Program Number B06-162R01

02·340 MEMORY TEST PROGRAM

Consists of:

Test Program Description	B06-162M95R01A15
Test Program Listing	06-162F01M96R01A13
Test Program Listing	06-162F02M96R01A13
Test Program Tape	06-162F01M17R01
Test Program Tape	06-162F02M17R01

PERKIN-ELMER

Computer Systems Division
2 Crescent Place
Oceanport, N.J. 07757

02-340 MEMORY TEST PROGRAM DESCRIPTION

02-340 MEMORY TEST 06-162R01

Related Documents

The following documents are related to the 02-340 Memory Test

02-340 Memory Test Program Listing	06-162F01M96R01A13
02-340 Memory Test Program Listing	06-162F02M96R01A13
02-340 Memory Test Program Tape	06-162F01M17R01
02-340 Memory Test Program Tape	06-162F02M17R01
Memory Test Program Tape	06-003M10
Memory Test Program Description	06-003M95A15
Memory Test Program Listing	06-003M96A13

PURPOSE OF TEST

This test is designed to test the worst case patterns for 32KB core memory, Part Numbers, 02-340F01 and F02, and 02-341F01 and F02. This test supplements and should be run along with the 06-003 Memory Test to test this memory.

The test is designed in two parts. Part 1 loads into the low core and checks the core locations from Top of Program to Top of Memory. Part 2 loads starting at Memory Location X'1000' and tests the low core. There are a total of 16 subtests in each part and 16 different data patterns are used to test the memory. The data patterns loaded depend on the condition of the addressing lines MA060, MA100, MA110,and MA130 (MA060 is Bit-6, MA110 is Bit-11, MA100 is Bit-10, and MA130 is Bit-13 in the 16-Bit address of a Memory Location). The data loaded is either X'0000' or X'FFFF'. Refer to Appendix 3.

Example:

In Test 6, when Exclusive OR of Bit 6 and Bit-10 is the same as Exclusive OR of Bit-11 and Bit-13, the data written is equal to 0. Otherwise, the data written is equal to X'FFFF'.

Each pattern in Appendix 3 is used to test into the core. The complement of the pattern is loaded into the same location, read back, and checked. The pattern is reloaded into the same location, read back, and checked.

MINIMUM HARDWARE REQUIRED

The following is a list of the minimum hardware required.

1. Model 7/16 Basic Processor or equivalent.
2. Minimum of 32KB Memory.
3. Teletype (Device No. X'02') or CRT (PASLA Device No. X'10' and X'11').
4. Console Panel is optional.

REQUIREMENTS OF MACHINE UNDER TEST

The following lists the requirements of the machine under test.

1. The Teletype must be connected at a Device Address of X'02'. If the Teletype address is different, memory location labeled TTYADR must be changed.
2. The CRT on PASLA must be connected at a device address of X'10' and X'11'. If the PASLA address is different, memory location labeled CRTADR must be changed. If the CRT is on a Current Loop Interface, it is treated the same as a TTY.
3. Memory Location "IO" must be X'0202' for a TTY or X'0101' for a CRT on PASLA (see Appendix 1).
4. This test assumes that the Memory Test (06-003) and the Processor Test (06-106)are run prior to running this test, without detecting a failure.

LOADING PROCEDURES

This Test Program Tape is divided into two parts. Each part is in M17 format and can be loaded using the standard 50 sequence. Refer to the Figure in Appendix 2.

To load Part 1: Place the tape (06-162F01M17R01) in the reader. Load and execute the 50 Sequence. When Part 1 is loaded, the following title is printed: 02-340 06-162R01 PART 1.

To load Part 2: Place the tape (06-162F02M17R01) in the reader. Load and execute the 50 Sequence. When Part 2 is loaded, the following title is printed: 02-340 06-162R01 PART 2.

OPERATING PROCEDURES

Normal Testing

Part 1

When the title is printed, the program determines the Top of Core and stores it at Memory Location labeled MAXMEM. It then executes Tests 0 through 15 and checks the memory for 16 different data patterns shown in Appendix 3. Location LOADR is set to the memory address of top of program (LAST +2) and HIADR is set to Top of Core. The memory tested consists of all the Memory Locations from LOADR to HIADR.

If no errors are detected, characters NO ERROR are printed. Refer to the Section on Error Procedures in the case of errors.

Part 2

When the title is printed, the program executes Tests 0 through 15 as in Part 1. LOADR is set to ZERO and HIADR is set to X'0FFF'. The memory tested consists of all the Memory Locations from LOADR to HIADR.

If no errors are detected, characters NO ERROR are printed. Refer to the Section on Error Procedures in the case of an error.

Optional Testing

1. In order to inhibit all the printouts and run either Part 1 or Part 2 continuosly, the Teletype only can be turned OFF. When this is done, all the tests are run continuously. The program counts the total number of times the test is repeated in Memory Location labeled TOTAL. If an error is detected, the count in Memory Location labeled TOTERR is incremented. The contents of TOTAL and TOTERR are continuously copied into Console Panel Display 1 and 2 respectively.

2. Part 1 and Part 2 check the Memory Locations from LOADR to HIADR. In Part 1, LOADR and HIADR are set to check the memory from Top of the Program to the Top of Core. These locations in memory can be changed to any other value to loop on smaller memory locations. However, HIADR must be greater than or equal to LOADR and both must fall in the Memory Locations from Top of Program to Top of Memory in Part 1. In Part 2, they must fall within Memory Locations X'0' through X'0FFF'. If the values lie outside of these areas in any part, when the program execution is started from ORG+4, the program changes these values back to their default values.

ERROR PROCEDURES

1. If an error is detected and the Console Device is ON, the error message is printed as shown below:

   XXXX YYYY ZZZZ

   where XXXX = contents of Register 4
   = address of the memory location

   YYYY = contents of Register 9
   = expected data at Location XXXX

   ZZZZ = contents of Register 10
   = error data read from Location XXXX

2. If an error is detected, Memory Location TOTERR contains a non-zero number. When the test is completed, characters ERRORS are output to indicate to the user that the test is complete.

3. The size of the memory which is tested can be changed by changing the two locations LOADR and HIADR as explained in the Section on Optional Testing. When this is done, the starting address for the test is X'84' for Part 1 and X'1004' for Part 2. The Teletype only can be turned OFF to inhibit printouts and make measurements.

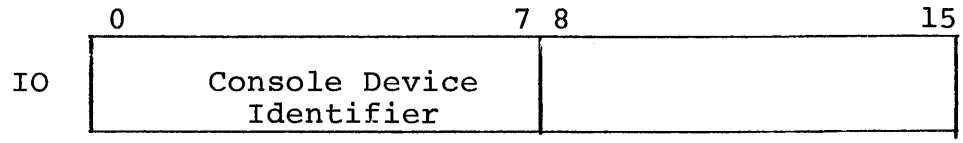
PROGRAMMING NOTES

For Model 70 with 65K bytes of memory, approximate execution time is one minute for Part 1 and thirty seconds for Part 2.

APPENDIX 1

CONSOLE DEVICE DEFINITION

The halfword labelled IO (see the listing) has the default value for the Teletype as the console device. If the configuration is different, it must be changed as follows:



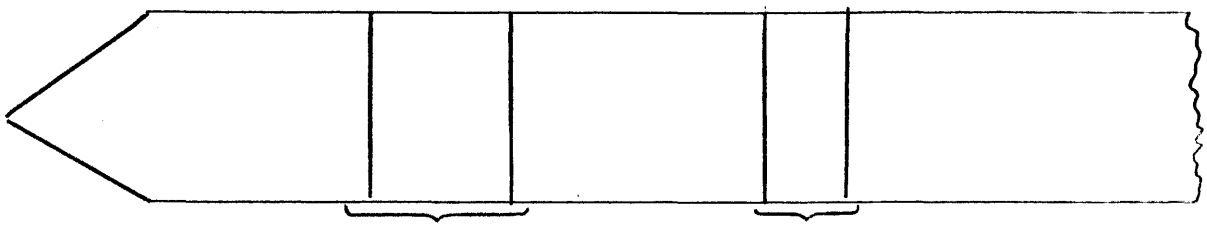
Console Device Identifier	Explanation
X'01'	GDT/CRT on PASLA/PALM Interface, strapped for FDX and the highest baud rate.
X'02'	TTY on TTY Interface GDT/CRT on Current Loop Interface
0,X'03-X'FF'	Reserved. The program defaults it to 2.

The Teletype or Current Loop Interface, if used, should be strapped for the Device Address of X'02'. If it is different, the halfword labelled TTYADR (see the listing) must be changed accordingly.

The GDT (Graphic Display Terminal) or CRT, if used on PASLA Interface, should be strapped for the Device Address of X'10' and X'11' for receiving and transmitting side respectively. If it is different, the halfword labelled CRTADR (see the listing) must be changed accordingly.

APPENDIX 2

Program Tape



APPENDIX 3

Test No.	Exclusive OR of Bits 6 and 10 of the Address	Exclusive OR of Bits 11 and 13 of the Address	Data Written into that Address
0	-	-	0
1	0 1 1	- 0 1	0 0 X'FFFF'
2	0 1 1	- 0 1	0 X'FFFF' 0
3	0 1	- -	0 X'FFFF'
4	0 0 1	0 1 -	0 X'FFFF' 0
5	- -	0 1	0 X'FFFF'
6	0 0 1 1	0 1 0 1	0 X'FFFF' X'FFFF' 0
7	0 0 1	0 1 -	0 X'FFFF' X'FFFF'
8	0 0 1	0 1 -	X'FFFF' 0 0
9	0 0 1 1	0 1 0 1	X'FFFF' 0 0 X'FFFF'

Test No.	Exclusive OR of Bits 6 and 10 of the Address	Exclusive OR of Bits 11 and 13 of the Address	Data Written into that Address
10	- -	0 1	X'FFFF' 0
11	0 0 1	0 1 -	X'FFFF' 0 X'FFFF'
12	0 1	- -	X'FFFF' 0
13	0 1 1	- 0 1	X'FFFF' 0 X'FFFF'
14	0 1 1	- 0 1	X'FFFF' X'FFFF' 0
15	-	-	X'FFFF'

PROG= M02P1   ASSEMBLED BY CAL 03-066R05-00   (32-BIT)

```
**06162101

           SCRAT                                                                  M0210010
           CROSS                                                                  M0210020
           WIDTH 120                                                              M0210030
           TARGT 16                                                               M0210040
           SQCHK                                                                  M0210045
M02P1      PROG  02-340 MEMORY TEST 06-162F01M96R01A13        PART 1             M0210050
*                                                                                 M0210060
*          COPYRIGHT INTERDATA , INC.      JULY, 1975                             M0210070
*                                                                                 M0210080
*          PROGRAM USES MODEL 7/16 BASIC INSTRUCTION SET                          M0210090
*                                                                                 M0210100
*          THIS PROGRAM IS DESIGNED TO TEST THE 32 KB CORE MEMORY                 M0210110
*                                                                                 M0210120
*          PART NUMBERS  02-340F01 , F02; 02-341F01 ,F02                          M0210130
*                                                                                 M0210140
*          FOR ITS WORST CASE PATTERNS, THIS TEST SHOULD BE RUN IN                M0210150
*                                                                                 M0210160
*          ADDITION TO MEMORY TEST 06-003 TO CHECK THIS MEMORY                    M0210170
*                                                                                 M0210180
*          THE PROGRAM IS DIVIDED INTO 2 PARTS.                                   M0210190
*                                                                                 M0210200
*          PART 1 LOADS INTO LOW CORE X'100' THRU X'4CF'                          M0210210
*                                                                                 M0210220
*          AND CHECKS THE HIGH CORE FROM X'4D0' TO TOP OF CORE                    M0210230
*                                                                                 M0210240
*          PART 2 LOADS INTO HIGH CORE FROM X'1000' THRU X'1387'                  M0210250
*                                                                                 M0210260
*          AND CHECKS THE LOW CORE FROM X'0000' THRU X'0FFF'                      M0210270
*                                                                                 M0210280
*          THE PROGRAM LOADS WITH THE STANDARD 50 SEQUENCE AND                    M0210290
*                                                                                 M0210300
*          REQUIRES A TELETYPE AT DEVICE ADDRESS OF X'02' OR                      M0210310
*                                                                                 M0210320
*          CRT AT PASLA DEVICE ADDRESS OF X'10' & X'11'.                          M0210330
*                                                                                 M0210340
*                 BIT 6 = BIT6 OF ADDRESS IN R4                                   M0210350
*                 BIT10 = BIT10 OF ADDRESS IN R4                                  M0210360
*                 BIT11 = BIT11 OF ADDRESS IN R4                                  M0210370
*                 BIT12 = EXCLUSIVE OR OF BITS 6 & 10 OF ADDRESS IN R4            M0210380
*                 BIT13 = BIT13 OF ADDRESS IN R4                                  M0210390
*                 BIT34 = EXCLUSIVE OR OF BITS 11 & 13 OF ADDRESS IN R4           M0210400
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MEMORY LOADER

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                              44  *                                                            M0210420
     0000 0000                45  R0      EQU  0          SCRT.REG.                            M0210430
     0000 0001                46  R1      EQU  1          CONTAINS 1 FOR CONSOLE ADDRESS       M0210440
     0000 0002                47  R2      EQU  2          CONTAINS TTYADR                      M0210450
     0000 0003                48  R3      EQU  3          TTY STATUS                           M0210460
     0000 0004                49  R4      EQU  4          ADR. OF MEM. LOC. TESTED             M0210470
     0000 0005                50  R5      EQU  5          DATA PATTERN FOR BIT12 =0 & BIT34 =0 M0210480
     0000 0006                51  R6      EQU  6          DATA PATTERN FOR BIT12 =0 & BIT34 =1 M0210490
     0000 0007                52  R7      EQU  7          DATA PATTERN FOR BIT12 =1 & BIT34 =0 M0210500
     0000 0008                53  R8      EQU  8          DATA PATTERN FOR BIT12 =1 & BIT34 =1 M0210510
     0000 0009                54  R9      EQU  9          CORRECT DATA EXPECTED AT LOC. 0(R4)  M0210520
     0000 000A                55  R10     EQU  10         DATA READ FROM TEST LOC. 0(R4)       M0210530
     0000 000B                56  R11     EQU  11         BITS 6 & 10 SET IN THIS HALFWORD     M0210540
     0000 000C                57  R12     EQU  12         BITS 11 & 13 SET IN THIS HALFWORD    M0210550
     0000 000D                58  R13     EQU  13                                              M0210560
     0000 000E                59  R14     EQU  14                                              M0210570
     0000 000F                60  R15     EQU  15         RETURN ADDRESS ERR.RTN.              M0210580
                              61  *                                                            M0210590
0000R                         62          ORG  X'80'                                           M0210600
                              63  *                                                            M0210610
0080 C810 0100                64  STLDR   LHI  R1,FIRST   LOAD STARTING ADDRESS                M0210620
0084 2421                     65          LIS  R2,1       BXLE INDEX VALUE                     M0210630
0086 C830 04F3                66          LHI  R3,QRT     LOAD ENDING ADDRESS                  M0210640
008A 2480                     67          LIS  R8,0       ZERO CHKSUM REGISTER                 M0210650
008C D340 0078                68          LB   R4,X'78'   LOAD INPUT DEVICE ADDRESS            M0210660
0090 DE40 0079                69          OC   R4,X'79'   READ MODE                            M0210670
0094 9D45                     70  SENSES  SSR  R4,R5                                           M0210680
0096 2081                     71          BTBS 8,1        WAIT FOR BUSY = 0                    M0210690
0098 9B46                     72          RDR  R4,R6      READ                                 M0210700
009A 0866                     73          LHR  R6,R6                                           M0210710
009C 2234                     74          BZS  SENSES     WAIT FOR NON-ZERO CHARACTER          M0210720
009E D261 0000                75  STBYTE  STB  R6,0(R1)   STORE DATA BYTE                      M0210730
00A2 9D45                     76          SSR  R4,R5                                           M0210740
00A4 2081                     77          BTBS 8,1        WAIT FOR BUSY = 0                    M0210750
00A6 D361 0000                78          LB   R6,0(R1)   LOAD BYTE FROM MEMORY                M0210760
00AA 0786                     79          XHR  R8,R6      COMPUTE CHKSUM                       M0210770
00AC 9471                     80          EXBR R7,R1      READY LOC                            M0210780
00AE 9827                     81          WHR  R2,R7      DISPLAY LOC                          M0210790
00B0 9B46                     82          RDR  R4,R6      READ NEXT DATA BYTE                  M0210800
00B2 C110 009E                83          BXLE R1,STBYTE  REPEAT UNTIL END                     M0210810
00B6 CB80 005A                84          SHI  R8,X'5A'   IS CHKSUM OK ?                       M0210820
00BA 2132                     85          BNZS HALTON     NO, HALT PROCESSOR                   M0210830
00BC 9828                     86          WHR  R2,R8      YES, ZERO DISPLAY                    M0210840
00BE C860 8000                87  HALTON  LHI  R6,X'8000'                                      M0210850
00C2 9576                     88          EPSR R7,R6      HALT PROCESSOR                       M0210860
00C4 4300 0050                89          B    X'50'      REPEAT LOADING SEQUENCE              M0210870
                              90  *                                                            M0210880
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                                   92  *                                                                   M0210900
 00C8                              93            ORG    X'100'                                             M0210910
                                   94  *                                                                   M0210920
 0100   4300 0122                  95  FIRST     B      START1            TO TEST FROM LOADR THRU MAXMEM   M0210930
 0104   4300 0126                  96            B      START2            TO TEST FROM LOADR THRU HIADR    M0210940
                                   97  *                                                                   M0210950
 0108   A498                       98  READ      DC     X'A498'           READ I/O COMMAND                 M0210960
        0000 0109                  99  WRITE     EQU    *-1               WRITE I/O COMMAND                M0210970
 010A   04F4                      100  LOADR     DC     LAST+2                                             M0210980
 010C   3FFE                      101  HIADR     DC     X'3FFE'                                            M0210990
 010E   3FFE                      102  MAXMEM    DC     X'3FFE'           PROGRAM PUTS ACTUAL TOP OF CORE HERE M0211000
                                  103  *                                                                   M0211010
 0110   0202                      104  IO        DC     X'0202'           I/O POINTER                      M0211020
                                  105  *                                                                   M0211030
 0112   1011                      106  CRTADR    DC     X'1011'           PASLA ADDRESS                    M0211040
 0114   0202                      107  TTYADR    DC     X'0202'           TTY ADDRESS                      M0211050
                                  108  *                                                                   M0211060
 0116   0000                      109  CRTFLG    DC     X'0'              PASLA FLAG                       M0211070
 0118   00                        110  ADDRESS   DB     X'0'              I/O DEVICE ADDRESS               M0211080
 0119   F8                        111  PADSET    DB     X'F8'             PASLA SPEED COMMAND              M0211090
 011A   B9AB                      112  READ1     DC     X'B9AB'           PASLA COMMANDS                   M0211100
 011C   A498                      113  READ2     DC     X'A498'           TTY COMMANDS                     M0211110
                                  114  *                                                                   M0211120
 011E   0220                      115  BIT12     DC     X'220'            BITS 6 & 10 ARE SET              M0211130
 0120   0014                      116  BIT34     DC     X'14'             BITS 11 & 13 ARE SET             M0211140
                                  117  *                                                                   M0211150
                                  118  *                                                                   M0211160
 0122   2480                      119  START1    LIS    R8,0                                               M0211170
 0124   2302                      120            BS     START                                              M0211180
 0126   2481                      121  START2    LIS    R8,1                                               M0211190
        0000 0128                 122  START     EQU    *                                                  M0211200
 0128   C200 012C                 123            LPSW   ZERO                                               M0211210
 012C   0000                      124  ZERO      DC     0,CKIO            PSW = 0000                       M0211220
 012E   0130
 0130   D330 0110                 125  CKIO      LB     R3,IO             WHICH I/O DEVICE ?               M0211230
 0134   C530 0001                 126            CLHI   R3,X'01'                                           M0211240
 0138   213F                      127            BNES   TTY                                                M0211250
                                  128  *                                                                   M0211260
 013A   4830 011A                 129  CRT       LH     R3,READ1          CRT ON PASLA                     M0211270
 013E   4030 0108                 130            STH    R3,READ                                            M0211280
 0142   243F                      131            LIS    R3,X'F'                                            M0211290
 0144   4030 0116                 132            STH    R3,CRTFLG                                          M0211300
 0148   D330 0112                 133            LB     R3,CRTADR                                          M0211310
 014C   D230 0118                 134            STB    R3,ADDRESS                                         M0211320
 0150   DE30 0119                 135            OC     R3,PADSET                                          M0211330
 0154   230C                      136            BS     EXECUTE                                            M0211340
                                  137  *                                                                   M0211350
 0156   4830 011C                 138  TTY       LH     R3,READ2          TTY                              M0211360
 015A   4030 0108                 139            STH    R3,READ                                            M0211370
 015E   2430                      140            LIS    R3,0                                               M0211380
 0160   4030 0116                 141            STH    R3,CRTFLG                                          M0211390
 0164   D330 0114                 142            LB     R3,TTYADR                                          M0211400
 0168   D230 0118                 143            STB    R3,ADDRESS                                         M0211410
                                  144  *                                                                   M0211420
        0000 016C                 145  EXECUTE   EQU    *                                                  M0211430
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016C  41E0 046A          146          BAL   R14,PRINT          "02-340  PART 1  06-162F01R01"   M0211440
0170  04A8               147          DC    Z(TITLE)                                          M0211450
0172  04C7               148          DC    Z(TITEND)                                         M0211460
      0000 0174          149  CNTNU   EQU   *                                                 M0211470
                         150  *                                                               M0211480
                         151  *       SEARCH TOP OF CORE AND STORE AT MAXMEM                   M0211490
                         152  *                                                               M0211500
      0000 0174          153  TOPMEM  EQU   *                  DETECT TOP OF CORE             M0211510
0174  C810 04F4          154          LHI   R1,LAST+2                                         M0211520
0178  C800 A5A5          155          LHI   R0,X'A5A5'                                        M0211530
017C  4001 0000          156  RDTOP   STH   R0,0(R1)           STORE PATTERN IN MEMORY        M0211540
0180  4831 0000          157          LH    R3,0(R1)           READ PATTERN                   M0211550
0184  0503               158          CLHR  R0,R3              IF PATTERN READ DIFFERENT      M0211560
0186  2134               159          BNES  FOUND              LOCATION NOT IN MEMORY         M0211570
0188  2612               160          AIS   R1,2                                              M0211580
018A  4230 017C          161          BNZ   RDTOP                                             M0211590
018E  2712               162  FOUND   SIS   R1,2                                              M0211600
0190  4010 010E          163          STH   R1,MAXMEM          MAXMEM = LARGEST AVAIL. HALFWORD M0211610
0194  0888               164          LHR   R8,R8                                             M0211620
0196  2133               165          BNZS  CHKLO                                             M0211630
0198  4010 010C          166          STH   R1,HIADR                                          M0211640
                         167  *                                                               M0211650
                         168  *                                                               M0211660
      0000 019C          169  CHKLO   EQU   *                  CHECK LO AND HI ADDRESSES      M0211670
019C  C850 FFFE          170          LHI   R5,X'FFFE'                                        M0211680
01A0  4800 010A          171          LH    R0,LOADR           BOTH MUST LIE OUTSIDE THE PROGRAM M0211690
01A4  0405               172          NHR   R0,R5              R0 = EVEN ADR.                 M0211700
01A6  C500 04F4          173          CLHI  R0,LAST+2          IF LOADR < LAST +2             M0211710
01AA  2383               174          BNLS  CHKL03             LOADR FALLS IN THE PROGRAM     M0211720
01AC  C800 04F4          175          LHI   R0,LAST+2          SET LOADR TO LAST+2            M0211730
01B0  4000 010A          176  CHKL03  STH   R0,LOADR           RESTORE LOADR                  M0211740
01B4  4830 010C          177          LH    R3,HIADR           R3 = HIADR                     M0211750
01B8  0435               178          NHR   R3,R5                                             M0211760
01BA  0530               179          CLHR  R3,R0              IF HIADR < LOADR               M0211770
01BC  2185               180          BLS   RSTHI                                             M0211780
01BE  4530 010E          181          CLH   R3,MAXMEM          IF HIADR > MAXMEM              M0211790
01C2  2334               182          BES   STORHI                                            M0211800
01C4  2183               183          BLS   STORHI                                            M0211810
01C6  4830 010E          184  RSTHI   LH    R3,MAXMEM          SET HIADR TO MAXMEM            M0211820
01CA  4030 010C          185  STORHI  STH   R3,HIADR                                          M0211830
                         186  *                                                               M0211840
                         187  *                                                               M0211850
      0000 01CE          188  TEST    EQU   *                                                 M0211860
01CE  2411               189          LIS   R1,1               LOAD DISPLAY ADDRESS           M0211870
01D0  D320 0116          190          LB    R2,ADDRESS         LOAD I/O DEVICE ADDRESS        M0211880
01D4  2400               191          LIS   R0,0                                              M0211890
01D6  4000 04DC          192          STH   R0,TOTAL           ZERO TOTAL                     M0211900
01DA  4000 04DE          193          STH   R0,TOTERR          ZERO TOTAL ERRORS              M0211910
01DE  4000 04D8          194          STH   R0,STSCHK          ZERO DU FLAG                   M0211915
01E2  DE10 04DB          195          OC    R1,INCRM           DISPLAY IN INCREMENTAL MODE    M0211916
01E6  9810               196          WHR   R1,R0              ZERO DISPLAY                   M0211917
01E8  9810               197          WHR   R1,R0                                             M0211918
01EA  DE10 04DA          198          OC    R1,NORM            DISPLAY IN NORMAL MODE         M0211919
01EE  48B0 011E          199          LH    R11,BIT12          HEX 220 IN R11                 M0211920
01F2  48C0 0120          200          LH    R12,BIT34          HEX 14 IN R12                  M0211930
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01F6  2450          201  TEST0   LIS   R5,0                                    M0211940
01F8  0865          202           LHR   R6,R5                                   M0211950
01FA  0875          203           LHR   R7,R5                                   M0211960
01FC  0885          204           LHR   R8,R5          R5=R6=R7=R8=0            M0211970
01FE  4100 02E8     205           BAL   R0,LODTA                                M0211980
0202  2450          206  TEST1   LIS   R5,0           R5 = 0                   M0211990
0204  0865          207           LHR   R6,R5          R6 = 0                   M0212000
0206  0875          208           LHR   R7,R5          R7 = 0                   M0212010
0208  2581          209           LCS   R8,1           R8 = FFFF                M0212020
020A  4100 02E8     210           BAL   R0,LODTA                                M0212030
020E  2571          211  TEST2   LCS   R7,1           R5=R6=0, R7 = FFFF       M0212040
0210  2480          212           LIS   R8,0           R8=0                     M0212050
0212  4100 02E8     213           BAL   R0,LODTA                                M0212060
0216  2581          214  TEST3   LCS   R8,1           R8=FFFF, R5=R6=0,R7=FFFF M0212070
0218  4100 02E8     215           BAL   R0,LODTA                                M0212080
021C  2561          216  TEST4   LCS   R6,1           R6=FFFF ,R5=0            M0212090
021E  2470          217           LIS   R7,0           R7=0                     M0212100
0220  0887          218           LHR   R8,R7          R8=0                     M0212110
0222  4100 02E8     219           BAL   R0,LODTA                                M0212120
0226  2581          220  TEST5   LCS   R8,1           R8=FFFF,R5=0,R6=FFFF,R7=0 M0212130
0228  4100 02E8     221           BAL   R0,LODTA                                M0212140
022C  2571          222  TEST6   LCS   R7,1           R7=FFFF, R5=0 ,R6=FFFF   M0212150
022E  0885          223           LHR   R8,R5          R8=0                     M0212160
0230  4100 02E8     224           BAL   R0,LODTA                                M0212170
0234  2581          225  TEST7   LCS   R8,1           R8=FFFF,R5=0,R6=FFFF,R7=FFFF M0212180
0236  4100 02E8     226           BAL   R0,LODTA                                M0212190
023A  2551          227  TEST8   LCS   R5,1           R5=FFFF                  M0212200
023C  2460          228           LIS   R6,0           R6=0                     M0212210
023E  0876          229           LHR   R7,R6          R7=0                     M0212220
0240  0886          230           LHR   R8,R6          R8=0                     M0212230
0242  4100 02E8     231           BAL   R0,LODTA                                M0212240
0246  2581          232  TEST9   LCS   R8,1           R8=FFFF,R5=FFFF,R6=0,R7=0 M0212250
0248  4100 02E8     233           BAL   R0,LODTA                                M0212260
024C  2571          234  TEST10  LCS   R7,1           R7=FFFF,R5=FFFF,R6=0     M0212270
024E  0886          235           LHR   R8,R6          R8=0                     M0212280
0250  4100 02E8     236           BAL   R0,LODTA                                M0212290
0254  2581          237  TEST11  LCS   R8,1           R8=FFFF,R5=FFFF,R6=0,R7=FFFF M0212300
0256  4100 02E8     238           BAL   R0,LODTA                                M0212310
025A  2561          239  TEST12  LCS   R6,1           R6=FFFF,R5=FFFF          M0212320
025C  2470          240           LIS   R7,0           R7=0                     M0212330
025E  0887          241           LHR   R8,R7          R8=0                     M0212340
0260  4100 02E8     242           BAL   R0,LODTA                                M0212350
0264  2581          243  TEST13  LCS   R8,1           R8=FFFF,R5=R6=FFFF,R7=0  M0212360
0266  4100 02E8     244           BAL   R0,LODTA                                M0212370
026A  0875          245  TEST14  LHR   R7,R5          R7=FFFF,R5=R6=FFFF       M0212380
026C  2480          246           LIS   R8,0           R8=0                     M0212390
026E  4100 02E8     247           BAL   R0,LODTA                                M0212400
0272  0885          248  TEST15  LHR   R8,R5          R5 = R6 = R7 = R8 = FFFF M0212410
0274  4100 02E8     249           BAL   R0,LODTA                                M0212420
                    250  *                                                     M0212430
                    251  *                                                     M0212440
                    252  *                                                     M0212450
                    253  *                                                     M0212460
      0000 0278     254  TSTEND  EQU   *                                       M0212464
0278  D320 0118     255           LB    R2,ADDRESS     LOAD I/O DEVICE ADDRESS  M0212466
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027C 9023           256          SSR   R2,R3                                          M0212470
027E 4310 02A2      257          BFC   1,DONE                                         M0212480
0282 4010 04D8      258          STH   R1,STSCHK          SET DU FLAG                 M0212485
0286 6110 04DC      259 INCRE    AHM   R1,TOTAL           TOTAL=TOTAL+1               M0212490
     0000 028A      260 REPEAT   EQU   *                                             M0212500
028A DE10 04DB      261          OC    R1,INCRM           DISPLAY IN INCREMENTAL MODE M0212510
028E 4800 04DE      262          LH    R0,TOTERR                                      M0212520
0292 9400           263          EXBR  R0,R0                                          M0212530
0294 9810           264          WHR   R1,R0              DISPLAY 2 = TOTERR          M0212540
0296 4800 04DC      265          LH    R0,TOTAL                                       M0212550
029A 9400           266          EXBR  R0,R0                                          M0212560
029C 9810           267          WHR   R1,R0              DISPLAY 1 = TOTAL           M0212570
029E 4300 01F6      268          B     TEST0                                          M0212580
     0000 02A2      269 DONE     EQU   *                                             M0212590
02A2 4800 04DE      270          LH    R0,TOTERR                                      M0212600
02A6 2136           271          BNZS  ERRPR              BRANCH IF ERROR             M0212610
02A8 41E0 046A      272          BAL   R14,PRINT          "NO ERROR"                  M0212620
02AC 04E2           273          DC    Z(NOERR)                                       M0212630
02AE 04F3           274          DC    Z(NOERRD)                                      M0212640
02B0 2305           275          BS    END                                            M0212650
02B2 41E0 046A      276 ERRPR    BAL   R14,PRINT          "ERROR"                     M0212660
02B6 04E8           277          DC    Z(ERR)                                         M0212670
02B8 04F3           278          DC    Z(NOERRD)                                      M0212680
02BA D320 0118      279 END      LB    R2,ADDRESS                                     M0212690
02BE DE20 0108      280          OC    R2,READ            READ IN BLK. MODE           M0212700
02C2 9D23           281 END2     SSR   R2,R3              R3 = TTY STATUS             M0212710
02C4 4380 02CE      282          BFC   8,CHKEY            BUSY = READ                 M0212720
02C8 4210 0128      283          BTC   1,START            DU = RESTART                M0212730
02CC 2205           284          BS    END2               SSR UNTIL BUSY              M0212740
02CE 9B23           285 CHKEY    RDR   R2,R3              R3 = KEY DEPRESSED          M0212750
02D0 C430 007F      286          NHI   R3,X'7F'           ZERO OUT PARITY             M0212760
02D4 C530 000D      287          CLHI  R3,13              IS IT CR KEY ?              M0212770
02D8 4330 0128      288          BE    START              YES , REPEAT THE TEST       M0212780
02DC C530 000A      289          CLHI  R3,10              IS IT LF KEY ?              M0212790
02E0 4230 02BA      290          BNE   END                NO , WAIT FOR ANOTHER KEY   M0212800
02E4 4300 0050      291          B     X'50'              YES , LOAD PART 2           M0212810
                    292 *                                                            M0212820
                    293 *                                                            M0212830
                    294 *          LOAD THE DATA PATTERN IN ADDRESS SPECIFIED BY R4  M0212840
                    295 *          IF BIT12 = 0 & BIT34 = 0 , LOAD R5                M0212850
                    296 *          IF BIT12 = 0 & BIT34 = 1 , LOAD R6                M0212860
                    297 *          IF BIT12 = 1 & BIT34 = 0 , LOAD R7                M0212870
                    298 *          IF BIT12 = 1 & BIT34 = 1 , LOAD R8                M0212880
                    299 *                                                            M0212890
                    300 *                                                            M0212900
     0000 02E8      301 LODTA    EQU   *                                             M0212910
02E8 4000 04E0      302          STH   R0,NXTST           R0 = ADD. OF NEXT TEST      M0212920
02EC 4840 010A      303          LH    R4,LOADR                                       M0212930
     0000 02F0      304 LODTA0   EQU   *                                             M0212940
02F0 0804           305          LHR   R0,R4                                          M0212950
02F2 040B           306          NHR   R0,R11             BITS 6 & 10 BOTH 0 ?        M0212960
02F4 2334           307          BZS   BT1ZRO                                         M0212970
02F6 050B           308          CLHR  R0,R11             BITS 6 & 10 BOTH 1 ?        M0212980
02F8 4230 0312      309          BNE   BT1ONE                                         M0212990
02FC 0804           310 BT1ZRO   LHR   R0,R4              EXCLUSIVE OR OF BITS 6 & 10 IS 0 M0213000
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02FE  040C            311          NHR   R0,R12          BITS 11 & 13 BOTH 0 ?                  M0213010
0300  2134            312          BNZS  BT0CH2                                                   M0213020
0302  4054 0000        313  BT00    STH   R5,0(R4)        EXCLUSIVE OR OF BITS 11 & 13 IS 0      M0213030
0306  2305            314          BS    LDTA2                                                    M0213040
0308  050C            315  BT0CH2  CLHR  R0,R12          BITS 11 & 13 BOTH 1 ?                  M0213050
030A  2234            316          BES   BT00                                                     M0213060
030C  4064 0000        317  BT01    STH   R6,0(R4)                                               M0213070
0310  2306            318  LDTA2   BS    LDTA3                                                    M0213080
0312  0804            319  BT1ONE  LHR   R0,R4           EXCLUSIVE OR OF BITS 6 & 10 IS 1       M0213090
0314  040C            320          NHR   R0,R12          BITS 11 & 13 BOTH 0 ?                  M0213100
0316  2134            321          BNZS  BT1CH2                                                   M0213110
0318  4074 0000        322  BT10    STH   R7,0(R4)        EXCLUSIVE OR OF BITS 11 & 13 IS 0      M0213120
031C  2305            323  LDTA3   BS    LOADED                                                   M0213130
031E  050C            324  BT1CH2  CLHR  R0,R12          BITS 11 & 13 BOTH 1 ?                  M0213140
0320  2234            325          BES   BT10                                                     M0213150
0322  4084 0000        326  BT11    STH   R8,0(R4)        EXCLUSIVE OR OF BITS 11 & 13 IS 1      M0213160
      0000 0326        327  LOADED  EQU   *                                                      M0213165
0326  2642            328          AIS   R4,2                                                     M0213170
0328  2337            329          BZS   CHKDTA                                                   M0213180
032A  4540 010C        330          CLH   R4,HIADR                                               M0213190
032E  4280 02F0        331          BL    LODTA0                                                   M0213200
0332  4330 02F0        332          BE    LODTA0                                                   M0213210
      0000 0336        333  CHKDTA  EQU   *               CHECK THE DATA LOADED                  M0213220
0336  4840 010A        334          LH    R4,LOADR                                                 M0213230
                       335  *       LOADS EXPECTED DATA PATTERN IN R9 TO MATCH ADDRESS IN R4      M0213240
033A  0895            336  CHKDT1  LHR   R9,R5           ASSUME BIT12 = 0 , BIT34 = 0           M0213250
033C  0804            337          LHR   R0,R4                                                    M0213260
033E  040B            338          NHR   R0,R11                                                   M0213270
0340  2334            339          BZS   DT1ZRO                                                   M0213280
0342  050B            340          CLHR  R0,R11                                                   M0213290
0344  4230 035C        341          BNE   DT1ONE                                                   M0213300
0348  0804            342  DT1ZRO  LHR   R0,R4           BIT 12 = 0                             M0213310
034A  040C            343          NHR   R0,R12                                                   M0213320
034C  4330 0358        344          BZ    CHKA2           BRANCH IF BIT34 = 0                    M0213330
0350  050C            345          CLHR  R0,R12                                                   M0213340
0352  4330 0358        346          BE    CHKA2           BRANCH IF BIT 34 = 0                   M0213350
0356  0896            347          LHR   R9,R6           BIT34 = 1 SO R9 = R6                   M0213360
0358  4300 036A        348  CHKA2   B     CHKDTE                                                   M0213370
035C  0897            349  DT1ONE  LHR   R9,R7           BIT12 = 1 ASSUME BIT34 = 0             M0213380
035E  0804            350          LHR   R0,R4           BRING ADDRESS FROM R4 TO R0            M0213390
0360  040C            351          NHR   R0,R12                                                   M0213400
0362  2334            352          BZS   CHKDTE          ASSUMPTION O.K.  R9 = R7               M0213410
0364  050C            353          CLHR  R0,R12                                                   M0213420
0366  2332            354          BES   CHKDTE                                                   M0213430
0368  0898            355          LHR   R9,R8           BIT34 = 1 SO R9 = R8                   M0213440
      0000 036A        356  CHKDTE  EQU   *               R9 = DATA EXPECTED                     M0213450
036A  48A4 0000        357          LH    R10,0(R4)       R10 = DATA READ                        M0213460
036E  059A            358          CLHR  R9,R10          IF R9 = R10 , NO ERROR                 M0213470
0370  2335            359          BES   COMP1           CHECK COMPLE. PATTERN                  M0213480
0372  41F0 03C6        360          BAL   R15,ERROR                                              M0213490
0376  4300 03A6        361          B     CHKDTG                                                 M0213500
037A  0809            362  COMP1   LHR   R0,R9           STORE R9 TEMPORARILY                   M0213510
037C  C790 FFFF        363          XHI   R9,-1           R9 = COMPLE. PATTERN                   M0213520
0380  4094 0000        364          STH   R9,0(R4)                                               M0213530
0384  48A4 0000        365          LH    R10,0(R4)                                              M0213540
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0388   059A                         CLHR  R9,R10                                      M0213550
038A   2335                         BES   COMP2                                       M0213560
038C   41F0 03C6                    BAL   R15,ERROR                                   M0213570
0390   4300 03A6                    B     CHKDTG                                      M0213580
0394   0890               COMP2     LHR   R9,R0          RESTORE R9                   M0213590
0396   4094 0000                    STH   R9,0(R4)       R9 = ORIGINAL PATTERN        M0213600
039A   48A4 0000                    LH    R10,0(R4)                                   M0213610
039E   059A                         CLHR  R9,R10                                      M0213620
03A0   2333                         BES   CHKDTG                                      M0213630
03A2   41F0 03C6                    BAL   R15,ERROR                                   M0213640
       0000 03A6          CHKDTG    EQU   *                                           M0213645
03A6   48E0 04D8                    LH    R14,STSCHK     CHK DU FLAG                  M0213647
03AA   2133                         BNZS  CHKDTH                                      M0213648
03AC   94E4                         EXBR  R14,R4         DISPLAY LOC.                 M0213650
03AE   981E                         WHR   R1,R14         WRITE TO DISPLAY             M0213652
       0000 03B0          CHKDTH    EQU   *                                           M0213654
03B0   2642                         AIS   R4,2           IF HIADR = FFFE              M0213655
03B2   2337                         BZS   CHKEND         WHEN R4 = 0 , DONE           M0213660
03B4   4540 010C                    CLH   R4,HIADR       OTHERWISE                    M0213670
03B8   4280 033A                    BL    CHKDT1         WHEN R4 > HIADR , DONE       M0213680
03BC   4330 033A                    BE    CHKDT1                                      M0213690
03C0   4800 04E0          CHKEND    LH    R0,NXTST       R0 = STARTING ADDRESS OF NEXT TEST M0213700
03C4   0300                         BR    R0             GO TO NEXT TEST              M0213710
                          *                                                           M0213720
                          *                                                           M0213730
                          *                                                           M0213740
       0000 03C6          ERROR     EQU   *                                           M0213750
03C6   D320 0118                    LB    R2,ADDRESS     LOAD I/O DEVICE ADDRESS      M0213760
03CA   4830 0116                    LH    R3,CRTFLG                                   M0213770
03CE   2332                         BZS   AHMSS                                       M0213780
03D0   2621                         AIS   R2,1                                        M0213790
03D2   6110 04DE          AHMSS     AHM   R1,TOTERR      INCREMENT ERROR COUNT        M0213800
03D6   DE20 0109                    OC    R2,WRITE                                    M0213810
03DA   9D23                         SSR   R2,R3          IF TTY DU = 1 ,COUNT ERRORS  M0213820
03DC   4310 03EC                    BFC   1,PRTERR       OTHERWISE PRINT ERROR MESSAGE M0213830
03E0   4800 04E0                    LH    R0,NXTST       NXTST=0 , IF TEST15          M0213840
03E4   4330 0286                    BZ    INCRE          INCREMENT TOTAL IF TEST15    M0213850
03E8   4300 03C0                    B     CHKEND                                      M0213860
03EC   C8D0 04C8          PRTERR    LHI   R13,PRTBUF                                  M0213870
03F0   0804                         LHR   R0,R4                                       M0213880
03F2   41E0 0410                    BAL   R14,CONVRT     CONVERT LOC ADDRESS          M0213890
03F6   26D5                         AIS   R13,5                                       M0213900
03F8   0809                         LHR   R0,R9                                       M0213910
03FA   41E0 0410                    BAL   R14,CONVRT     CONVERT DATA EXPECTED        M0213920
03FE   26D5                         AIS   R13,5                                       M0213930
0400   080A                         LHR   R0,R10                                      M0213940
0402   41E0 0410                    BAL   R14,CONVRT     CONVERT DATA OBSERVED        M0213950
0406   41E0 046A                    BAL   R14,PRINT      PRINT ERROR                  M0213960
040A   04C8                         DC    Z(PRTBUF)                                   M0213970
040C   04D7                         DC    Z(PRBUFZ)                                   M0213980
040E   030F                         BR    R15            RETURN                       M0213990
                          *                                                           M0214000
                          *                                                           M0214010
0410   0830               CONVRT    LHR   R3,R0          CONVERT CONTENTS OF R0       M0214020
0412   903C                         SRLS  R3,12          TO 4 ASCII CHARACTERS        M0214030
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0414  C630 0030              OHI   R3,X'30'                                      M0214040
0418  C530 003A              CLHI  R3,X'3A'    STORE THERE AT MEM. LOC.          M0214050
041C  2182                   BLS   BYTE1       (R13) THRU (R13)+3                M0214060
041E  2637                   AIS   R3,7                                          M0214070
0420  D23D 0000      BYTE1   STB   R3,0(R13)                                     M0214080
                     *                                                           M0214090
0424  0830                   LHR   R3,R0       LOAD DATA                         M0214100
0426  9038                   SRLS  R3,8                                          M0214110
0428  C430 000F              NHI   R3,15       MASK 4 BITS                       M0214120
042C  C630 0030              OHI   R3,X'30'    CONVERT TO ASCII                  M0214130
0430  C530 003A              CLHI  R3,X'3A'                                      M0214140
0434  2182                   BLS   BYTE2                                         M0214150
0436  2637                   AIS   R3,7                                          M0214160
0438  D23D 0001      BYTE2   STB   R3,1(R13)   STORE IN MEMORY                   M0214170
                     *                                                           M0214180
043C  0830                   LHR   R3,R0       LOAD                              M0214190
043E  9034                   SRLS  R3,4                                          M0214200
0440  C430 000F              NHI   R3,15       MASK                              M0214210
0444  C630 0030              OHI   R3,X'30'    CONVERT                           M0214220
0448  C530 003A              CLHI  R3,X'3A'                                      M0214230
044C  2182                   BLS   BYTE3                                         M0214240
044E  2637                   AIS   R3,7                                          M0214250
0450  D23D 0002      BYTE3   STB   R3,2(R13)   STORE                             M0214260
                     *                                                           M0214270
0454  C400 000F              NHI   R0,15       MASK                              M0214280
0458  C600 0030              OHI   R0,X'30'    CONVERT                           M0214290
045C  C500 003A              CLHI  R0,X'3A'                                      M0214300
0460  2182                   BLS   BYTE4                                         M0214310
0462  2607                   AIS   R0,7                                          M0214320
0464  D20D 0003      BYTE4   STB   R0,3(R13)   STORE                             M0214330
0468  030E                   BR    R14         RETURN                            M0214340
                     *                                                           M0214350
                     *                                                           M0214360
046A  D320 0118      PRINT   LB    R2,ADDRESS  LOAD I/O DEVICE ADDRESS           M0214370
046E  4830 0116              LH    R3,CRTFLG                                     M0214380
0472  2332                   BZS   CQ          IF TTY, BRANCH                    M0214390
0474  2621                   AIS   R2,1        INDEX CRT ADDRESS                 M0214400
0476  DE20 0109      CQ      OC    R2,WRITE    WRITE MODE                        M0214410
047A  9D20                   SSR   R2,R0                                         M0214420
047C  2081                   BTBS  8,1         WAIT FOR BUSY = 0                 M0214430
047E  483E 0000              LH    R3,0(R14)   LOAD START ADDRESS OF MESSAGE     M0214440
0482  DA23 0000      WD      WD    R2,0(R3)    WRITE                             M0214450
0486  9D20                   SSR   R2,R0                                         M0214460
0488  2081                   BTBS  8,1         WAIT FOR BUSY = 0                 M0214470
048A  453E 0002              CLH   R3,2(R14)                                     M0214480
048E  2383                   BNLS  COQ         BRANCH IF FINISHED                M0214490
0490  2631                   AIS   R3,1        INDEX ADDRESS                     M0214500
0492  2208                   BS    WD          CONTINUE PRINTING                 M0214510
0494  4830 0116      COQ     LH    R3,CRTFLG                                     M0214520
0498  433E 0004              BZ    4(R14)      IF TTY, RETURN TO PROGRAM         M0214530
049C  0733                   XHR   R3,R3                                         M0214540
049E  9A23                   WDR   R2,R3       IF CRT, SEND X'00' TO INTERFACE   M0214550
04A0  9D20                   SSR   R2,R0                                         M0214560
04A2  2081                   BTBS  8,1         WAIT FOR BUSY = 0                 M0214570
04A4  430E 0004              B     4(R14)      RETURN TO PROGRAM                 M0214580
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                                476  *                                                                  M0214590
                                477  *                                                                  M0214600
                                478  *        DATA STORAGE AREA                                         M0214610
                                479  *                                                                  M0214620
                                480  *                                                                  M0214630
04A8   0D0A                     481  TITLE    DC    X'D0A'              CR , LF                         M0214660
04AA   3032 2D33 3430 2020      482           DC    C'02-340  PART 1  06-162F01R01'                     M0214670
04B2   5041 5254 2031 2020
04BA   3036 2D31 3632 4630
04C2   3152 3031
04C6   0D0A                     483           DC    X'D0A'                                              M0214680
       0000 04C7                484  TITEND   EQU   *-1                                                M0214690
                                485  *                                                                  M0214700
                                486  *                                                                  M0214710
04C8   5245 4734 2052 4547      487  PRTBUF   DC    C'REG4 REG9 REGA'                                   M0214720
04D0   3920 5245 4741
04D6   0D0A                     488           DC    X'D0A'                                              M0214730
       0000 04D7                489  PRBUFZ   EQU   *-1                                                M0214740
04D8   0000                     490  STSCHK   DC    0                   DU FLAG                         M0214745
04DA   8040                     491  NORM     DC    X'8040'             DISPLAY COMMANDS                M0214746
       0000 04DB                492  INCRM    EQU   *-1                                                M0214747
04DC   0000                     493  TOTAL    DC    0                                                   M0214750
04DE   0000                     494  TOTERR   DC    0                                                   M0214760
04E0   0000                     495  NXTST    DC    0                                                   M0214770
04E2   FFFF                     496  NOERR    DC    -1                                                  M0214780
04E4   FFFF                     497           DC    -1                                                  M0214790
04E6   0D0A                     498           DC    X'D0A'                                              M0214800
       0000 04EB                499  ERR      EQU   *+3                                                M0214810
04E8   4E4F 2045 5252 4F52      500           DC    C'NO ERRORS'                                        M0214820
04F0   5320
04F2   0D0A                     501           DC    X'D0A'                                              M0214830
       0000 04F3                502  NOERRD   EQU   *-1                                                M0214840
       0000 04F2                503  LAST     EQU   *-2                                                M0214850
       0000 04F3                504  QRT      EQU   *-1                                                M0214860
                                505  *                                                                  M0214870
04F4                            506           END                                                       M0214880
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ASSEMBLED BY CAL 03-066R05-00 (32-BIT)

START OPTIONS: T=16,SCR,CRO

1 CAL ERROR PREVIOUS ERROR ON PAGE 1
NO CAL WARNINGS
2 PASSES

ABSTOP	0000 04F4								
ADC	0000 0002								
ADDRESS	0000 0118	110*	134	143	190	255	279	393	454
AHMSS	0000 03D2	395	397*						
BIT12	0000 011E	115*	199						
BIT34	0000 0120	116*	200						
BT00	0000 0302	313*	316						
BT01	0000 030C	317*							
BT0CH2	0000 0308	312	315*						
BT10	0000 0318	322*	325						
BT11	0000 0322	326*							
BT1CH2	0000 031E	321	324*						
BT1ONE	0000 0312	309	319*						
BT1ZRO	0000 02FC	307	310*						
BYTE1	0000 0420	423	425*						
BYTE2	0000 0438	432	434*						
BYTE3	0000 0450	441	443*						
BYTE4	0000 0464	448	450*						
CHKA2	0000 0358	344	346	348*					
CHKDT1	0000 033A	336*	385	386					
CHKDTA	0000 0336	329	333*						
CHKDTE	0000 036A	348	352	354	356*				
CHKDTG	0000 03A6	361	369	374	376*				
CHKDTH	0000 03B0	378	381*						
CHKEND	0000 03C0	383	387*	403					
CHKEY	0000 02CE	282	285*						
CHKLO	0000 019C	165	169*						
CHKLO3	0000 01B0	174	176*						
CKIO	0000 0130	124	125*						
CNTNU	0000 0174	149*							
COMP1	0000 037A	359	362*						
COMP2	0000 0394	367	370*						
CONVRT	0000 0410	406	409	412	419*				
COQ	0000 0494	466	469*						
CQ	0000 0476	456	458*						
CRT	0000 013A	129*							
CRTADR	0000 0112	106*	133						
CRTFLG	0000 0116	109*	132	141	394	455	469		
DONE	0000 02A2	257	269*						
DT1ONE	0000 035C	341	349*						
DT1ZRO	0000 0348	339	342*						
END	0000 02BA	275	279*	290					
END2	0000 02C2	281*	284						
ERR	0000 04EB	277	499*						
ERROR	0000 03C6	360	368	375	392*				
ERRPR	0000 02B2	271	276*						
EXECUTE	0000 016C	136	145*						

PROG= M02P2 ASSEMBLED BY CAL 03-066R05-00 (32-BIT)

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                                    1  M02P2   PROG  02-340 MEMORY TEST 06-162F02M96R01A13   PART 2          M0220000
                                    2          SCRAT                                                        M0220010
                                    3          CROSS                                                        M0220020
                                    4          WIDTH 120                                                    M0220030
                                    5          TARGT 16                                                     M0220040
                                    6          SQCHK                                                        M0220045
                                    7  *                                                                    M0220060
          0000 0000                 8  R0      EQU   0              SCRT.REG.                               M0220070
          0000 0001                 9  R1      EQU   1              CONTAINS 1 FOR CONSOLE ADDRESS          M0220080
          0000 0002                10  R2      EQU   2              CONTAINS TTYADR                         M0220090
          0000 0003                11  R3      EQU   3              TTY STATUS                              M0220100
          0000 0004                12  R4      EQU   4              ADR. OF MEM. LOC. TESTED                M0220110
          0000 0005                13  R5      EQU   5              DATA PATTERN FOR BIT12 =0 & BIT34 =0    M0220120
          0000 0006                14  R6      EQU   6              DATA PATTERN FOR BIT12 =0 & BIT34 =1    M0220130
          0000 0007                15  R7      EQU   7              DATA PATTERN FOR BIT12 =1 & BIT34 =0    M0220140
          0000 0008                16  R8      EQU   8              DATA PATTERN FOR BIT12 =1 & BIT34 =1    M0220150
          0000 0009                17  R9      EQU   9              CORRECT DATA EXPECTED AT LOC. 0(R4)     M0220160
          0000 000A                18  R10     EQU   10             DATA READ FROM TEST LOC. 0(R4)          M0220170
          0000 000B                19  R11     EQU   11             BITS 6 & 10 SET IN THIS HALFWORD        M0220180
          0000 000C                20  R12     EQU   12             BITS 11 & 13 SET IN THIS HALFWORD       M0220190
          0000 000D                21  R13     EQU   13                                                     M0220200
          0000 000E                22  R14     EQU   14                                                     M0220210
          0000 000F                23  R15     EQU   15             RETURN ADDRESS ERR.RTN.                 M0220220
                                   24  *                                                                    M0220240
    0000R                          25          ORG   X'80'                                                  M0220250
                                   26  *                                                                    M0220260
    0080  C810 1000                27  STLDR   LHI   R1,FIRST       LOAD STARTING ADDRESS                   M0220270
    0084  2421                    28          LIS   R2,1           BXLE INDEX VALUE                        M0220280
    0086  C830 13DB                29          LHI   R3,QRT         LOAD ENDING ADDRESS                     M0220290
    008A  2480                    30          LIS   R8,0           ZERO CHKSUM REGISTER                    M0220300
    008C  D340 0078                31          LB    R4,X'78'       LOAD INPUT DEVICE ADDRESS               M0220310
    0090  DE40 0079                32          OC    R4,X'79'       READ MODE                               M0220320
    0094  9D45                    33  SENSES  SSR   R4,R5                                                  M0220330
    0096  2081                    34          BTBS  8,1            WAIT FOR BUSY = 0                       M0220340
    0098  9B46                    35          RDR   R4,R6          READ                                    M0220350
    009A  0866                    36          LHR   R6,R6                                                  M0220360
    009C  2234                    37          BZS   SENSES         WAIT FOR NON-ZERO CHARACTER             M0220370
    009E  D261 0000               38  STBYTE  STB   R6,0(R1)       STORE DATA BYTE                         M0220380
    00A2  9D45                    39          SSR   R4,R5                                                  M0220390
    00A4  2081                    40          BTBS  8,1            WAIT FOR BUSY = 0                       M0220400
    00A6  D361 0000               41          LB    R6,0(R1)       LOAD BYTE FROM MEMORY                   M0220410
    00AA  0786                    42          XHR   R8,R6          COMPUTE CHKSUM                          M0220420
    00AC  9471                    43          EXBR  R7,R1          READY LOC                               M0220430
    00AE  9827                    44          WHR   R2,R7          DISPLAY LOC                             M0220440
    00B0  9B46                    45          RDR   R4,R6          READ NEXT DATA BYTE                     M0220450
    00B2  C110 009E               46          BXLE  R1,STBYTE      REPEAT UNTIL END                        M0220460
    00B6  CB80 000B               47          SHI   R8,X'0B'       IS CHKSUM OK ?                          M0220470
    00BA  2132                    48          BNZS  HALTON         NO, HALT PROCESSOR                      M0220480
    00BC  9828                    49          WHR   R2,R8          YES, ZERO DISPLAY                       M0220490
    00BE  C860 8000               50  HALTON  LHI   R6,X'8000'                                             M0220500
    00C2  9576                    51          EPSR  R7,R6          HALT PROCESSOR                          M0220510
    00C4  4300 0050               52          B     X'50'          REPEAT LOADING SEQUENCE                 M0220520
                                  53  *                                                                    M0220530
```

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                   *
00C8                             ORG    X'1000'
                   *
1000  4300 1020    FIRST         B      START1      CHECKS HIGH & LOW ADDRESSES
1004  4300 1024                  B      START2      DOES NOT CHECK HIGH & LOW ADDRESSES
                   *
1008  A498         READ          DC     X'A498'     READ I/O COMMAND
      0000 1009    WRITE         EQU    *-1         WRITE I/O COMMAND
100A  0000         LOADR         DC     0
100C  0FFE         HIADR         DC     FIRST-2
                   *
100E  0202         IO            DC     X'0202'     I/O POINTER
                   *
1010  1011         CRTADR        DC     X'1011'     PASLA ADDRESS
1012  0202         TTYADR        DC     X'0202'     TTY ADDRESS
                   *
1014  0000         CRTFLG        DC     X'0'        PASLA FLAG
1016  00           ADDRESS       DB     X'0'        I/O DEVICE ADDRESS
1017  F8           PADSET        DB     X'F8'       PASLA SPEED COMMAND
1018  B9AB         READ1         DC     X'B9AB'     PASLA COMMANDS
101A  A498         READ2         DC     X'A498'     TTY COMMANDS
                   *
101C  0220         BIT12         DC     X'220'      BITS 6 & 10 ARE SET
101E  0014         BIT34         DC     X'14'       BITS 11 & 13 ARE SET
                   *
                   *
1020  2480         START1        LIS    R8,0
1022  2302                       BS     START
1024  2481         START2        LIS    R8,1
      0000 1026    START         EQU    *
1026  C200 102A                  LPSW   ZERO
102A  0000         ZERO          DC     0,CKIO      PSW = 0000
102C  102E
102E  D330 100E    CKIO          LB     R3,IO       WHICH I/O DEVICE ?
1032  C530 0001                  CLHI   R3,X'01'
1036  213F                       BNES   TTY
                   *
1038  4830 1018    CRT           LH     R3,READ1    CRT ON PASLA
103C  4030 1008                  STH    R3,READ
1040  243F                       LIS    R3,X'F'
1042  4030 1014                  STH    R3,CRTFLG
1046  D330 1010                  LB     R3,CRTADR
104A  D230 1016                  STB    R3,ADDRESS
104E  DE30 1017                  OC     R3,PADSET
1052  230C                       BS     EXECUTE
                   *
1054  4830 101A    TTY           LH     R3,READ2    TTY
1058  4030 1008                  STH    R3,READ
105C  2430                       LIS    R3,0
105E  4030 1014                  STH    R3,CRTFLG
1062  D330 1012                  LB     R3,TTYADR
1066  D230 1016                  STB    R3,ADDRESS
                   *
      0000 106A    EXECUTE       EQU    *
106A  41E0 1352                  BAL    R14,PRINT   "02-340  PART 2  06-162F02R01"
```

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106E  1390                   DC    Z(TITLE)                                       M0221090
1070  13AF                   DC    Z(TITEND)                                      M0221100
      0000 1072     CNTNU    EQU   *                                              M0221110
1072  0888                   LHR   R8,R8                                          M0221120
1074  4230 10A0              BNZ   TEST                                           M0221130
                    *                                                             M0221140
                    *                                                             M0221150
      0000 1078     CHKLO    EQU   *             CHECK LO,HI ADR.                 M0221160
1078  4800 100C              LH    R0,HIADR      R0 = HIADR                       M0221170
107C  C850 FFFE              LHI   R5,X'FFFE'                                     M0221180
1080  0405                   NHR   R0,R5         R0 = EVEN NO.                    M0221190
1082  C500 1000              CLHI  R0,FIRST      IF R0 > FIRST                    M0221200
1086  2183                   BLS   CHKLO2                                         M0221210
1088  C800 0FFE              LHI   R0,FIRST-2    RESET HIADR TO FIRST-2           M0221220
108C  4000 100C     CHKLO2   STH   R0,HIADR                                       M0221230
1090  4830 100A              LH    R3,LOADR      R3 = LOADR                       M0221240
1094  0435                   NHR   R3,R5                                          M0221250
1096  0503                   CLHR  R0,R3         IF R3 > HIADR                    M0221260
1098  2382                   BNLS  CHKLO3                                         M0221270
109A  2430                   LIS   R3,0          RESET LOADR TO ZERO              M0221280
109C  4030 100A     CHKLO3   STH   R3,LOADR                                       M0221290
                    *                                                             M0221300
                    *                                                             M0221310
      0000 10A0     TEST     EQU   *                                              M0221320
10A0  2411                   LIS   R1,1          LOAD DISPLAY ADDRESS             M0221330
10A2  D320 1016              LB    R2,ADDRESS    LOAD I/O DEVICE ADDRESS          M0221340
10A6  2400                   LIS   R0,0                                           M0221350
10A8  4000 13C4              STH   R0,TOTAL      ZERO TOTAL                       M0221360
10AC  4000 13C6              STH   R0,TOTERR     ZERO TOTAL ERRORS                M0221370
10B0  4000 13C0              STH   R0,STSCHK     ZERO DU FLAG                     M0221375
10B4  DE10 13C3              OC    R1,INCRM      DISPLAY IN INCREMENTAL MODE      M0221376
10B8  9810                   WHR   R1,R0         ZERO DISPLAY                     M0221377
10BA  9810                   WHR   R1,R0                                          M0221378
10BC  DE10 13C2              OC    R1,NORM       DISPLAY IN NORMAL MODE           M0221379
10C0  48B0 101C              LH    R11,BIT12     HEX 220 IN R11                   M0221380
10C4  48C0 101E              LH    R12,BIT34     HEX 14 IN R12                    M0221390
10C8  2450          TEST0    LIS   R5,0                                           M0221400
10CA  0865                   LHR   R6,R5                                          M0221410
10CC  0875                   LHR   R7,R5                                          M0221420
10CE  0885                   LHR   R8,R5         R5=R6=R7=R8=0                    M0221430
10D0  4100 11D2              BAL   R0,LODTA                                       M0221440
10D4  2450          TEST1    LIS   R5,0          R5 = 0                           M0221450
10D6  0865                   LHR   R6,R5         R6 = 0                           M0221460
10D8  0875                   LHR   R7,R5         R7 = 0                           M0221470
10DA  2581                   LCS   R8,1          R8 = FFFF                        M0221480
10DC  4100 11D2              BAL   R0,LODTA                                       M0221490
10E0  2571          TEST2    LCS   R7,1          R5=R6=0, R7 = FFFF               M0221500
10E2  2480                   LIS   R8,0          R8=0                             M0221510
10E4  4100 11D2              BAL   R0,LODTA                                       M0221520
10E8  2581          TEST3    LCS   R8,1          R8=FFFF, R5=R6=0,R7=FFFF         M0221530
10EA  4100 11D2              BAL   R0,LODTA                                       M0221540
10EE  2561          TEST4    LCS   R6,1          R6=FFFF ,R5=0                    M0221550
10F0  2470                   LIS   R7,0          R7=0                             M0221560
10F2  0887                   LHR   R8,R7         R8=0                             M0221570
10F4  4100 11D2              BAL   R0,LODTA                                       M0221580
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10F8  2581           163  TEST5   LCS   R8,1          R8=FFFF,R5=0,R6=FFFF,R7=0          M0221590
10FA  4100 11D2      164          BAL   R0,LODTA                                        M0221600
10FE  2571           165  TEST6   LCS   R7,1          R7=FFFF, R5=0 R6=FFFF              M0221610
1100  0885           166          LHR   R8,R5          R8=0                               M0221620
1102  4100 11D2      167          BAL   R0,LODTA                                        M0221630
1106  2581           168  TEST7   LCS   R8,1          R8=FFFF,R5=0,R6=FFFF,R7=FFFF       M0221640
1108  4100 11D2      169          BAL   R0,LODTA                                        M0221650
110C  2551           170  TEST8   LCS   R5,1          R5=FFFF                            M0221660
110E  2460           171          LIS   R6,0          R6=0                               M0221670
1110  0876           172          LHR   R7,R6         R7=0                               M0221680
1112  0886           173          LHR   R8,R6         R8=0                               M0221690
1114  4100 11D2      174          BAL   R0,LODTA                                        M0221700
1118  2581           175  TEST9   LCS   R8,1          R8=FFFF,R5=FFFF,R6=0,R7=0          M0221710
111A  4100 11D2      176          BAL   R0,LODTA                                        M0221720
111E  2571           177  TEST10  LCS   R7,1          R7=FFFF,R5=FFFF,R6=0               M0221730
1120  0886           178          LHR   R8,R6         R8=0                               M0221740
1122  4100 11D2      179          BAL   R0,LODTA                                        M0221750
1126  2581           180  TEST11  LCS   R8,1          R8=FFFF,R5=FFFF,R6=0,R7=FFFF       M0221760
1128  4100 11D2      181          BAL   R0,LODTA                                        M0221770
112C  2561           182  TEST12  LCS   R6,1          R6=FFFF,R5=FFFF                    M0221780
112E  2470           183          LIS   R7,0          R7=0                               M0221790
1130  0887           184          LHR   R8,R7         R8=0                               M0221800
1132  4100 11D2      185          BAL   R0,LODTA                                        M0221810
1136  2581           186  TEST13  LCS   R8,1          R8=FFFF,R5=R6=FFFF,R7=0            M0221820
1138  4100 11D2      187          BAL   R0,LODTA                                        M0221830
113C  0875           188  TEST14  LHR   R7,R5         R7=FFFF,R5=R6=FFFF                 M0221840
113E  2480           189          LIS   R8,0          R8=0                               M0221850
1140  4100 11D2      190          BAL   R0,LODTA                                        M0221860
1144  0885           191  TEST15  LHR   R8,R5         R5 = R6 = R7 = R8 = FFFF           M0221870
1146  4100 11D2      192          BAL   R0,LODTA                                        M0221880
      0000 114A      193  TSTEND  EQU   *                                               M0221884
114A  D320 1016      194          LB    R2,ADDRESS    LOAD I/O DEVICE ADDRESS            M0221886
114E  9D23           195          SSR   R2,R3                                           M0221890
1150  4310 1174      196          BFC   1,DONE                                          M0221900
1154  4010 13C0      197          STH   R1,STSCHK     SET DU FLAG                        M0221905
1158  6110 13C4      198  INCRE   AHM   R1,TOTAL      TOTAL=TOTAL+1                      M0221910
      0000 115C      199  REPEAT  EQU   *                                               M0221920
115C  DE10 13C3      200          OC    R1,INCRM      DISPLAY IN INCREMENTAL MODE        M0221930
1160  4800 13C6      201          LH    R0,TOTERR                                       M0221940
1164  9400           202          EXBR  R0,R0                                           M0221950
1166  9810           203          WHR   R1,R0         DISPLAY 2 = TOTERR                 M0221960
1168  4800 13C4      204          LH    R0,TOTAL                                        M0221970
116C  9400           205          EXBR  R0,R0                                           M0221980
116E  9810           206          WHR   R1,R0         DISPLAY 1 = TOTAL                  M0221990
1170  4300 10C8      207          B     TEST0                                           M0222000
      0000 1174      208  DONE    EQU   *                                               M0222010
1174  C800 0000      209          LHI   R0,0          THIS ROUTINE RESETS TESTED CORE    M0222020
1178  4810 100A      210          LH    R1,LOADR      WITH ALL ZEROS, START AT LOADR     M0222030
117C  C820 0002      211          LHI   R2,2          INCREMENT = 2                      M0222040
1180  4830 100C      212          LH    R3,HIADR      UPPER LIMIT = HIADR                M0222050
1184  4001 0000      213  RESET   STH   R0,0(R1)      STORE ZEROS                        M0222060
1188  C110 1184      214          BXLE  R1,RESET      UNTILL BXLE LIMIT                  M0222070
118C  4800 13C6      215          LH    R0,TOTERR                                       M0222080
1190  2136           216          BNZS  ERRPR         BRANCH IF ERROR                    M0222090
1192  41E0 1352      217          BAL   R14,PRINT     "NO ERROR"                         M0222100
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1196  13CA                      DC    Z(NOERR)                                  M0222110
1198  13DB                      DC    Z(NOERRD)                                 M0222120
119A  2305                      BS    END                                       M0222130
119C  41E0 1352       ERRPR     BAL   R14,PRINT         "ERROR"                 M0222140
11A0  13D3                      DC    Z(ERR)                                    M0222150
11A2  13DB                      DC    Z(NOERRD)                                 M0222160
11A4  D320 1016       END       LB    R2,ADDRESS                                M0222170
11A8  DE20 1008                 OC    R2,READ           READ IN BLK. MODE       M0222180
11AC  9D23            END2      SSR   R2,R3             R3 = TTY STATUS         M0222190
11AE  4380 11B8                 BFC   8,CHKEY                                   M0222200
11B2  4210 1026                 BTC   1,START                                   M0222210
11B6  2205                      BS    END2                                      M0222220
11B8  9B23            CHKEY     RDR   R2,R3             R3 = KEY DEPRESSED      M0222230
11BA  C430 007F                 NHI   R3,X'7F'          ZERO OUT PARITY         M0222240
11BE  C530 000D                 CLHI  R3,13             IS IT CR KEY ?          M0222250
11C2  4330 1026                 BE    START             YES , REPEAT THE TEST   M0222260
11C6  C530 000A                 CLHI  R3,10             IS IT LF KEY ?          M0222270
11CA  4230 11A4                 BNE   END               NO , WAIT FOR ANOTHER KEY  M0222280
11CE  4300 0050                 B     X'50'             YES , PART 2 TEST IS COMPLETELY OVER  M0222290
                      *                                                         M0222300
                      *                                                         M0222310
                      *               LOAD THE DATA PATTERN IN ADDRESS SPECIFIED BY R4  M0222320
                      *               IF BIT12 = 0 & BIT34 = 0 , LOAD R5        M0222330
                      *               IF BIT12 = 0 & BIT34 = 1 , LOAD R6        M0222340
                      *               IF BIT12 = 1 & BIT34 = 0 , LOAD R7        M0222350
                      *               IF BIT12 = 1 & BIT34 = 1 , LOAD R8        M0222360
                      *                                                         M0222370
                      *                                                         M0222380
      0000 11D2       LODTA     EQU   *                                         M0222390
11D2  4000 13C8                 STH   R0,NXTST          R0 = ADD. OF NEXT TEST  M0222400
11D6  4840 100A                 LH    R4,LOADR                                  M0222410
      0000 11DA       LODTA0    EQU   *                                         M0222420
11DA  0804                      LHR   R0,R4                                     M0222430
11DC  040B                      NHR   R0,R11            BITS 6 & 10 BOTH 0 ?    M0222440
11DE  2334                      BZS   BT1ZRO                                    M0222450
11E0  050B                      CLHR  R0,R11            BITS 6 & 10 BOTH 1 ?    M0222460
11E2  4230 11FC                 BNE   BT1ONE                                    M0222470
11E6  0804            BT1ZRO    LHR   R0,R4             EXCLUSIVE OR OF BITS 6 & 10 IS 0   M0222480
11E8  040C                      NHR   R0,R12            BITS 11 & 13 BOTH 0 ?   M0222490
11EA  2134                      BNZS  BT0CH2                                    M0222500
11EC  4054 0000       BT00      STH   R5,0(R4)          EXCLUSIVE OR OF BITS 11 & 13 IS 0  M0222510
11F0  2305                      BS    LDTA2                                     M0222520
11F2  050C            BT0CH2    CLHR  R0,R12            BITS 11 & 13 BOTH 1 ?   M0222530
11F4  2234                      BES   BT00                                      M0222540
11F6  4064 0000       BT01      STH   R6,0(R4)                                  M0222550
11FA  2306            LDTA2     BS    LDTA3                                     M0222560
11FC  0804            BT1ONE    LHR   R0,R4             EXCLUSIVE OR OF BITS 6 & 10 IS 1   M0222570
11FE  040C                      NHR   R0,R12            BITS 11 & 13 BOTH 0 ?   M0222580
1200  2134                      BNZS  BT1CH2                                    M0222590
1202  4074 0000       BT10      STH   R7,0(R4)          EXCLUSIVE OR OF BITS 11 & 13 IS 0  M0222600
1206  2305            LDTA3     BS    LOADED                                    M0222610
1208  050C            BT1CH2    CLHR  R0,R12            BITS 11 & 13 BOTH 1 ?   M0222620
120A  2234                      BES   BT10                                      M0222630
120C  4084 0000       BT11      STH   R8,0(R4)          EXCLUSIVE OR OF BITS 11 & 13 IS 1  M0222640
      0000 1210       LOADED    EQU   *                                         M0222645
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1210  2642            273          AIS   R4,2                                          M0222650
1212  2337            274          BZS   CHKDTA                                       M0222660
1214  4540 100C       275          CLH   R4,HIADR                                      M0222670
1218  4280 11DA       276          BL    LODTA0                                        M0222680
121C  4330 11DA       277          BE    LODTA0                                        M0222690
      0000 1220       278 CHKDTA   EQU   *                 CHECK THE DATA LOADER     M0222700
1220  4840 100A       279          LH    R4,LOADR                                      M0222710
                      280 *        LOADS EXPECTED DATA PATTERN IN R9 TO MATCH ADDRESS IN R4 M0222720
1224  0895            281 CHKDT1   LHR   R9,R5            ASSUME BIT12 = 0 , BIT34 = 0 M0222730
1226  0804            282          LHR   R0,R4                                         M0222740
1228  040B            283          NHR   R0,R11                                        M0222750
122A  2334            284          BZS   DT1ZRO                                        M0222760
122C  050B            285          CLHR  R0,R11                                        M0222770
122E  4230 1246       286          BNE   DT1ONE                                        M0222780
1232  0804            287 DT1ZRO   LHR   R0,R4            BIT 12 = 0                M0222790
1234  040C            288          NHR   R0,R12                                        M0222800
1236  4330 1242       289          BZ    CHKA2           BRANCH IF BIT34 = 0         M0222810
123A  050C            290          CLHR  R0,R12                                        M0222820
123C  4330 1242       291          BE    CHKA2           BRANCH IF BIT 34 = 0        M0222830
1240  0896            292          LHR   R9,R6           BIT34 = 1 SO R9 = R6        M0222840
1242  4300 1254       293 CHKA2    B     CHKDTE                                        M0222850
1246  0897            294 DT1ONE   LHR   R9,R7           BIT12 = 1 ASSUME BIT34 = 0  M0222860
1248  0804            295          LHR   R0,R4           BRING ADDRESS FROM R4 TO R0 M0222870
124A  040C            296          NHR   R0,R12                                        M0222880
124C  2334            297          BZS   CHKDTE          ASSUMPTION O.K.  R9 = R7    M0222890
124E  050C            298          CLHR  R0,R12                                        M0222900
1250  2332            299          BES   CHKDTE                                        M0222910
1252  0898            300          LHR   R9,R8           BIT34 = 1 SO R9 = R8        M0222920
      0000 1254       301 CHKDTE   EQU   *               R9 = DATA EXPECTED          M0222930
1254  48A4 0000       302          LH    R10,0(R4)       R10 = DATA READ             M0222940
1258  059A            303          CLHR  R9,R10          IF R9 = R10 , NO ERROR      M0222950
125A  2333            304          BES   COMP1                                         M0222960
125C  41F0 12AA       305          BAL   R15,ERROR                                     M0222970
1260  0809            306 COMP1    LHR   R0,R9           STORE R9 TEMPORARILY        M0222980
1262  C790 FFFF       307          XHI   R9,-1           R9 = COMPLE. PATTERN        M0222990
1266  4094 0000       308          STH   R9,0(R4)                                      M0223000
126A  48A4 0000       309          LH    R10,0(R4)                                     M0223010
126E  059A            310          CLHR  R9,R10                                        M0223020
1270  2335            311          BES   COMP2                                         M0223030
1272  41F0 12AA       312          BAL   R15,ERROR                                     M0223040
1276  4300 128C       313          B     CHKDTG                                        M0223050
127A  0890            314 COMP2    LHR   R9,R0           RESTORE R9                  M0223060
127C  4094 0000       315          STH   R9,0(R4)        R9 = ORIGINAL PATTERN       M0223070
1280  48A4 0000       316          LH    R10,0(R4)                                     M0223080
1284  059A            317          CLHR  R9,R10                                        M0223090
1286  2333            318          BES   CHKDTG                                        M0223100
1288  41F0 12AA       319          BAL   R15,ERROR                                     M0223110
      0000 128C       320 CHKDTG   EQU   *                                           M0223115
128C  48E0 13C0       321          LH    R14,STSCHK      CHK DU FLAG                 M0223117
1290  2133            322          BNZS  CHKDTH                                        M0223118
1292  94E4            323          EXBR  R14,R4          DISPLAY LOC.                M0223120
1294  981E            324          WHR   R1,R14          WRITE TO DISPLAY            M0223122
      0000 1296       325 CHKDTH   EQU   *                                           M0223124
1296  2642            326          AIS   R4,2            IF HIADR = FFFE             M0223125
1298  4540 100C       327          CLH   R4,HIADR                                      M0223130
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129C  4280 1224          328          BL    CHKDT1                                                    M0223140
12A0  4330 1224          329          BE    CHKDT1                                                    M0223150
12A4  4800 13C8          330  CHKEND  LH    R0,NXTST        R0 = STARTING ADDRESS OF NEXT TEST        M0223160
12A8  0300               331          BR    R0              GO TO NEXT TEST                           M0223170
                         332  *                                                                        M0223180
                         333  *                                                                        M0223190
      0000 12AA          334  ERROR   EQU   *                                                         M0223200
12AA  D320 1016          335          LB    R2,ADDRESS      LOAD I/O DEVICE ADDRESS                   M0223210
12AE  4830 1014          336          LH    R3,CRTFLG                                                 M0223220
12B2  2332               337          BZS   AHMSS                                                     M0223230
12B4  2621               338          AIS   R2,1                                                      M0223240
12B6  6110 13C6          339  AHMSS   AHM   R1,TOTERR       INCREMENT ERROR COUNT                     M0223250
12BA  DE20 1009          340          OC    R2,WRITE                                                  M0223260
12BE  9D23               341          SSR   R2,R3           IF TTY DU = 1 ,COUNT ERRORS               M0223270
12C0  4310 12D4          342          BFC   1,PRTERR        OTHERWISE PRINT ERROR MESSAGE             M0223280
12C4  C800 114A          343          LHI   R0,TSTEND       IF ERROR IN TEST 15                       M0223290
12C8  4500 13C8          344          CLH   R0,NXTST        INCREMENT TOTAL                           M0223300
12CC  4330 1158          345          BE    INCRE                                                     M0223310
12D0  4300 12A4          346          B     CHKEND                                                    M0223320
12D4  C8D0 13B0          347  PRTERR  LHI   R13,PRTBUF                                                M0223330
12D8  0804               348          LHR   R0,R4                                                     M0223340
12DA  41E0 12F8          349          BAL   R14,CONVRT      CONVERT LOC ADDRESS                       M0223350
12DE  26D5               350          AIS   R13,5                                                     M0223360
12E0  0809               351          LHR   R0,R9                                                     M0223370
12E2  41E0 12F8          352          BAL   R14,CONVRT      CONVERT DATA EXPECTED                     M0223380
12E6  26D5               353          AIS   R13,5                                                     M0223390
12E8  080A               354          LHR   R0,R10                                                    M0223400
12EA  41E0 12F8          355          BAL   R14,CONVRT      CONVERT DATA OBSERVED                     M0223410
12EE  41E0 1352          356          BAL   R14,PRINT       PRINT ERROR                               M0223420
12F2  13B0               357          DC    Z(PRTBUF)                                                 M0223430
12F4  13BF               358          DC    Z(PRBUFZ)                                                 M0223440
12F6  030F               359          BR    R15             RETURN                                    M0223450
                         360  *                                                                        M0223460
                         361  *                                                                        M0223470
12F8  0830               362  CONVRT  LHR   R3,R0           CONVERT CONTENTS OF R0                    M0223480
12FA  903C               363          SRLS  R3,12           TO 4 ASCII CHARACTERS                     M0223490
12FC  C630 0030          364          OHI   R3,X'30'        TO PRINT                                  M0223500
1300  C530 003A          365          CLHI  R3,X'3A'        STORE THERE AT MEM. LOC.                  M0223510
1304  2182               366          BLS   BYTE1           (R13) THRU (R13)+3                        M0223520
1306  2637               367          AIS   R3,7                                                      M0223530
1308  D23D 0000          368  BYTE1   STB   R3,0(R13)                                                 M0223540
                         369  *                                                                        M0223550
130C  0830               370          LHR   R3,R0           LOAD DATA                                 M0223560
130E  9038               371          SRLS  R3,8                                                      M0223570
1310  C430 000F          372          NHI   R3,15           MASK 4 BITS                               M0223580
1314  C630 0030          373          OHI   R3,X'30'        CONVERT TO ASCII                          M0223590
1318  C530 003A          374          CLHI  R3,X'3A'                                                  M0223600
131C  2182               375          BLS   BYTE2                                                     M0223610
131E  2637               376          AIS   R3,7                                                      M0223620
1320  D23D 0001          377  BYTE2   STB   R3,1(R13)       STORE IN MEMORY                           M0223630
                         378  *                                                                        M0223640
1324  0830               379          LHR   R3,R0           LOAD                                      M0223650
1326  9034               380          SRLS  R3,4                                                      M0223660
1328  C430 000F          381          NHI   R3,15           MASK                                      M0223670
132C  C630 0030          382          OHI   R3,X'30'        CONVERT                                   M0223680
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1330  C530 003A          383          CLHI  R3,X'3A'                                  M0223690
1334  2182               384          BLS   BYTE3                                      M0223700
1336  2637               385          AIS   R3,7                                       M0223710
1338  D23D 0002          386  BYTE3   STB   R3,2(R13)          STORE                  M0223720
                         387  *                                                       M0223730
133C  C400 000F          388          NHI   R0,15              MASK                   M0223740
1340  C600 0030          389          OHI   R0,X'30'           CONVERT                M0223750
1344  C500 003A          390          CLHI  R0,X'3A'                                  M0223760
1348  2182               391          BLS   BYTE4                                      M0223770
134A  2607               392          AIS   R0,7                                       M0223780
134C  D20D 0003          393  BYTE4   STB   R0,3(R13)          STORE                  M0223790
1350  030E               394          BR    R14                RETURN                 M0223800
                         395  *                                                       M0223810
                         396  *                                                       M0223820
1352  D320 1016          397  PRINT   LB    R2,ADDRESS         LOAD I/O DEVICE ADDRESS M0223830
1356  4830 1014          398          LH    R3,CRTFLG                                  M0223840
135A  2332               399          BZS   CQ                 IF TTY, BRANCH         M0223850
135C  2621               400          AIS   R2,1               INDEX CRT ADDRESS      M0223860
135E  DE20 1009          401  CQ      OC    R2,WRITE           WRITE MODE             M0223870
1362  9D20               402          SSR   R2,R0                                      M0223880
1364  2081               403          BTBS  8,1                WAIT FOR BUSY = 0      M0223890
1366  483E 0000          404          LH    R3,0(R14)          LOAD START ADDRESS OF MESSAGE M0223900
136A  DA23 0000          405  WD      WD    R2,0(R3)           WRITE                  M0223910
136E  9D20               406          SSR   R2,R0                                      M0223920
1370  2081               407          BTBS  8,1                WAIT FOR BUSY = 0      M0223930
1372  453E 0002          408          CLH   R3,2(R14)                                  M0223940
1376  2383               409          BNLS  COQ                BRANCH IF FINISHED     M0223950
1378  2631               410          AIS   R3,1               INDEX ADDRESS          M0223960
137A  2208               411          BS    WD                 CONTINUE PRITNING      M0223970
137C  4830 1014          412  COQ     LH    R3,CRTFLG                                  M0223980
1380  433E 0004          413          BZ    4(R14)             IF TTY, RETURN TO PROGRAM M0223990
1384  0733               414          XHR   R3,R3                                      M0224000
1386  9A23               415          WDR   R2,R3              IF CRT, SEND X'00' TO INTERFACE M0224010
1388  9D20               416          SSR   R2,R0                                      M0224020
138A  2081               417          BTBS  8,1                WAIT FOR BUSY = 0      M0224030
138C  430E 0004          418          B     4(R14)             RETURN TO PROGRAM      M0224040
                         419  *                                                       M0224050
                         420  *                                                       M0224060
                         421  *       DATA STORAGE AREA                               M0224070
                         422  *                                                       M0224080
                         423  *                                                       M0224090
1390  0D0A               424  TITLE   DC    X'D0A'             CR , LF                M0224100
1392  3032 2D33 3430 2020 425          DC    C'02-340  PART 2  06-162F02R01'          M0224110
139A  5041 5254 2032 2020
13A2  3036 2D31 3632 4630
13AA  3252 3031
13AE  0D0A               426          DC    X'D0A'                                   M0224120
      0000 13AF          427  TITEND  EQU   *-1                                       M0224130
                         428  *                                                       M0224140
                         429  *                                                       M0224150
13B0  5245 4734 2052 4547 430  PRTBUF  DC    C'REG4 REG9 REGA'                        M0224160
13B8  3920 5245 4741
13BE  0D0A               431          DC    X'D0A'                                   M0224170
      0000 13BF          432  PRBUF7  EQU   *-1                                       M0224180
13C0  0000               433  STSCHK  DC    0                  DU FLAG               M0224185
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13C2  8040                  434  NORM    DC    X'8040'          DISPLAY COMMANDS      M0224186
      0000 13C3             435  INCRM   EQU   *-1                                    M0224187
13C4  0000                  436  TOTAL   DC    0                                      M0224190
13C6  0000                  437  TOTERR  DC    0                                      M0224200
13C8  0000                  438  NXTST   DC    0                                      M0224210
13CA  FFFF                  439  NOERR   DC    -1                                     M0224220
13CC  FFFF                  440          DC    -1                                     M0224230
13CE  0D0A                  441          DC    X'D0A'                                 M0224240
      0000 13D3             442  ERR     EQU   *+3                                    M0224250
13D0  4E4F 2045 5252 4F52   443          DC    C'NO ERRORS'                           M0224260
13D8  5320
13DA  0D0A                  444          DC    X'D0A'                                 M0224270
      0000 13DB             445  NOERRD  EQU   *-1                                    M0224280
      0000 13DA             446  LAST    EQU   *-2                                    M0224290
      0000 13DB             447  QRT     EQU   *-1                                    M0224300
13DC                        448          END                                          M0224310
```

ASSEMBLED BY CAL 03-066R05-00 (32-BIT,

START OPTIONS: T=16,SCR,CRO

NO CAL ERRORS
NO CAL WARNINGS
2 PASSES

ABSTOP	0000 13DC								
ADC	0000 0002								
ADDRESS	0000 1016	71*	95	104	133	194	224	335	397
AHMSS	0000 12B6	337	339*						
BIT12	0000 101C	76*	142						
BIT34	0000 101E	77*	143						
BT00	0000 11EC	258*	261						
BT01	0000 11F6	262*							
BT0CH2	0000 11F2	257	260*						
BT10	0000 1202	267*	270						
BT11	0000 120C	271*							
BT1CH2	0000 1208	266	269*						
BT1ONE	0000 11FC	254	264*						
BT1ZRO	0000 11E6	252	255*						
BYTE1	0000 1308	366	368*						
BYTE2	0000 1320	375	377*						
BYTE3	0000 1338	384	386*						
BYTE4	0000 134C	391	393*						
CHKA2	0000 1242	289	291	293*					
CHKDT1	0000 1224	281*	328	329					
CHKDTA	0000 1220	274	278*						
CHKDTE	0000 1254	293	297	299	301*				
CHKDTG	0000 128C	313	318	320*					
CHKDTH	0000 1296	322	325*						
CHKEND	0000 12A4	330*	346						
CHKEY	0000 11B8	227	230*						
CHKLO	0000 1078	115*							
CHKLO2	0000 108C	120	122*						
CHKLO3	0000 109C	126	128*						
CKIO	0000 102E	85	86*						
CNTNU	0000 1072	110*							
COMP1	0000 1260	304	306*						
COMP2	0000 127A	311	314*						
CONVRT	0000 12F8	349	352	355	362*				
COQ	0000 137C	409	412*						
CQ	0000 135E	399	401*						
CRT	0000 1038	90*							
CRTADR	0000 1010	67*	94						
CRTFLG	0000 1014	70*	93	102	336	398	412		
DONE	0000 1174	196	208*						
DT1ONE	0000 1246	286	294*						
DT1ZRO	0000 1232	284	287*						
END	0000 11A4	220	224*	235					
END2	0000 11AC	226*	229						
ERR	0000 13D3	222	442*						
ERROR	0000 12AA	305	312	319	334*				
ERRPR	0000 119C	216	221*						

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                      166    170    188    191    258    281
R6        0000 0006    14*    35     36     36     38     41     42     45     50     51    145    150    159
                      171    172    173    178    182    262    292
R7        0000 0007    15*    43     44     51    146    151    154    160    161    165    172    177    183
                      184    188    267    294
R8        0000 0008    16*    30     42     47     49     80     82    111    111    147    152    155    157
                      161    163    166    168    173    175    178    180    184    186    189    191    271
                      300
R9        0000 0009    17*   281    292    294    300    303    306    307    308    310    314    315    317
                      351
READ      0000 1008    60*    91    100    225
READ1     0000 1018    73*    90
READ2     0000 101A    74*    99
REPEAT    0000 115C   199*
RESET     0000 1184   213*   214
SENSES    0000 0094    33*    37
START     0000 1026    81     83*   228    233
START1    0000 1020    57     80*
START2    0000 1024    58     82*
STBYTE    0000 009E    38*    46
STLDR     0000 0080    27*
STSCHK    0000 13C0   137    197    321    433*
TEST      0000 10A0   112    131*
TEST0     0000 10C8   144*   207
TEST1     0000 10D4   149*
TEST10    0000 111E   177*
TEST11    0000 1126   180*
TEST12    0000 112C   182*
TEST14    0000 113C   188*
TEST15    0000 1144   191*
TEST2     0000 10E0   154*
TEST3     0000 10E8   157*
TEST4     0000 10EE   159*
TEST5     0000 10F8   163*
TEST6     0000 10FE   165*
TEST7     0000 1106   168*
TEST8     0000 110C   170*
TEST9     0000 1118   175*
TESTU3    0000 1136   186*
TITEND    0000 13AF   109    427*
TITLE     0000 1390   108    424*
TOTAL     0000 13C4   135    198    204    436*
TOTERR    0000 13C6   136    201    215    339    437*
TSTEND    0000 114A   193*   343
TTY       0000 1054    88     99*
TTYADR    0000 1012    68*   103
WD        0000 136A   405*   411
WRITE     0000 1009    61*   340    401
ZERO      0000 102A    84     85*
```