$             ;REPORT ERROR
022544                          6$:
022544  012760  005001  000024              MOV     #DMD!MUR!MCLK,RMMR1(R0) ;LOAD RMMR1
022552  012760  001001  000024              MOV     #DMD!MUR,RMMR1(R0)      ;LOAD RMMR1
022560  016005  000024                      MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
022564  032705  000040                      BIT     #WC,R5          ;WAIT FOR PROM STROBE TO GO OFF
022570  001423                              BEQ     7$
022572  005304                              DEC     R4
022574  001363                              BNE     6$
022576  010037  001136                      MOV     R0,$BDADR       ;PROM STROBE WONT RESET
022602  062737  000024  001136              ADD     #RMMR1,$BDADR   ;
022610  012737  000040  001142              MOV     #WC,$BDDAT
022616  005037  001140                      CLR     $GDDAT
022622  062716  000002                      ADD     #2,(SP)
022626  112776  000062  000000              MOVB    #62,@(SP)
022634  000137  023302                      JMP     60$
                                
                                ;SECOND, CLOCK INDEX PULSE TO
                                ;  (1) CLEAR FORMAT CHANGE FLOP
                                ;  (2) CLEAR RTC FLOP
022640                          7$:
```

```
 56 022640  012760  001005  000024          MOV     #DMD.MUR.MI,RMMR1(R0)    ;LOAD RMMR1
 57 022646  012760  001001  000024          MOV     #DMD.MUR,RMMR1(R0)       ;LOAD RMMR1
 58
 59 022654  012760  000000  000014          MOV     #0,RMER1(R0)     ;LOAD RMER1
 60 022662  012760  000000  000042          MOV     #0,RMER2(R0)     ;LOAD RMER2
 61 022670  012760  000023  000000          MOV     #PACACK.GO,RMCS1(R0)     ;LOAD RMCS1
 62 022676  016037  000012  001142          MOV     RMDS(R0),$BDDAT ;STORE RMDS AT $BDDAT
 63 022704  042737  177677  001142          BIC     #^CVV,$BDDAT     ;VOLUME VALID SHOULD BE SET
 64 022712  001021                          BNE     10$
 65 022714  010037  001136                  MOV     R0,$BDADR        ;SETUP ERROR MSG
 66 022720  062737  000012  001136          ADD     #RMDS,$BDADR
 67 022726  012737  000100  001140          MOV     #VV,$GDDAT
 68 022734  062716  000002                  ADD     #2,(SP)          ,WRITE ERROR NUMBER
 69 022740  112776  000100  000000          MOVB    #100,@(SP)       ;
 70 022746  012737  000022  001174          MOV     #PACACK,$TMP0
 71 022754  000552                          BR      60$
 72
 73                                 ;LOAD REGISTERS
 74 022756                          10$:
 75 022756  013760  001420  000006          MOV     RMDA0,RMDA(R0)   ;LOAD RMDA
 76 022764  013760  001446  000034          MOV     RMDC0,RMDC(R0)   ;LOAD RMDC
 77 022772  013760  001444  000032          MOV     RMOF0,RMOF(R0)   ;LOAD RMOF
 78 023000  013760  001414  000002          MOV     RMWC0,RMWC(R0)   ;LOAD RMWC
 79 023006  013760  001416  000004          MOV     RMBA0,RMBA(R0)   ;LOAD RMBA
 80
 81                                 ;ENABLE DEBUG CLOCK AND LOAD FUNCTION CODE
 82 023014  012760  041401  000024          MOV     #DMD!MUR!DBEN!MOC,RMMR1(R0)      ;LOAD RMMR1
 83 023022  012760  000000  000014          MOV     #0,RMER1(R0)     ;LOAD RMER1
 84 023030  012760  000000  000042          MOV     #0,RMER2(R0)     ;LOAD RMER2
 85 023036  013760  001412  000000          MOV     RMCS10,RMCS1(R0)         ;LOAD RMCS1
 86
 87                                 ;WAIT FOR 'RUN AND GO'' TO SET
 88 023044  012737  000310  001534          MOV     #200.,WATCH      ;SET WATCHDOG TIMER VALUE
    023052  004777  156460                  JSR     PC,@CLOCK        ;START THE CLOCK
 89 023056                          20$:
    023056  016037  000024  001142          MOV     RMMR1(R0),$BDDAT         ;STORE RMMR1 AT $BDDAT
 90 023064  042737  137777  001142          BIC     #^CRG,$BDDAT
 91 023072  001023                          BNE     30$
 92 023074  005737  001534                  TST     WATCH            ;ANY TIME LEFT?
 93 023100  001366                          BNE     20$              ;YES-WAIT
 94 023102  004777  156432                  JSR     PC,@STOPCL       ;STOP THE CLOCK
 95 023106  012737  040000  001140          MOV     #RG,$GDDAT       ;SETUP ERROR MSG
 96 023114  010037  001136                  MOV     R0,$BDADR
 97 023120  062737  000024  001136          ADD     #RMMR1,$BDADR
 98 023126  062716  000002                  ADD     #2,(SP)          ;WRITE ERRO. NUMBER IN
 99 023132  112776  000101  000000          MOVB    #101,@(SP)               ;USER'S CALL -
100
101 023140  000460                          BR      60$
102 023142                          30$:
    023142  004777  156372                  JSR     PC,@STOPCL       ;STOP THE CLOCK
103
104                                ;STEP COMMAND SEQUENCER TO HEAD SEQUENCE AT LOCATION 156 (17 CLOCKS)
105 023146  012704  000021                  MOV     #17.,R4          ;R4=CLOCK COUNT
106 023152                          40$:
    023152  012760  141401  000024          MOV     #DMD!MUR.DBEN!MOC!DBCK,RMMR1(R0)         ;LOAD RMMR1
107 023160  012760  041401  000024          MOV     #DMD!MUR.DBEN MOC,RMMR1(R0)      ;LOAD RMMR1
108 023166  005304                          DEC     R4
```

```
                                        BNE     40$
                                ;DROP ON CYLINDER TO RESET LATCH, THEN SET ON CYLINDER TO PASS
                                ;TEST AT LOCATION 166
023172  012760  041001  000024          MOV     #DMD.MUR!DBEN,RMMR1(R0) ;LOAD RMMR1
023200  012760  041401  000024          MOV     #DMD.MUR!DBEN!MOC,RMMR1(R0)     ;LOAD RMMR1
                                ;STEP SEQUENCER (35 CLOCKS) AND VERIFY SEARCH IS ENABLED
023206  012704  000043                  MOV     #35.,R4         ;R4=CLOCK COUNT
023212                          50$:
023212  012760  151401  000024          MOV     #DMD!MUR!DBEN.MOC!DBCK!MSEN,RMMR1(R0)   ;LOAD RMMR1
023220  012760  051401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
023226  005304                          DEC     R4
023230  001370                          BNE     50$
023232  016037  000024  001142          MOV     RMMR1(R0),$BDDAT        ;STORE RMMR1 AT $BDDAT
023240  042737  173777  001142          BIC     #^CESRC,$BDDAT  ;SEARCH SHOULD BE ENABLED
023246  001015                          BNE     60$
023250  010037  001136                  MOV     R0,$BDADR       ;SETUP ERROR MESSAGE
023254  062737  000024  001136          ADD     #RMMR1,$BDADR
023262  012737  004000  001140          MOV     #ESRC,$GDDAT
023270  062716  000002                  ADD     #2,(SP)         ;WRITE ERROR NUMBER
023274  112776  000102  000000          MOVB    #102,@(SP)
023302                          60$:
023302  000207                          RTS     PC
```

```
                                .SBTTL  SECTOR COMPARE SUBROUTINE

                                ;THIS SUBROUTINE CONTINUES THE EXECUTION OF A DATA COMMAND
                                ;FROM WHERE SEARCH HAS BEEN ENABLED TO WHERE SECTOR COMPARE
                                ;IS SET.

023304                          SCTCMP:

                                ;SET INDEX PULSE TO CLEAR FORMAT CHANGE FLOP
023304  012760  051405  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MI,RMMR1(R0)     ;LOAD RMMR1
023312  012760  051401  000024          MOV     #DMD.MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1

                                ;WAIT AT LEAST 4 MS FOR 'RETURN TO CENTER LINE' ONE SHOT TO SET
023320  012737  000006  001534          MOV     #6,WATCH        ;SET WATCHDOG TIMER VALUE
023326  004777  156204                  JSR     PC,@CLOCK       ;START THE CLOCK
023332  005737  001534          10$:    TST     WATCH
023336  001375                          BNE     10$
023340  004777  156174                  JSR     PC,@STOPCL      ;STOP THE CLOCK

                                ;DATA INPUT TO SEARCH ENABLE FLOP SHOULD BE ONE - CLOCK SECTOR PULSE TO
                                ;SET FLOP
023344  012760  051441  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MS,RMMR1(R0)     ;LOAD RMMR1
023352  012760  051401  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1

                                ;WITH SECTOR COMPARE HIGH, CLOCK SECTOR PULSE TO SET SECTOR COMPARE FLOP
023360  012760  051403  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)    ;LOAD RMMR1
023366  012760  051443  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC!MS,RMMR1(R0)  ;LOAD RMMR1
023374  012760  051403  000024          MOV     #DMD!MUR!DBEN!MOC!MSEN!MSC,RMMR1(R0)     ;LOAD RMMR1
023402  012760  051401  000024          MOV     #DMD!MUR.DBEN!MOC!MSEN,RMMR1(R0)         ;LOAD RMMR1

023410  000207                          RTS     PC
```

```
                        .SBTTL  SET LOOKING FOR SYNC SUBROUTINE

                        ;THIS SUBROUTINE WILL SETUP THE DATA TIMING SEQUENCER
                        ;ASSUMING SEARCH IS ENABLED,TO THE POINT WHERE 'PLFS'' IS ACTIVE

023412                  SETLFS:

                        ;PULSE BIT CLOCK UNTIL PROM STROBE SETS
023412                  10$:
023412  012760  055401  000024        MOV     #DMD!MUR!DBEN.MOC.MSEN!MCLK,RMMR1(R0)   ;LOAD RMMR1
023420  012760  051401  000024        MOV     #DMD.MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
023426  016005  000024                MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
023432  032705  000040                BIT     #WC,R5
023436  001765  -                     BEQ     10$

                        ;SET UP DATA SEQUENCER TO LOCATION 11. WHERE PLFS WILL SET
023440  012704  000260                MOV     #176.,R4                 ;MAX NUMBER OF BIT CLOCK
023444                  20$:
023444  012760  055401  000024        MOV     #DMD!MUR!DBEN!MOC!MSEN!MCLK,RMMR1(R0)   ;LOAD RMMR1
023452  012760  051401  000024        MOV     #DMD!MUR!DBEN!MOC!MSEN,RMMR1(R0)        ;LOAD RMMR1
023460  016005  000024                MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
023464  032705  002000                BIT     #PLFS,R5                 ;EXIT IF PLFS IS SET
023470  001010                        BNE     30$
023472  005304                        DEC     R4                       ,ERROR IF COUNT EXHAUSTED
023474  001363                        BNE     20$
023476  062716  000002                ADD     #2,(SP)                  ;
023502  112776  000035  000000        MOVB    #35,@(SP)                ;CANT SET PLFS
023510  000430                        BR      50$

                        ;STEP THE MAIN REG CLOCK UNTIL THE TRAILING EDGE OF PROM STORBE
                        ;IS DETECTED.
023512                  30$:
023512  016005  000024                MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
023516  032705  000040                BIT     #WC,R5
023522  001007                        BNE     40$
023524  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)   ;LOAD RMMR1
023532  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)        ;LOAD RMMR1
023540  000414                        BR      50$
023542                  40$:
023542  016005  000024                MOV     RMMR1(R0),R5    ;STORE RMMR1 AT R5
023546  032705  000040                BIT     #WC,R5
023552  001407                        BEQ     50$
023554  012760  055401  000024        MOV     #MR1AAA!MCLK,RMMR1(R0)   ;LOAD RMMR1
023562  012760  051401  000024        MOV     #MR1AAA,RMMR1(R0)        ;LOAD RMMR1
023570  000764                        BR      40$
023572                  50$:
023572  000207                        RTS     PC                       ;EXIT
```

```
                        .SBTTL  CLOCK SYNC SUBROUTINE

                        ;THIS SUBROUTINE WILL SIMULATE THE HEADER AND DATA SYNC
                        ;PATTERN BEING READ

023574                  CLKSNC:

                        ;VERIFY THAT 'PLFS'' IS ON
023574  016004  000024          MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
023600  032704  002000          BIT     #PLFS,R4        ;LOOK FOR SYN SET ?
023604  001023                  BNE     10$             ;BRANCH IF SO
023606  010437  001142          MOV     R4,$BDDAT       ;
023612  042737  175777  001142  BIC     #^CPLFS,$BDDAT
023620  012737  002000  001140  MOV     #PLFS,$GDDAT
023626  010037  001136          MOV     R0,$BDADR                               ;
023632  062737  000024  001136  ADD     #RMMR1,$BDADR
023640  062716  000002          ADD     #2,(SP)
023644  112776  000035  000000  MOVB    #35,@(SP)
023652  000472                  BR      60$
023654  012705  000021  10$:    MOV     #17.,R5         ;MAKE SURE PROM STROBE IS OFF
023660  032704  000040  20$:    BIT     #WC,R4
023664  001434                  BEQ     30$
023666  012760  055401  000024  MOV     #MR1AAA!MCLK,RMMR1(R0)  ;LOAD RMMR1
023674  012760  051401  000024  MOV     #MR1AAA,RMMR1(R0)       ;LOAD RMMR1
023702  016004  000024          MOV     RMMR1(R0),R4    ;STORE RMMR1 AT R4
023706  005305                  DEC     R5
023710  001363                  BNE     20$

                        ;ERROR CAN'T RESET PROM STROBE WITH LFS ACTIVE
023712  010437  001142          MOV     R4,$BDDAT       ;SETUP ERROR FOR USER
023716  042737  177737  001142  BIC     #^CWC,$BDDAT
023724  005037  001140          CLR     $GDDAT                                  ;
023730  010037  001136          MOV     R0,$BDADR
023734  062737  000024  001136  ADD     #RMMR1,$BDADR
023742  062716  000002          ADD     #2,(SP)
023746  112776  000062  000000  MOVB    #62,@(SP)
023754  000431                  BR      60$

                        ;CLOCK THE SYNC PATTERN (00011001) THROUGH THE SHIFT REGISTER
023756                  30$:
023756  012704  014400          MOV     #014400,R4
023762  012737  000020  024042  MOV     #16.,70$        ;STROBE BIT COUNT
023770  012705  051401  40$:    MOV     #MR1AAA,R5      ;GENERATE REG VALUE
023774  000241                  CLC                     ;WITH MAINTENANCE CLOCK ON
023776  006004                  ROR     R4
024000  103002                  BCC     50$
024002  052705  002000          BIS     #MRD,R5         ;SET READ BIT PER PATTERN BIT

024006                  50$:
024006  010560  000024          MOV     R5,RMMR1(R0)    ;LOAD RMMR1
024012  052705  004000          BIS     #MCLK,R5
024016  010560  000024          MOV     R5,RMMR1(R0)    ;LOAD RMMR1
024022  042705  004000          BIC     #MCLK,R5                ;CLOCK ONE BIT
024026  010560  000024          MOV     R5,RMMR1(R0)    ;LOAD RMMR1
024032  005337  024042          DEC     70$
024036  001354                  BNE     40$
```

```
                                        ;CAN'T VERIFY SYNC CLOCK WAS DETECTED
                                        ;USER CAN DO SO BY STEPING
                                        ;BIT CLOCK AND VERIFY PROM STROBE SETS WITHIN ONE WORD TIME
024040                                  60$:
024040  000207                                RTS     PC
024042  000000                          70$:  .WORD   0               ;TEMPORARY STORAGE
```

```
                                .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

024044                          $SAVREG:
024044  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
024046  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
024050  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
024052  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
024054  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
024056  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
024060  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
024064  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
024070  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
024074  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
024100  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
024102                          $RESREG:
024102  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
024106  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
024112  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
024116  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
024122  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
024124  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
024126  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
024130  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
024132  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
024134  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
024136  000002                          RTI
```

```
                                .SBTTL  BINARY TO ASCII AND TYPE ROUTINE

                                ;;**********************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 16-BIT
                                ;*BINARY-ASCII NUMBER AND TYPE IT.
                                ;*CALL:
                                ;*      MOV     NUMBER,-(SP)    ;;NUMBER TO BE TYPED
                                ;*      TYPBN                   ;;TYPE IT

024140  010146                 $TYPBN: MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
024142  016601  000006                  MOV     6(SP),R1        ;;GET THE INPUT NUMBER
024146  000261                          SEC                     ;;SET "C" SO CAN KEEP TRACK OF THE NUMBER OF BITS
024150  112737  000060  024212  1$:     MOVB    #'0,$BIN        ;;SET CHARACTER TO AN ASCII "0".
024156  006101                          ROL     R1              ;;GET THIS BIT
024160  001406                          BEQ     2$              ;;DONE?
024162  105537  024212                  ADCB    $BIN            ;;NO--SET THE CHARACTER EQUAL TO THIS BIT
024166  104401  024212                  TYPE    ,$BIN           ;;GO TYPE THIS BIT
024172  000241                          CLC                     ;;CLEAR "C" SO CAN KEEP TRACK OF BITS
024174  000765                          BR      1$              ;;GO DO THE NEXT BIT
024176  012601                  2$:     MOV     (SP)+,R1        ;;POP THE STACK INTO R1
024200  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
024206  012616                          MOV     (SP)+,(SP)
024210  000002                          RTI                     ;;RETURN TO USER
024212     000     000          $BIN:   .BYTE   0,0             ;;STORAGE FOR ASCII CHAR. AND TERMINATOR
```

```
                                .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

024214                          $TYPDS:
024214  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
024216  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
024220  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
024222  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
024224  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
024226  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
024232  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
024236  100004                          BPL     1$              ;;BR IF INPUT IS POS.
024240  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
024242  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
024250  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
024252  012703  024430                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
024256  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
024262  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
024264  016001  024420                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
024270  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
024272  002402                          BLT     4$              ;;BR IF DONE
024274  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
024276  000774                          BR      3$
024300  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
024302  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
024304  001002                          BNE     5$              ;;FALL THROUGH IF 0
024306  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
024310  100407                          BMI     7$              ;;BR IF YES
024312  106316                  5$:     ASLB    (SP)            ;;MSD?
024314  103003                          BCC     6$              ;;BR IF NO
024316  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
024324  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
024330  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
024334  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
024336  005720                          TST     (R0)+           ;;JUST INCREMENTING
024340  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
024344  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
024346  003002                          BGT     8$              ;;GO TO EXIT
024350  010502                          MOV     R5,R2           ;;GET THE LSD
024352  000764                          BR      6$              ;;GO CHANGE TO ASCII
024354  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
024356  100003                          BPL     9$              ;;BR IF NO
024360  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
024366  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
024370  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
024372  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
024374  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
024376  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
```

```
024400  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
024402  104401  024430                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
024406  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
024414  012616                          MOV     (SP)+,(SP)
024416  000002                          RTI                     ;;RETURN TO USER
024420  023420                  $DTBL:  10000.
024422  001750                          1000.
024424  000144                          100.
024426  000012                          10.
024430                          $DBLK:  .BLKW   4
```

```
                        .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

024440  017646  000000        $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
024444  116637  000001  024663        MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
024452  112637  024665                MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
024456  062716  000002                ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
024462  000406                        BR      $TYPON
024464  112737  000001  024663 $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
024472  112737  000006  024665        MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
024500  112737  000005  024662 $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
024506  010346                        MOV     R3,-(SP)        ;;SAVE R3
024510  010446                        MOV     R4,-(SP)        ;;SAVE R4
024512  010546                        MOV     R5,-(SP)        ;;SAVE R5
024514  113704  024665                MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
024520  005404                        NEG     R4
024522  062704  000006                ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
024526  110437  024664                MOVB    R4,$OMODE       ;;SAVE IT FOR USE
024532  113704  024663                MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
024536  016605  000012                MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
024542  005003                        CLR     R3              ;;CLEAR THE OUTPUT WORD
024544  006105                1$:     ROL     R5              ;;ROTATE MSB INTO "C"
024546  000404                        BR      3$              ;;GO DO MSB
024550  006105                2$:     ROL     R5              ;;FORM THIS DIGIT
024552  006105                        ROL     R5
024554  006105                        ROL     R5
024556  010503                        MOV     R5,R3
024560  006103                3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
024562  105337  024664                DECB    $OMODE          ;;TYPE THIS DIGIT?
024566  100016                        BPL     7$              ;;BR IF NO
024570  042703  177770                BIC     #177770,R3      ;;GET RID OF JUNK
024574  001002                        BNE     4$              ;;TEST FOR 0
024576  005704                        TST     R4              ;;SUPPRESS THIS 0?
024600  001403                        BEQ     5$              ;;BR IF YES
024602  005204                4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
024604  052703  000060            BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
024610  052703  000040     5$:    BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
024614  110337  024660            MOVB    R3,8$           ;;SAVE FOR TYPING
024620  104401  024660            TYPE    ,8$             ;;GO TYPE THIS DIGIT
024624  105337  024662     7$:    DECB    $OCNT           ;;COUNT BY 1
024630  003347                    BGT     2$              ;;BR IF MORE TO DO
024632  002402                    BLT     6$              ;;BR IF DONE
024634  005204                    INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
024636  000744                    BR      2$              ;;GO DO THE LAST DIGIT
024640  012605     6$:    MOV     (SP)+,R5        ;;RESTORE R5
024642  012604                    MOV     (SP)+,R4        ;;RESTORE R4
024644  012603                    MOV     (SP)+,R3        ;;RESTORE R3
024646  016666  000002  000004    MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
024654  012616                    MOV     (SP)+,(SP)
024656  000002                    RTI                     ;;RETURN
024660     000     8$:    .BYTE   0               ;;STORAGE FOR ASCII DIGIT
024661     000                    .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
024662     000     $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
024663     000     $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
024664  000000     $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                .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
                                ;*

024666  105737  001173          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
024672  100002                          BPL     1$              ;;BR IF YES
024674  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
024676  000430                          BR      3$              ;;LEAVE
024700  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
024702  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
024706  122737  000001  001242          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
024714  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
024716  132737  000100  001243          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
024724  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
024726  010037  024736                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
024732  004737  031300                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
024736  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
024740  132737  000040  001243  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
024746  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
024750  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
024752  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
024754  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
024756  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
024760  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
024764  000002                          RTI                     ;;RETURN
024766  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
024772  001430                          BEQ     8$
024774  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
025000  001006                          BNE     5$
025002  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
025004  104401                          TYPE                    ;;TYPE A CR AND LF
025006  001217                          $CRLF
025010  105037  025216                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
025014  000755                          BR      2$              ;;GET NEXT CHARACTER
025016  004737  025100          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
025022  123726  001172          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
025026  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
025030  013746  001170                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
025034  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
025040  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
025042  004737  025100                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
025046  105337  025216                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
025052  000770                          BR      7$              ;;LOOP
```

```
                                        ;HORIZONTAL TAB PROCESSOR

025054  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
025060  004737  025100          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
025064  132737  000007  025216          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
025072  001372                          BNE     9$              ;;TAB STOP
025074  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
025076  000724                          BR      2$              ;;GET NEXT CHARACTER
025100                          $TYPEC:
025100  105777  154054                  TSTB    @$TKS           ;;CHAR IN KYBD BUFFER?
025104  100022                          BPL     10$             ;;BR IF NOT
025106  017746  154050                  MOV     @$TKB,-(SP)     ;;GET CHAR
025112  042716  177600                  BIC     #177600,(SP)    ;;STRIP EXTRANEOUS BITS
025116  122716  000023                  CMPB    #$XOFF,(SP)     ;;WAS CHAR XOFF
025122  001012                          BNE     102$            ;;BR IF NOT
025124                          101$:
025124  105777  154030                  TSTB    @$TKS           ;;WAIT FOR CHAR
025130  100375                          BPL     101$
025132  117716  154024                  MOVB    @$TKB,(SP)      ;;GET CHAR
025136  042716  177600                  BIC     #177600,(SP)    ;;STRIP IT
025142  122716  000021                  CMPB    #$XON,(SP)      ;;WAS IT XON?
025146  001366                          BNE     101$            ;;BR IF NOT
025150                          102$:
025150  005726                          TST     (SP)+           ;;FIX STACK
025152                          10$:
025152  105777  154006                  TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
025156  100375                          BPL     10$
025160  116677  000002  154000          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
025166  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
025174  001003                          BNE     1$              ;;BRANCH IF NO
025176  105037  025216                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
025202  000406                          BR      $TYPEX          ;;EXIT
025204  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
025212  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
025214  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
025216  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
025220  000207          $TYPEX: RTS     PC
```

```
                                .SBTTL  SCOPE HANDLER ROUTINE

                                ;;**********************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                                ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW11=1         INHIBIT ITERATIONS
                                ;*SW09=1         LOOP ON ERROR
                                ;*SW08=1         LOOP ON TEST IN SWR<7:0>
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE=IOT

025222                          $SCOPE:
025222  104410                          CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
025224  032777  040000  153722  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
025232  001402                          BEQ     9$              ;;NO IF SW14=0
025234  000137  025664                  JMP     $OVER           ;;JUMP OVER SCOPE ROUTINE
025240                          9$:
                                ;######START OF CODE FOR THE XOR TESTER######
025240  000416                  $XTSTR: BR      6$              ;;IF RUNNING ON THE 'XOR' TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A 'NOP' (NOP-240)
025242  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
025246  012737  025266  000004          MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
025254  005737  177060                  TST     @#177060        ;;TIME OUT ON XOR?
025260  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
025264  000561                          BR      $SVLAD          ;;GO TO THE NEXT TEST
025266  022626                  5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
025270  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
025274  000521                          BR      7$              ;;LOOP ON THE PRESENT TEST
025276                          6$:;######END OF CODE FOR THE XOR TESTER######
025276  032777  000400  153650          BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
025304  001421                          BEQ     2$              ;;BR IF NO
025306  005046                          CLR     -(SP)           ;;CLEAR A TEMP. LOCATION
025310  117716  153640                  MOVB    @SWR,(SP)       ;;PICKUP THE DESIRED TEST NUMBER
025314  001414                          BEQ     8$              ;;BRANCH IF BAD TEST NUMBER IN SWR
025316  022716  000024                  CMP     #24,(SP)        ;;CHECK THE NUMBER IN THE SWR
025322  002411                          BLT     8$              ;;BRANCH IF TEST NUMBER IS OUT OF RANGE
025324  011637  001116                  MOV     (SP),$TSTNM     ;;UPDATE THE TEST NUMBER
025330  005316                          DEC     (SP)            ;;BACKUP BY ONE
025332  006316                          ASL     (SP)            ;;SCALE THE TEST NUMBER AS AN INDEX
025334  062716  025702                  ADD     #$SW08TBL,(SP)  ;;FORM THE ADDRESS OF TEST POINTER
025340  013637  001122                  MOV     @(SP)+,$LPADR   ;;SET LOOP ADDRESS TO DESIRED TEST
025344  000547                          BR      $OVER           ;;GO LOOP ON THE TEST
025346  005726                  8$:     TST     (SP)+           ;;CLEAN THE BAD TEST NUMBER OFF OF THE STACK
025350  105737  001117          2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
025354  001502                          BEQ     3$              ;;BR IF NO
025356  022737  177777  026342          CMP     #-1,CPSAVE      ;;SEE IF TIMEOUT WAS PREVIOUSLY RECORDED
025364  001455                          BEQ     2003$           ;;KICK AROUND ROUTINE IF SO
025366  013746  000004                  MOV     ERRVEC,-(SP)    ;;SAVE CONTENTS OF ERROR VECTOR
025372  012737  025410  000004          MOV     #2000$,ERRVEC   ;;SETUP 'TRAP' RETURN ADDRESS
025400  013737  177766  026342          MOV     177766,CPSAVE   ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
025406  000406                          BR      2001$
025410  012737  177777  026342  2000$:  MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
025416  012716  025424                  MOV     #2001$,(SP)     ;;SETUP RETURN ADDRESS
025422  000002                          RTI
```

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025424  012637  000004          2001$:  MOV     (SP)+,ERRVEC    ;;RESTORE CONTENTS OF ERROR VECTOR

025430  022737  177777  026342  2002$:  CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
025436  001430                          BEQ     2003$           ;;BRANCH IF SO
025440  032737  000001  026342          BIT     #BIT00,CPSAVE   ;;SEE IF THE POWER MONITOR BIT IS ON
025446  001424                          BEQ     2003$           ;;BRANCH TO CONTINUE ROUTINE IF CLEAR
025450  042737  000001  177766          BIC     #BIT00,177766   ;;CLEAR THE BIT FOUND TO BE SET
025456  013746  001154                  MOV     SWR,-(SP)       ;;SAVE SWR ADDRESS
025462  017646  000000                  MOV     @(SP),-(SP)     ;;SAVE SWR VALUE
025466  012737  000176  001154          MOV     #176,SWR        ;;GET SOFTWARE SWR ADDRESS
025474  011677  153454                  MOV     (SP),@SWR       ;;GET CURRENT SWR VALUE
025500  042777  001000  153446          BIC     #BIT09,@SWR     ;;DON'T ALLOW LOOP ON ERROR ON THIS ERROR
025506  104177                          EMT     177             ;;CALL SPECIAL POWER FAIL BIT ERROR CALL
025510  012676  000000                  MOV     (SP)+,@(SP)     ;;RESTORE SWR TO ORIGINAL VALUE
025514  012637  001154                  MOV     (SP)+,SWR       ;;RESTORE SWR ADDRESS
025520                          2003$:
025520  123737  001131  001117          CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
025526  101015                          BHI     3$              ;;BR IF NO
025530  032777  001000  153416          BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
025536  001404                          BEQ     4$              ;;BR IF NO
025540  013737  001124  001122  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
025546  000446                          BR      $OVER
025550  105037  001117          4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
025554  005037  001206                  CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
025560  000415                          BR      1$              ;;ESCAPE TO THE NEXT TEST
025562  032777  004000  153364  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
025570  001011                          BNE     1$              ;;BR IF YES
025572  005737  001230                  TST     $PASS           ;;IF FIRST PASS OF PROGRAM
025576  001406                          BEQ     1$              ;;      INHIBIT ITERATIONS
025600  005237  001120                  INC     $ICNT           ;;INCREMENT ITERATION COUNT
025604  023737  001206  001120          CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
025612  002024                          BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
025614  012737  000001  001120  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
025622  013737  025700  001206          MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
025630  105237  001116          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
025634  113737  001116  001226          MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
025642  011637  001122                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
025646  011637  001124                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
025652  005037  001210                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
025656  112737  000001  001131          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
025664  013777  001116  153264  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
025672  013716  001122                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
025676  000002                          RTI                     ;;FIXES PS
025700  000024                  $MXCNT: 20.                     ;;MAX. NUMBER OF ITERATIONS
025702                          $SW08TBL:
        000024                  .REPT   $TN-1
025702  005370                          .WORD   TST1+2          ;;STARTING ADDRESS OF TEST 1
025704  005700                          .WORD   TST2+2          ;;STARTING ADDRESS OF TEST 2
025706  006062                          .WORD   TST3+2          ;;STARTING ADDRESS OF TEST 3
025710  006232                          .WORD   TST4+2          ;;STARTING ADDRESS OF TEST 4
025712  006362                          .WORD   TST5+2          ;;STARTING ADDRESS OF TEST 5
025714  007446                          .WORD   TST6+2          ;;STARTING ADDRESS OF TEST 6
025716  010516                          .WORD   TST7+2          ;;STARTING ADDRESS OF TEST 7
025720  010640                          .WORD   TST10+2         ;;STARTING ADDRESS OF TEST 10
025722  010724                          .WORD   TST11+2         ;;STARTING ADDRESS OF TEST 11
025724  011174                          .WORD   TST12+2         ;;STARTING ADDRESS OF TEST 12
025726  011524                          .WORD   TST13+2         ;;STARTING ADDRESS OF TEST 13
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025730  012110          .WORD   TST14+2         ;;STARTING ADDRESS OF TEST 14
025732  012436          .WORD   TST15+2         ;;STARTING ADDRESS OF TEST 15
025734  013106          .WORD   TST16+2         ;;STARTING ADDRESS OF TEST 16
025736  013532          .WORD   TST17+2         ;;STARTING ADDRESS OF TEST 17
025740  013754          .WORD   TST20+2         ;;STARTING ADDRESS OF TEST 20
025742  014446          .WORD   TST21+2         ;;STARTING ADDRESS OF TEST 21
025744  015434          .WORD   TST22+2         ;;STARTING ADDRESS OF TEST 22
025746  016702          .WORD   TST23+2         ;;STARTING ADDRESS OF TEST 23
025750  020072          .WORD   TST24+2         ;;STARTING ADDRESS OF TEST 24
```

```
                                .SBTTL  ERROP HANDLER ROUTINE

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

025752  105037  026344        $ERROR: CLRB    IBSAVE          ;;CLEAR THE ITEM BYTE SAVE LOCATION
025756  104410                        CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
025760  105237  001117        7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
025764  001775                        BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
025766  013777  001116  153162        MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROP FLAG
025774  032777  002000  153152        BIT     #BIT10,@SWR     ;;BELL ON ERROR?
026002  001402                        BEQ     1$              ;;NO - SKIP
026004  104401  001212                TYPE    ,$BELL          ;;RING BELL
026010  005237  001126        1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
026014  011637  001132                MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
026020  162737  000002  001132        SUB     #2,$ERRPC
026026  117737  153100  001130        MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
026034  032777  001000  153112        BIT     #BIT09,@SWR     ;;SEE IF LOOP ON ERROR IS SET
026042  001060                        BNE     1004$           ;;BRANCH AROUND ROUTINE IF SO
026044  122737  000177  001130        CMPB    #177,$ITEMB     ;;SEE IF THIS IS THE POWER FAIL CALL
026052  001454                        BEQ     1004$           ;;BRANCH AROUND ROUTINE IF IT IS
026054  105737  026344                TSTB    IBSAVE          ;;SEE IF THIS IS THE 2ND ERROR CALL IN THIS ROUTINE
026060  001047                        BNE     1003$           ;;BRANCH IF SO
026062  022737  177777  026342        CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
026070  001445                        BEQ     1004$           ;;BRANCH IF SO
026072  013746  000004                MOV     ERRVEC,-(SP)    ;;SAVE CONTENTS OF ERROR VECTOR
026076  012737  026114  000004        MOV     #1000$,ERRVEC   ;;SETUP 'TRAP' RETURN ADDRESS
026104  013737  177766  026342        MOV     177766,CPSAVE   ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
026112  000406                        BR      1001$
026114  012737  177777  026342  1000$:  MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
026122  012716  026130                MOV     #1001$,(SP)     ;;SETUP RETURN ADDRESS
026126  000002                        RTI
026130  012637  000004        1001$:  MOV     (SP)+,ERRVEC    ;;RESTORE CONTENTS OF ERROR VECTOR

026134  022737  177777  026342  1002$:  CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
026142  001420                        BEQ     1004$           ;;BRANCH IF SO
026144  032737  000001  026342        BIT     #BIT00,CPSAVE   ;;SEE IF POWER MONITOR BIT IS SET IN CPU ERR REG
026152  001414                        BEQ     1004$           ;;BRANCH IF OK
026154  042737  000001  177766        BIC     #BIT00,177766   ;;CLEAR THE BIT FOUND SET
026162  113737  001130  026344        MOVB    $ITEMB,IBSAVE   ;;MAKE IBSAVE NON-ZERO FOR DUAL ERROR CALL
026170  112737  000177  001130        MOVB    #177,$ITEMB     ;;SET $ITEMB TO SPECIAL POWER FAIL POINTER
026176  000402                        BR      1004$           ;;BRANCH OVER IBSAVE CLEARING

026200  105037  026344        1003$:  CLRB    IBSAVE          ;;CLEAR IBSAVE SO 2ND TIME THROUGH EXITS
026204                        1004$:
026204  032777  020000  152742        BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
026212  001004                        BNE     20$             ;;SKIP TYPEOUTS
026214  004737  026346                JSR     PC,ERRTYP       ;;GO TO USER ERROR ROUTINE
```

```
026220  104401  001217          TYPE    ,$CRLF
026224                  20$:
026224  122737  000001  001242  CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
026232  001007                  BNE     2$              ;;NO,SKIP APT ERROR REPORT
026234  113737  001130  026246  MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
026242  004737  031310          JSR     PC,$ATV4        ;;REPORT FATAL ERROR TO APT
026246     000          21$:    .BYTE   0
026247     000                  .BYTE   0
026250  000777          22$:    BR      22$             ;;APT ERROR LOOP
026252  105737  026344  2$:     TSTB    IBSAVE          ;;SEE IF IBSAVE IS LOADED
026256  001005                  BNE     3$              ;;BRANCH IF NOT - NO HALT ON PWR MON BIT ERROR
026260  005777  152670          TST     @SWR            ;;HALT ON ERROR
026264  100002                  BPL     3$              ;;SKIP IF CONTINUE
026266  000000                  HALT                    ;;HALT ON ERROR!
026270  104410                  CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
026272                  3$:
026272  032777  001000  152654  BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
026300  001402                  BEQ     4$              ;;BR IF NO
026302  013716  001124          MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
026306  005737  001210  4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
026312  001402                  BEQ     5$              ;;BR IF NONE
026314  013716  001210          MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
026320                  5$:
026320  022737  021530  000042  CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
026326  001001                  BNE     6$              ;;BRANCH IF NO
026330  000000                  HALT                    ;;YES
026332                  6$:
026332  105737  026344          TSTB    IBSAVE          ;;SEE IF ITEM BYTE SAVE LOCATION HAS AN ERROR CALL
026336  001210                  BNE     7$              ;;BRANCH BACK TO CALL ORIGINAL ERROR
026340  000002                  RTI                     ;;RETURN
026342  000000          CPSAVE: .WORD   0               ;;LOCATION TO SAVE CPU ERROR REG CONTENTS
026344  000000          IBSAVE: .WORD   0               ;;LOCATION TO SAVE ITEM BYTE
```

```
                                        .SBTTL  ERROR TYPEOUT ROUTINE
                                ;
                                ;*THE ERROR TYPEOUT ROUTINE ASSEMBLES AND PRINTS INFORMATION
                                ;*REGARDING THE DETECTION OF AN ERROR AS FOLLOWS:
                                ;*
                                ;*      .UNIT NUMBER, DRIVE TYPE, TEST NUMBER, ERROR NUMBER AND
                                ;*PROGRAM COUNTER ARE PRINTED ON THE FIRST LINE;
                                ;*      .ERROR MESSAGE IS ASSEMBLED, FORMATTED AND PRINTED ON
                                ;*ONE OR MORE SUCCEEDING LINES;
                                ;*      .PAIRED LINES OF ERROR HEADERS AND ERROR DATA ARE PRINTED
                                ;*AFTER THE ERROR MESSAGE.
                                ;
026346  104414                  ERRTYP: SAVREG
026350  032777  020000  152576          BIT     #SW13,@SWR      ;INHIBIT TYPEOUTS??
026356  001402                        BEQ     1$              ;NO.!
026360  000137  027206                JMP     27$             ;YES!.
                                ;
                                ;TYPE UNIT NUMBER, DRIVE TYPE, TEST NUMBER, ERROR NUMBER, AND
                                ;PROGRAM COUNTER
026364  104401  001217          1$:     TYPE    ,$CRLF
026370  104401  027222                  TYPE    ,ERTY00         ;TYPE "DRV#"
026374  013746  001234                  MOV     $UNIT,-(SP)     ;;SAVE $UNIT FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
026400  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
026402     003                          .BYTE   3               ;;TYPE 3 DIGIT(S)
026403     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                ;
                                ;TYPE 'DRIVE TYPE' RM05, RM03 OR RM02 FOR UNIT UNDER TEST
026404  013700  001276                  MOV     $BASE,R0        ;GET RM BASE ADDRESS
026410  016000  000026                  MOV     RMDT(R0),R0     ;GET DRIVE TYPE REGISTER
026414  042700  177740                  BIC     #177740,R0      ;SAVE DRIVE TYPE BITS AND
026420  012737  032211  026472          MOV     #$RM03,3$       ;GET ASCII DRIVE TYPE
026426  022700  000024                  CMP     #24,R0          ;IS DEVICE AN RM03 ?
026432  001414                        BEQ     2$              ;YES !!
                                ;
026434  012737  032204  026472          MOV     #$RM02,3$       ;SAVE ASCII DRIVE TYPE
026442  022700  000025                  CMP     #25,R0          ;IS DEVICE AN RM02 ?
026446  001406                        BEQ     2$              ;YES !!
                                ;
026450  012737  032216  026472          MOV     #$RM05,3$       ;SAVE ASCII DRIVE TYPE
026456  022700  000027                  CMP     #27,R0          ;IS DEVICE AN RM05 ?
026462  001004                        BNE     4$              ;NO !!
026464  104401  027257          2$:     TYPE    ,ERTY05         ;TYPE " - "
026470  104401                          TYPE                    ;TYPE DRIVE TYPE
026472  000000                  3$:     .WORD   0               ;DRIVE TYPE MESSAGE IS STORED HERE
                                ;
                                ;TYPE TEST NUMBER, ERROR NUMBER AND PROGRAM COUNTER
026474  005037  027212          4$:     CLR     TSTNMB          ;LOAD TEST NUMBER FOR
026500  013737  001226  027212          MOV     $TESTN,TSTNMB
026506  104401  027227                  TYPE    ,ERTY01         ;TYPE "TST#"
026512  013746  027212                  MOV     TSTNMB,-(SP)    ;;SAVE TSTNMB FOR TYPEOUT
                                                                ;;TYPE TEST NUMBER
026516  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
026520     003                          .BYTE   3               ;;TYPE 3 DIGIT(S)
026521     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
026522  005037  027214                  CLR     ERRNMB          ;LOAD ERROR NUMBER FOR
026526  113737  001130  027214          MOVB    $ITEMB,ERRNMB   ;TYPEOUT
```

```
 50 026534  001406                        BEQ     5$              ;SKIP IF NO ERROR CALLED
 51 026536  104401  027237                TYPE    ,ERTY02         ;TYPE 'ERR#'
 52 026542  013746  027214                MOV     ERRNMB,-(SP)    ;;SAVE ERRNMB FOR TYPEOUT
                                                                   ;;TYPE ERROR NUMBER
    026546  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
    026550     003                        .BYTE   3               ;;TYPE 3 DIGIT(S)
    026551     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
 53 026552  104401  027246        5$:     TYPE    ,ERTY03         ;TYPE 'PC='
 54 026556  013746  001132                MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                                   ;;TYPE PROGRAM COUNTER
    026562  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
    026564     006                        .BYTE   6               ;;TYPE 6 DIGIT(S)
    026565     001                        .BYTE   1               ;;TYPE LEADING ZEROS
 55
 56                                ;GENERATE POINTER TO ERROR TABLE UNLESS ERROR NUMBER IS 0
 57 026566  005737  027214        6$:     TST     ERRNMB          ;WAS AN ERROR CALLED?
 58 026572  001002                        BNE     7$              ;BR IF YES
 59 026574  000137  027206                JMP     27$             ;NO--EXIT
 60
 61 026600  104401  001217        7$:     TYPE    ,$CRLF          ;YES-TYPE CRLF
 62 026604  105037  027220                CLRB    BOTFLG          ;CLEAR BOT FLAG
 63 026610  105037  027221                CLRB    CHRCNT          ;CLEAR CHARACTER COUNTER
 64 026614  013700  027214                MOV     ERRNMB,R0       ;R0 POINTS TO FIRST OF
 65 026620  122700  000177                CMPB    #177,R0         ;SEE IF THIS ERROR CALL IS SPECIAL POWER FAIL CALL
 66 026624  001003                        BNE     8$              ;BRANCH IF NOT
 67 026626  012700  027264                MOV     #PFECH,R0       ;MOVE POWER FAIL ERROR CALL TABLE TO R0
 68 026632  000405                        BR      9$
 69 026634  006300        8$:     ASL     R0                      ;FOUR ENTRIES IN ERROR
 70 026636  006300                ASL     R0                      ;TABLE
 71 026640  006300                ASL     R0
 72 026642  062700  001532                ADD     #$ERRTB-8.,R0
 73 026646  011001        9$:     MOV     (R0),R1                 ;R1 POINTS TO ERROR MESSAGE
 74                                                                ;TABLE
 75 026650  001507                        BEQ     19$             ;BRANCH IF NO ERROR MESSAGE
 76
 77                                ;TYPE THE ERROR MESSAGE
 78 026652  012102        10$:    MOV     (R1)+,R2                ;R2=ADDRESS OF MESSAGE STRING
 79 026654  001505                        BEQ     19$             ;BRANCH IF END OF MESSAGE
 80 026656  010237  027024                MOV     R2,18$          ;LOAD ADDRESS OF STRING
 81 026662  005037  027216                CLR     BOTADR          ;CLEAR BOT ADDRESS
 82 026666  112203        11$:    MOVB    (R2)+,R3                ;END OF STRING??
 83 026670  001454                        BEQ     17$             ;YES!!
 84 026672  122703  000015                CMPB    #CR,R3          ;CARRIAGE RETURN??
 85 026676  001003                        BNE     12$             ;NO!!
 86 026700  105037  027221                CLRB    CHRCNT          ;YES-CLEAR CHAR COUNT
 87 026704  000770                        BR      11$             ;GET NEXT CHARACTER
 88 026706  122703  000012        12$:    CMPB    #LF,R3          ;LINE FEED??
 89 026712  001765                        BEQ     11$             ;YES-GET NEXT CHARACTER
 90 026714  122703  000011                CMPB    #HT,R3          ;HORIZONTAL TAB??
 91 026720  001007                        BNE     14$             ;NO!!
 92 026722  105237  027221        13$:    INCB    CHRCNT          ;ADJUST CHARACTER COUNT
 93 026726  132737  000007  027221        BITB    #7,CHRCNT
 94 026734  001372                        BNE     13$
 95 026736  000407                        BR      15$
 96 026740  105237  027221        14$:    INCB    CHRCNT          ;INCREMENT CHARACTER COUNT
 97 026744  122703  000040                CMPB    #' ,R3          ;SPACE??
 98 026750  001002                        BNE     15$             ;NO..
```

```
 99 026752  010237  027216                    MOV     R2,BOTADR       ;SAVE ADDRESS OF SPACE
100 026756  122737  000100  027221  15$:      CMPB    #64.,CHRCNT     ;END OF LINE??
101 026764  103340                            BHIS    11$             ;NO.!
102 026766  013704  027216                    MOV     BOTADR,R4       ;GET ADDRESS OF LAST SPACE
103 026772  001007                            BNE     16$             ;BRANCH IF SPACE DETECTED
104 026774  104401  001217                    TYPE    ,$CRLF          ;TYPE CRLF
105 027000  105037  027221                    CLRB    CHRCNT          ;CLEAR CHARACTER COUNT
106 027004  013702  027024                    MOV     18$,R2          ;SET UP R2 FOR TESTING
107 027010  000726                            BR      11$
108 027012  105044                    16$:    CLRB    -(R4)           ;REPLACE SPACE
109 027014  112737  177777  027220            MOVB    #-1,BOTFLG      ;SET BOT FLAG
110 027022  104401                    17$:    TYPE                    ;TYPE ERROR MESSAGE STRING
111 027024  000000                    18$:    .WORD                   ;STRING ADDRESS GOES HERE
112 027026  105737  027220                    TSTB    BOTFLG          ;WAS STRING TRUNCATED??
113 027032  001707                            BEQ     10$             ;NO!!
114 027034  104401  001217                    TYPE    ,$CRLF          ;YES-TYPE CRLF
115 027040  105037  027220                    CLRB    BOTFLG          ;CLEAR BOT FLAG
116 027044  105037  027221                    CLRB    CHRCNT          ;CLEAR CHARACTER COUNT
117 027050  013702  027216                    MOV     BOTADR,R2       ;SETUP R2 FOR TESTING
118 027054  010237  027024                    MOV     R2,18$          ;SETUP 18$ FOR TYPING
119 027060  112742  000040                    MOVB    #' ,-(R2)       ;RESTORE SPACE
120 027064  105722                            TSTB    (R2)+           ;RESTORE R2
121 027066  000677                            BR      11$             ;TYPE REST OF STRING
122
123                                   ;TYPE ERROR HEADER AND ERROR DATA
124 027070  016001  000002            19$:    MOV     2(R0),R1        ;R1 POINTS TO ERROR HEADER TABLE
125 027074  001444                            BEQ     27$             ;BRANCH IF NO HEADER
126 027076  104401  001217                    TYPE    ,$CRLF          ;(ASSUME NO DATA)
127 027102  016002  000004                    MOV     4(R0),R2        ;R2 POINTS TO DATA ADDRESS TABLE
128 027106  016003  000006                    MOV     6(R0),R3        ;R3 POINTS TO FORMAT TABLE
129 027112  012137  027122            20$:    MOV     (R1)+,21$       ;PUT HEADER ADDRESS FOR TYPE
130 027116  001433                            BEQ     27$             ;BRANCH IF END OF HEADERS
131                                                                   ;(ASSUME END OF DATA)
132 027120  104401                            TYPE
133 027122  000000                    21$:    .WORD   0               ;HEADER ADDRESS GOES HERE
134 027124  104401  001217                    TYPE    ,$CRLF
135 027130  005702                            TST     R2              ;DATA WITH HEADER??
136 027132  001767                            BEQ     20$             ;NO!!
137 027134  012204                            MOV     (R2)+,R4        ;R4 POINTS TO DATA ADDRESS
138 027136  012305                            MOV     (R3)+,R5        ;R5 POINTS TO FORMAT
139 027140  105725                    22$:    TSTB    (R5)+           ;WHAT KIND OF DATA??
140 027142  100407                            BMI     24$             ;BINARY
141 027144  001403                            BEQ     23$             ;OCTAL
142 027146  013446                            MOV     @(R4)+,-(SP)    ;DECIMAL
143 027150  104405                            TYPDS
144 027152  000405                            BR      25$
145 027154  013446                    23$:    MOV     @(R4)+,-(SP)
146 027156  104402                            TYPOC
147 027160  000402                            BR      25$
148 027162  013446                    24$:    MOV     @(R4)+,-(SP)
149 027164  104406                            TYPBN
150 027166  005714                    25$:    TST     (R4)            ;MORE DATA??
151 027170  001403                            BEQ     26$             ;NO!!
152 027172  104401  027254                    TYPE    ,ERTY04         ;YES-TYPE 2 SPACES
153 027176  000760                            BR      22$             ;AND CONTINUE
154 027200  104401  001217            26$:    TYPE    ,$CRLF          ;TYPE ONE BLANK LINE
155 027204  000742                            BR      20$             ;BEFORE NEXT HEADER
```

```
                        27$:    RESREG
                                RTS     PC

                        TSTNMB: .WORD   0               ;TEST NUMBER
                        ERRNMB: .WORD   0               ;ERROR NUMBER
                        BOTADR: .WORD   0               ;BEGINNING OF TEXT ADDRESS
                        BOTFLG: .BYTE   0               ;BOT FLAG
                        CHRCNT: .BYTE   0               ;CHARACTER COUNT

                        ERTY00: .ASCIZ  @DRV#@
                        ERTY01: .ASCIZ  @, TEST#@
                        ERTY02: .ASCIZ  @, ERR#@
                        ERTY03: .ASCIZ  @, PC=@
                        ERTY04: .ASCIZ  @ @
                        ERTY05: .ASCIZ  @ - @
                        .EVEN
                        PFECH:  PFECH1,PFECH2,PFECH3,PFECH4 ;WORDS DEFINING TABLES BELOW
                        PFECH1: .+4,0
                                .ASCIZ  ?POWER MONITOR BIT IN CPU ERROR REGISTER FOUND SET?
                                .EVEN
                        PFECH2: .+4,0
                                .ASCIZ  ?CPUERREG?
                                .EVEN
                        PFECH3: .+2
                                .WORD   CPSAVE,0
                        PFECH4: .+2
                                .BYTE   0,0
```

```
                        .SBTTL  TTY INPUT ROUTINE

                        ;;*****************************************************************
                        .ENABL  LSB
027412  000000          $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
027414  000000          $TKQIN: .WORD   0               ;;INPUT POINTER
027416  000000          $TKQOUT: .WORD  0               ;;OUTPUT POINTER
027420                  $TKQSRT: .BLKB  1               ;;TTY KEYBOARD QUEUE
        027421          $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
                        ;
027422  005037  027412  $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
027426  012737  027420  027414    MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
027434  013737  027414  027416    MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
027442  012737  027472  000060    MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
027450  012737  000200  000062    MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
027456  005777  151500            TST     @$TKB           ;;CLEAR DONE FLAG
027462  012777  000100  151470    MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
027470  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 (SHUT)
                        ;
027472  117746  151464  $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
027476  042716  177600    BIC     #^C177,(SP)     ;;STRIP THE JUNK
027502  021627  000021    CMP     (SP),#$XON      ;;IS IT A RANDOM XON?
027506  001002            BNE     30$             ;;BRANCH IF NO
027510  005726            TST     (SP)+           ;;CLEAN RANDOM XON OFF STACK
027512  000002            RTI                     ;;RETURN
027514                  30$:
027514  021627  000003    CMP     (SP),#3         ;;IS IT A CONTROL C?
027520  001007            BNE     1$              ;;BRANCH IF NO
027522  104401  030620    TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
027526  004737  027422    JSR     PC,$TKINT       ;;INIT THE KEYBOARD
027532  005726            TST     (SP)+           ;;CLEAN UP STACK
027534  000137  030662    JMP     SHUT            ;;CONTROL C RESTART
027540  021627  000007  1$:   CMP     (SP),#7         ;;IS IT A CONTROL G?
027544  001004            BNE     2$              ;;BRANCH IF NO
027546  022737  000176  001154    CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
027554  001500            BEQ     6$              ;;GO TO SWR CHANGE

027556                  2$:
027556  022737  000001  027412    CMP     #1,$TKCNT       ;;IS THE QUEUE FULL?
027564  001004            BNE     3$              ;;BRANCH IF NO
027566  104401  001212    TYPE    ,$BELL          ;;RING THE TTY BELL
```

```
027572  005726                          TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
027574  000451                          BR      5$              ;;EXIT
027576  021627  000023          3$:     CMP     (SP),#23        ;;IS IT A CONTROL-S?
027602  001021                          BNE     32$             ;;BRANCH IF NO
027604  005077  15135C                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
027610  005726                          TST     (SP)+           ;;CLEAN CHAR OFF STACK
027612  105777  151342          31$:    TSTB    @$TKS           ;;WAIT FOR A CHAR
027616  100375                          BPL     31$             ;;LOOP UNTIL ITS THERE
027620  117746  151336                  MOVB    @$TKB,-(SP)     ;;GET THE CHARACTER
027624  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
027630  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
027634  001366                          BNE     31$             ;;BRANCH IF NO
027636  012777  000100  151314          MOV     #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
027644  000002                          RTI                     ;;RETURN
027646  005237  027412          32$:    INC     $TKCNT          ;;COUNT THIS CHARACTER
027652  021627  000140                  CMP     (SP),#140       ;;IS IT UPPER CASE?
027656  002405                          BLT     4$              ;;BRANCH IF YES
027660  021627  000175                  CMP     (SP),#175       ;;IS IT A SPECIAL CHAR?
027664  003002                          BGT     4$              ;;BRANCH IF YES
027666  042716  000040                  BIC     #40,(SP)        ;;MAKE IT UPPER CASE
027672  112677  177516          4$:     MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
027676  005237  027414                  INC     $TKQIN          ;;UPDATE THE POINTER
027702  023727  027414  027421          CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
027710  001003                          BNE     5$              ;;BRANCH IF NO
027712  012737  027420  027414          MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
027720  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.
027722  022737  000176  001154  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
027730  001124                          BNE     15$             ;;EXIT IF NOT
027732  105777  151222                  TSTB    @$TKS           ;;IS A CHAR WAITING?
027736  100121                          BPL     15$             ;;IF NOT, EXIT
027740  117746  151216                  MOVB    @$TKB,-(SP)     ;;YES
027744  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT  7-BIT ASCII
027750  021627  000007                  CMP     (SP),#7         ;;IS IT A CONTROL-G?
027754  001300                          BNE     2$              ;;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.
027756  123727  001150  000001  6$:      CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
027764  001674                          BEQ     2$              ;;BRANCH IF YES
027766  005726                          TST     (SP)+           ;;CLEAR CONTROL-G OFF STACK
027770  004737  027422                  JSR     PC,$TKINT       ;;FLUSH THE TTY INPUT QUEUE
027774  005077  151160                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
030000  112737  000001  001151          MOVB    #1,$INTAG       ;;SET INTERRUPT MODE INDICATOR

030006  104401  030632                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
030012  104401  030637  $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
030016  013746  000176                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
030022  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
030024  104401  030650                  TYPE    .$MNEW          ;;PROMPT FOR NEW SWR
030030  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
030032  005046                          CLR     -(SP)           ;;THE NEW SWR
030034  105777  151120          7$:     TSTB    @$TKS           ;;CHAR THERE?
030040  100375                          BPL     7$              ;;IF NOT TRY AGAIN

030042  117746  151114                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
030046  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII

030052  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
030056  001015                          BNE     9$              ;;BRANCH IF NOT
030060  104401  030620                  TYPE    .$CNTLC         ;;YES, ECHO CONTROL-C (^C)
030064  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
030070  123727  001151  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
030076  001003                          BNE     8$              ;;BRANCH IF NO
030100  012777  000100  151052          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
030106  000137  030662          8$:     JMP     SHUT            ;;CONTROL-C RESTART


030112  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
030116  001005                          BNE     10$             ;;BRANCH IF NOT
030120  104401  030625                  TYPE    .$CNTLU         ;;YES, ECHO CONTROL-U (^U)
030124  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
030130  000737                          BR      19$             ;;LET'S TRY IT AGAIN


030132  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
030136  001022                          BNE     16$             ;;BRANCH IF NO
030140  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
030144  001403                          BEQ     11$             ;;BRANCH IF YES
030146  016677  000002  151000          MOV     2(SP),@SWR      ;;SAVE NEW SWR
030154  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
030160  104401  001217          14$:    TYPE    .$CRLF          ;;ECHO <CR> AND <LF>
030164  123727  001151  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
030172  001003                          BNE     15$             ;;BRANCH IF NOT
030174  012777  000100  150756          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
030202  000002          15$:    RTI                             ;;RETURN
030204  004737  025100          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
030210  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
030214  002420                          BLT     18$             ;;BRANCH IF YES
030216  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
030222  003015                          BGT     18$             ;;BRANCH IF YES
030224  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
030230  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
030234  001403                          BEQ     17$             ;;BRANCH IF YES
030236  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
030240  006316                          ASL     (SP)            ;;   CHAR OVER TO MAKE
030242  006316                          ASL     (SP)            ;;   ROOM FOR NEW ONE.
030244  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
030250  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
030254  000667                          BR      7$              ;;GET THE NEXT ONE
030256  104401  001216          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
030262  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
                                ;

030264  011646                  $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
030266  016666  000004  000002          MOV     4(SP),2(SP)     ;;THE PS
030274  005066  000004                  CLR     4(SP)           ;;GET READY FOR A CHARACTER
030300  005046                          CLR     -(SP)           ;;PUT NEW PS ON STACK
030302  012746  030310                  MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
030306  000002                          RTI                     ;;POP NEW PC AND PS
030310                          64$:
030310  005737  027412          1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
030314  001775                          BEQ     1$
030316  005337  027412                  DEC     $TKCNT          ;;DECREMENT THE COUNTER
030322  117766  177070  000004        MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
030330  005237  027416                  INC     $TKQOUT         ;;UPDATE THE POINTER
030334  023727  027416  027421        CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
030342  001003                          BNE     2$              ;;BRANCH IF NO
030344  012737  027420  027416        MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
030352  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

030354  010346                  $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
030356  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
030360  012703  030610          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
030364  022703  030620          2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
030370  101456                          BLOS    4$              ;;BR IF YES
030372  104411                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
030374  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
030376  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
030402  001022                          BNE     5$              ;;BR IF NO
030404  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
030406  001007                          BNE     6$              ;;BR IF NO
030410  112737  000134  030606        MOVB    #'\,9$          ;;TYPE A BACK SLASH
030416  104401  030606                  TYPE    ,9$
030422  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
030426  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
030430  020327  030610                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
030434  103434                          BLO     4$              ;;BR IF YES
030436  111337  030606                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
030442  104401  030606                  TYPE    ,9$             ;;GO TYPE
030446  000746                          BR      2$              ;;GO READ ANOTHER CHAR.
030450  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
030452  001406                          BEQ     7$              ;;BR IF NO
030454  112737  000134  030606        MOVB    #'\,9$          ;;TYPE A BACK SLASH
030462  104401  030606                  TYPE    ,9$
030466  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
030470  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
030474  001003                          BNE     8$              ;;BR IF NO
```

```
030476  104401  03062>          TYPE    ,$CNTLU         ;;TYPE A CONTROL 'U'
030502  000726                  BR      1$              ;;GO START OVER
030504  122713  000022  8$:     CMPB    #22,(R3)        ;;IS CHARACTER A '^R'?
030510  001011                  BNE     3$              ;;BRANCH IF NO
030512  105013                  CLRB    (R3)            ;;CLEAR THE CHARACTER
030514  104401  001217          TYPE    ,$CRLF          ;;TYPE A 'CR' & 'LF'
030520  104401  030610          TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
030524  000717                  BR      2$              ;;GO PICKUP ANOTHER CHACTER
030526  104401  001216  4$:     TYPE    ,$QUES          ;;TYPE A '?'
030532  000712                  BR      1$              ;;CLEAR THE BUFFER AND LOOP
030534  111337  030606  3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
030540  104401  030606          TYPE    ,9$
030544  122723  000015          CMPB    #15,(R3)+       ;;CHECK FOR RETURN
030550  001305                  BNE     2$              ;;LOOP IF NOT RETURN
030552  105063  177777          CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
030556  104401  001220          TYPE    ,$LF            ;;TYPE A LINE FEED
030562  005726                  TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
030564  012603                  MOV     (SP)+,R3        ;;RESTORE R3
030566  011646                  MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
030570  016666  000004  000002  MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
030576  012766  030610  000004  MOV     #$TTYIN,4(SP)
030604  000002                  RTI                     ;;RETURN
030606     000          9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
030607     000                  .BYTE   0               ;;TERMINATOR
030610                  $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
030620     136     103     015  $CNTLC: .ASCIZ  /^C/<15><12>    ;;CONTROL 'C'
030625     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U'
030632     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL 'G'
030637     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
030650     040     040     116  $MNEW:  .ASCIZ  /  NEW = /
                                .EVEN
2
3 030662  005737  000042  SHUT:   TST     @#42            ;ANY MONITOR PRESENT ?
4 030666  001002                  BNE     1$              ;BR IF YES
5 030670  000137  002732          JMP     START           ;GO TO START
6 030674  005037  001300  1$:     CLR     $DEVM           ;FUDGE NO DRIVES IN MAP
7 030700  000137  021332          JMP     $EOP            ;RETURN TO $EOP
```

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

                        ;;*****************************************************************
                        ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                        ;*CHANGE IT TO BINARY.
                        ;*CALL:
                        ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                        ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                        ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT

030704  011646          $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
030706  016666  000004  000002  MOV     4(SP),2(SP)     ;;INPUT NUMBER
030714  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
030716  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
030720  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
030722  104412          1$:     RDLIN                   ;;READ AN ASCIZ LINE
030724  012600                  MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
030726  005001                  CLR     R1              ;;CLEAR DATA WORD
030730  005002                  CLR     R2
030732  112046          2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
030734  001412                  BEQ     3$              ;;IF ZERO GET OUT
030736  006301                  ASL     R1              ;;*2
030740  006102                  ROL     R2
030742  006301                  ASL     R1              ;;*4
030744  006102                  ROL     R2
030746  006301                  ASL     R1              ;;*8
030750  006102                  ROL     R2
030752  042716  177770          BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
030756  062601                  ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
030760  000764                  BR      2$              ;;LOOP
030762  005726          3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
030764  010166  000012          MOV     R1,12(SP)       ;;SAVE THE RESULT
030770  010237  031004          MOV     R2,$HIOCT
030774  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
030776  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
031000  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
031002  000002                  RTI                     ;;RETURN
031004  000000          $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
                                .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.

031006  016646  000002          $TRAP:  MOV     2(SP),-(SP)     ;;ASSUME THE STATUS OF
031012  042716  000020                  BIC     #20,(SP)        ;; THE CALLER--DO NOT ALLOW
031016  012746  031024                  MOV     #1$,-(SP)       ;; T-BIT TRAPS
031022  000002                          RTI                     ;;SET THE NEW STATUS
031024  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
031026  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
031032  005740                          TST     -(R0)           ;;BACKUP BY 2
031034  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
031036  006300                          ASL     R0              ;;POSITION FOR INDEXING
031040  016000  031060                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
031044  000200                          RTS     R0              ;;GO TO ROUTINE


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

031046  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
031050  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
031056  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

                                ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                ;*BY THE ''TRAP'' INSTRUCTION.
                                ;       ROUTINE
                                ;       -------
031060  031046                  $TRPAD: .WORD   $TRAP2
031062  024666                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
031064  024464                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
031066  024440                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
031070  024500                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
031072  024214                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
031074  024140                          $TYPBN  ;;CALL=TYPBN    TRAP+6(104406)  TYPE BINARY (ASCII) NUMBER

031076  030012                          $GTSWR  ;;CALL=GTSWR    TRAP+7(104407)  GET SOFT-SWR SETTING

031100  027722                          $CKSWR  ;;CALL=CKSWR    TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR
031102  030264                          $RDCHR  ;;CALL=RDCHR    TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE
031104  030354                          $RDLIN  ;;CALL=RDLIN    TRAP+12(104412) TTY TYPEIN STRING ROUTINE
031106  030704                          $RDOCT  ;;CALL=RDOCT    TRAP+13(104413) READ AN OCTAL NUMBER FROM TTY
031110  024044                          $SAVREG ;;CALL=SAVREG   TRAP+14(104414) SAVE R0-R5 ROUTINE
031112  024102                          $RESREG ;;CALL=RESREG   TRAP+15(104415) RESTORE R0-R5 ROUTINE
```

```
                                        .SBTTL  POWER DOWN AND UP ROUTINES

                                        ;;*****************************************************************
                                        ;POWER DOWN ROUTINE
031114  012737  031254  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
031122  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
031130  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
031132  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
031134  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
031136  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
031140  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
031142  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
031144  017746  150004                  MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
031150  010637  031260                  MOV     SP,$SAVR6       ;;SAVE SP
031154  012737  031166  000024          MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
031162  000000                          HALT
031164  000776                          BR      .-2             ;;HANG UP

                                        ;;*****************************************************************
                                        ;POWER UP ROUTINE
031166  012737  031254  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
031174  013706  031260                  MOV     $SAVR6,SP       ;;GET SP
031200  005037  031260                  CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
031204  005237  031260          1$:     INC     $SAVR6          ;;WAIT FOR THE INC
031210  001375                          BNE     1$              ;;OF  WORD
031212  012677  147736                  MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
031216  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
031220  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
031222  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
031224  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
031226  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
031230  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
031232  012737  031114  000024          MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
031240  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
031246  104401                          TYPE                    ;REPORT THE POWER FAILURE
031250  031262          $PWRMG: .WORD   $POWER                  ;;POWER FAIL MESSAGE POINTER
031252  000002                  RTI
031254  000000          $ILLUP: HALT                            ;;THE POWER UP SEQUENCE WAS STARTED
031256  000776                  BR      .-2                     ;; BEFORE THE POWER DOWN WAS COMPLETE
031260  000000          $SAVR6: 0                               ;;PUT THE SP HERE
031262     015     012     120  $POWER: .ASCIZ  <15><12>'POWER'
                                .EVEN
```

```
                                .SBTTL  APT COMMUNICATIONS ROUTINE

                                ;;*****************************************************************
031272  112737  000001  031536  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
031300  112737  000001  031534  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
031306  000403                  $ATYC   BR      $ATYC
031310  112737  000001  031536  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
031316                          $ATYC:
031316  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
031320  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
031322  105737  031534                  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
031326  001450                          BEQ     5$              ;;IF NOT:  BR
031330  122737  000001  001242          CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
031336  001031                          BNE     3$              ;;IF NOT:  BR
031340  132737  000100  001243          BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
031346  001425                          BEQ     3$              ;;IF NOT:  BR
031350  017600  000004                  MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
031354  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
031362  005737  001222          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
031366  001375                          BNE     1$              ;;IF NOT:  WAIT
031370  010037  001236                  MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
031374  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
031376  001376                          BNE     2$
031400  163700  001236                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
031404  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
031406  010037  001240                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
031412  012737  000004  001222          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
031420  000413                          BR      5$
031422  017637  000004  031446  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
031430  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
031436  013746  177776                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
031442  004737  024666                  JSR     PC,$TYPF        ;;CALL TYPE MACRO
031446  000000                  4$:     .WORD   0
031450                          5$:
031450  105737  031536          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
031454  001416                          BEQ     12$             ;;IF NOT:  BR
031456  005737  001242                  TST     $ENV            ;;RUNNING UNDER APT?
031462  001413                          BEQ     12$             ;;IF NOT:  BR
031464  005737  001222          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
031470  001375                          BNE     11$             ;;IF NOT:  WAIT
031472  017637  000004  001224          MOV     @4(SP),$FATAL   ;;GET ERROR #
031500  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
031506  005237  001222                  INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
031512  105037  031536          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
031516  105037  031535                  CLRB    $LFLG           ;;CLEAR LOG FLAG
031522  105037  031534                  CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
031526  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
031530  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
031532  000207                          RTS     PC              ;;RETURN
031534     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
031535     000          $LFLG:  .BYTE   0               ;;LOG FLAG
031536     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
                                .EVEN
        000200          APTSIZE = 200
        000001          APTENV  = 001
        000100          APTSPOOL= 100
        000040          APTCSUP = 040
```

```
                                        .SBTTL  CONSOLE MESSAGES
 2
 3 031540  075  000        EQUALS: .ASCIZ  @=@
 4 031542  101  114  114   ALL:    .ASCIZ  @ALL@<CRLF>
 5 031547  040  077  040   QUES:   .ASCIZ  @ ? @
 6 031553  054  040  000   COMMA:  .ASCIZ  @, @
 7 031556  200  124  131   MSHELP: .ASCIZ  <CRLF>@TYPE HELP TEXT (L) N ? @
 8 031607  200  122  115   CNSL01: .ASCIZ  <CRLF>@RMCS1=@
 9 031617  040  114  111   CNSL02: .ASCIZ  @ LIMITS - LO= 160000, HI= 17XXXX@<CRLF>
10 031661  122  115  126   CNSL03: .ASCIZ  @RMVEC=@
11 031670  040  114  111   CNSL04: .ASCIZ  @ LIMITS - LO= 0, HI= 1000@<CRLF><LF>
12 031724  200  124  131   CNSL07: .ASCII  <CRLF>@TYPE "A" TO TEST ALL DRIVES, OR TYPE DRIVE NUMBER(S)@
 3 032011  200  101  116           .ASCIZ  <CRLF>@AND TERMINATE INPUT WITH A CARRIAGE RETURN.@
14 032066  200        CNSL08: .ASCII  <CRLF>
15 032067  040  077  111   CNSL09: .ASCIZ  @ ?ILLEGAL INPUT@<CRLF>
16 032110  200  104  122   DRIVES: .ASCIZ  <CRLF>/DRIVE(S) TO BE TESTED/
17 032137  116  117  116   NONE:   .ASCIZ  /NONE/
18 032144  200  104  122   MSDRVS: .ASCIZ  <CRLF>/DRIVE(S): /
19 032160  104  122  111   MSGDRV: .ASCIZ  /DRIVE/
20 032166  200  125  116   SYSTAT: .ASCIZ  <CRLF>/UNIT STATUS:/
21 032204  122  115  060   $RM02:  .ASCIZ  /RM02/
22 032211  122  115  060   $RM03:  .ASCIZ  /RM03/
23 032216  122  115  060   $RM05:  .ASCIZ  /RM05/
24 032223  040  116  117   NOTRM:  .ASCIZ  @ NOT AN RM05/3/2@
25 032244  040  114  117   LODEV:  .ASCIZ  / LOAD DEVICE/
26 032261  040  116  117   NOTPRS: .ASCIZ  / NOT PRESENT/
27 032276  040  116  117   NOTAVL: .ASCIZ  / NOT AVAILABLE/
28 032315  040  117  106   UNTOFF: .ASCIZ  / OFFLINE/
29 032326  040  117  116   UNTON:  .ASCIZ  / ONLINE/
30 032336  116  000        N:      .ASCIZ  /N/
31 032340  131  000        Y:      .ASCIZ  /Y/
32 032342  040        BLNKS4: .ASCII  / /
33 032343  040        BLNKS3: .ASCII  / /
34 032344  040        BLNKS2: .ASCII  / /
35 032345  040  000   BLNKS1: .ASCIZ  / /
36                      .EVEN
```

```
                        .SBTTL  FUNCTION CODE TABLE

                        ;THE FUNCTION CODE TABLE IS USED TO DEFINE STATUS CONDITIONS FOR
                        ;EACH FUNCTION CODE.  BIT USAGE IS AS FOLLOWS:

                        ;       ATA - BIT 15 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF ATA SHOULD BE SET WHEN THE FUNCTION CODE IS EXECUTED, OTHERWISE,
                        ;BIT 15 IS ZERO, INDICATING THAT ATA SHOULD NOT NORMALLY BE SET.
                        ;NOTE THAT ATA MAY BE SET WHEN A COMMAND IS EXECUTED EVEN THOUGH
                        ;IT IS NOT EXPECTED AS A RESULT OF THE COMMAND.

                        ;       WCE - BIT 14 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF WRITE CHECK ERRORS ARE ENABLED AS A FUNCTION OF THE COMMAND.

                        ;       OPI - BIT 13 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF OPI ERRORS ARE ENABLED DURING THE EXECUTION OF THAT COMMAND.

                        ;       IVC - BIT 12 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF IVC ERRORS ARE ENABLED DURING THE EXECUTION OF THAT COMMAND.

                        ;       WLE - BIT 11 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF WRITE ERRORS ARE ENABLED DURING THE EXECUTION OF THAT COMMAND.
                        ;THE WRITE ERRORS WHICH ARE ENABLED ARE 'WLE', 'WCF', 'DPE', 'UPE'.

                        ;       IAE - BIT 10 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF INVALID ADDRESS ERROR IS ENABLED FOR THAT COMMAND.

                        ;       AOE - BIT 09 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF READ AND WRITE ERRORS ARE ENABLED DURING THE EXECUTION OF THE
                        ;COMMAND.  THE ERRORS ENABLED BY THIS BIT ARE 'TRE', 'DLT', 'NEM',
                        ;'MXF', 'LBT', AND 'AOE'.

                        ;               BIT 08 IS NOT USED.

                        ;       HCE - BIT 07 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF HEADER ERRORS ARE ENABLED DURING THE EXECUTION OF THAT COMMAND.
                        ;HEADER ERRORS INCLUDE 'HCRC', 'HCE', 'FER', AND 'BSE'.

                        ;       ECH - BIT 06 IS SET IN THE ENTRY FOR A GIVEN FUNCTION CODE
                        ;IF DATA FIELD ERRORS ARE ENABLED DURING THE EXECUTION OF THAT
                        ;COMMAND.  THESE ERRORS INCLUDE 'MDPE', 'DCK', AND 'ECH'.

                        ;               BIT 05 IS NOT USED.

                        ;               BIT 04 IS NOT USED.

                        ;               BIT 03 IS NOT USED.

                        ;               BIT 02 IS NOT USED.

                        ;               BIT 01 IS NOT USED.

                        ;       ILF - BIT 00 IS SET IF THE FUNCTION CODE IS ILLEGAL.

032350                  FNCDTB:                                 ;FUNCTION CODE TABLE

032350  020000          .WORD   OPI                             ;NOP
```

```
 58 032352  130001          .WORD   OPI.ATA.ILF!IVC                  ;ILLEGAL FUNCTION (2)
 59 032354  132000          .WORD   ATA.OPI.IVC!IAE                  ;SEEK
 60 032356  130000          .WORD   ATA!OPI.IVC                      ;RECALIBRATE
 61 032360  020000          .WORD   OPI                              ;DRIVE CLEAR
 62 032362  030000          .WORD   OPI.IVC                          ;RELEASE
 63 032364  130000          .WORD   OPI!ATA.IVC                      ;OFFSET
 64 032366  130000          .WORD   OPI!ATA!IVC                      ;RETURN TO CENTERLINE
 65 032370  020000          .WORD   OPI                              ;READ IN PRESET
 66 032372  020000          .WORD   OPI                              ;PACK ACKNOWLEDGE
 67 032374  130001          .WORD   OPI.ATA.ILF!IVC                  ;ILLEGAL FUNCTION (24)
 68 032376  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (26)
 69 032400  132000          .WORD   ATA!OPI.IVC!IAE                  ;SEARCH
 70 032402  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (32)
 71 032404  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (34)
 72 032406  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (36)
 73 032410  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (40)
 74 032412  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (42)
 75 032414  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (44)
 76 032416  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (46)
 77 032420  073300          .WORD   WCE!OPI!IVC!IAE!AOE!HCE!ECH      ;WRITE CHECK DATA
 78 032422  073300          .WORD   WCE!OPI!IVC!IAE!AOE!HCE!ECH      ;WRITE CHECK HEADER AND DATA
 79 032424  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (54)
 80 032426  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (56)
 81 032430  037200          .WORD   OPI!IVC!WLE!IAE!AOE!HCE          ;WRITE DATA
 82 032432  037000          .WORD   OPI!IVC!WLE!IAE!AOE              ;WRITE HEADER AND DATA
 83 032434  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (64)
 84 032436  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (66)
 85 032440  033300          .WORD   OPI!IVC!IAE!AOE!HCE!ECH          ;READ DATA
 86 032442  033300          .WORD   OPI!IVC!IAE!AOE!HCE!ECH          ;READ HEADER AND DATA
 87 032444  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (74)
 88 032446  130001          .WORD   OPI!ATA!ILF!IVC                  ;ILLEGAL FUNCTION (76)
```

SEQ 013/

```
                        .SBTTL  ATTENTION (ATA) TABLE

032450  001     ATNTBL: .BYTE   1.
032451  002             .BYTE   2.
032452  004             .BYTE   4.
032453  010             .BYTE   8.
032454  020             .BYTE   16.
032455  040             .BYTE   32.
032456  100             .BYTE   64.
032457  200             .BYTE   128.
                .EVEN
```

```
                                        .SBTTL  ERROR MESSAGE TABLE
                                
032460  047151  040562  000000  EMT1:   .WORD   EMS300,EMS1,0
032466  047167  047212  047237  EMT2:   .WORD   EMS301,EMS302,EMS303,EMS1,EMS304
032500  052427  051633  051773          .WORD   EMS511,EMS500,EMS501,EMS502,EMS503,0
032514  047167  047257  047212  EMT3:   .WORD   EMS301,EMS306,EMS302
032522  052427  052150  051773          .WORD   EMS511,EMS505,EMS501,EMS502,0
032534  047151  047212  047273  EMT4:   .WORD   EMS300,EMS302,EMS307,EMS2
032544  052427  052020  051773          .WORD   EMS511,EMS502,EMS501,EMS503,0
032556  047167  047334  047351  EMT5:   .WORD   EMS301,EMS310,EMS311
032564  052427  052020  051773          .WORD   EMS511,EMS502,EMS501,EMS503,EMS504
032576  047415  000000                  .WORD   EMS312,0
032602  047167  047257  047351  EMT6:   .WORD   EMS301,EMS306,EMS311
032610  052427  052020  051773          .WORD   EMS511,EMS502,EMS501,EMS503,EMS504,0
032624  047167  047453  047212  EMT7:   .WORD   EMS301,EMS313,EMS302
032632  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,EMS504,EMS503,0
032646  047561  047602  047504  EMT10:  .WORD   EMS316,EMS317,EMS314
032654  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
032664  047561  047602  047533  EMT11:  .WORD   EMS316,EMS317,EMS315
032672  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
032702  047561  047622  047504  EMT12:  .WORD   EMS316,EMS320,EMS314
032710  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
032720  047561  047622  047533  EMT13:  .WORD   EMS316,EMS320,EMS315
032726  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
032736  047561  047642  047504  EMT14:  .WORD   EMS316,EMS321,EMS314
032744  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
032754  047561  047642  047533  EMT15:  .WORD   EMS316,EMS321,EMS315
032762  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
032772  047561  047662  047504  EMT16:  .WORD   EMS316,EMS322,EMS314
033000  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
033010  047561  047662  047533  EMT17:  .WORD   EMS316,EMS322,EMS315
033016  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
033026  045142  050101  050157  EMT20:  .WORD   EMS71,EMS335,EMS340,EMS72,EMS377,EMS372
033042  052427  052070  000000          .WORD   EMS511,EMS503,0
033050  045142  050124  050157  EMT21:  .WORD   EMS71,EMS336,EMS340,EMS72,EMS400,EMS372
033064  052427  052070  000000          .WORD   EMS511,EMS503,0
033072  045277  050404  045347  EMT22:  .WORD   EMS73,EMS352,EMS74,EMS402,EMS70,EMS406
033106  052427  052070  052115          .WORD   EMS511,EMS503,EMS504,0
033116  045277  050404  045422  EMT23:  .WORD   EMS73,EMS352,EMS75,EMS402,EMS77,EMS406
033132  052427  052070  052115          .WORD   EMS511,EMS503,EMS504,0
033142  045277  050521  045422  EMT24:  .WORD   EMS73,EMS356,EMS75,EMS402,EMS77,EMS377
033156  052427  052070  052115          .WORD   EMS511,EMS503,EMS504,0
033166  045277  050101  050157  EMT25:  .WORD   EMS73,EMS335,EMS340,EMS76,EMS411
033200  052427  052070  000000          .WORD   EMS511,EMS503,0
033206  047167  047257  046541  EMT26:  .WORD   EMS301,EMS306,EMS252,EMS253,EMS327,EMS254
033222  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,EMS502
033232  047770  047504  000000          .WORD   EMS330,EMS314,0
033240  050143  045277  051376  EMT27:  .WORD   EMS337,EMS73,EMS410,EMS76,EMS411
033252  052427  052070  000000          .WORD   EMS511,EMS503,0
033260  050143  045602  050170  EMT30:  .WORD   EMS337,EMS100,EMS341,EMS101
033270  052427  052070  052115          .WORD   EMS511,EMS503,EMS504,0
033300  047151  046541          EMT31:  .WORD   EMS300,EMS252
033304  052427  051773  052070          .WORD   EMS511,EMS501,EMS503,0
033314  045602  051016          EMT32:  .WORD   EMS100,EMS370
033320  052427  052115  000000          .WORD   EMS511,EMS504,0
033326  045602  051422          EMT33:  .WORD   EMS100,EMS412
033332  052427  052115  000000          .WORD   EMS511,EMS504,0
```

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 58 033340  045716  051422          EMT34:  .WORD   EMS102,EMS412
 59 033344  052427  052070  000000          .WORD   EMS511,EMS503,0
 60 033352  045716  050124          EMT35:  .WORD   EMS102,EMS336
 61 033356  052427  052070  000000          .WORD   EMS511,EMS503,0
 62 033364  045602  050101  050157  EMT36:  .WORD   EMS100,EMS335,EMS340,EMS102,EMS334
 63 033376  052427  052115  000000          .WORD   EMS511,EMS504,0
 64 033404  045602  050101  050157  EMT37:  .WORD   EMS100,EMS335,EMS340,EMS102,EMS377,EMS365
 65 033420  051435  046024  051467          .WORD   EMS413,EMS104,EMS4'5
 66 033426  052427  052115  000000          .WORD   EMS511,EMS504,0
 67 033434  045602  050124  050157  EMT40:  .WORD   EMS100,EMS336,EMS340,EMS416,EMS104,EMS415
 68 033450  052427  052115  000000          .WORD   EMS511,EMS504,0
 69 033456  045602  050124  050157  EMT41:  .WORD   EMS100,EMS336,EMS340,EMS73,EMS415,EMS402
 70 033472  045716  051212          .WORD   EMS102,EMS400
 71 033476  052427  052115  000000          .WORD   EMS511,EMS504,0
 72 033504  045764  051227  047762  EMT42:  .WORD   EMS103,EMS401,EMS327,EMS370
 73 033514  052427  052070  000000          .WORD   EMS511,EMS503,0
 74 033522  051450  046024  051517  EMT43:  .WORD   EMS414,EMS104,EMS417
 75 033530  052427  052115  000000          .WORD   EMS511,EMS504,0
 76 033536  046051  051227  047762  EMT44:  .WORD   EMS105,EMS401,EMS327,EMS370
 77 033546  052427  052070  000000          .WORD   EMS511,EMS503,0
 78 033554  047151  046574          EMT45:  .WORD   EMS300,EMS253
 79 033560  052427  051773  052070          .WORD   EMS511,EMS501,EMS503,0
 80 033570  046112  051227  051517  EMT46:  .WORD   EMS106,EMS401,EMS417
 81 033576  052427  052070  000000          .WORD   EMS511,EMS503,0
 82 033604  051435  046157  051535  EMT47:  .WORD   EMS413,EMS107,EMS420,EMS417
 83 033614  052427  052115  000000          .WORD   EMS511,EMS504,0
 84 033622  046167  051435  051333  EMT50:  .WORD   EMS110,EMS413,EMS405,EMS107
 85 033632  052427  052070  000000          .WORD   EMS511,EMS503,0
 86 033640  050231  046226  051550  EMT51:  .WORD   EMS343,EMS111,EMS421
 87 033646  052427  052115  000000          .WORD   EMS511,EMS504,0
 88 033654  051450  051506  046157  EMT52:  .WORD   EMS414,EMS416,EMS107,EMS421
 89 033664  052427  052115  000000          .WORD   EMS511,EMS504,0
 90 033672  050007  040747  046732  EMT53:  .WORD   EMS331,EMS4,EMS256
 91 033700  052427  051773  000000          .WORD   EMS511,EMS501,0
 92 033706  046244  051435  051333  EMT54:  .WORD   EMS112,EMS413,EMS405,EMS607
 93 033716  052427  052070  000000          .WORD   EMS511,EMS503,0
 94 033724  046302  051227  047762  EMT55:  .WORD   EMS113,EMS401,EMS327,EMS370
 95 033734  052427  052070  000000          .WORD   EMS511,EMS503,0
 96 033742  046341  051227  051517  EMT56:  .WORD   EMS114,EMS401,EMS417
 97 033750  052427  052070  000000          .WORD   EMS511,EMS503,0
 98 033756  046762  050037          EMT57:  .WORD   EMS257,EMS3'2
 99 033762  052427  052223  051773          .WORD   EMS511,EMS506,EMS501,0
100 033772  041000  050055          EMT60:  .WORD   EMS5,EMS333
101 033776  052427  052264  051773          .WORD   EMS511,EMS507,EMS501,0
102 034006  051435  046407  051535  EMT61:  .WORD   EMS413,EMS115,EMS420,EMS417
103 034016  052427  052115  000000          .WORD   EMS511,EMS504,0
104 034024  050322  045602  050170  EMT62:  .WORD   EMS346,EMS100,EMS341,EMS101
105 034034  052427  052115  000000          .WORD   EMS511,EMS504,0
106 034042  046302  051033          EMT63:  .WORD   EMS113,EMS371
107 034046  052427  052070  000000          .WORD   EMS511,EMS503,0
108 034054  051435  046424  050420  EMT64:  .WORD   EMS413,EMS116,EMS353
109 034062  052427  052115  000000          .WORD   EMS511,EMS504,0
110 034070  051565  050420          EMT65:  .WORD   EMS422,EMS353
111 034074  052427  052115  000000          .WORD   EMS511,EMS504,0
112 034102  041321  050124  050177  EMT66:  .WORD   EMS12,EMS336,EMS342
113 034110  052427  051773  000000          .WORD   EMS511,EMS501,0
114 034116  047151  041050          EMT67:  .WORD   EMS300,EMS6
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115 034122  052427  051773                  .WORD   EMS511,EMS501
116 034126  041114  050055  000000          .WORD   EMS7,EMS333,0
117 034134  047151  041050  047762  EMT70:  .WORD   EMS300,EMS6,EMS327,EMS7
118 034144  052427  051773  052115          .WORD   EMS511,EMS501,EMS504,0
119 034154  041050  050101  050157  EMT71:  .WORD   EMS6,EMS335,EMS340,EMS10,EMS333,EMS342
120 034170  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
121 034200  041050  050124  050157  EMT72:  .WORD   EMS6,EMS336,EMS340,EMS10,EMS334,EMS342
122 034214  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
123 034224  047167  047016  047237  EMT73:  .WORD   EMS301,EMS260,EMS303,EMS11
124 034234  052427  051773  052020          .WORD   EMS511,EMS501,EMS502,0
125 034244  050231  050245  050177  EMT74:  .WORD   EMS343,EMS344,EMS342,0
126 034254  047151  041377          EMT75:  .WORD   EMS300,EMS13
127 034260  052427  052070  000000          .WORD   EMS511,EMS503,0
128 034266  050322  041377  050274  EMT76:  .WORD   EMS346,EMS13,EMS345
129 034274  052427  052070  000000          .WORD   EMS511,EMS503,0
130 034302  050143  041377  050274  EMT77:  .WORD   EMS337,EMS13,EMS345
131 034310  052427  052070  000000          .WORD   EMS511,EMS503,0
132 034316  047167  047453  046627  EMT100: .WORD   EMS301,EMS313,EMS254,EMS347,EMS13
133 034330  052427  052070  000000          .WORD   EMS511,EMS503,0
134 034336  050322  041446  050170  EMT101: .WORD   EMS346,EMS14,EMS341,EMS15
135 034346  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
136 034356  050143  045074          EMT102: .WORD   EMS337,EMS70
137 034362  052427  052070  000000          .WORD   EMS511,EMS503,0
138 034370  047167  047453  046627  EMT103: .WORD   EMS301,EMS313,EMS254,EMS347,EMS15
139 034402  052427  052070                  .WORD   EMS511,EMS503
140 034406  041446  050037  000000          .WORD   EMS14,EMS332,0
141 034414  050322  041652  050170  EMT104: .WORD   EMS346,EMS17,EMS341,EMS16
142 034424  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
143 034434  050143  041652  050170  EMT105: .WORD   EMS337,EMS17,EMS341,EMS16
144 034444  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
145 034454  047167  047453  046627  EMT106: .WORD   EMS301,EMS313,EMS254,EMS347,EMS16
146 034466  052427  052070                  .WORD   EMS511,EMS503
147 034472  041652  050037  000000          .WORD   EMS17,EMS332,0
148 034500  050322  041713  050170  EMT107: .WORD   EMS346,EMS20,EMS341,EMS21
149 034510  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
150 034520  041713  050366  041757  EMT110: .WORD   EMS20,EMS351,EMS21,EMS350,EMS22,EMS315
151 034534  052427  051773  000000          .WORD   EMS511,EMS501,0
152 034542  041713  050071  050361  EMT111: .WORD   EMS20,EMS334,EMS350,EMS22,EMS333
153 034554  052427  051773  000000          .WORD   EMS511,EMS501,0
154 034562  050143  041713  050170  EMT112: .WORD   EMS337,EMS20,EMS341,EMS21
155 034572  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
156 034602  050143  041713  050170  EMT113: .WORD   EMS337,EMS20,EMS341,EMS21,EMS350,EMS22,EMS334
157 034620  052427  051773  000000          .WORD   EMS511,EMS501,0
158 034626  041713  050404  041757  EMT114: .WORD   EMS20,EMS352,EMS21,EMS350,EMS22,EMS333
159 034642  052427  051773  000000          .WORD   EMS511,EMS501,0
160 034650  047167  047453  046627  EMT115: .WORD   EMS301,EMS313,EMS254,EMS347,EMS21
161 034662  052427  052070                  .WORD   EMS511,EMS503
162 034666  041713  050037  000000          .WORD   EMS20,EMS332,0
163 034674  050322  042103  050170  EMT116: .WORD   EMS346,EMS23,EMS341,EMS24
164 034704  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
165 034714  050143  042103  050170  EMT117: .WORD   EMS337,EMS23,EMS341,EMS24
166 034724  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
167 034734  047167  047453  046627  EMT120: .WORD   EMS301,EMS313,EMS254,EMS347,EMS24
168 034746  052427  052070                  .WORD   EMS511,EMS503
169 034752  042103  050037  000000          .WORD   EMS23,EMS332,0
170 034760  050322  042240  050170  EMT121: .WORD   EMS346,EMS25,EMS341,EMS26
171 034770  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
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 172 035000  050143  042240  050170  EMT122: .WORD   EMS337,EMS25,EMS341,EMS26
 173 035010  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
 174 035020  047167  047453  046627  EMT123: .WORD   EMS301,EMS313,EMS254,EMS347,EMS26
 175 035032  052427  052070                  .WORD   EMS511,EMS503
 176 035036  042240  050037  000000          .WORD   EMS25,EMS332,0
 177 035044  047151  042375  047273  EMT124: .WORD   EMS300,EMS27,EMS307,EMS2
 178 035054  052427  052070  000000          .WORD   EMS511,EMS503,0
 179 035062  050007  042375  050420  EMT125: .WORD   EMS331,EMS27,EMS353
 180 035070  052427  052070                  .WORD   EMS511,EMS503
 181 035074  042441  047533  000000          .WORD   EMS30,EMS315,0
 182 035102  050143  042375  050170  EMT126: .WORD   EMS337,EMS27,EMS341,EMS30
 183 035112  052427  052070  000000          .WORD   EMS511,EMS503,0
 184 035120  047167  047453  046627  EMT127: .WORD   EMS301,EMS313,EMS254,EMS347,EMS30
 185 035132  052427  052070                  .WORD   EMS511,EMS503
 186 035136  042375  050037  000000          .WORD   EMS27,EMS332,0
 187 035144  042521  050444  046437  EMT130: .WORD   EMS31,EMS354,EMS250
 188 035152  052427  052115  052070          .WORD   EMS511,EMS504,EMS503,0
 189 035162  042572  050444  046437  EMT131: .WORD   EMS32,EMS354,EMS250
 190 035170  052427  052115  052070          .WORD   EMS511,EMS504,EMS503,0
 191 035200  050477  042652  046437  EMT132: .WORD   EMS355,EMS33,EMS250,EMS341,EMS30
 192 035212  052427  052115  000000          .WORD   EMS511,EMS504,0
 193 035220  050477  042702  046437  EMT133: .WORD   EMS355,EMS34,EMS250,EMS341,EMS30
 194 035232  052427  052115  000000          .WORD   EMS511,EMS504,0
 195 035240  050007  040747  046670  EMT134: .WORD   EMS331,EMS4,EMS255
 196 035246  052427  052115  000000          .WORD   EMS511,EMS504,0
 197 035254  042731  050541  050563  EMT135: .WORD   EMS35,EMS357,EMS360,EMS15
 198 035264  052427  051773  000000          .WORD   EMS511,EMS501,0
 199 035272  047047  050637          EMT136: .WORD   EMS261,EMS362
 200 035276  052427  052070  000000          .WORD   EMS511,EMS503,0
 201 035304  047151  042773  047273  EMT137: .WORD   EMS300,EMS36,EMS307,EMS2
 202 035314  052427  051773  000000          .WORD   EMS511,EMS501,0
 203 035322  050477  043023  046670  EMT140: .WORD   EMS355,EMS37,EMS255,EMS341,EMS30
 204 035334  052427  052115  000000          .WORD   EMS511,EMS504,0
 205 035342  050322  043055  050274  EMT141: .WORD   EMS346,EMS40,EMS345
 206 035350  052427  052115  000000          .WORD   EMS511,EMS504,0
 207 035356  050143  043055  050170  EMT142: .WORD   EMS337,EMS40,EMS341,EMS30
 208 035366  052427  052115  000000          .WORD   EMS511,EMS504,0
 209 035374  050660  047334  043133  EMT143: .WORD   EMS363,EMS310,EMS41
 210 035402  052427  051773  000000          .WORD   EMS511,EMS501,0
 211 035410  050143  043133  050170  EMT144: .WORD   EMS337,EMS41,EMS341,EMS252,EMS327,EMS253
 212 035424  052427  051773  000000          .WORD   EMS511,EMS501,0
 213 035432  043133  050444  050675  EMT145: .WORD   EMS41,EMS354,EMS364,EMS252,EMS365,EMS253
 214 035446  052427  051773  000000          .WORD   EMS511,EMS501,0
 215 035454  047167  047257  042773  EMT146: .WORD   EMS301,EMS306,EMS36
 216 035462  052427  051773  052070          .WORD   EMS511,EMS501,EMS503,0
 217 035472  050723  043201          EMT147: .WORD   EMS366,EMS42
 218 035476  052427  052070  000000          .WORD   EMS511,EMS503,0
 219 035504  050746  050420  050716  EMT150: .WORD   EMS367,EMS353,EMS365,EMS42,EMS354,EMS3
 220 035520  052427  052070  000000          .WORD   EMS511,EMS503,0
 221 035526  050143  042773          EMT151: .WORD   EMS337,EMS36
 222 035532  052427  051773  000000          .WORD   EMS511,EMS501,0
 223 035540  043263  050444  042773  EMT152: .WORD   EMS43,EMS354,EMS36
 224 035546  052427  051773  000000          .WORD   EMS511,EMS501,0
 225 035554  050746  050420  050716  EMT153: .WORD   EMS367,EMS353,EMS365,EMS36,EMS370
 226 035566  052427  052070  000000          .WORD   EMS511,EMS503,0
 227 035574  050746  050420  050716  EMT154: .WORD   EMS367,EMS353,EMS365,EMS36,EMS371
 228 035606  052427  052070  000000          .WORD   EMS511,EMS503,0
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  229 035614  047151  043334  047273  EMT155: .WORD   EMS300,EMS44,EMS307,EMS2
  230 035624  052427  052070  000000          .WORD   EMS511,EMS503,0
  231 035632  050746  050420  050716  EMT156: .WORD   EMS367,EMS353,EMS365,EMS44,EMS354,EMS3
  232 035646  052427  052070  000000          .WORD   EMS511,EMS503,0
  233 035654  047151  043375  047273  EMT157: .WORD   EMS300,EMS45,EMS307,EMS2
  234 035664  052427  052070  000000          .WORD   EMS511,EMS503,0
  235 035672  050746  050420  050716  EMT160: .WORD   EMS367,EMS353,EMS365,EMS45,EMS354,EMS3
  236 035706  052427  052070  051773          .WORD   EMS511,EMS503,EMS501
  237 035714  042731  050055  000000          .WORD   EMS35,EMS333,0
  238 035722  047151  043452  047273  EMT161: .WORD   EMS300,EMS46,EMS307,EMS2
  239 035732  052427  052070  000000          .WORD   EMS511,EMS503,0
  240 035740  050143  043452  050420  EMT162: .WORD   EMS337,EMS46,EMS353
  241 035746  052427  052070  051773          .WORD   EMS511,EMS503,EMS501,0
  242 035756  042731  050101  050143  EMT163: .WORD   EMS35,EMS335,EMS337,EMS41,EMS334,EMS372
  243 035772  052427  051773  000000          .WORD   EMS511,EMS501,0
  244 036000  043534  050101  050143  EMT164: .WORD   EMS47,EMS335,EMS337,EMS41,EMS335,EMS372
  245 036014  052427  051773  000000          .WORD   EMS511,EMS501,0
  246 036022  050143  042731  047762  EMT165: .WORD   EMS337,EMS35,EMS327,EMS47
  247 036032  052427  051773                  .WORD   EMS511,EMS501
  248 036036  043133  050055  051062          .WORD   EMS41,EMS333,EMS372,0
  249 036046  047151  043534  047273  EMT166: .WORD   EMS300,EMS47,EMS307,EMS2
  250 036056  052427  051773  052070          .WORD   EMS511,EMS501,EMS503,0
  251 036066  043574  050101  050157  EMT167: .WORD   EMS50,EMS335,EMS340,EMS36,EMS333
  252 036100  052427  051773  052070          .WORD   EMS511,EMS501,EMS503,0
  253 036110  050143  042731          EMT170: .WORD   EMS337,EMS35
  254 036114  052427  051773  000000          .WORD   EMS511,EMS501,0
  255 036122  043574  042702  040702  EMT171: .WORD   EMS50,EMS34,EMS3
  256 036130  052427  051773  000000          .WORD   EMS511,EMS501,0
  257 036136  047167  047257  043643  EMT172: .WORD   EMS301,EMS306,EMS51
  258 036144  052427  051773  052115          .WORD   EMS511,EMS501,EMS504,0
  259 036154  050746  050420  050716  EMT173: .WORD   EMS367,EMS353,EMS365,EMS47,EMS354,EMS3
  260 036170  052427  051773  000000          .WORD   EMS511,EMS501,0
  261 036176  047151  046437  047762  EMT174: .WORD   EMS300,EMS250,EMS327,EMS255,EMS327,EMS256
  262 036212  050170  052526                  .WORD   EMS341,EMS600
  263 036216  052427  051773  000000          .WORD   EMS511,EMS501,0
  264 036224  047151  046732  050170  EMT175: .WORD   EMS300,EMS256,EMS341,EMS600
  265 036234  052427  051773  000000          .WORD   EMS511,EMS501,0
  266 036242  047151  046437  050170  EMT176: .WORD   EMS300,EMS250,EMS341,EMS600
  267 036252  052427  052115  000000          .WORD   EMS511,EMS504,0
  268 036260                          EMT177:
  269 036260  050143  043712  050170  EMT200: .WORD   EMS337,EMS52,EMS341,EMS601
  270 036270  052427  051773  000000          .WORD   EMS511,EMS501,0
  271 036276  050322  043712  050170  EM1201: .WORD   EMS346,EMS52,EMS341,EMS602
  272 036306  052427  051773  000000          .WORD   EMS511,EMS501,0
  273 036314  050322  043643  050170  EMT202: .WORD   EMS346,EMS51,EMS341,EMS602
  274 036324  052427  051773  000000          .WORD   EMS511,EMS501,0
  275 036332  050322  043712  050274  EMT203: .WORD   EMS346,EMS52,EMS345,EMS373,EMS255
  276 036344  052427  052115  051773          .WORD   EMS511,EMS504,EMS501,0
  277 036354  050322  043712  050170  EMT204: .WORD   EMS346,EMS52,EMS341,EMS27
  278 036364  052427  052115  051773          .WORD   EMS511,EMS504,EMS501,0
  279 036374  043753  050444  040702  EMT205: .WORD   EMS53,EMS354,EMS3
  280 036402  052427  052070  052020          .WORD   EMS511,EMS503,EMS502,EMS510,0
  281 036414  050143  044014  051120  EMT206: .WORD   EMS337,EMS54,EMS374,EMS250,EMS327,EMS255
  282 036430  047762  040702                  .WORD   EMS327,EMS3
  283 036434  052427  052115  051773          .WORD   EMS511,EMS504,EMS501,0
  284 036444  044014  050444  040702  EMT207: .WORD   EMS54,EMS354,EMS3
  285 036452  052427  051773  000000          .WORD   EMS511,EMS501,0
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286 036460 044014 050444 050675 EMT210: .WORD   EMS54,EMS354,EMS364,EMS250
287 036470 052427 052115 000000         .WORD   EMS511,EMS504,0
288 036476 044014 050444 050675 EMT211: .WORD   EMS54,EMS354,EMS364,EMS255
289 036506 052427 052115 000000         .WORD   EMS511,EMS504,0
290 036514 050143 044071        EMT212: .WORD   EMS337,EMS55
291 036520 052427 052115 000000         .WORD   EMS511,EMS504,0
292 036526 044147 050071 050274 EMT213: .WORD   EMS56,EMS334,EMS345,EMS373,EMS262,EMS327,EMS251
293 036544 052427 051 '73               .WORD   EMS511,EMS501
294 036550 044147 050101 000000         .WORD   EMS56,EMS335,0
295 036556 050143 044147        EMT214: .WORD   EMS337,EMS56
296 036562 052427 051773 000000         .WORD   EMS511,EMS501,0
297 036570 044242 050055 050361 EMT215: .WORD   EMS57,EMS333,EMS350,EMS60,EMS334
298 036602 052427 051773 000000         .WORD   EMS511,EMS501,0
299 036610 050660 047257 041000 EMT216: .WORD   EMS363,EMS306,EMS5
300 036616 052427 051773 000000         .WORD   EMS511,EMS501,0
301 036624 050660 047257 044400 EMT217: .WORD   EMS363,EMS306,EMS61
302 036632 052427 051773 000000         .WORD   EMS511,EMS501,0
303 036640 044453 050055 051151 EMT220: .WORD   EMS62,EMS333,EMS375,EMS251
304 036650 052427 051773 000000         .WORD   EMS511,EMS501,0
305 036656 044453 050055 051165 EMT221: .WORD   EMS62,EMS333,EMS376,EMS262
306 036666 052427 051773 000000         .WORD   EMS511,EMS501,0
307 036674 044453 050055 051165 EMT222: .WORD   EMS62,EMS333,EMS376,EMS250
308 036704 052427 051773 000000         .WORD   EMS511,EMS501,0
309 036712 050322 044453 050170 EMT223: .WORD   EMS346,EMS62,EMS341,EMS603
310 036722 052427 051773 000000         .WORD   EMS511,EMS501,0
311 036730 050322 044534 051165 EMT224: .WORD   EMS346,EMS63,EMS376,EMS262
312 036740 052427 051773 052070         .WORD   EMS511,EMS501,EMS503,0
313 036750 044534 050055 050361 EMT225: .WORD   EMS63,EMS333,EMS350,EMS363,EMS310,EMS262
314 036764 052427 051773 000000         .WORD   EMS511,EMS501,0
315 036772 044534 050541 042773 EMT226: .WORD   EMS63,EMS357,EMS36,EMS372
316 037002 052427 051773 000000         .WORD   EMS511,EMS501,0
317 037010 044534 050521 050563 EMT227: .WORD   EMS63,EMS356,EMS360,EMS15
318 037020 052427 051773 000000         .WORD   EMS511,EMS501,0
319 037026 044534 050521 050611 EMT230: .WORD   EMS63,EMS356,EMS361,EMS15
320 037036 052427 051773 000000         .WORD   EMS511,EMS501,0
321 037044 044534 050521 043133 EMT231: .WORD   EMS63,EMS356,EMS41
322 037052 052427 051773 000000         .WORD   EMS511,EMS501,0
323 037060 043133 051201 050177 EMT232: .WORD   EMS41,EMS377,EMS342,EMS365,EMS63,EMS332
324 037074 052427 051773 000000         .WORD   EMS511,EMS501,0
325 037102 050746 050420 050716 EMT233: .WORD   EMS367,EMS353,EMS365,EMS63,EMS401
326 037114 052427 052070 051773         .WORD   EMS511,EMS503,EMS501,0
327 037124 041571 051201 051062 EMT234: .WORD   EMS16,EMS377,EMS372,EMS365,EMS64,EMS354,EMS3
328 037142 052427 052070 051773         .WORD   EMS511,EMS503,EMS501,0
329 037152 047151 044644 047273 EMT235: .WORD   EMS300,EMS65,EMS307,EMS2
330 037162 052427 052020 052070         .WORD   EMS511,EMS502,EMS503,0
331 037172 044147 051201 051165 EMT236: .WORD   EMS56,EMS377,EMS376,EMS252,EMS372,EMS350
332 037206 044644 051227                .WORD   EMS65,EMS401
333 037212 052427 052020 052070         .WORD   EMS511,EMS502,EMS503,EMS501,0
334 037224 047151 044705 047273 EMT237: .WORD   EMS300,EMS66,EMS307,EMS2
335 037234 052427 05177, 052070         .WORD   EMS511,EMS501,EMS503,0
336 037244 041513 051212 051062 EMT240: .WORD   EMS15,EMS400,EMS372,EMS350,EMS66,EMS401
337 037260 052427 052070 051773         .WORD   EMS511,EMS503,EMS501,0
338 037270 044705 050124 050157 EMT241: .WORD   EMS66,EMS336,EMS340,EMS15,EMS406,EMS405,EMS604
339 037306 052427 052070 000000         .WORD   EMS511,EMS503,0
340 037314 051253 052660 051244 EMT242: .WORD   EMS403,EMS604,EMS402,EMS21,EMS377
341 037326 052427 052070                .WORD   EMS511,EMS503
342 037332 042773 050101 000000         .WORD   EMS36,EMS335,0
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343 037340  044705  050124  050157  EMT243: .WORD   EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS604
344 037356  052427  052070  000000          .WORD   EMS511,EMS503,0
345 037364  044534  051227  051333  EMT244: .WORD   EMS63,EMS401,EMS405,EMS604
346 037374  052427  052070  000000          .WORD   EMS511,EMS503,0
347 037402  042773  051016  051333  EMT245: .WORD   EMS36,EMS370,EMS405,EMS604
348 037412  052427  052070  000000          .WORD   EMS511,EMS503,0
349 037420  051253  052660  051244  EMT246: .WORD   EMS403,EMS604,EMS402,EMS24,EMS377
350 037432  052427  052070                  .WORD   EMS511,EMS503
351 037436  042773  050101  000000          .WORD   EMS36,EMS335,0
352 037444  044762  050037  051333  EMT247: .WORD   EMS67,EMS332,EMS405,EMS604
353 037454  052427  052070  000000          .WORD   EMS511,EMS503,0
354 037462  044705  050124  050157  EMT250: .WORD   EMS66,EMS336,EMS340,EMS15,EMS406,EMS405,EMS605
355 037500  052427  052070  000000          .WORD   EMS511,EMS503,0
356 037506  051253  052705  051244  EMT251: .WORD   EMS403,EMS605,EMS402,EMS21,EMS377
357 037520  052427  052070                  .WORD   EMS511,EMS503
358 037524  042773  050101  000000          .WORD   EMS36,EMS335,0
359 037532  044705  050124  050157  EMT252: .WORD   EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS605
360 037550  052427  052070  000000          .WORD   EMS511,EMS503,0
361 037556  044534  051227  051333  EMT253: .WORD   EMS63,EMS401,EMS405,EMS605
362 037566  052427  052070  000000          .WORD   EMS511,EMS503,0
363 037574  042773  051016  051333  EMT254: .WORD   EMS36,EMS370,EMS405,EMS605
364 037604  052427  052070  000000          .WORD   EMS511,EMS503,0
365 037612  051253  052705  051244  EMT255: .WORD   EMS403,EMS605,EMS402,EMS24,EMS377
366 037624  052427  052070                  .WORD   EMS511,EMS503
367 037630  042773  050101  000000          .WORD   EMS36,EMS335,0
368 037636  044762  050037  051333  EMT256: .WORD   EMS67,EMS332,EMS405,EMS605
369 037646  052427  052070  000000          .WORD   EMS511,EMS503,0
370 037654  044705  050124  050157  EMT257: .WORD   EMS66,EMS336,EMS340,EMS15,EMS406,EMS405,EMS606
371 037672  052427  052070  000000          .WORD   EMS511,EMS503,0
372 037700  051253  052723  051244  EMT260: .WORD   EMS403,EMS606,EMS402,EMS21,EMS377
373 037712  052427  052070                  .WORD   EMS511,EMS503
374 037716  042773  050101  000000          .WORD   EMS36,EMS335,0
375 037724  044705  050124  050157  EMT261: .WORD   EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS606
376 037742  052427  052070  000000          .WORD   EMS511,EMS503,0
377 037750  044534  051227  051333  EMT262: .WORD   EMS63,EMS401,EMS405,EMS606
378 037760  052427  052070  000000          .WORD   EMS511,EMS503,0
379 037766  042773  051016  051333  EMT263: .WORD   EMS36,EMS370,EMS405,EMS606
380 037776  052427  052070  000000          .WORD   EMS511,EMS503,0
381 040004  051253  052723  051244  EMT264: .WORD   EMS403,EMS606,EMS402,EMS24,EMS377
382 040016  052427  052070                  .WORD   EMS511,EMS503
383 040022  042773  050101  000000          .WORD   EMS36,EMS335,0
384 040030  045074  051227  051333  EMT265: .WORD   EMS70,EMS401,EMS405,EMS606
385 040040  052427  052070  000000          .WORD   EMS511,EMS503,0
386 040046  044762  050037  051333  EMT266: .WORD   EMS67,EMS332,EMS405,EMS606
387 040056  052427  052070  000000          .WORD   EMS511,EMS503,0
388 040064  044705  050521  051356  EMT267: .WORD   EMS66,EMS356,EMS407
389 040072  052427  052070  000000          .WORD   EMS511,EMS503,0
390 040100  044705  050124  050157  EMT270: .WORD   EMS66,EMS336,EMS340,EMS15,EMS406,EMS405,EMS607
391 040116  052427  052070  000000          .WORD   EMS511,EMS503,0
392 040124  051253  052743  051244  EMT271: .WORD   EMS403,EMS607,EMS402,EMS21,EMS377
393 040136  052427  052070                  .WORD   EMS511,EMS503
394 040142  042375  050124  000000          .WORD   EMS27,EMS336,0
395 040150  042375  051016  051333  EMT272: .WORD   EMS27,EMS370,EMS405,EMS607
396 040160  052427  052070  000000          .WORD   EMS511,EMS503,0
397 040166  042375  051033  051333  EMT273: .WORD   EMS27,EMS371,EMS405,EMS607
398 040176  052427  052070  000000          .WORD   EMS511,EMS503,0
399 040204  042773  051314  051333  EMT274: .WORD   EMS36,EMS404,EMS405,EMS607
```

SEQ 0145

```
400 040214  052427  052070  000000          .WORD   EMS511,EMS503,0
401 040222  043753  051227  051333  EMT275: .WORD   EMS53,EMS401,EMS405,EMS607
402 040232  052427  052070  052020          .WORD   EMS511,EMS503,EMS502,0
403 040242  044762  050037  051333  EMT276: .WORD   EMS67,EMS332,EMS405,EMS607
404 040252  052427  052070  000000          .WORD   EMS511,EMS503,0
405 040260  044705  050124  050157  EMT277: .WORD   EMS66,EMS336,EMS340,EMS26,EMS404,EMS405,EMS607
406 040276  052427  052070  000000          .WORD   EMS511,EMS503,0
407 040304  051253  052743  051244  EMT300: .WORD   EMS403,EMS607,EMS402,EMS24,EMS377
408 040316  052427  052070                  .WORD   EMS511,EMS503
409 040322  042375  050124  000000          .WORD   EMS27,EMS336,0
410 040330  045074  051227  051333  EMT301: .WORD   EMS70,EMS401,EMS40  EMS607
411 040340  052427  052070  000000          .WORD   EMS511,EMS503,0
412 040346  047151  046670  050170  EMT302: .WORD   EMS300,EMS255,EMS341,EMS600
413 040356  052427  052115  000000          .WORD   EMS511,EMS504,0
```

```
 1 040364  052761  000000          EHT1:    .WORD   EH1,0
 2 040370  053037  000000          EHT2:    .WORD   EH2,0
 3 040374  053054  000000          EHT5:    .WORD   EH5,0
 4 040400  053112  000000          EHT7:    .WORD   EH7,0
 5 040404  053131  000000          EHT47:   .WORD   EH47,0
 6 040410  053157  000000          EHT52:   .WORD   EH52,0
 7 040414  053255  000000          EHT57:   .WORD   EH57,0
 8 040420  053313  000000          EHT61:   .WORD   EH61,0
 9 040424  053351  000000          EHT65:   .WORD   EH65,0
10 040430  053425  000000          EHT71:   .WORD   EH71,0
11 040434  053045  000000          EHT74:   .WORD   EH3,0
12 040440  053502  000000          EHT115:  .WORD   EH115,0
13 040444  053577  000000          EHT130:  .WORD   EH130,0
14 040450  053715  000000          EHT132:  .WORD   EH132,0
15 040454  054013  000000          EHT142:  .WORD   EH142,0
16 040460  054111  000000          EHT145:  .WORD   EH145,0
17 040464  054226  000000          EHT150:  .WORD   EH150,0
18 040470  054324  000000          EHT213:  .WORD   EH213,0
19 040474  054421  000000          EHT220:  .WORD   EH220,0
```

SEQ 014[illegible]

```
 1 040500  054460          EDT1:    .WORD   ED1
 2 040502  054470          EDT2:    .WORD   ED2
 3 040504  054474          EDT5:    .WORD   ED5
 4 040506  054502          EDT47:   .WORD   ED47
 5 040510  054512          EDT52:   .WORD   ED52
 6 040512  054524          EDT57:   .WORD   ED57
 7 040514  054532          EDT61:   .WORD   ED61
 8 040516  054544          EDT65:   .WORD   ED65
 9 040520  054554          EDT71:   .WORD   ED71
10 040522  054470          EDT74:   .WORD   ED2
11 040524  054564          EDT115:  .WORD   ED115
12 040526  054576          EDT130:  .WORD   ED130
13 040530  054564          EDT132:  .WORD   ED115
14 040532  054612          EDT220:  .WORD   ED220
```

SEQ 0148

```
     1 040534  054616                EFT1:   .WORD   EF1
     2 040536  054621                EFT2:   .WORD   EF2
     3 040540  054622                EFT5:   .WORD   EF5
     4 040542  054624                EFT57:  .WORD   EF57
     5 040544  054616                EFT65:  .WORD   EF1
     6 040546  054616                EFT71:  .WORD   EF1
     7 040550  054621                EFT74:  .WORD   EF2
     8 040552  054624                EFT115: .WORD   EF57
     9 040554  054630                EFT130: .WORD   EF130
    10 040556  054624                EFT132: .WORD   EF57
    11 040560  054622                EFT220: .WORD   EF5
```

```
 1 040562  116  117  116  EMS1:   .ASCIZ  @NONEXISTENT DEVICE 'NED' (RMCS2,BIT 12) @
 2 040633  103  117  116  EMS2:   .ASCIZ  @CONTROLLER CLEAR 'CLR' (RMCS2,BIT 05) @
 3 040702  106  125  116  EMS3:   .ASCIZ  @FUNCTION CODE (RMCS1, BITS 01 - 05) @
 4 040747  125  116  125  EMS4:   .ASCIZ  @UNUSED BIT POSITIONS OF @
 5 041000  104  105  126  EMS5:   .ASCIZ  @DEVICE AVAILABLE 'DVA' (RMCS1, BIT 11) @
 6 041050  120  101  122  EMS6:   .ASCIZ  @PARTIY ERROR 'PAR' (RMER1, BIT 03) @
 7 041114  104  101  124  EMS7:   .ASCIZ  @DATA PARITY ERROR 'DPE' (RMER2, BIT 03) @
 8 041165  120  101  122  EMS10:  .ASCIZ  @PARITY TEST 'PAT' (RMCS2, BIT 04) @
 9 041230  115  101  123  EMS11:  .ASCII  @MASSBUS CONTROL BUS PARITY ERROR 'MCPF' @
10 041300  050  122  115           .ASCIZ  @(RMCS1, BIT 13) @
11 041321  111  114  114  EMS12:  .ASCIZ  @ILLEGAL REGISTER ERROR 'ILR' (RMER1, BIT 01) @
12 041377  104  111  101  EMS13:  .ASCIZ  @DIAGNOSTIC MODE 'DMD' (RMMR1, BIT 00) @
13 041446  115  105  104  EMS14:  .ASCIZ  @MEDIUM ON LINE 'MOL' (RMDS, BIT 12) @
14 041513  115  101  111  EMS15:  .ASCIZ  @MAINTENANCE UNIT READY 'MUR' (RMMR1, BIT 09) @
15 041571  115  101  111  EMS16:  .ASCIZ  @MAINTENANCE WRITE PROTECT 'MWP' (RMMR1, BIT 03) @
16 041652  127  122  111  EMS17:  .ASCIZ  @WRITE LOCK 'WRL' (RMDS, BIT 11) @
17 041713  104  105  126  EMS20:  .ASCIZ  @DEVICE CHECK 'DVC' (RMER2, BIT 07) @
18 041757  115  101  111  EMS21:  .ASCIZ  @MAINTENANCE DRIVE FAULT 'MDF' (RMMR1, BIT 06) @
19 042036  125  116  123  EMS22:  .ASCIZ  @UNSAFE STATUS 'UNS' (RMER1, BIT 14) @
20 042103  123  105  105  EMS23:  .ASCIZ  @SEEK INCOMPLETE STATUS 'SKI' (RMER2, BIT 14) @
21 042161  115  101  111  EMS24:  .ASCIZ  @MAINTENANCE SEEK ERROR 'MSER' (RMMR1, BIT 07) @
22 042240  120  117  123  EMS25:  .ASCIZ  @POSITIONING IN PROGRESS 'PIP' (RMDS, BIT 13) @
23 042316  115  101  111  EMS26:  .ASCIZ  @MAINTENANCE ON CYLINDER 'MOC' (RMMR1, BIT 08) @
24 042375  105  116  104  EMS27:  .ASCIZ  @END OF BLOCK 'EBL' (RMMR1, BIT 13) @
25 042441  104  111  101  EMS30:  .ASCIZ  @DIAGNOSTIC END OF BLOCK 'DEBL' (RMMR1, BIT 13) @
26 042521  114  101  123  EMS31:  .ASCIZ  @LAST SECTOR STATUS 'LS' (RMMR1, BIT 02) @
27 042572  114  101  123  EMS32:  .ASCIZ  @LAST SECTOR/TRACK STATUS 'LST' (RMMR1, BIT 01) @
28 042652  123  105  103  EMS33:  .ASCIZ  @SECTOR ADDRESS BITS OF @
29 042702  124  122  101  EMS34:  .ASCIZ  @TRACK ADDRESS BITS OF @
30 042731  126  117  114  EMS35:  .ASCIZ  @VOLUME VALID 'VV' (RMDS, BIT 06) @
31 042773  107  117  040  EMS36:  .ASCIZ  @GO BIT (RMCS1, BIT 00) @
32 043023  103  131  114  EMS37:  .ASCIZ  @CYLINDER ADDRESS BITS OF @
33 043055  114  101  123  EMS40:  .ASCIZ  @LAST BLOCK TRANSFERRED, 'LBT' (RMDS, BIT 10) @
34 043133  103  117  115  EMS41:  .ASCIZ  @COMPOSITE ERROR 'ERR' (RMDS, BIT 14) @
35 043201  103  117  115  EMS42:  .ASCIZ  @COMMAND SEQUENCER TEST BIT 'TST' (RMMR2, BIT 12) @
36 043263  104  122  111  EMS43:  .ASCIZ  @DRIVE READY STATUS 'DRY' (RMDS, BIT 07) @
37 043334  103  117  116  EMS44:  .ASCIZ  @CONTINUE 'CONT' (RMMR1, BIT 06) @
38 043375  111  116  126  EMS45:  .ASCIZ  @INVALID COMMAND ERROR 'IVC' (RMER2, BIT 12) @
39 043452  114  117  123  EMS46:  .ASCIZ  @LOSS OF SYSTEM CLOCK ERROR 'LSC' (RMER2, BIT 11) @
40 043534  117  103  103  EMS47:  .ASCIZ  @OCCUPIED 'OCC' (RMMR1, BIT 15) @
41 043574  111  114  114  EMS50:  .ASCIZ  @ILLEGAL FUNCTION 'ILF' (RMER1, BIT 0) @
42 043643  117  106  106  EMS51:  .ASCIZ  @OFFSET DIRECTION 'OFD' (RMOF, BIT 07) @
43 043712  117  106  106  EMS52:  .ASCIZ  @OFFSET MODE 'OM' (RMDS, BIT 00) @
44 043753  122  125  116  EMS53:  .ASCIZ  @RUN AND GO 'RG' (RMMR1, BIT 14) @
45 044014  111  116  126  EMS54:  .ASCIZ  @INVALID ADDRESS ERROR 'IAE' (RMER1, BIT 10) @
46 044071  101  104  104  EMS55:  .ASCIZ  @ADDRESS OVERFLOW ERROR 'AOE' (RMER1, BIT 09) @
47 044147  122  105  107  EMS56:  .ASCII  @REGISTER MODIFICATION REFUSED ERROR @
48 044213  042  122  115           .ASCIZ  @'RMR' (RMER1, BIT 02) @
49 044242  104  122  111  EMS57:  .ASCIZ  @DRIVE REQUEST REQUIRED STATUS 'DRQ' (RMDT, BIT 11) @
50 044326  120  122  117  EMS60:  .ASCIZ  @PROGRAMMABLE STATUS 'PGM' (RMDS, BIT 09) @
51 044400  104  122  111  EMS61:  .ASCIZ  @DRIVE PRESENT STATUS 'DPR' (RMDS, BIT 08) @
52 044453  120  117  122  EMS62:  .ASCIZ  @PORT REQUEST FLOP 'RQA,RQB' (RMMR2, BITS 15,14) @
53 044534  101  124  124  EMS63:  .ASCIZ  @ATTENTION 'ATA' (RMDS, BIT 15) @
54 044574  127  122  111  EMS64:  .ASCIZ  @WRITE LOCK ERROR 'WLE' (RMER1, BIT 11) @
55 044644  105  130  103  EMS65:  .ASCIZ  @EXCEPTION 'REX' (RMMR1, BIT 12) @
56 044705  111  116  126  EMS66:  .ASCIZ  @INVALID COMMAND ERROR 'IVC' (RMER2, BIT 12) @
57 044762  124  101  107  EMS67:  .ASCIZ  @TAG BUS (RMMR2, BITS 00-09) OR TAG CONTROL @
```

```
 58 045036  114  111  116          .ASCIZ  @LINES (RMMR2, BITS 10,11,13) @
 59 045074  123  105  101  EMS70:  .ASCIZ  @SEARCH ENABLE 'ESRC' (RMMR1, BIT 11) @
 60
 61 045142  117  120  105  EMS71:  .ASCIZ  @OPERATION IMCOMPLETE ERROR 'OPI'(RMER1 BIT13) @
 62 045221  104  111  123  EMS72:  .ASCIZ  @DISABLE SEARCH TIMEOUT 'MSEN' (RMMR1 BIT 12) @
 63 045277  104  122  111  EMS73:  .ASCIZ  @DRIVE TIMING ERROR 'DTE'(RMER1,BIT 12) @
 64 045347  115  101  111  EMS74:  .ASCIZ  @MAINTENANCE INDEX PULSE 'MI'(RMMR1 BIT 2) @
 65 045422  115  101  111  EMS75:  .ASCIZ  @MAINTENANCE SECTOR PULSE 'MS'(RMMR1 BIT 5) @
 66 045476  106  117  122  EMS76:  .ASCIZ  @FORMAT BIT 'FMT16' (RMOF,BIT12) @
 67 045537  123  105  103  EMS77:  .ASCIZ  @SECTOR COMPARE 'MSC'(RMMR1 BIT 1) @
 68 045602  120  122  117  EMS100: .ASCIZ  @PROM STROBE 'WC' (RMMR1 BIT 5) @
 69 045642  115  101  111  EMS101: .ASCIZ  @MAINTENANCE BIT CLOCK 'MCLK' (RMMR1 BIT11) @
 70 045716  114  117  117  EMS102: .ASCIZ  @LOOKING FOR SYNC 'PLFS'(RMMR1,BIT10) @
 71 045764  127  122  111  EMS103: .ASCIZ  @WRITE GATE 'BB00' (RMMR2 BIT0) @
 72 046024  110  105  101  EMS104: .ASCIZ  @HEADER SYNC PATTERN @
 73 046051  110  105  101  EMS105: .ASCIZ  @HEADER AREA 'PHA' (RMMR1 BIT 7) @
 74 046112  105  116  101  EMS106: .ASCIZ  @ENABLE CRC OUT 'ECRC' (RMMR1 BIT 9) @
 75 046157  110  105  101  EMS107: .ASCIZ  @HEADER @
 76 046167  122  105  101  EMS110: .ASCIZ  @READ GATE 'BB01'(RMMR2 BIT 1) @
 77 046226  110  105  101  EMS111: .ASCIZ  @HEADER ERROR @
 78 046244  104  101  124  EMS112: .ASCIZ  @DATA TIMING SEQUENCER OUTPUT @
 79 046302  104  101  124  EMS113: .ASCIZ  @DATA AREA 'PDA' (RMMR1 BIT 8) @
 80 046341  105  116  101  EMS114: .ASCIZ  @ENABLE ECC OUT 'EECC' (RMMR1, BIT 4) @
 81 046407  105  103  103  EMS115: .ASCIZ  @ECC PATTERN @
 82 046424  105  103  103  EMS116: .ASCIZ  @ECC ERROR @
 83 046437  104  111  123  EMS250: .ASCIZ  @DISK ADDRESS REGISTER (RMDA) @
 84 046475  103  117  116  EMS251: .ASCIZ  @CONTROL STATUS REGISTER #1 (RMCS1) @
 85 046541  105  122  122  EMS252: .ASCIZ  @ERROR REGISTER #1 (RMER1) @
 86 046574  105  122  122  EMS253: .ASCIZ  @ERROR REGISTER #2 (RMER2) @
 87 046627  115  101  111  EMS254: .ASCIZ  @MAINTENANCE REGISTER #1 (RMMR1) @
 88 046670  104  105  123  EMS255: .ASCIZ  @DESIRED CYLINDER REGISTER (RMDC) @
 89 046732  117  106  106  EMS256: .ASCIZ  @OFFSET REGISTER (RMOF) @
 90 046762  104  122  111  EMS257: .ASCIZ  @DRIVE TYPE REGISTER (RMDT) @
 91 047016  110  117  114  EMS260: .ASCIZ  @HOLDING REGISTER (RMHR) @
 92 047047  123  105  122  EMS261: .ASCIZ  @SERIAL NUMBER REGISTER (RMSN) @
 93 047106  101  124  124  EMS262: .ASCIZ  @ATTENTION SUMMARY REGISTER (RMAS) @
 94
 95 047151  103  101  116  EMS300: .ASCIZ  @CANNOT CLEAR @
 96 047167  103  101  116  EMS301: .ASCIZ  @CANNOT WRITE/READ @
 97 047212  101  116  131  EMS302: .ASCIZ  @ANY DEVICE REGISTER @
 98 047237  127  111  124  EMS303: .ASCIZ  @WITHOUT @
 99 047250  105  122  122  EMS304: .ASCIZ  @ERROR @
100 047257  101  040  117  EMS306: .ASCIZ  @A ONE FROM @
101 047273  125  123  111  EMS307: .ASCIZ  @USING MASSBUS INITIALIZE, I.E., @
102 047334  101  040  132  EMS310: .ASCIZ  @A ZERO FROM @
103 047351  105  126  105  EMS311: .ASCIZ  @EVERY DEVICE REGISTER BIT POSITION @
104 047415  124  110  105  EMS312: .ASCIZ  @THE FOLLOWING BITS ARE STUCK @
105 047453  101  040  123  EMS313: .ASCIZ  @A SHIFTING ONE BIT FROM @
106 047504  101  120  120  EMS314: .ASCIZ  @APPEARS STUCK AT ZERO @
107 047533  101  120  120  EMS315: .ASCIZ  @APPEARS STUCK AT ONE @
108 047561  122  105  107  EMS316: .ASCIZ  @REGISTER SELECT @
109 047602  061  040  050  EMS317: .ASCIZ  @1 (1,2,4,8,16) @
110 047622  062  040  050  EMS320: .ASCIZ  @2 (1,2,4,8,16) @
111 047642  064  040  050  EMS321: .ASCIZ  @4 (1,2,4,8,16) @
112 047662  070  040  050  EMS322: .ASCIZ  @8 (1,2,4,8,16) @
113 047702  101  114  114  EMS323: .ASCIZ  @ALL ONES FROM @
114 047721  101  114  114  EMS324: .ASCIZ  @ALL ZEROS FROM @
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115 047741  101  124  040  EMS325: .ASCIZ  @AT ZERO @
116 047752  101  124  040  EMS326: .ASCIZ  @AT ONE @
117 047762  054  040  117  EMS327: .ASCIZ  @, OR @
118 047770  015  012  103  EMS330: .ASCIZ  <CR><LF>@CS MBA CLRL @
119 050007  103  101  116  EMS331: .ASCIZ  @CANNOT READ ZEROS FROM @
120 050037  111  123  040  EMS332: .ASCIZ  @IS INCORRECT @
121 050055  111  123  040  EMS333: .ASCIZ  @IS NOT SET @
122 050071  111  123  040  EMS334: .ASCIZ  @IS SET @
123 050101  123  110  117  EMS335: .ASCIZ  @SHOULD NOT BE SET @
124 050124  123  110  117  EMS336: .ASCIZ  @SHOULD BE SET @
125 050143  103  101  116  EMS337: .ASCIZ  @CANNOT SET @
126 050157  102  105  103  EMS340: .ASCIZ  @BECAUSE @
127 050170  125  123  111  EMS341: .ASCIZ  @USING @
128 050177  104  125  122  EMS342: .ASCIZ  @DURING REGISTER TRANSFER @
129 050231  125  116  105  EMS343: .ASCIZ  @UNEXPECTED @
130 050245  102  125  123  EMS344: .ASCIZ  @BUS TIMEOUT (04 TRAP) @
131 050274  102  131  040  EMS345: .ASCIZ  @BY REGISTER TRANSFER @
132 050322  103  101  116  EMS346: .ASCIZ  @CANNOT RESET @
133 050340  127  111  124  EMS347: .ASCIZ  @WITHOUT SETTING @
134 050361  102  125  124  EMS350: .ASCIZ  @BUT @
135 050366  127  101  123  EMS351: .ASCIZ  @WAS RESET BY @
136 050404  127  101  123  EMS352: .ASCIZ  @WAS SET BY @
137 050420  111  116  040  EMS353: .ASCIZ  @IN DIAGNOSTIC MODE @
138 050444  111  123  040  EMS354: .ASCIZ  @IS INCORRECT ACCORDING TO @
139 050477  103  101  116  EMS355: .ASCIZ  @CANNOT INCREMENT @
140 050521  127  101  123  EMS356: .ASCIZ  @WAS NOT SET BY @
141 050541  127  101  123  EMS357: .ASCIZ  @WAS NOT RESET BY @
142 050563  060  040  124  EMS360: .ASCIZ  @0 TO 1 TRANSITION OF @
143 050611  061  040  124  EMS361: .ASCIZ  @1 TO 0 TRANSITION OF @
144 050637  111   23  040  EMS362: .ASCIZ  @IS INCONSISTENT @
145 050660  103  101  116  EMS363: .ASCIZ  @CANNOT READ @
146 050675  124  105  123  EMS364: .ASCIZ  @TEST PATTERN IN @
147 050716  101  116  104  EMS365: .ASCIZ  @AND @
148 050723  103  101  116  EMS366: .ASCIZ  @CANNOT INITIALIZE @
149 050746  124  110  105  EMS367: .ASCIZ  @THE COMMAND SEQUENCER HAS BEEN CLOCKED @
150 051016  122  105  123  EMS370: .ASCIZ  @RESET EARLY @
151 051033  104  111  104  EMS371: .ASCIZ  @DID NOT RESET ON TIME @
152 051062  104  125  122  EMS372: .ASCIZ  @DURING COMMAND EXECUTION @
153 051114  124  117  040  EMS373: .ASCIZ  @TO @
154 051120  127  111  124  EMS374: .ASCIZ  @WITH ANY COMBINATION OF @
155 051151  102  131  040  EMS375: .ASCIZ  @BY READING @
156 051165  102  131  040  EMS376: .ASCIZ  @BY WRITING @
157 051201  127  101  123  EMS377: .ASCIZ  @WAS SET @
158 051212  127  101  123  EMS400: .ASCIZ  @WAS NOT SET @
159 051227  104  111  104  EMS401: .ASCIZ  @DID NOT SET @
160 051244  127  110  111  EMS402: .ASCIZ  @WHILE @
161 051253  103  117  115  EMS403: .ASCIZ  @COMMAND SEQUENCER DID NOT ABORT @
162 051314  127  101  123  EMS404: .ASCIZ  @WAS NOT RESET @
163 051333  104  125  122  EMS405: .ASCIZ  @DURING @
164 051343  127  101  123  EMS406: .ASCIZ  @WAS RESET @
165 051356  123  105  101  EMS407: .ASCIZ  @SEARCH TIMEOUT @
166 051376  101  106  124  EMS410: .ASCIZ  @AFTER @
167 051405  127  101  123  EMS411: .ASCIZ  @WAS CHANGED @
168 051422  123  105  124  EMS412: .ASCIZ  @SET EARLY @
169 051435  111  116  103  EMS413: .ASCIZ  @INCORRECT @
170 051450  103  101  116  EMS414: .ASCIZ  @CANNOT DETECT @
171 051467  127  101  123  EMS415: .ASCIZ  @WAS SIMULATED @
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 172 051506  103  117  122  EMS416: .ASCIZ  @CORRECT @
 173 051517  104  125  122  EMS417: .ASCIZ  @DURING WRITE @
 174 051535  107  105  116  EMS420: .ASCIZ  @GENERATED @
 175 051550  104  125  122  EMS421: .ASCIZ  @DURING READ @
 176 051565  111  116  103  EMS422: .ASCIZ  @INCORRECT DATA TRANSFERRED TO MEMORY @
 177
 178 051633  011  104  105  EMS500: .ASCII  @       DEVICE IS NONEXISTENT,@<CR><LF>
 179 051664  011  104  105          .ASCII  @       DEVICE IS SWITCHED TO OTHER PORT@<CR><LF>
 180 051727  011  124  122          .ASCIZ  @       TRANSCEIVER ENABLE SWITCH IS OFF@<CR><LF>
 181 051773  011  111  106  EMS501: .ASCIZ  @       IF MODULE, M7686,@<CR><LF>
 182 052020  011  115  101  EMS502: .ASCIZ  @       MASSBUS TRANSCEIVER, M5922 OR M5923     @<CR><LF>
 183 052070  011  103  123  EMS503: .ASCIZ  @       CS MODULE, M7684,@<CR><LF>
 184 052115  011  104  123  EMS504: .ASCIZ  @       DS MODULE, M8685/M7685,@<CR><LF>
 185 052150  011  104  105  EMS505: .ASCIZ  @       DEVICE IS SWITCHED TO A/B PORT POSITION@<CR><LF>
 186 052223  011  104  105  EMS506: .ASCIZ  @       DEVICE IS NOT AN RM05/3/2, OR@<CR><LF>
 187 052264  011  104  105  EMS507: .ASCIZ  @       DEVICE IS SWITCHED TO PROGRAMMABLE PORT POSITION, OR@<CR><LF>
 188 052354  011  101  123  EMS510: .ASCIZ  @       ASSUMING THE RH CONTROLLER HAS NO FAULT@<CR><LF>
 189 052427  015  012  011  EMS511: .ASCII          <CR><LF>@       PROBABLE FAULT(S):@<CR><LF>
 190 052456  011  050  116          .ASCIZ  @       (NOT INCLUDING CABLES OR CONNECTORS)@<CR><LF>
 191
 192 052526  122  105  101  EMS600: .ASCIZ  @READ IN PRESET COMMAND @
 193 052556  117  106  106  EMS601: .ASCIZ  @OFFSET COMMAND @
 194 052576  122  105  124  EMS602: .ASCIZ  @RETURN TO CENTER CENTER COMMAND @
 195 052637  122  105  114  EMS603: .ASCIZ  @RELEASE COMMAND @
 196 052660  122  105  103  EMS604: .ASCIZ  @RECALIBRATE COMMAND @
 197 052705  123  105  105  EMS605: .ASCIZ  @SEEK COMMAND @
 198 052723  123  105  101  EMS606: .ASCIZ  @SEARCH COMMAND @
 199 052743  104  101  124  EMS607: .ASCIZ  @DATA COMMAND @
```

```
                                .ASCII  @EXPCTD  RECEVD  REGSTR@<CRLF>
                                .ASCIZ  @STATUS  STATUS  ADRESS@
                                .ASCII  @ BASE@<CRLF>
                                .ASCIZ  @ADRESS@
                                .ASCII  @EXPCTD   STUCK@<CRLF>
                                .ASCIZ  @RESULT  BIT(S)@
                                .ASCIZ  @EXPCTD  RECEVD@
                                .ASCIZ  @ FIRST  SECOND    CRC@
                                .ASCII  @EXPCTD  RECEVD  EXPCTD  RECEVD@<CRLF>
                                .ASCIZ  @FIRST   FIRST   SECOND  SECOND@
                                .ASCII  @RECEVD  DRVTYP@<CRLF>
                                .ASCIZ  @DRVTYP  REGADR@
                                .ASCIZ  @ EXPECTED ECC    RECEIVED ECC@
                                .ASCII  @EXPCTD  RECEVD  TEST@<CRLF>
                                .ASCIZ  @STATUS  STATUS  REGSTR@
                                .ASCII  @EXPCTD  RECEVD   TEST@<CRLF>
                                .ASCIZ  @STATUS  STATUS  PATTRN@
                                .ASCII  @EXPCTD  RECEVD  REGSTR   TEST@<CRLF>
                                .ASCIZ  @STATUS  STATUS  ADRESS  PATTRN@
                                .ASCII  @EXPCTD  RECEVD  REGSTR   TEST   OFFSET@<CRLF>
                                .ASCIZ  @STATUS  STATUS  ADRESS  PATTRN  REGSTR@
                                .ASCII  @EXPCTD  ACTUAL  REGSTR  OFFSET@<CRLF>
                                .ASCIZ  @COUNT   COUNT   ADRESS  REGSTR@
                                .ASCII  @EXPCTD  RECVED  REGSTR  OFFSET@<CRLF>
                                .ASCIZ  @STATUS  STATUS  ADRESS  REGSTR@
                                .ASCII  @EXPCTD  ACTUAL  REGSTR  RMER1    RMER2@<CRLF>
                                .ASCIZ  @CMPERR  CMPERR  ADRESS  PATTRN  PATTRN@
                                .ASCII  @EXPCTD  ACTUAL  REGSTR FUNCTION@<CRLF>
                                .ASCIZ  @RESULT  RESULT  ADRESS    CODE@
                                .ASCII  @EXPCTD  ACTUAL  STATUS    TEST@<CRLF>
                                .ASCIZ  @RESULT  RESULT  ADRESS  REGSTR@
                                .ASCII  @ACTUAL  REGSTR@<CRLF>
                                .ASCIZ  @RESULT  ADRESS@
                        .EVEN
```

```
                                                ED1:    .WORD   $GDDAT,$BDDAT,$BDADR,0
                                                ED2:    .WORD   $BDADR,0
                                                ED5:    .WORD   $GDDAT,$BDDAT,0
                                                ED47:   .WORD   $TMP0,$TMP1,$TMP2,0
                                                ED52:   .WORD   $TMP0,BUFFER,$TMP1,BUFFER+2,0
                                                ED57:   .WORD   $BDDAT,$BDADR,0
                                                ED61:   .WORD   $TMP2,$TMP3,$TMP0,$TMP1,0
                                                ED65:   .WORD   $GDDAT,$BDDAT,$TMP0,0
                                                ED71:   .WORD   $GDDAT,$BDDAT,RMHR0,0
                                                ED115:  .WORD   $GDDAT,$BDDAT,$BDADR,$TMP0,0
                                                ED130:  .WORD   $GDDAT,$BDDAT,$BDADR,$TMP0,$TMP1,0
                                                ED220:  .WORD   $BDDAT,$BDADR

                                                EF1:    .BYTE   0,0,0
                                                EF2:    .BYTE   0
                                                EF5:    .BYTE   0,0
                                                EF57:   .BYTE   0,0,0,0
                                                EF130:  .BYTE   0,0,0,0,0

                                                .EVEN
                                                BUFFER:
                                                BUFONE: .BLKW   258.
                                                BUFTWO: .BLKW   258.
                                                .=BUFFER

                                                HELP:
                                                .ASCII  <CRLF>
                                                .ASCII  <CRLF>
                                                .ASCII  @LIST OF TESTS@<CRLF>
                                                .ASCII  @------------@<CRLF>
                                                .ASCII  @T1     TRANSFER TEST@<CRLF>
                                                .ASCII  @T2     CTOD TEST@<CRLF>
                                                .ASCII  @T3     MASSBUS INITIALIZE TEST@<CRLF>
                                                .ASCII  @T4     CLEAR STUCK ACTIVE TEST@<CRLF>
                                                .ASCII  @T5     TRISTATE TRANSFER TEST@<CRLF>
                                                .ASCII  @T6     REGISTER SELECT TEST@<CRLF>
                                                .ASCII  @T7     DRIVE TYPE TEST@<CRLF>
                                                .ASCII  @T10    DEVICE AVAILABLE TEST@<CRLF>
                                                .ASCII  @T11    SEARCH TIMEOUT TEST@<CRLF>
                                                .ASCII  @T12    SET DTE TEST@<CRLF>
                                                .ASCII  @T13    FORMAT CHANGE TEST@<CRLF>
                                                .ASCII  @T14    PROM STROBE TEST@<CRLF>
                                                .ASCII  @T15    SYNC WORD COUNT INHIBIT TEST@<CRLF>
                                                .ASCII  @T16    SYNC DETECTION TEST@<CRLF>
                                                .ASCII  @T17    ABORT SYNC DETECTION TEST@<CRLF>
                                                .ASCII  @T20    SYNC GENERATION TEST@<CRLF>
                                                .ASCII  @T21    WRITE HEADER TEST@<CRLF>
                                                .ASCII  @T22    HEADER COMPARE TEST @<CRLF>
                                                .ASCII  @T23    ECC GENERATION TEST@<CRLF>
                                                .ASCII  @T24    ECC DETECTION TEST@<CRLF>
                                                .ASCII  <CRLF>
                                                .ASCII  @OPERATIONAL SWITCH SETTINGS@<CRLF>
                                                .ASCII  @-------------------------@<CRLF>
                                                .ASCII  @SWITCH                 USE@<CRLF>
                                                .ASCII  @------         ----------------@<CRLF>
                                                .ASCII  @  15           HALT ON ERROR@<CRLF>
                                                .ASCII  @  14           LOOP ON TEST@<CRLF>
```

```
     58 056043      040      040      061  .ASCII  @  13          INHIBIT ERROR TYPEOUTS@<CRLF>
     59 056100      040      040      061  .ASCII  @  12          @<CRLF>
     60 056107      040      040      061  .ASCII  @  11          INHIBIT ITERATIONS@<CRLF>
     61 056140      040      040      061  .ASCII  @  10          BELL ON ERROR@<CRLF>
     62 056164      040      040      040  .ASCII  @   9          LOOP ON ERROR@<CRLF>
     63 056210      040      040      040  .ASCII  @   8          LOOP ON TEST IN SWR<7:0>@<CRLF>
     64 056247      040      040      040  .ASCII  @   7          TN128@<CRLF>
     65 056263      040      040      040  .ASCII  @   6          TN64@<CRLF>
     66 056276      040      040      040  .ASCII  @   5          TN32@<CRLF>
     67 056311      040      040      040  .ASCII  @   4          TN16@<CRLF>
     68 056324      040      040      040  .ASCII  @   3          TN8@<CRLF>
     69 056336      040      040      040  .ASCII  @   2          TN4@<CRLF>
     70 056350      040      040      040  .ASCII  @   1          TN2@<CRLF>
     71 056362      040      040      040  .ASCIZ  @   0          TN1@<CRLF>
     72
     73             000200                .END    200
```

```
ABASE - 176700
ACDW1 - 000000
ACDW2 = 000000
ACPUOP- 000000
ADDW0 = 000000
ADDW1 = 000000
ADDW10= 000000
ADDW11= 000000
ADDW12= 000000
ADDW13= 000000
ADDW14= 000000
ADDW15= 000000
ADDW2 = 000000
ADDW3 = 000000
ADDW4 = 000000
ADDW5 = 000000
ADDW6 = 000000
ADDW7 - 000000
ADDW8 - 000000
ADDW9 = 000000
ADEVCT= 000000
ADEVM = 000000
ADR   - 000001
AENV  = 000000
AENVM = 000000
AFATAL= 000000
ALL     031542
AMADR1= 000000
AMADR2= 000000
AMADR3- 000000
AMADR4= 000000
AMAMS1= 000000
AMAMS2= 000000
AMAMS3= 000000
AMAMS4- 000000
AMSGAD= 000000
AMSGLG= 000000
AMSGTY= 000000
AMTYP1- 000000
AMTYP2- 000000
AMTYP3- 000000
AMTYP4- 000000
AOE   = 001000
APASS   000000
APE   - 100000
APRIOR= 000000
APTCSU- 000040
APTENV- 000001
APTSIZ= 000200
APTSPO= 000100
ASWREG= 000000
ATA   = 100000
ATESTN= 000000
ATNMSK= 000377
ATNTBL  032450
AUNIT - 000000
AUSWR   000000

AUTSIZ  001326
AVECT1= 120254
AVECT2= 000000
A16   - 000400
A17   = 001000
BADTMO  002642
BAI   = 000010
BB00  = 000001
BB01  = 000002
BB02  = 000004
BB03  = 000010
BB04  = 000020
BB05  = 000040
BB06  = 000100
BB07  = 000200
BB08  = 000400
BB09  = 001000
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
BLNKS1  032345
BLNKS2  032344
BLNKS3  032343
BLNKS4  032342
BOTADR  027216
BOTFLG  027220
BPTVEC- 000014
BSE   = 100000
BUFFER  054636
BUFONE  054636
BUFTWO  055642
CC    - 004000
CH    - 002000
CHGADR  001330

CHRCNT  027221
CKSWR = 104410
CLKSNC  023574
CLOCK   001536
CLR   = 000040
CMNSTA  005004
CNSL01  031607
CNSL02  031617
CNSL03  031661
CNSL04  031670
CNSL07  031724
CNSL08  032066
CNSL09  032067
CNTCLR  022404
COMMA   031553
CONT  = 000100
CPSAVE  026342
CR    = 000015
CRLF  = 000200
CYLMSK= 001777
DBCK  = 100000
DBEN  = 040000
DBL   = 002000
DCK   = 100000
DCISP = 177570
DEBL  = 020000
DISPLA  001156
DISPRE  000174
DLT   = 100000
DMD   = 000001
DPE   = 000010
DPEHI = 040000
DPELO = 020000
DPR   = 000400
DRIVES  032110
DRQ   = 004000
DRVCLR= 000010
DRY   = 000200
DSWR  = 177570
DTE   = 010000
DULPRT= 024024
DVA   = 004000
DVC   = 000200
EBL   = 020000
ECH   = 000100
ECI   = 004000
ECRC  = 001000
EDT1    040500
EDT115  040524
EDT130  040526
EDT132  040530
EDT2    040502
EDT220  040532
EDT47   040506
EDT5    040504
EDT52   040510
EDT57   040512

EDT61   040514
EDT65   040516
EDT71   040520
EDT74   040522
ED1     054460
ED115   054564
ED130   054576
ED2     054470
ED220   054612
ED47    054502
ED5     054474
ED52    054512
ED57    054524
ED61    054532
ED65    054544
ED71    054554
EECC  = 000020
EFT1    040534
EFT115  040552
EFT130  040554
EFT132  040556
EFT2    040536
EFT220  040560
EFT5    040540
EFT57   040542
EFT65   040544
EFT71   040546
EFT74   040550
EF1     054616
EF130   054630
EF2     054621
EF5     054622
EF57    054624
EHT1    040364
EHT115  040440
EHT130  040444
EHT132  040450
EHT142  040454
EHT145  040460
EHT150  040464
EHT2    040370
EHT213  040470
EHT220  040474
EHT47   040404
EHT5    040374
EHT52   040410
EHT57   040414
EHT61   040420
EHT65   040424
EHT7    040400
EHT71   040430
EHT74   040434
EH1     052761
EH115   053502
EH130   053577
EH132   053715
EH142   054013

EH145   054111
EH150   054226
EH2     053037
EH213   054324
EH220   054421
EH3     053045
EH47    053131
EH5     053054
EH52    053157
EH57    053255
EH61    053313
EH65    053351
EH7     053112
EH71    053425
EMS1    040562
EMS10   041165
EMS100  045602
EMS101  045642
EMS102  045716
EMS103  045764
EMS104  046024
EMS105  046051
EMS106  046112
EMS107  046157
EMS11   041230
EMS110  046167
EMS111  046226
EMS112  046244
EMS113  046302
EMS114  046341
EMS115  046407
EMS116  046424
EMS12   041321
EMS13   041377
EMS14   041446
EMS15   041513
EMS16   041571
EMS17   041652
EMS2    040633
EMS20   041713
EMS21   041757
EMS22   042036
EMS23   042103
EMS24   042161
EMS25   042240
EMS250  046437
EMS251  046475
EMS252  046541
EMS253  046574
EMS254  046627
EMS255  046670
EMS256  046732
EMS257  046762
EMS26   042316
EMS260  047016
EMS261  047047
EMS262  047106
```

SYMBOL TABLE

SEQ 0157

```
EMS27   042375
EMS3    040702
EMS30   042441
EMS300  047151
EMS301  047167
EMS302  047212
EMS303  047237
EMS304  047250
EMS306  047257
EMS307  047273
EMS31   042521
EMS310  047334
EMS311  047351
EMS312  047415
EMS313  047453
EMS314  047504
EMS315  047533
EMS316  047561
EMS317  047602
EMS32   042572
EMS320  047622
EMS321  047642
EMS322  047662
EMS323  047702
EMS324  047721
EMS325  047741
EMS326  047752
EMS327  047762
EMS33   042652
EMS330  047770
EMS331  050007
EMS332  050037
EMS333  050055
EMS334  050071
EMS335  050101
EMS336  050124
EMS337  050143
EMS34   042702
EMS340  050157
EMS341  050170
EMS342  050177
EMS343  050231
EMS344  050245
EMS345  050274
EMS346  050322
EMS347  050340
EMS35   042731
EMS350  050361
EMS351  050366
EMS352  050404
EMS353  050420
EMS354  050444
EMS355  050477
EMS356  050521
EMS357  050541
EMS36   042773
EMS360  050563
EMS361  050611
EMS362  050637
EMS363  050660
EMS364  050675
EMS365  050716
EMS366  050723
EMS367  050746
EMS37   043023
EMS370  051016
EMS371  051033
EMS372  051062
EMS373  051114
EMS374  051120
EMS375  051151
EMS376  051165
EMS377  051201
EMS4    040747
EMS40   043055
EMS400  051212
EMS401  051227
EMS402  051244
EMS403  051253
EMS404  051314
EMS405  051333
EMS406  051343
EMS407  051356
EMS41   043133
EMS410  051376
EMS411  051405
EMS412  051422
EMS413  051435
EMS414  051450
EMS415  051467
EMS416  051506
EMS417  051517
EMS42   043201
EMS420  051535
EMS421  051550
EMS422  051565
EMS43   043263
EMS44   043334
EMS45   043375
EMS46   043452
EMS47   043534
EMS5    041000
EMS50   043574
EMS500  051633
EMS501  051773
EMS502  052020
EMS503  052070
EMS504  052115
EMS505  052150
EMS506  052223
EMS507  052264
EMS51   043643
EMS510  052354
EMS511  052427
EMS52   043712
EMS53   043753
EMS54   044014
EMS55   044071
EMS56   044147
EMS57   044242
EMS6    041050
EMS60   044326
EMS600  052526
EMS601  052556
EMS602  052576
EMS603  052637
EMS604  052660
EMS605  052705
EMS606  052723
EMS607  052743
EMS61   044400
EMS62   044453
EMS63   044534
EMS64   044574
EMS65   044644
EMS66   044705
EMS67   044762
EMS7    041114
EMS70   045074
EMS71   045142
EMS72   045221
EMS73   045277
EMS74   045347
EMS75   045422
EMS76   045476
EMS77   045537
EMTVEC= 000030
EMT1    032460
EMT10   032646
EMT100  034316
EMT101  034336
EMT102  034356
EMT103  034370
EMT104  034414
EMT105  034434
EMT106  034454
EMT107  034500
EMT11   032664
EMT110  034520
EMT111  034542
EMT112  034562
EMT113  034602
EMT114  034626
EMT115  034650
EMT116  034674
EMT117  034714
EMT12   032702
EMT120  034734
EMT121  034760
EMT122  035000
EMT123  035020
EMT124  035044
EMT125  035062
EMT126  035102
EMT127  035120
EMT13   032720
EMT130  035144
EMT131  035162
EMT132  035200
EMT133  035220
EMT134  035240
EMT135  035254
EMT136  035272
EMT137  035304
EMT14   032736
EMT140  035322
EMT141  035342
EMT142  035356
EMT143  035374
EMT144  035410
EMT145  035432
EMT146  035454
EMT147  035472
EMT15   032754
EMT150  035504
EMT151  035526
EMT152  035540
EMT153  035554
EMT154  035574
EMT155  035614
EMT156  035632
EMT157  035654
EMT16   032772
EMT160  035672
EMT161  035722
EMT162  035740
EMT163  035756
EMT164  036000
EMT165  036022
EMT166  036046
EMT167  036066
EMT17   033010
EMT170  036110
EMT171  036122
EMT172  036136
EMT173  036154
EMT174  036176
EMT175  036224
EMT176  036242
EMT177  036260
EMT2    032466
EMT20   033026
EMT200  036260
EMT201  036276
EMT202  036314
EMT203  036332
EMT204  036354
EMT205  036374
EMT206  036414
EMT207  036444
EMT21   033050
EMT210  036460
EMT211  036476
EMT212  036514
EMT213  036526
EMT214  036556
EMT215  036570
EMT216  036610
EMT217  036624
EMT22   033072
EMT220  036640
EMT221  036656
EMT222  036674
EMT223  036712
EMT224  036730
EMT225  036750
EMT226  036772
EMT227  037010
EMT23   033116
EMT230  037026
EMT231  037044
EMT232  037060
EMT233  037102
EMT234  037124
EMT235  037152
EMT236  037172
EMT237  037224
EMT24   033142
EMT240  037244
EMT241  037270
EMT242  037314
EMT243  037340
EMT244  037364
EMT245  037402
EMT246  037420
EMT247  037444
EMT25   033166
EMT250  037462
EMT251  037506
EMT252  037532
EMT253  037556
EMT254  037574
EMT255  037612
EMT256  037636
EMT257  037654
EMT26   033206
EMT260  037700
EMT261  037724
EMT262  037750
EMT263  037766
EMT264  040004
EMT265  040030
EMT266  040046
EMT267  040064
EMT27   033240
```

```
EMT270  040100    EQUALS  031540    ILRG60= 000060    NSA    = 100000    RIP    = 000020
EMT271  040124    ERR    = 040000   ILRG62= 000062    OCC    = 100000    RLEASE= 000012
EMT272  040150    ERRNMB  027214    ILRG64= 000064    OFD    = 000200    RMAS   = 000016
EMT273  040166    ERROR  - 104000   ILRG66= 000066    OFFSET= 000014     RMASI    001354
EMT274  040204    ERRTYP  026346    ILRG70= 000070    OM     = 000001    RMASO    001430
EMT275  040222    ERRVEC= 000004    ILRG72= 000072    OPE    = 020000    RMBA   = 000004
EMT276  040242    ERTY00  027222    ILRG74= 000074    OPI    = 020000    RMBAE  = 000050
EMT277  040260    ERTY01  027227    ILRG76= 000076    OR     = 000200    RMBAEI   001406
EMT3    032514    ERTY02  027237    IOTVEC= 000020    PACACK= 000022     RMBAEO   001462
EMT30   033260    ERTY03  027246    IPCK0  = 000001   PAKACK= 000022     RMBAI    001342
EMT300  040304    ERTY04  027254    IPCK1  = 000002   PAR    = 000010    RMBAO    001416
EMT301  040330    ERTY05  027257    IPCK2  = 000004   PAT    = 000020    RMCS1  = 000000
EMT302  040346    ESRC   = 004000   IPCK3  = 000010   PCLOCK  022010     RMCS1I   001336
EMT31   033300    FER    = 000020   IR     = 000100   PCOUNT  022076     RMCS10   001412
EMT32   033314    FMT16  = 010000   IVC    = 010000   PDA    = 000400    RMCS2  = 000010
EMT33   033326    FNCDTB  032350    LBC    = 002000   PFECH   027264     RMCS2I   001346
EMT34   033340    FNCMSK= 000077    LBT    = 002000   PFECH1  027274     RMCS20   001422
EMT35   033352    F0      000002    LCLOCK  022026    PFECH2  027362     RMCS3  = 000052
EMT36   033364    F1     = 000004   LCOUNT  022076    PFECH3  027400     RMCS3I   001410
EMT37   033404    F2     = 000010   LF     = 000012   PFECH4  027406     RMCS30   001464
EMT4    032534    F3     = 000020   LODEV   032244    PGE    = 002000    RMDA   = 000006
EMT40   033434    F4     = 000040   LS     = 000004   PGM    = 001000    RMDAI    001344
EMT41   033456    GETBUF  001336    LSC    = 004000   PHA    = 000200    RMDAO    001420
EMT42   033504    GO     = 000001   LST    = 000002   PIP    = 020000    RMDB   = 000022
EMT43   033522    GTSWR  = 104407   LSTOP   022140    PIRQ   = 177772    RMDBI    001360
EMT44   033536    HCE     000200    LSTRK   001334    PIRQVE= 000240     RMDBO    001434
EMT45   033554    HCI    - 002000   MCLK,  = 004000   PLCLK   022034     RMDC   = 000034
EMT46   033570    HCRC   - 000400   MCPE   = 020000   PLFS   = 002000    RMDCI    001372
EMT47   033604    HELP    054636    MDF    = 000100   PLSTP   022144     RMDCO    001446
EMT5    032556    HT     = 000011   MDPE   = 000400   PR0    = 000000    RMDS   = 000012
EMT50   033622    IAE    - 002000   MI     = 000004   PR1    = 000040    RMDSI    001350
EMT51   033640    IBSAVE  026344    MOC    = 000400   PR2    = 000100    RMDSO    001424
EMT52   033654    IDXMSK= 000077    MOH    = 020000   PR3    = 000140    RMDT   = 000026
EMT53   033672    IE     = 000100   MOL    = 010000   PR4    = 000200    RMDTI    001364
EMT54   033706    ILF    - 000001   MRD    = 002000   PR5    = 000240    RMDTO    001440
EMT55   033724    ILF02  = 000002   MR1AAA= 051401    PR6    = 000300    RMEC1  = 000044
EMT56   033742    ILF24  = 000024   MS     = 000040   PR7    = 000340    RMEC1I   001402
EMT57   033756    ILF26  - 000026   MSC    = 000002   PS     = 177776    RMEC10   001456
EMT6    032602    ILF30   000030    MSDRVS  032144    PSEL   = 002000    RMEC2  = 000046
EMT60   033772    ILF32  - 000032   MSE    = 100000   PSTOP   022132     RMEC2I   001404
EMT61   034006    ILF34  - 000034   MSEN   = 010000   PSW    = 177776    RMEC20   001460
EMT62   034024    ILF36  = 000036   MSER   = 000200   PUTBUF  001412     RMER1  = 000014
EMT63   034042    ILF40  = 000040   MSGDRV  032160    PWRVEC= 000024     RMER1I   001352
EMT64   034054    ILF42  = 000042   MSHELP  031556    QUES    031547     RMER10   001426
EMT65   034070    ILF44  = 000044   MUR    = 001000   RD     = 000070    RMER2  = 000042
EMT66   034102    ILF46  = 000046   MWD    = 000010   RDCHR  = 104411    RMER2I   001400
EMT67   034116    ILF54  = 000054   MWP    = 000010   RDLIN  = 104412    RMER20   001454
EMT7    032624    ILF56  = 000056   MXF    = 001000   RDOCT  = 104413    RMHR   - 000036
EMT70   034134    ILF64  = 000064   N       032336    RDY    = 000200    RMHRI    001374
EMT71   034154    ILF66  = 000066   NDTMSK= 115760    READY   005200     RMHRO    001450
EMT72   034200    ILF74  = 000074   NED    = 010000   READY1  005226     RMLA   = 000020
EMT73   034224    ILF76  = 000076   NEM    = 004000   RECAL  = 000006    RMLAI    001356
EMT74   034244    ILR    = 000002   NONE    032137    RESREG= 104415     RMLAO    001432
EMT75   034254    ILRG50 - 000050   NOP    = 000000   RESVEC= 000010     RMMR1  = 000024
EMT76   034266    ILRG52= 000052    NOTAVL  032276    RFX    = 010000    RMMR1I   001362
EMT77   034302    ILRG54= 000054    NOTPRS  032261    RG     = 040000    RMMR10   001436
ENBSCH  022432    ILRG56= 000056    NOTRM   032223    RH      000072     RMMR2    000040
```

```
RMMR2I  001376
RMMR2O  001452
RMOF  = 000032
RMOFI   001370
RMOFO   001444
RMR   = 000004
RMSN  = 000030
RMSNI   001366
RMSNO   001442
RMWC  = 000002
RMWCI   001340
RMWCO   001414
RQA   = 100000
RQB   = 040000
RTC   - 000016
R6    =%000006
R7    =%000007
SADMSK= 000377
SAVREG= 104414
SA1   = 000001
SA16  = 000020
SA2   - 000002
SA4   = 000004
SA8   - 000010
SC    = 100000
SCOPE   000004
SCTCMP  023304
SCTMSK- 003700
SCO     000100
SC1   - 000200
SC2   - 000400
SC3   = 001000
SC4     002000
SEARCH- 000030
SEEK  - 000004
SETLFS  023412
SETOM   022302
SETVV   022160
SHUT    030662
SIZCLK  021550
SKI   = 040000
SNGPRT= 020024
STACK - 001100
STANDA  004322
START   002732
START1  002722
START2  002736
STKLMT= 177774
STOPCL  001540
SWR     001154
SWREG   000176
SW0   = 000001
SW00  = 000001
SW01  = 000002
SW02  = 000004
SW03  = 000010
SW04  = 000020
SW05  = 000040
SW06  = 000100
SW07  = 000200
SW08  = 000400
SW09  = 001000
SW1   = 000002
SW10  = 002000
SW11  = 004000
SW12  = 010000
SW13  = 020000
SW14  = 040000
SW15  = 100000
SW2   - 000004
SW3   - 000010
SW4   - 000020
SW5   - 000040
SW6   = 000100
SW7   - 000200
SW8   = 000400
SW9   = 001000
SYSTAT  032166
TADMSK= 177400
TAG   = 020000
TAGADR= 001114
TAP   = 040000
TA1   - 000400
TA16  = 010000
TA2   = 001000
TA4   - 002000
TA8   - 004000
TBITVE= 000014
TIME    001532
TKVEC = 000060
TPVEC = 000064
TRAPVE= 000034
TRE   = 040000
TRTVEC= 000014
TST   = 010000
TSTNMB  027212
TSTQUE  001466
TST1    005366
TST10   010636
TST11   010722
TST     011172
TST13   011522
TST14   012106
TST15   012434
TST16   013104
TST17   013530
TST2    005676
TST20   013752
TST21   014444
TST22   015432
TST23   016700
TST24   020070
TST3    006060
TST4    006230
TST5    006360
TST6    007444
TST7    010514
TYPBN = 104406
TYPDS = 104405
TYPE  = 104401
TYPOC = 104402
TYPON = 104404
TYPOS = 104403
UNS   = 040000
UNTMSK= 000007
UNTOFF  032315
UNTON   032326
UPE   = 020000
USE   = 040000
U0    = 000001
U1    = 000002
U2    = 000004
VV    = 000100
WATCH   001534
WC    = 000040
WCD   = 000050
WCE   = 040000
WCEHI = 010000
WCELO = 004000
WCF   = 000040
WCH   = 000052
WD    = 000060
WH    = 000062
WLE   = 004000
WRL   = 004000
XNUDC = 176000
XNUER2= 001567
XNUOF = 161577
XSIZ    003766
XXDP    001332
Y       032340
$APTHD  001100
$ATYC   031316
$ATY1   031272
$ATY3   031300
$ATY4   031310
$AUTOB  001150
$BASE   001276
$BDADR  001136
$BDDAT  001142
$BELL   001212
$BIN    024212
$CDW1   001302
$CDW2   001304
$CHARC  025216
$CKSWR  027722
$CMTAG  001114
$CM3  = 000000
$CM4  = 000005
$CNTLC  030620
$CNTLG  030632
$CNTLU  030625
$CPUOP  001250
$CRLF   001217
$DBLK   024430
$DDW0   001306
$DDW1   001310
$DDW2   001312
$DDW3   001314
$DDW4   001316
$DDW5   001320
$DDW6   001322
$DDW7   001324
$DEVCT  001232
$DEVM   001300
$DOAGN  021540
$DTBL   024420
$ENDAD  021530
$ENDCT  021366
$ENULL  021544
$ENV    001242
$ENVM   001243
$EOP    021332
$EOPCT  021360
$EOSP   021274
$ERFLG  001117
$ERMAX  001131
$ERROR  025752
$ERRPC  001132
$ERRTB  001542
$ERTTL  001126
$ESCAP  001210
$ETABL  001242
$ETEND  001326
$FATAL  001224
$FFLG   031536
$FILLC  001172
$FILLS  001171
$GDADR  001134
$GDDAT  001140
$GET42  021520
$GTSWR  030012
$GT42P  021514
$HD   = 000000
$HIBTS  001100
$HIOCT  031004
$ICNT   001120
$ILLUP  031254
$INTAG  001151
$ITEMB  001130
$LF     001220
$LFLG   031535
$LLCSR  001522
$LLVEC  001524
$LPADR  001122
$LPCSB  001514
$LPCSR  001512
$LPERR  001124
$LPVEC  001516
$MADR1  001254
$MADR2  001260
$MADR3  001264
$MADR4  001270
$MAIL   001222
$MAMS1  001252
$MAMS2  001256
$MAMS3  001262
$MAMS4  001266
$MBADR  001102
$MFLG   031534
$MNEW   030650
$MSGAD  001236
$MSGLG  001240
$MSGTY  001222
$MSWR   030637
$MTYP1  001253
$MTYP2  001257
$MTYP3  001263
$MTYP4  001267
$MXCNT  025700
$NULL   001170
$NWTST= 000001
$OCNT   024662
$OMODE  024664
$OVER   025664
$PASS   001230
$PASTM  001106
$POWER  031262
$PSW    001530
$PWRDN  031114
$PWRMG  031250
$PWRUP  031166
$QUES   001216
$RDCHR  030264
$RDLIN  030354
$RDOCT  030704
$RDSZ = 000010
$RESRE  024102
$RM02   032204
$RM03   032211
$RM05   032216
$RTNAD  02154?
$SAVRE  024044
$SAVR6  031260
$SCOPE  025222
$SETUP= 000137
$STUP = 177777
$SVLAD  025630
$SVPC = 000210
$SWR  = 167400
$SWREG  001244
$SWRMK= 000000
$SW08T  025702
$TESTN  001226
$TIMES  001206
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```
CZRMQB0 RM05/3/2 DSKLS TST 2    MACRO V04.00  4-APR-81 01:29:56 PAGE 45-6
SYMBOL TABLE                                                    SEQ 0160

$TKB    001162          $TMP0   001174          $TRAP   031006          $TYPE   024666          $VECT1  001272
$TKCNT  027412          $TMP1   001176          $TRAP2  031046          $TYPEC  025100          $VECT2  001274
$TKINT  027422          $TMP2   001200          $TRP    = 000016        $TYPEX  025220          $XOFF   = 000023
$TKQEN= 027421          $TMP3   001202          $TRPAD  031060          $TYPOC  024464          $XON    = 000021
$TKQIN  027414          $TMP4   001204          $TSTM   001104          $TYPON  024500          $XTSTR  025240
$TKQOU  027416          $TN     = 000025        $TSTNM  001116          $TYPOS  024440          $$GET4= 000000
$TKQSR  027420          $TPB    001166          $TTYIN  030610          $UNIT   001234          $$SW08= 000025
$TKS    001160          $TPFLG  001173          $TYPBN  024140          $UNITM  001110          $OFILL  024663
$TKSRV  027472          $TPS    001164          $TYPDS  024214          $USWR   001246          .$X     = 001100

. ABS.  056646      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  60672 WORDS  ( 237 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  70 PAGES
CZRMQB.BIC,CZRMQB/C=CZRMQB.DOC,CZRMQB,SYSMAC/M
```

```
$$GET4  14-20    14-20#
$$SW08  28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1
        28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1
        28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1     28-1#    28-1#
        28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#    28-1#
        28-1#    28-1#    28-1#    28-1#    28-1#
$OFILL  26-1     26-1#    26-1*    26-1*
$40CAT  28-1     29-1
$APTHD   5-8      5-8#
$ASTAT  35-1     35-1
$ATY1   35-1#
$ATY3   27-1     35-1#
$ATY4   29-1     35-1#
$ATYC   35-1     35-1#
$AUTOB   6-0#     9-28*     9-66     31-1     31-1     31-1
$BASE    6-0#     9-76     10-33     10-42*    11-56     13-1     13-67     13-73     13-106    13-137    13-159    13-326    13-518    13-543
        13-554   13-601    13-671    13-746    13-806    13-917    13-995    13-:37    13-;54    13-=29    13-?75    13-B10    18-9      30-25
$BDADR   6-0#     13-14*    13-15*    13-35*    13-36*    13-67*    13-537*   13-538*   13-550*   13-576*   13-577*   13-603*   13-604*   13-705*
        13-706*  13-728*   13-729*   13-749*   13-750*   13-843*   13-844*   13-882*   13-883*   13-908*   13-909*   13-940*   13-941*   13-:31*
        13-:32*  13-:61*   13-:62*   13-:76*   13-:77*   13-<04*   13-<05*   13-<26*   13-<27*   13-<64*   13-<65*   13-<82*   13-<83*   13-=48*
        13-=49*  13->54*   13->55*   13-?36*   13-?37*   13-?58*   13-?59*   13-a29*   13-a30*   13-a43*   13-a44*   13-a79*   13-a80*   13-a96*
        13-a97*  13-A25*   13-A26*   13-A79*   13-A80*   13-A98*   13-A99*   13-B51*   13-B52*   13-B72*   13-B73*   13-C26*   13-C27*   13-C36*
        13-C37*  13-C49*   13-C50*   13-C66*   13-C80*   13-C81*   13-C99*   13-D00*   16-23*    16-24*    17-22*    17-23*    19-30*    19-31*
        19-44*   19-45*    19-65*    19-66*    19-96*    19-97*    19-126*   19-127*   22-15*    22-16*    22-33*    22-34*    45-1      45-2
        45-6     45-10     45-11     45-12
$BDDAT   6-0#     13-8*     13-9      13-29*    13-30     13-208*   13-253*   13-315*   13-536*   13-546*   13-547*   13-575*   13-578*   13-594*
        13-595*  13-610*   13-611*   13-620*   13-621*   13-648*   13-649*   13-663*   13-664*   13-666*   13-702*   13-703*   13-725*   13-726*
        13-757*  13-758*   13-768*   13-769*   13-782*   13-783*   13-796*   13-797*   13-839*   13-840*   13-878*   13-879*   13-907*   13-947*
        13-948*  13-962*   13-963*   13-986*   13-987*   13-:25*   13-:26*   13-:57*   13-:58*   13-:71*   13-:72    13-;48*   13-;49    13-<03*
        13-<22*  13-<23*   13-<24    13-<85*   13-=69*   13->13*   13->52*   13-?34*   13-?54*   13-?55*   13-a22*   13-a23*   13-a25    13-a36*
        13-a37*  13-a39    13-a78*   13-a94*   13-A23*   13-A77*   13-A96*   13-B48*   13-B49*   13-B69*   13-B71*   13-C24*   13-C34*   13-C48*
        13-C64*  13-C78*   13-C97*   16-20*    16-21*    17-18*    17-19*    19-32*    19-46*    19-62*    19-63*    19-89*    19-90*    19-123*
        19-124*  22-12*    22-13*    22-30*    22-31*    45-1      45-3      45-6      45-8      45-9      45-10     45-11     45-12
$BELL   6-0#     29-1      29-1      29-1      31-1      31-1      31-1
$BIN    24-1     24-1#     24-1*     24-1*
$CDW1   6-0#
$CDW2   6-0#
$CHARC  27-1     27-1#     27-1*     27-1*     27-1*
$CKSWR  31-1#    33-1      33-1
$CM3    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  31-1     31-1      31-1      31-1      31-1#
$CNTLG  31-1     31-1#
$CNTLU  31-1     31-1      31-1#
$CPUOP  6-0#
$CRLF   6-0#     9-48      9-81      9-142     10-20     10-28     10-62     10-101    11-25     11-67     14-20     27-1      27-1      27-1
        29-1     29-1      29-1      30-20     30-61     30-104    30-114    30-126    30-134    30-154    31-1      31-1      31-1      31-1
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$DDW0   6-0#
$DDW1   6-0#
$DDW2   6-0#
$DDW3   6-0#
$DDW4   6-0#
$DDW5   6-0#
```

```
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$DDW7    6-0#
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$DEVM    6-0#    9-68*   9-79    9-120*  10-63*  10-70*  10-97*  10-98   11-4    11-38   31-6*
$DOAGN   14-20   14-20   14-20#
$DTBL    25-1    25-1#
$ENDAD   5-5     9-28    14-20#  29-1
$ENDCT   9-23    14-20#
$ENULL   14-20#
$ENV     6-0#    9-28    27-1    29-1    35-1    35-1
$ENVM    6-0#    9-23    9-72    27-1    27-1    35-1
$EOP     14-20#  31-7
$EOPCT   9-23*   14-20   14-20#
$EOSP    13-69   13-540  14-9#
$ERFLG   6-0#    28-1    28-1    28-1    28-1    28-1    28-1*   29-1    29-1    29-1*
$ERMAX   6-0#    9-23*   28-1    28-1    28-1    28-1*
$ERROR   9-23    29-1#
$ERRPC   6-0#    29-1    29-1    29-1    29-1*   29-1*   30-54
$ERRTB   8-0#    30-72
$ERTTL   6-0#    14-20   14-20   14-20*  29-1    29-1    29-1*
$ESCAP   6-0#    9-23*   28-1*   29-1    29-1    29-1    29-1
$ETABL   6-0#
$ETEND   5-8     6-0#
$FATAL   6-0#    35-1*
$FFLG    35-1    35-1#   35-1*   35-1*   35-1*
$FILLC   6-0#    27-1    27-1    27-1
$FILLS   6-0#    27-1    27-1
$GDADR   6-0#
$GDDAT   6-0#    13-11*  13-12*  13-13*  13-32*  13-33*  13-34*  13-209* 13-254* 13-314* 13-549* 13-580* 13-597* 13-605*
         13-707* 13-730* 13-762* 13-773* 13-786* 13-799* 13-842* 13-881* 13-906* 13-942* 13-991* 13-:30* 13-:60* 13-:78*
         13-;47* 13-;49  13-<02* 13-<28* 13-<66* 13-<84* 13-=70* 13->14* 13->53* 13-?35* 13-?57* 13-@24* 13-@25  13-@38*
         13-@39  13-@77* 13-@95* 13-A24* 13-A78* 13-A97* 13-B50* 13-B68* 13-C25* 13-C35* 13-C45* 13-C46  13-C65* 13-C79*
         13-C98* 16-25*  17-21*  19-33*  19-47*  19-67*  19-95*  19-128* 22-14*  22-32*  45-1    45-3    45-8    45-9
         45-10   45-11
$GET42   11-34   11-43   14-20#
$GT42P   14-20   14-20#
$GTSWR   31-1#   33-1    33-1
$HD      4-678   4-678   4-678
$HIBTS   5-8#
$HIOCT   32-1#   32-1*
$ICNT    6-0#    28-1    28-1    28-1    28-1*   28-1*
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        13-671   13-746   13-806   13-917   13-995   13-:37   13-;54   13-=29   13-?75   13-B10   14-20    14-20    14-20    14-20
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EMS327	39-45	39-72	39-76	39-94	39-117	39-211	39-246	39-261	39-261	39-281	39-282	39-292	43-117#	
EMS33	39-191	43-28#												
EMS330	39-47	43-118#												
EMS331	39-90	39-179	39-195	43-119#										
EMS332	39-98	39-140	39-147	39-162	39-169	39-176	39-186	39-323	39-352	39-368	39-386	39-403	43-120#	
EMS333	39-100	39-116	39-119	39-152	39-158	39-237	39-248	39-251	39-297	39-303	39-305	39-307	39-313	43-121#
EMS334	39-62	39-121	39-152	39-156	39-242	39-292	39-297	43-122#						
EMS335	39-33	39-43	39-62	39-64	39-119	39-242	39-244	39-244	39-251	39-294	39-342	39-351	39-358	39-367
	39-374	39-383	43-123#											
EMS336	39-35	39-60	39-67	39-69	39-112	39-121	39-338	39-343	39-354	39-359	39-370	39-375	39-390	39-394
	39-405	39-409	43-124#											
EMS337	39-48	39-50	39-130	39-136	39-143	39-154	39-156	39-165	39-172	39-182	39-207	39-211	39-221	39-240
	39-242	39-244	39-246	39-253	39-269	39-281	39-290	39-295	43-125#					
EMS34	39-193	39-255	43-29#											
EMS340	39-33	39-35	39-43	39-62	39-64	39-67	39-69	39-119	39-121	39-251	39-338	39-343	39-354	39-359
	39-370	39-375	39-390	39-405	43-126#									
EMS341	39-50	39-104	39-134	39-141	39-143	39-148	39-154	39-156	39-163	39-165	39-170	39-172	39-182	39-191
	39-193	39-203	39-207	39-211	39-262	39-264	39-266	39-269	39-271	39-273	39-277	39-309	39-412	43-127#
EMS342	39-112	39-119	39-121	39-125	39-323	43-128#								
EMS343	39-86	39-125	43-129#											
EMS344	39-125	43-130#												
EMS345	39-128	39-130	39-205	39-275	39-292	43-131#								
EMS346	39-104	39-128	39-134	39-141	39-148	39-163	39-170	39-205	39-271	39-273	39-275	39-277	39-309	39-311
	43-132#													
EMS347	39-132	39-138	39-145	39-160	39-167	39-174	39-184	43-133#						
EMS35	39-197	39-237	39-242	39-246	39-253	43-30#								
EMS350	39-150	39-152	39-156	39-158	39-297	39-313	39-331	39-336	43-134#					
EMS351	39-150	43-135#												
EMS352	39-37	39-39	39-158	43-136#										
EMS353	39-108	39-110	39-179	39-219	39-225	39-227	39-231	39-235	39-240	39-259	39-325	43-137#		
EMS354	39-187	39-189	39-213	39-219	39-223	39-231	39-235	39-259	39-279	39-284	39-286	39-288	39-327	43-138#
EMS355	39-191	39-193	39-203	43-139#										
EMS356	39-41	39-317	39-319	39-321	39-388	43-140#								
EMS357	39-197	39-315	43-141#											
EMS36	39-201	39-215	39-221	39-223	39-225	39-227	39-251	39-315	39-342	39-347	39-351	39-358	39-363	39-367
	39-374	39-379	39-383	39-399	43-31#									
EMS360	39-197	39-317	43-142#											
EMS361	39-319	43-143#												
EMS362	39-199	43-144#												
EMS363	39-209	39-299	39-301	39-313	43-145#									
EMS364	39-213	39-286	39-288	43-146#										
EMS365	39-64	39-213	39-219	39-225	39-227	39-231	39-235	39-259	39-323	39-325	39-327	43-147#		
EMS366	39-217	43-148#												
EMS367	39-219	39-225	39-227	39-231	39-235	39-259	39-325	43-149#						
EMS37	39-203	43-32#												

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EMS504	39-11	39-14	39-16	39-38	39-40	39-42	39-51	39-55	39-57	39-63	39-66	39-68	39-71	39-75
	39-83	39-87	39-89	39-103	39-105	39-109	39-111	39-118	39-188	39-190	39-192	39-194	39-196	39-204
	39-206	39-208	39-258	39-267	39-276	39-278	39-283	39-287	39-289	39-291	39-413	43-184#		
EMS505	39-7	43-185#												
EMS506	39-99	43-186#												
EMS507	39-101	43-187#												
EMS51	39-257	39-273	43-42#											
EMS510	39-280	43-188#												
EMS511	39-5	39-7	39-9	39-11	39-14	39-16	39-18	39-20	39-22	39-24	39-26	39-28	39-30	39-32
	39-34	39-36	39-38	39-40	39-42	39-44	39-46	39-49	39-51	39-53	39-55	39-57	39-59	39-61
	39-63	39-66	39-68	39-71	39-73	39-75	39-77	39-79	39-81	39-83	39-85	39-87	39-89	39-91
	39-93	39-95	39-97	39-99	39-101	39-103	39-105	39-107	39-109	39-111	39-113	39-115	39-118	39-120
	39-122	39-124	39-127	39-129	39-131	39-133	39-135	39-137	39-139	39-142	39-144	39-146	39-149	39-151
	39-153	39-155	39-157	39-159	39-161	39-164	39-166	39-168	39-171	39-173	39-175	39-178	39-180	39-183
	39-185	39-188	39-190	39-192	39-194	39-196	39-198	39-200	39-202	39-204	39-206	39-208	39-210	39-212
	39-214	39-216	39-218	39-220	39-222	39-224	39-226	39-228	39-230	39-232	39-234	39-236	39-239	39-241
	39-243	39-245	39-247	39-250	39-252	39-254	39-256	39-258	39-260	39-263	39-265	39-267	39-270	39-272
	39-274	39-276	39-278	39-280	39-283	39-285	39-287	39-289	39-291	39-293	39-296	39-298	39-300	39-302
	39-304	39-306	39-308	39-310	39-312	39-314	39-316	39-318	39-320	39-322	39-324	39-326	39-328	39-330
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	39-364	39-366	39-369	39-371	39-373	39-376	39-378	39-380	39-382	39-385	39-387	39-389	39-391	39-393
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EMS54	39-281	39-284	39-286	39-288	43-45#									
EMS55	39-290	43-46#												
EMS56	39-292	39-294	39-295	39-331	43-47#									
EMS57	39-297	43-49#												
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EMS600	39-262	39-264	39-266	39-412	43-192#									
EMS601	39-269	43-193#												
EMS602	39-271	39-273	43-194#											
EMS603	39-309	43-195#												
EMS604	39-338	39-340	39-343	39-345	39-347	39-349	39-352	43-196#						
EMS605	39-354	39-356	39-359	39-361	39-363	39-365	39-368	43-197#						
EMS606	39-370	39-372	39-375	39-377	39-379	39-381	39-384	39-386	43-198#					
EMS607	39-92	39-390	39-392	39-395	39-397	39-399	39-401	39-403	39-405	39-407	39-410	43-199#		
EMS61	39-301	43-51#												
EMS62	39-303	39-305	39-307	39-309	43-52#									
EMS63	39-311	39-313	39-315	39-317	39-319	39-321	39-323	39-325	39-345	39-361	39-377	43-53#		
EMS64	39-327	43-54#												
EMS65	39-329	39-332	43-55#											
EMS66	39-334	39-336	39-338	39-343	39-354	39-359	39-370	39-375	39-388	39-390	39-405	43-56#		
EMS67	39-352	39-368	39-386	39-403	43-57#									
EMS7	39-116	39-117	43-7#											
EMS70	39-37	39-136	39-384	39-410	43-59#									
EMS71	39-33	39-35	43-61#											
EMS72	39-33	39-35	43-62#											
EMS73	39-37	39-39	39-41	39-43	39-48	39-69	43-63#							
EMS74	39-37	43-64#												
EMS75	39-39	39-41	43-65#											
EMS76	39-43	39-48	43-66#											
EMS77	39-39	39-41	43-67#											
EMT1	8-3	39-3#												

CROSS REFERENCE TABLE (CREF V01-05)

EMT162 39-240#
EMT163 39-242#
EMT164 39-244#
EMT165 39-246#
EMT166 39-249#
EMT167 39-251#
EMT17 8-46 39-31#
EMT170 8-193 39-253#
EMT171 39-255#
EMT172 39-257#
EMT173 8-202 39-259#
EMT174 8-205 39-261#
EMT175 8-208 39-264#
EMT176 8-211 39-266#
EMT177 39-268#
EMT2 8-6 39-4#
EMT20 8-49 39-33#
EMT200 8-217 39-269#
EMT201 39-271#
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EMT203 39-275#
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EMT217 39-301#
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EMT231 39-321#
EMT232 39-323#
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EMT235 39-329#
EMT236 39-331#
EMT237 39-334#
EMT24 8-61 39-41#
EMT240 39-336#
EMT241 39-338#
EMT242 39-340#
EMT243 39-343#

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EMT245 39-347#
EMT246 39-349#
EMT247 39-352#
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EMT251 39-356#
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EMT301 39-410#
EMT302 8-214 39-412#
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EMT32 8-79 39-54#
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EMT35 8-88 39-60#
EMT36 8-91 39-62#
EMT37 8-94 39-64#
EMT4 8-12 39-8#
EMT40 8-97 39-67#
EMT41 8-100 39-69#
EMT42 8-103 39-72#
EMT43 8-106 8-109 39-74#
EMT44 39-76#
EMT45 8-112 39-78#
EMT46 8-115 39-80#
EMT47 8-118 39-82#
EMT5 8-15 39-10#
EMT50 8-121 39-84#
EMT51 8-124 39-86#
EMT52 8-127 39-88#
EMT53 39-90#

	37-67	37-68	37-69	37-70	37-71	37-72	37-73	37-74	37-75	37-76	37-77	37-78	37-79	37-80
	37-81	37-82	37-83	37-84	37-85	37-86	37-87	37-88						
OR	4-938#													
PACACK	4-708#	16-19	16-28	19-61	19-70									
PAKACK	4-707#	4-708												
PAR	4-776#													
PAT	4-941#													
PCLOCK	15-13	15-52#												
PCOUNT	15-15	15-69#												
PDA	4-826#	13-@23	13-@67	13-@77	13-@91	13-@92	13-@95	13-A15	13-C19	13-C23				
PFECH	30-67	30-172#												
PFECH1	30-172	30-173#												
PFECH2	30-172	30-176#												
PFECH3	30-172	30-179#												
PFECH4	30-172	30-181#												
PGE	4-935#													
PGM	4-756#													
PHA	4-827#	13-;96	13-<02	13-<62	13-<66	13-@23	13-A60	13-A62						
PIP	4-752#													
PIRQ	4-682#													
PIRQVE	4-682#													
PLCLK	15-54	15-58#												
PLFS	4-824#	13-840	13-879	13-881	13->50	13->53	13-?28	13-?35	13-B42	13-B49	13-B62	13-B68	13-B71	21-21
	22-10	22-13	22-14											
PLSTP	15-82	15-86#												
PR0	4-682#	11-49												
PR1	4-682#													
PR2	4-682#													
PR3	4-682#													
PR4	4-682#													
PR5	4-682#	15-64												
PR6	4-682#	9-26	15-9	15-16	15-30	15-62								
PR7	4-682#	15-61												
PS	4-682	4-682#												
PSEL	4-922#													
PSTOP	15-14	15-81#												
PSW	4-682#													
PUTBUF	7-0#													
PWRVEC	4-682#	9-23*	9-23*	34-1*	34-1*	34-1*	34-1*	34-1*	34-1*					
QUES	36-5#													
R6	4-682#	9-23	9-23*	9-23*										
R7	4-682#													
RD	4-723#	13-925	13-:03	13-B20										
RDCHR	10-12	10-65	10-82	31-1	33-1#									
RDLIN	32-1	33-1#												
RDOCT	10-35	10-49	33-1#											
RDY	4-925#													
READY	11-37#	14-16	14-20											
READY1	11-35	11-46#												
RECAL	4-701#													
RESREG	30-156	33-1#												
RESVEC	4-682#													
REX	4-822#													
RG	4-820#	19-90	19-95											
RH	4-724#	13-=38												
RIP	4-706#													
RLEASE	4-703#													

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TAG       4-865#
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TBITVE    4-682#
TIME      7-0#      15-58*    15-71*    15-73*
TKVEC     4-682#    31-1*     31-1*
TPVEC     4-682#
TRAPVE    4-682#    9-23*     9-23*
TRE       4-920#
TRTVEC    4-682#
TST       4-866#
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TST11     13-554#   28-1
TST12     13-601#   28-1
TST13     13-671#   28-1
TST14     13-746#   28-1
TST15     13-806#   28-1
TST16     13-917#   28-1
TST17     13-995#   28-1
TST2      13-73#    28-1
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TST22     13-=29#   28-1
TST23     13-?75#   28-1
TST24     13-B10#   28-1
TST3      13-106#   28-1
TST4      13-137#   28-1
TST5      13-159#   28-1
TST6      13-326#   28-1
TST7      13-518#   28-1
TSTNMB    30-44*    30-45*    30-47     30-159#
TSTQUE    7-0#      11-8      11-9*     11-50     11-58     13-1      13-73     13-106    13-137    13-159    13-326    13->18    13-543    13-554
          13-601    13-671    13-746    13-806    13-917    13-995    13-:37    13-;54    13-=29    13-?75    13-B10    14-11     14-13*    14-17
          14-17*    18-11
TYPBN     30-149    33-1#
TYPDS     14-20     14-20     30-143    33-1#
TYPE      9-6       9-28      9-42      9-48      9-53      9-59      9-60      9-77      9-81      9-83      9-108     9-114     9-117     9-123
          9-130     9-133     9-134     9-135     9-142     10-11     10-16     10-17     10-19     10-20     10-28     10-32     10-34     10-40
          10-44     10-48     10-54     10-61     10-62     10-64     10-69     10-75     10-86     10-87     10-92     10-101    11-3      11-6
          11-7      11-14     11-25     11-30     11-67     11-68     14-20     14-20     14-20     24-1      25-1      26-1      27-1      29-1
          29-1      30-20     30-21     30-39     30-40     30-46     30-51     30-53     30-61     30-104    30-110    30-114    30-126    30-132
          30-134    30-152    30-154    31-1      31-1      31-1      31-1      31-1      31-1      31-1      31-1      31-1      31-1      31-1
          31-1      31-1      31-1      31-1      31-1      31-1      31-1      33-1#     34-1
TYPOC     9-8       10-33     10-47     30-146    31-1      33-1#
TYPON     33-1#
TYPOS     9-45      9-56      9-82      11-16     11-69     30-22     30-47     30-52     30-54     33-1#
U0        4-945#
U1        4-945#
U2        4-945#
UNS       4-765#    13-150
UNTMSK    4-949#    13-12     13-33
UNTOFF    9-123     36-28#
UNTON     9-133     36-29#
UPE       4-932#
USE       4-888#
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$$CMTM   5-10#    6-0      6-0      6-0      6-0      6-0
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$$NEWT   4-682#  13-1     13-73    13-106   13-137   13-159   13-326   13-518   13-543   13-554   13-601   13-671   13-746   13-806
        13-917   13-995   13-:37   13-;54   13-=29   13-?75   13-B10
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.$APTH   4-674#   5-8
.$APTY   4-674#  35-1
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.$CMTA   4-671#   5-10
.$EOP    4-671#  14-20
.$ERRO   4-671#  29-1
.$POWE   4-673#  34-1
.$RDDE   4-672#
.$RDOC   4-672#  32-1
.$READ   4-672#  31-1
.$SAVE   4-673#  23-1
.$SCOP   4-671#  28-1
.$SIZE   4-673#
.$TRAP   4-673#  33-1
.$TYPB   4-672#  24-1
.$TYPD   4-672#  25-1
.$TYPE   4-671#  27-1
.$TYPO   4-672#  26-1
.EQUAT   4-670#   4-682
.HEADE   4-670#   4-678
.SETUP   4-670#   4-978
.SWRHI   4-670#   4-679
.SWRLO   4-670#   4-679#   4-680
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        13-442   13-464   13-480   13-495   13-545   13-608   13-677   13-748   16-14    19-19
CLKOFF   4-594#  13-572   13-591   19-94    19-102   20-17
CLKON    4-585#  13-569   13-588   19-88    20-14
CLKSNC   4-654#  13-@04   13-B31   13-B78
COMMEN   4-682#
ENBSCH   4-620#  13-564   13-635   13-690   13-816   13-927   13-:05   13-:47   13-;72   13-=40   13-?95   13-B22
ENDCOM   4-682#
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         8-43     8-46     8-49     8-52     8-55     8-58     8-61     8-64     8-67     8-70     8-73     8-76     8-79     8-82
         8-85     8-88     8-91     8-94     8-97     8-100    8-103    8-106    8-109    8-112    8-115    8-118    8-121    8-124
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         8-169    8-172    8-175    8-178    8-181    8-184    8-187    8-190    8-193    8-196    8-199    8-202    8-205    8-208
         8-211    8-214    8-217
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        13-690   13-710   13-731   13-763   13-774   13-787   13-800   13-816   13-819   13-846   13-884   13-910   13-927   13-930
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        13-?60   13-?72   13-?95   13-?98   13-@01   13-@04   13-@31   13-@45   13-@81   13-@98   13-A27   13-A56   13-A81   13-B00
        13-B22   13-B25   13-B28   13-B31   13-B53   13-B74   13-B78   13-C28   13-C38   13-C51   13-C67   13-C82   13-D01   28-1
ESCAPE   4-682#
GETAS    4-272#
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