PERKIN-ELMER

MODEL 3220
WRITABLE CONTROL STORE (WCS)

Test Program

Consists of:

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Program Listing	06-232M91A13
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06-232 R01

R01 PATCH INFORMATION

LOCATION	OLD HEX	NEW HEX
A36	F871	EE71

This patch to be incorporated in object 06-232 R00.1
on multimedia packages.
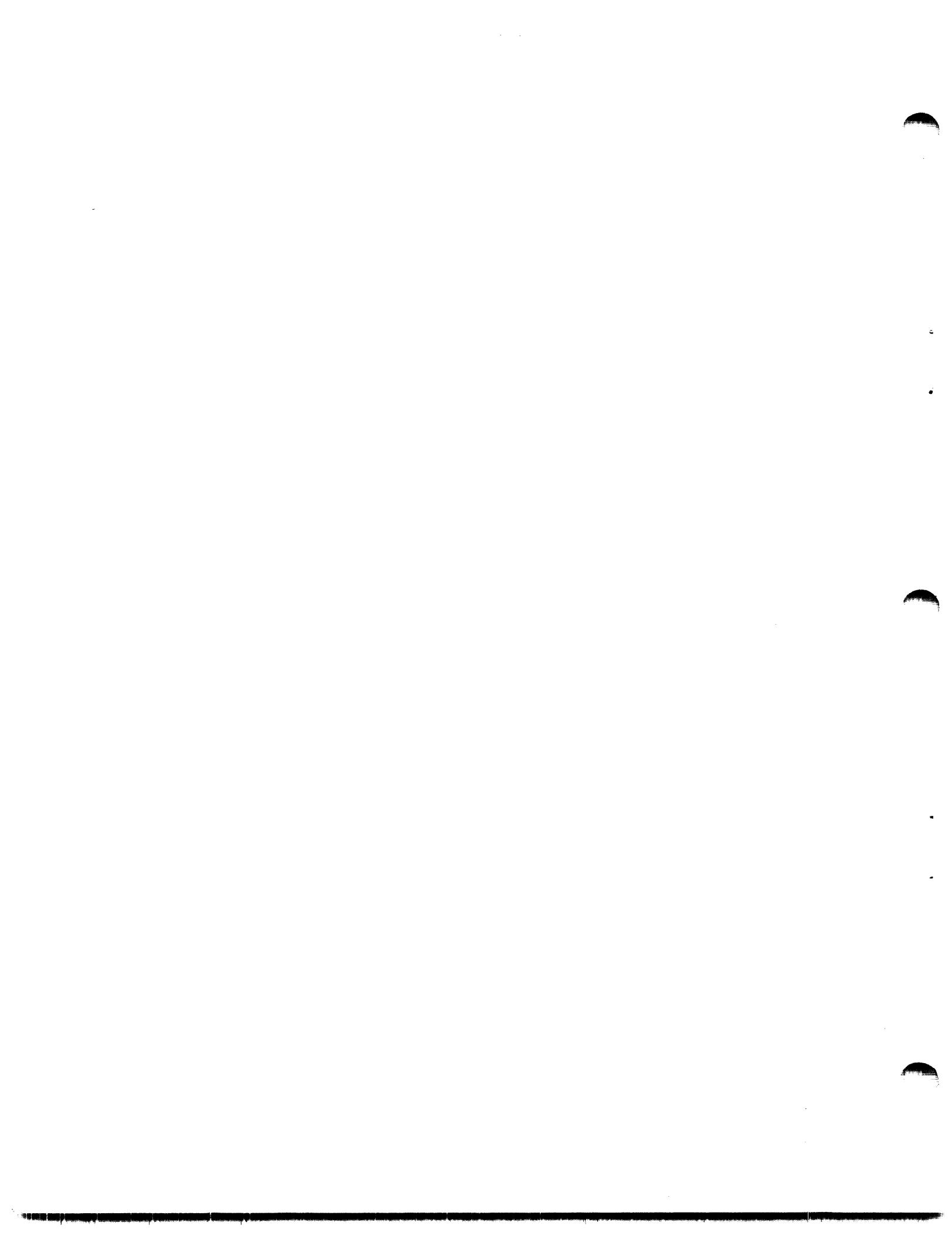
MODEL 3220
WRITABLE CONTROL STORE (WCS)
TEST PROGRAM

1.1 GENERAL

The purpose of the Model 3220 Writable Control Store (WCS) test is to verify its operation by exercising the WCS RAM with worst-case data patterns and be executing the microcode from every location in it. Also included is a test to check the microregisters. Prior to exercising these tests, the program checks for the correct execution of the WDCS, RDCS, FCS, and BDCS instructions. In order to perform this test, the operator should be familiar with the contents of the Model 3220 Microinstruction Reference Manual, Publication Number 29-694.

2.1 REQUIREMENTS OF MACHINE UNDER TEST

This program assumes that the programs listed below have been run without detecting an error.

```
Series 3200 Processor Test Part 1      06-228
Series 3200 Processor Test Part 2      06-229
Series 3200 Memory Test                06-236F01
                                       06-236F02
```

Other applicable test programs:

```
Model 1100 Terminal Test               06-217
Model 1200 Terminal Test               06-218
```

3.1 MINIMUM HARDWARE REQUIRED

- Processor: Model 3220 with WCS option

- Minimum memory: 128kb

- Console input device (refer to Appendix A): Teletype, CRT, or Carousel 300 on PASLA

- List device (refer to Appendix A): Teletype, CRT, Carousel 300 on PASLA, or Line Printer

● Object input device or multimedia loader

4.1 LOADING PROCEDURES

The program object is self-loading using the X'50' sequence shown below:

```
    LOCATION    CONTENTS

    X'30'       X'0000'
    X'32'       X'0000'
    X'34'       X'0000'
    X'36'       X'0050'
    X'50'       X'D500'
    X'52'       X'00CF'
    X'54'       X'4300'
    X'56'       X'0080'
    X'78'       X'85A1'    For 800 BPI mag tape
    X'78'       X'C186'    For floppy media disc
    X'78'       X'1399'    For high-speed, paper-tape reader/punch
```

4.1.2 Multimedia Diagnostic Loading Procedure

To load this program from the Perkin-Elmer Multimedia Diagnostic System, refer to Program Number 06-176A15.

5.1 OPERATING PROCEDURES

When the program is loaded, refer to Appendix A, and set up the console and list device parameters if devices other than the standard system console are desired. Select the program start address (X'A00'), and begin execution. Observe the following title is output to the console device:

```
    MODEL 3220 WCS TESST 06-232R00
    *
```

5.1.1 Normal Testing

● When the title has been printed, the program returns with a prompt on the console device. Enter the RUN command. The program prints "WCS detected", and if no errors are detected in the 'INIT' routine (see listing and options), it prints 'TEST EXECUTION STARTED', and the following tests are executed in sequence.

TEST 0

The address of each fullword of WCS is written as data into that fullword. The fullword is read and checked in each case.

TEST 1

This is the worst-case access test. ZERO's are written into each fullword of WCS. A fullword is read out and tested for ZERO, and ONE's are written into the next sequential fullword.

TEST 2

This subtest tests all data lines and WCS locations. The test pattern Y'80000000', Y'40000000', Y'20000000'..., Y'00000002', Y'00000001' is loaded into each 16-fullword block of WCS starting at the lowest address. The complement of the test pattern is loaded, starting at the highest address. The data is read back and checked in each case.

TEST 3

ZERO's are written into all WCS locations. Each successive fullword is read out, checked for ZEROs, and rewritten with all ONEs. Each fullword of WCS is read back and tested for all ONEs.

TEST 4

This subtest verifies that data written to a WCS location is not simultaneously written into any other WCS location.

SUBTEST 5

This subtest checks the WCS with worst-case data patterns. The WCS is first tested with the patterns Y'55555555' and Y'AAAAAAAA'. The patterns Y'7FFFFFFF', Y'BFFFFFFF'..., Y'FFFFFFFE' are written (a single ZERO bit moved through a field of ONE's). Finally, the patterns Y'80000000', Y'40000000'..., Y'00000001' are written (a single ONE bit is moved through a field of ZEROs). The data is read back and tested in each case.

TEST 6

A microcode subroutine is loaded into the first portion of WCS and executed by using the BDCS and ECS instructions. All 16 variations of the ECS instruction are used. (The microsubroutine is relocated to the next available WCS location and re-executed. The process is repeated for all available WCS locations.) A subroutine for testing BRANCH and YDP1 is also executed.

TEST 9

All the microregisters are zeroed. Data pattern of Y'00000001' is written into a microregister. Data is read back from all the microregisters (both from A and B stacks) and checked. Test is repeated using the same data pattern for all the microregisters. Test is executed again as above with data patterns of Y'00000002', Y'00000007'...Y'FFFFFFFF' (marching ones) and with data patterns of Y'7FFFFFFF', Y'3FFFFFFF'...Y'00000000' (marching zeros through ones). Test also uses alternating patterns of A's and 5's to check the microregisters.

APPENDIX A
USER DEVICE DEFINITION

The halfword labeled IO (see the listing) has the default value
for the ASCII Programmer's Console on a PASLA interface.   This
device is used as the operator's command console and as the list
device. If a different configuration is desired, change location
IO as follows:


```
0                                   7 8                          15
     ---------------------------------------------------------------
'IO' | CONSOLE DEVICE IDENTIFIER | LIST DEVICE IDENTIFIER |
     ---------------------------------------------------------------
```


CONSOLE DEVICE IDENTIFIER	EXPLANATION
===========================	===
X'01'	CRT or GDT on PASLA/PALM interface, strapped for FDX and highest baud rate.
X'02'	TTY, GDT, CRT, or Carousel 15/30 on a current loop interface.
X'04'	Carousel 300 on PASLA/PALM interface, strapped for FDX and highest baud rate.
X'05'	TTY, GDT, CRT, or Carousel 15/30 on micro I/O bus adapter.
X'00', X'03' X'06' - X'FF'	Reserved, defaults to X'01'.

LIST DEVICE IDENTIFIER	EXPLANATION
X'01'	CRT or GDT on PASLA/PALM interface, strapped for FDX and highest baud rate.
X'02'	TTY, GDT, CRT, or Carousel 15/30 on a current loop interface.
X'03'	Line Printer.
X'04'	Carousel 300 on PASLA/PALM interface, strapped for FDX and highest baud rate.
X'05'	TTY, GDT, CRT, or Carousel 15/30 on micro I/O bus adapter.
X'00', X'06' - X'FF'	Reserved, defaults to X'01'.

APPENDIX B
OPTION/COMMAND INPUT STRUCTURE

An asterisk (*) is output to the list device to indicate that the program is awaiting an option input. Any option may be typed in from the console input device, followed by a space and the desired hexadecimal value; an exception is the TEST option that accepts arguments separated by commas. A Carriage Return (CR) is issued to terminate every option/command input. An invalid option/command or value will cause a (?) followed by a Carriage Return (CR), Line Feed (LF), and an asterisk (*) to occur.
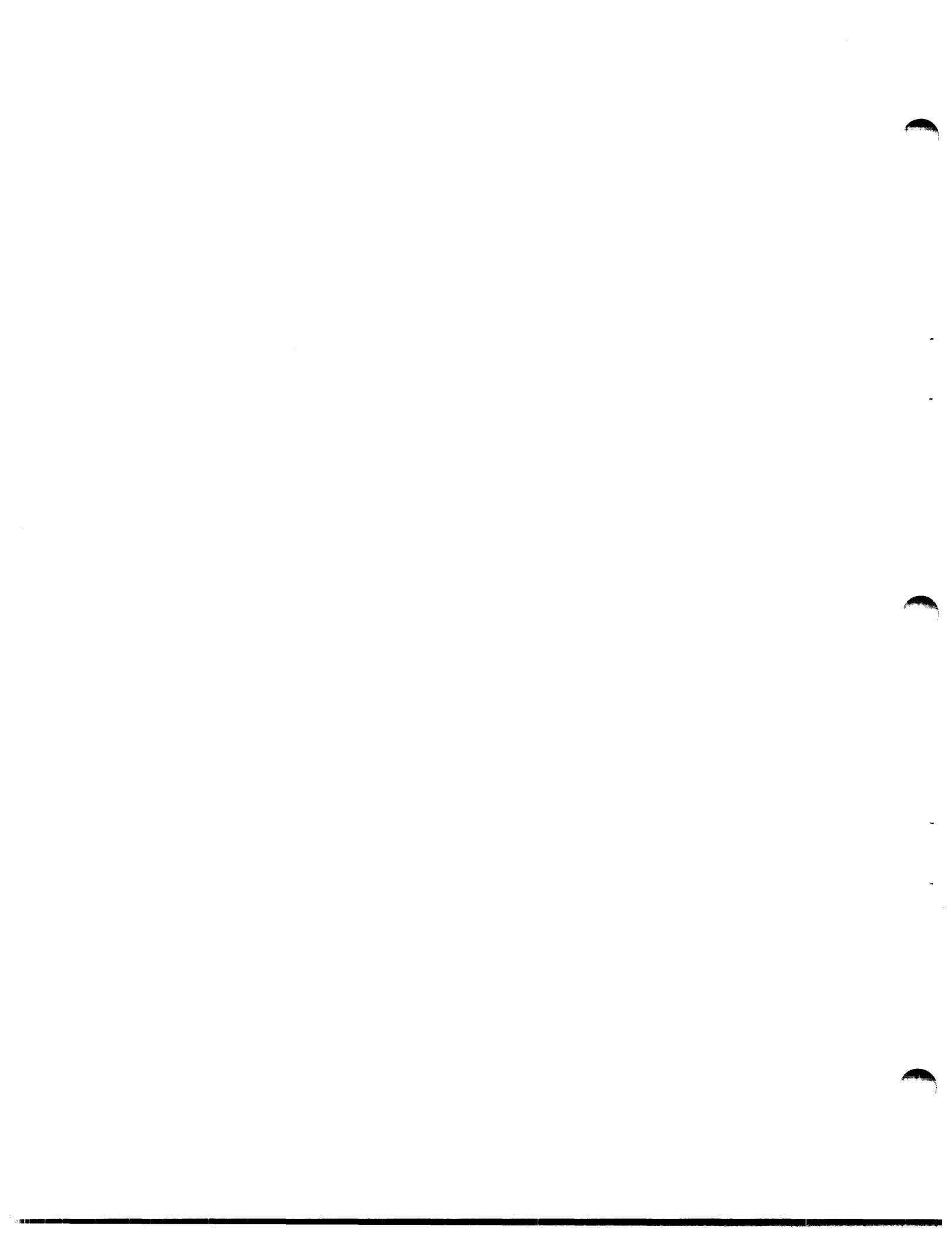
APPENDIX C
OPTIONS TABLE

OPTION	DEFAULT VALUE	DESCRIPTION
TEST	0,1,2,3,4,5,6,9	Selects the test(s) to be executed.
LOOP	0	Determines the number of times each test selected is to be executed. Value ranges from X'0001' to X'FFFF'.
NOMSG	0	Determines whether or not all messages will be printed. 0 = all messages 1 = error messages 2 = no messages (see Note 1)
CONTIN	0	Enables the user to run all selected tests continuously. 0 = normal execution 1 = continuous execution
RUN		Enter this command to execute this test.
CON		Enter this command to give control to the microcode console routine.
MODE	0	Determines when the tests selected are to be executed if errors occur in 'INIT' routine (see listing). 0 = halt 1 = execute
TALLY	0	Determines whether or not errors are tallied. 0 = not tallied 1 = tally (see Note 2)
WSCLO	800	Selects the WCS low address (see Note 3).

OPTION	DEFAULT VALUE	DESCRIPTION
========	===============	=============
WCSHI	1000	Selects the WCS high address (see Note 3).
FWORD	A0A0A0A0	Selects the fullword pattern used in Test 8.

NOTE

1. The program executes selected tests continuously but does not print any messages nor accept any command. Control is given to microcode console support when the total number of times the execution of tests or the total error exceeds X'7FFF'. The program prints 'TOTAL' and 'TOTERR' upon execution at program start address X'A00'.

2. Errors tallied are printed only after executing all selected tests or on depressing the break key. No error messages are printed during execution of tests. The error message would be in the form:

       ERROR TTNN
       TOTAL COUNT = XXXX

   Where:

       XXXX is the total number of times the error occurred.

3. WCSLO option is not available for Test 6 (defaulted to X'800'). The WCS address used in the tests are from WCSLO up to but excluding WCSHI. The WCSLO and WCSHI addresses should be specified to lie on a 256-word boundary.

APPENDIX D
EXPECTED PRINTOUT

```
MODEL 3220 WCS TEST 06-232R00
*RUN
WCS DETECTED
TEST EXECUTION STARTED
TEST 00
NO ERROR
TEST 01
NO ERROR
TEST 02
NO ERROR
TEST 03
NO ERROR
TEST 04
NO ERROR
TEST 05
NO ERROR
TEST 06
NO ERROR
TEST 09
NO ERROR
END OF TEST
*TEST 7
*RUN
WCS DETECTED
TEST EXECUTION STARTED
BREAK TERMINATION          (USER DEPRESSES BRK KEY)
*TEST 8
*RUN
WCS DETECTED
TEST EXECUTION STARTED
BREAK TERMINATION          (USER DEPRESSES BRK KEY)
*
```
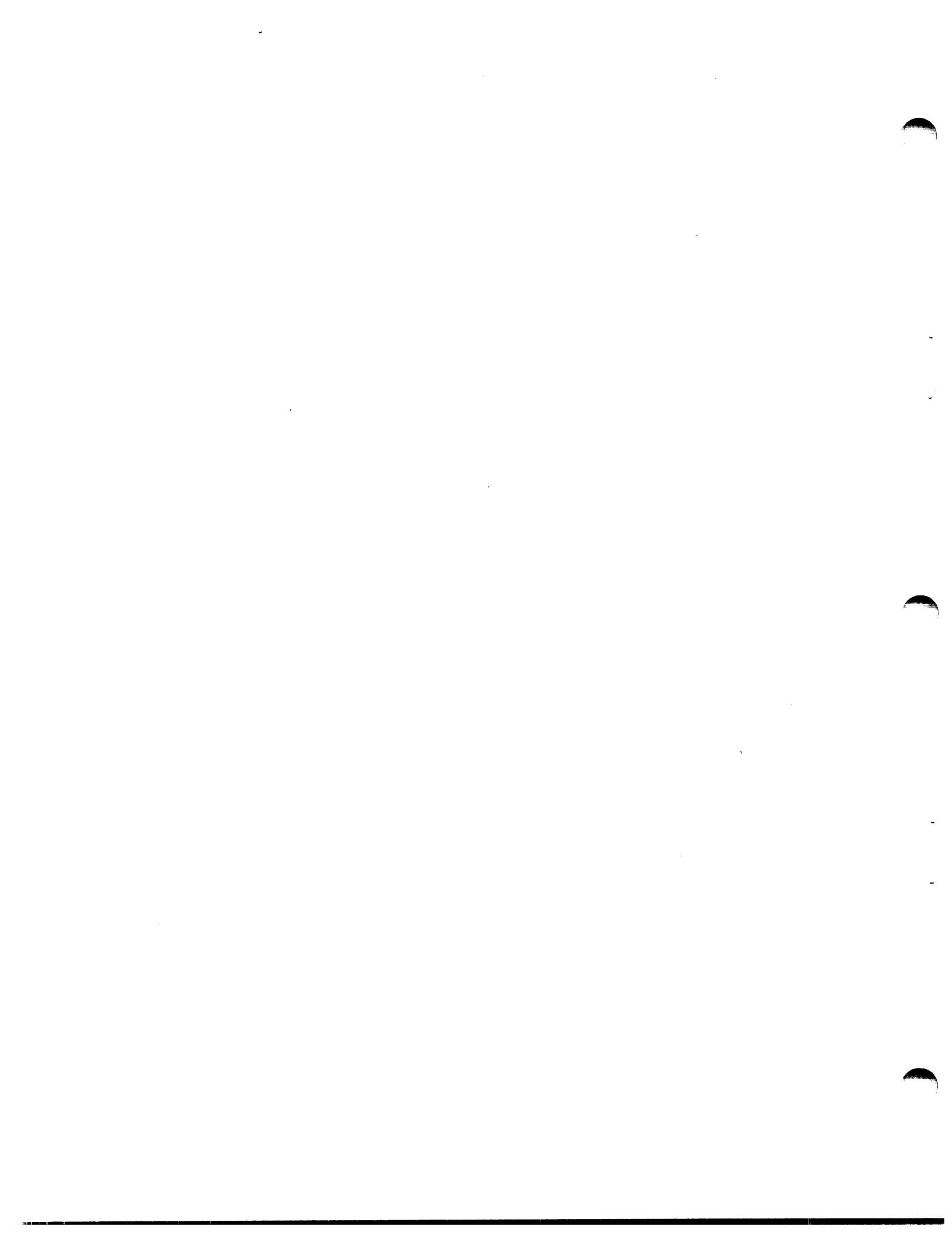
APPENDIX E
ERROR TABLE

TEST NUMBER	ERROR NUMBER	EXPLANATION
**	00	BDCS instruction was not illegal in the protect mode.
	01	BDCS instruction was illegal in both supervisor and protect modes.
	02	BDCS instruction did not branch to proper WCS location.
	03	RDCS instruction was not illegal in protect mode.
	04	RDCS instruction was illegal in both the supervisor and protect modes.
	05	RDCS count (in register 3) incorrect the termination.
	06	Not used.
	07	WDCS instruction was not illegal in protect mode.
	08	WDCS instruction was illegal in both supervisor and protect modes.
	09	Unused R/WDCS codes not illegal in supervisor or protect modes.
0-5, 7	0A	WCS data error detected. The following message is also printed: ADDRESS EXPECTED OBSERVED XXXXXX YYYYYYY ZZZZZZZ Where: XXXXXX is the WCS location. YYYYYYY is the expected data pattern. ZZZZZZZ is the actual data read.

TEST NUMBER	ERROR NUMBER	EXPLANATION
6	12	Subroutine error (using ECS).
6	13	Subroutine error (using BDCS).
6	0A	Subroutine error (BRANCH TEST).
09	14	Compare error. Microregister 0 in A stack.
09	15	Compare error. Microregister 0 in B stack.
09	16	Data modified in microregister 1 (A stack) by writing into microregister 0.
09	17	Data modified in microregister 1 (B stack) by writing into microregister 0.
09	18	Data modified in microregister 2 (A stack) by writing into microregister 0.
09	19	Data modified in microregister 2 (B stack) by writing into microregister 0.
09	1A	Data modified in microregister 3 (A stack) by writing into microregister 0.
09	1B	Data modified in microregister 3 (B stack) by writing into microregister 0.
09	1C	Compare error. Microregister 1 in A stack.
09	1D	Compare error. Microregister 1 in B stack.
09	1E	Data modified in microregister 0 (A stack) by writing into microregister 1.
09	1F	Data modified in microregister 0 (B stack) by writing into microregister 1.
09	20	Data modified in microregister 2 (A stack) by writing into microregister 1.

TEST NUMBER	ERROR NUMBER	EXPLANATION
09	20	Data modified in microregister 2 (A stack) by writing into microregister 1.
09	21	Data modified in microregister 2 (B stack) by writing into microregister 1.
09	22	Data modified in microregister 3 (A stack) by writing into microregister 1.
09	23	Data modified in microregister 3 (B stack) by writing into microregister 1.
09	24	Compare error. Microregister 2 in A stack.
09	25	Compare error. Microregister 2 in B stack.
09	26	Data modified in microregister 0 (A stack) by writing into microregister 2.
09	27	Data modified in microregister 0 (B stack) by writing into microregister 2.
09	28	Data modified in microregister 1 (A stack) by writing into microregister 2.
09	29	Data modified in microregister 1 (B stack) by writing into microregister 2.
09	2A	Data modified in microregister 3 (A stack) by writing into microregister 2.
09	2B	Data modified in microregister 3 (B stack) by writing into microregister 2.
09	2C	Compare error. Microregister 3 in A stack.
09	2D	Compare error. Microregister 3 in B stack.

TEST NUMBER	ERROR NUMBER	EXPLANATION
09	2E	Data modified in microregister 0 (A stack) by writing into microregister 3.
09	2F	Data modified in microregister 0 (B stack) by writing into microregister 3.
09	30	Data modified in microregister 1 (A stack) by writing into microregister 3.
09	31	Data modified in microregister 1 (B stack) by writing into microregister 3.
09	32	Data modified in microregister 2 (A stack) by writing into microregister 3.
09	33	Data modified in microregister 2 (B stack) by writing into microregister 3.

The following message is also printed in Test 9.

```
    TEST PATTERN      ERROR BITS
    XXXXXXX           0800800
```

Where:

```
    XXXXXXX      is the data pattern
                 used for testing at the
                 time of failure.

    0800800      in this example indi-
                 cates bits 4 and 16 of
                 the register caused the
                 error.
```

ERROR NUMBER	EXPLANATION
TTF1	Arithmetic fault interrupt.
TTF2	Illegal instruction interrupt.
TTF3	Machine malfunction interrupt.
TTF4	Unsolicited immediate interrupt.
TTF5	Memory access controller interrupt.
TTF6	Interrupt into wrong register.
TTF7	Data format fault.
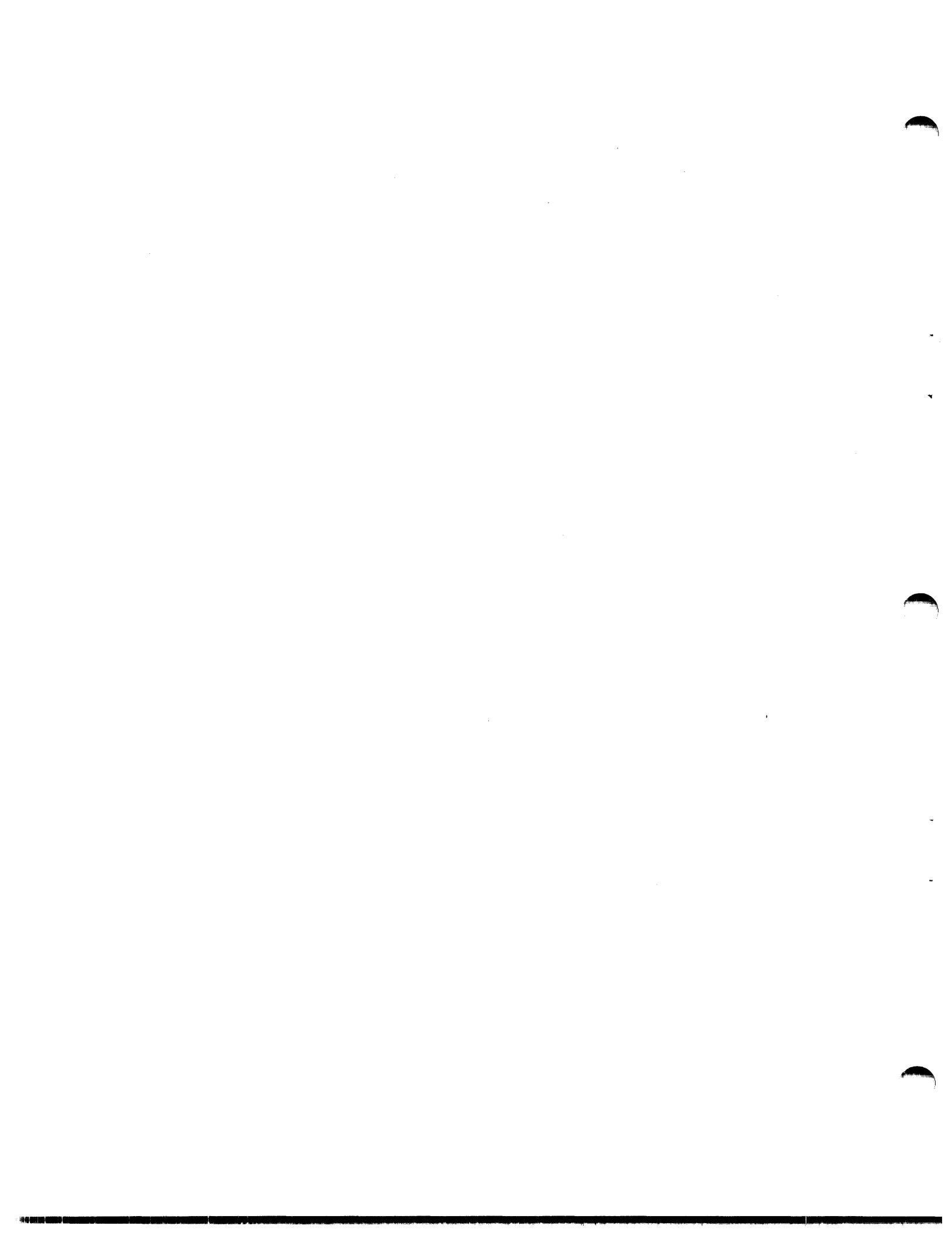
```
                                       1  **06232R00
                                       2  WCS.3220 PROG   MODEL 3220  WRITEABLE CONTROL STORE TEST 06-232M91R00A13
                                       3           CROSS
                                       4           TARGT 32
                                       5           NORX3
                                       6           WIDTH 120
                                       7  **
                                       8  *
                                       9  * MODEL 3220  WRITEABLE CONTROL STORE TEST 06-232R00
                                      10  *
                                      11  * COPYRIGHT     PERKIN ELMER INC.,  MARCH 1979
                                      12  *
                                      13  * PROGRAM USES SERIES 32 INSTRUCTION SET
                                      14  *
                                      15  * PURPOSE OF TEST:
                                      16  * THIS PROGRAM TESTS WRITEABLE CONTROL STORES AS A DATA
                                      17  * STORE AND AS INSTRUCTION STORE.
                                      18  *
                                      19  * ASSUMPTIONS:
                                      20  * IT IS ASSUMED THAT THE FOLLOWING TEST HAVE BEEN RUN WITHOUT
                                      21  * DETECTING AN ERROR, PRIOR TO LOADING THIS TEST:
                                      22  *      06-228 MODEL 3220 PROCESSOR TEST PART 1
                                      23  *      06-229 MODEL 3220 PROCESSOR TEST PART 2
                                      24  *
                                      25  * NORMAL TESTING:
                                      26  * THE PROGRAM REQUIRES A MODEL 3220 PROCESSOR WITH
                                      27  * 128K BYTES OF MEMORY,OPTIONS AND RUN COMMANDS ARE TO
                                      28  * BE ENTERED VIA A CONSOLE DEVICE.
                                      29  * THIS TEST USES THE ETPE R04P0
                                      30  *
                                      31  * A TELETYPE MUST BE ATTACHED AT THE DEVICE ADDRESS X'02'.IF THE
                                      32  * TELETYPE IS ATTACHED AT A DIFFERENT ADDRESS,CHANGE LOCATIONS
                                      33  * CLIFADR AND CLIFADR+2 TO THE ACTUAL TELETYPE ADDRESSES. IF CRT
                                      34  * ON PASLA (FDX ONLY) IS TO BE USED FOR I/O, CHANG LOCATION 'IO'
                                      35  * TO X'0101'.PASLA ADDRESSES FOR CRT ARE ASSUMED TO BE X'10'(READ
                                      36  * SIDE) AND X'11'(WRITE SIDE). IF THE PASLA IS CONNECTED AT DIFFERENT
                                      37  * CHANGE LOCATIONS PASLADR (FOR READ SIDE) & PASLADR+2 (WRITE SIDE)
                                      38  * TO THE ACTUAL PASLA ADDRESSES.SIMILAR ACTION SHOULD BE TAKEN IF
                                      39  * A CAROUSEL 300 OR MICRO I/O BUS IS USED .
                                      40  *
                                      41  * THE 06-232M17R00 TAPE IS AN ABSOLUTE TAPE WITH FRONT END BOOT
                                      42  * LOADER.
                                      43  *
                                      44  *
          0000 0001                   45  RET2     EQU    1
          0000 0004                   46  ZERO     EQU    4
          0000 0005                   47  ONE      EQU    5
          0000 0006                   48  TTY      EQU    6
          0000 0007                   49  DAT      EQU    7
          0000 0008                   50  TAB      EQU    8
          0000 0009                   51  STAT     EQU    9
          0000 000A                   52  FOUR     EQU    10
          0000 000A                   53  FLAG     EQU    10
```

```
          0000 000B              54  CHAR     EQU    11
          0000 000C              55  POINT    EQU    12
          0000 000D              56  ADRS     EQU    13
          0000 000E              57  TST      EQU    14
                                 58  *
                                 59  *
                                 60  *
                                 61  * ETPE FILE  ** START**
                                 62  * NEW REVISIONS OF ETPE SHOULD BE INSERTED AFTER THIS LINE
                                 63  * TO BE COMPATIBLE WITH THE TEST PROGRAM.
                                 64  * THE LAST LINE IS INDICATE BY THE CARD * ETPE FILE **END**
                                 65  *         CONDITIONAL ASSEMBLY PARAMETERS TO FOLLOW
                                 66  *
                                 67  *               IN ALL CASES, 0 EQUALS DELETE
                                 68  *                             1 EQUALS INCLUDE
                                 69  *
                                 70  *               EXCEPT FOR STIMER, 0 EQUALS DELETED
                                 71  *                                  1 EQUALS INCLUDE SOFTWARE
                                 72  *                                  2 EQUALS INCLUDE HARDWARE
                                 73  *                                  3 EQUALS INCLUDE BOTH
                                 74  * TIMER LABEL IS "TIMER" FOR SOFTWARE AND
                                 75  * HARDWARE, EXCEPT WHEN BOTH ARE INCLUDED.
                                 76  * THEN LABELS ARE "STIMER" AND "HTIMER"
                                 77  * RESPECTIVELY.
                                 78  *
                                 79  * LABEL "CLOCK" MUST BE EQUAL TO THE LFC ADDRESS.
                                 80  *
                                 81  *
                                 82  *
                                 83  *
          0000 0000              84  SR5BIN   EQU    0
          0000 0000              85  SDECTAB  EQU    0
          0000 0000              86  SDECHEX  EQU    0
          0000 0000              87  SDECASC  EQU    0
          0000 0000              88  SKBINT   EQU    0
          0000 0001              89  SCLOCK   EQU    1
          0000 0000              90  SDISPLAY EQU    0
          0000 0000              91  R0       EQU    0
          0000 0001              92  R1       EQU    1
          0000 0002              93  R2       EQU    2
          0000 0003              94  R3       EQU    3
          0000 0004              95  R4       EQU    4
          0000 0005              96  R5       EQU    5
          0000 0006              97  R6       EQU    6
          0000 0007              98  R7       EQU    7
          0000 0008              99  R8       EQU    8
          0000 0009             100  R9       EQU    9
          0000 000A             101  R10      EQU    10
          0000 000B             102  R11      EQU    11
          0000 000C             103  R12      EQU    12
          0000 000D             104  R13      EQU    13
          0000 000E             105  R14      EQU    14
          0000 000E             106  RET      EQU    14
          0000 000F             107  R15      EQU    15
          0000 000F             108  LINK     EQU    15
```

```
                                     109  *
                                     110  *
                                     111  *   BOOTLOADER WITH CHKSUM
                                     112  *
000000:I                             113          CRG    X'80'
000080        2421                   114          LIS    R2,1
000082        2303       =000088     115          BS     BOOT
000084        0000 2AE8              116          DC     A(RSAVE)           REGISTER SAVE POINTER(32-BIT M/C)
000088        C810 0A00              117  BOOT     LHI    R1,ORIGIN1        R1 = ADR( FIRST BYTE OF TEST PROG )
00008C        C830 2A5A              118          LHI    R3,LNZB+1         R3 = ADR( LAST NON-ZERO BYTE )
000090        4030 0022              119          STH    R3,X'22'          REGISTER SAVE POINTER(16-BIT M/C)
000094        2731                   120          SIS    R3,1
000096        C860 00FF              121  MN       LHI    R6,X'00FF'        R6 = CHKSUM BYTE = X'MN'
00009A        D340 0078              122          LB     R4,X'78'          INPUT DEV ADR
00009E        DE40 0079              123          OC     R4,X'79'
0000A2        9D45                   124  LEADER   SSR    R4,R5
0000A4        2091       =000001     125          BTBS   9,1               DU,BSY
0000A6        9B45                   126          RDR    R4,R5
0000A8        0855                   127          LDAR   R5,R5
0000AA        2234       =0000A2     128          BZS    LEADER            IGNORE LEADER
0000AC        D251 0000              129  LOAD     STB    R5,0(R1)          STORE 1ST NON-ZERO & SUBSEQUENT BYTE
0000B0        D351 0000              130          LB     R5,0(R1)          RELOAD DATA BYTE TO
0000B4        0765                   131          XAR    R6,R5             GENERATE CHKSUM
0000B6        9481                   132          EXBR   R8,R1
0000B8        9828                   133          WHR    R2,R8             DISPLAY MEMORY ADDRESS
0000BA        9D45                   134          SSR    R4,R5
0000BC        2091       =000001     135          BTBS   9,1               DU,BSY
0000BE        9B45                   136          RDR    R4,R5
0000C0        C110 00AC              137          BXLE   R1,LOAD           LOAD TILL LAST BYTE
0000C4        9486                   138          EXBR   R8,R6
0000C6        9828                   139          WHR    R2,R8             FINAL CHKSUM
0000C8        8800                   140          DCX    8800              GO TO MICROCODE CONSOLE ROUTINE
                                     141  *
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                      143              SQUEZ
0000CA                                144              ORG     X'A00'
000A00          4300 0A60             145   ORIGIN1    B       START1          START HERE FOR 32-BIT PROCESSOR
000A00                                146              IFZ     ADC-2
                                      147   ORIGIN2    B       START2          START HERE FOR 16-BIT PROCESSOR
                                      148   ORIGIN3    B       START3          SPECIAL 32-BIT PROCESSOR START
                                      149   ORIGIN4    B       START4          SPECIAL 16-BIT PROCESSOR START
                                      150              ELSE
000A04          4300 0A7E             151   ORIGIN2    B       START3          SPECIAL START(S) - 32 BIT PROCESSOR
000A08          4300 0A7E             152              B       START3
000A0C          4300 0A7E             153              B       START3
                                      154              ENDC
                                      155   *
                                      156   *------------------------------
                                      157   *   TEST CONSTANTS                              *
                                      158   *
000A10          0101                  159   IO         DC      X'0101'         I/O DEVICE(S) IDENTIFIER
000A12          0010                  160   PASLADR    DC      X'0010'         PALSA/PALM READ ADDRESS
000A14          0011                  161              DC      X'0011'         PASLA/PALM WRITE ADDRESS
000A16          0002                  162   CLIFADR    DC      X'0002'         CURRENT LOOP INTERFACE READ ADDRESS
000A18          0002                  163              DC      X'0002'         CURRENT LOOP INTERFACE WRITE ADDRESS
000A1A          0062                  164   LPADR      DC      X'0062'         DUMMY FOR LINE PRINTER
000A1C          0062                  165              DC      X'0062'         WRITE ADDRESS
000A1E          0010                  166   C300ADR    DC      X'0010'         CAROUSEL/PASLA READ ADDRESS
000A20          0011                  167              DC      X'0011'         CAROUSEL/PASLA WRITE ADDRESS
000A22          00C0                  168   MICROBUS   DC      X'00C0'         MICROBUS READ ADDRESS
000A24          00C0                  169              DC      X'00C0'         MICROBUS WRITE ADDRESS
000A26          0000                  170              DCX     0               PROVISION FOR SPECIAL DEVICE (READ)
000A28          0000                  171              DCX     0               WRITE ADDRESS
                                      172   *
                                      173   * IO =    0101  FOR CRT ON PASLA
                                      174   *         0202  FOR TELETYPE, CAROUSEL 15/30
                                      175   *         XX03  FOR LINE PRINTER
                                      176   *         0404  FOR CAROUSEL 300
                                      177   *         0505  FOR MICROBUS
                                      178   *
                                      179   *------------------------------------------------------------
                                      180   *   ETPE IO COMMANDS
                                      181   *
000A2A          0000                  182   CONRADR    DCX     0               CONSOLE DEVICE READ ADDRESS
000A2C          0000                  183   CONWADR    DCX     0               CONSOLE DEVICE WRITE ADDRESS
                                      184   *
000A2E          0000                  185   CONRD      DCX     0               CONSOLE READ/WRITE COMMANDS
                0000 0A2F             186   CONWRT     EQU     CONRD+1
000A30          0000                  187   CON2ND     DCX     0
                0000 0A31             188   CONENRD    EQU     CON2ND+1
000A32          0000                  189   CONCMD     DCX     0               DUMMY HW AS POINTER
000A34          B1A3                  190   CRTRD      DCX     B1A3            FOR CRT
000A36          F871                  191   CRT2ND     DCX     F871
000A38          A4D8                  192   CLIFRD     DCX     A4D8            *   CURRENT LOOP INTERFACE
000A3A          0064                  193   CLIF2ND    DCX     0064
000A3C          0080                  194   LPWRT      DCX     0080            *   LINE PRINTER
000A3E          0000                  195              DCX     0               DUMMY FOR LP
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
000A40      A1A3              196 CARRD    DCX    A1A3              *   CAROUSEL 300
000A42      F061              197 CAR2ND   DCX    F061
000A44      8202              198 MREADC   DCX    8202              *   MICROBUS
000A46      0392              199          DCX    0392
                             200 *
                             201 *-----------------------------------------------------------
000A48      00                202 CONRQ2S  DB     0                 CONSOLE REQUEST TO SEND CMD
000A49      33                203 CRTRQ2S  DB     X'33'             FOR CRT
000A4A      00                204          DB     0                 *   DUMMY BYTE FOR CLI
000A4B      00                205          DB     0                 *   DUMMY BYTE FOR LP
000A4C      23                206 CARRQ2S  DB     X'23'             *   CAROUSEL 300
000A4D      00                207          DB     0                 *   DUMMY BYTE FOR MICROBUS
000A4E                        208          DB     *                 (ALIGN ON HW BOUNDRY)
000A4E      0140              209 TIME     DC     X'140'            CONSTANT FOR 1 MS DELAY(X'C8'-MOD70)
000A50      0000              210          DCX    0                 RESERVED
000A52      70F0              211 PSW      DCX    70F0              PSW USED IN PROGRAM
000A54      30F0              212 PSW2     DCX    30F0              PSW USED IN EXEC
000A56      0000              213          DCX    0                 RESERVED
000A58      0000              214          DCX    0                 RESERVED
000A5A      0000              215          DCX    0                 RESERVED
000A5C      0000              216          DCX    0                 RESERVED
000A5E      0000              217          DCX    0                 RESERVED
                             218 *------------------------------
                             219 *
000A60      2410              220 START1   LIS    R1,0
000A62      4010 0030         221          STH    R1,X'30'          DISABLE INT AT PROCESSOR LEVEL
000A66      4820 0A54         222          LH     R2,PSW2
000A6A      4020 0032         223          STH    R2,X'32'          SELECT REG SET 15
000A6A                        224          IFZ    ADC-2
                             225          LCS    R2,1
                             226          STH    R2,MOD32          SET MODEL 32 PROCESSOR FLAG
                             227          B      ST
                             228 START2   LIS    R1,0
                             229          STH    R1,MOD32          RESET MOD 32 PROCESSOR FLAG
                             230          LH     R1,PSW2
                             231          ENDC
000A6E      C820 0A80         232 ST       LHI    R2,START
000A72      4010 0034         233          STH    R1,X'34'
000A76      4020 0036         234          STH    R2,X'36'          II INT NEW PSW LOC
000A7A      0000              235          DCX    0                 TAKE AN ILLEGAL INSTRUCTION INT
000A7C      2200      =000A7C 236          BS     *                 HALT IF II NOT TAKEN
                             237 *
*000A7E     220F      =000A60 238 START3   B      START1            INSERT SPECIAL ROUTINE HERE
000A7E                        239          IFZ    ADC-2
                             240 START4   B      START2            INSERT SPECIAL ROUTINE HERE
                             241          ENDC
                             242 *
000A80      D310 0A10         243 START    LB     R1,IO             GET I/O IDENTIFIERS
000A84      D320 0A11         244          LB     R2,IO+1
000A88      2436              245          LIS    R3,6              IDENTIFIER CAN BE 1,2,3,4,5
000A8A      0513              246          CLAR   R1,R3
000A8C      2182      =000A90 247          BLS    IO.OK1            BRANCH IF KB IDENTIFIER OK
000A8E      2411              248          LIS    R1,1              OTHERWISE FORCE IT TO BE PASLA
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
000A90      0523                249 IO.OK1  CLAR   R2,R3
*000A92     2182      =000A96   250         BL     IO.OK2               SAME TEST FOR LIST DEVICE
000A94      2421                251         LIS    R2,1
000A96      D210 0A10           252 IO.OK2  STB    R1,IO                REESTABLISH VALUES
000A9A      D220 0A11           253         STB    R2,IO+1
000A9E      D362 0A48           254         LB     R6,CONRQ2S(R2)
000AA2      4060 16DC           255         STH    R6,PASFLG2           SET PASLA FLAG (LIST DEVICE)
000AA6      0966                256         LDAR   R6,R6
*000AA8     2336      =000AB4   257         BZ     IO.OK3               SKIP IF NOT PASLA
000AAA      9122                258         SLHLS  R2,2
000AAC      4802 0A10           259         LH     R0,IO(R2)
000AB0      DE02 0A32           260         OC     R0,CONCMD(R2)        ISSUE 2ND COMMAND (TO LIST DEVICE***
                                261 *
000AB4      41F0 141A           262 IO.OK3  BAL    LINK,SETKB           ESTABLISH KEYBOARD DEVICE (& IOSAVE)
000AB8      9310                263         LBR    R1,R0                (R1) = 1,2,4,5 ; (R0 = KBIDENT)
000ABA      9112                264         SLHLS  R1,2                 (R1)=4,8,15,20
000ABC      2712                265         SIS    R1,2
000ABE      4831 0A10           266         LH     R3,IO(R1)
000AC2      4030 0A2A           267         STH    R3,CONRADR           SET UP CONSOLE DEVICE READ ADDRESS
000AC6      4831 0A12           268         LH     R3,IO+2(R1)
000ACA      4030 0A2C           269         STH    R3,CONWADR           SET UP CONSOLE WRITE ADDRESS
000ACE      4821 0A32           270         LH     R2,CONCMD(R1)
000AD2      4020 0A2E           271         STH    R2,CONRD             SET UP R/W COMMANDS
000AD6      4821 0A34           272         LH     R2,CONCMD+2(R1)
000ADA      4020 0A30           273         STH    R2,CON2ND            2ND CMD; ENABLE READ CMD
000ADE      9310                274         LBR    R1,R0
000AE0      D341 0A48           275         LB     R4,CONRQ2S(R1)
000AE4      D240 0A48           276         STB    R4,CONRQ2S           CONSOLE REQUEST TO SEND
000AE8      4040 16DA           277         STH    R4,PASFLG            SET PASLA FLAG (CONSOLE)
000AEC      0844                278         LDAR   R4,R4
000AEE      2333      =000AF4   279         BZS    IO.OK4               SKIP 2ND OC IF NOT PASLA DEVICE
000AF0      9422                280         EXBR   R2,R2
000AF2      9E32                281         OCR    R3,R2                ISSUE 2ND COMMAND (TO CONSOLE)
000AF4      DE30 0A2E           282 IO.OK4  OC     R3,CONRD             PUT CONSOLE IN READ MODE
000AF8      9B3F                283         RDR    R3,R15               READ A DUMMY CHARACTER (SET BUSY)
                                284 *
000AFA      41F0 145C           285         BAL    LINK,LCORE           SET UP LOW CORE
000AFE      2400                286         LIS    R0,0
000B00      4000 16EA           287         STH    R0,WASDU             RESET 'DEVICE UNAVAILABLE' FLAGS
000B04      4000 16EC           288         STH    R0,WASDU1
000B08      41F0 1258           289         BAL    LINK,CRLF
000B0C      C850 1B24           290         LHI    R5,TITLE
000B10      41F0 11CC           291         BAL    R15,PRINT            PRINT TEST PROGRAM TITLE
000B14      48F0 17C0           292         LH     R15,DUSAVE           LOAD NOMSG VALUE
000B18      C5F0 0002           293         CLHI   R15,2                DU??
000B1C      4330 0F7A           294         BE     KEEP10
000B20      4300 0B50           295         B      OPTIN
                                296 *
                                297 * FORCE PRINT
                                298 *
000B24      48E0 17C0           299 FORPRT  LH     R14,DUSAVE           LOAD VALUE
000B28      40E0 17C4           300         STH    R14,DUSAVE1          SAVE
000B2C      24EE                301         LIS    R14,R14
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
000B2E      40E0 16E4          302          STH   R14,ISITERR        FORCE PRINT
000B32      24E0               303          LIS   R14,C
000B34      40E0 17C0          304          STH   R14,DUSAVE         FORCE PRINT
000B38      030F               305          BR    LINK               RETURN
                               306   *
                               307   *   KEYBOARD INPUT ROUTINE
                               308   *
000B3A      24F0               309  OPTIN2   LIS   LINK,0
000B3C      40F0 16E0          310          STH   LINK,BRKFLG        CLEAR FLAG
000B40      41F0 0B24          311          BAL   LINK,FORPRT        FORCE PRINT
000B44      C850 17A4          312          LHI   R5,BRKMSG
000B48      41F0 11CC          313          BAL   LINK,PRINT
000B4C      41F0 0BE6          314          BAL   LINK,RESPRT        RESTORE
000B50      41F0 0B24          315  OPTIN    BAL   LINK,FORPRT        FORCE PRINT
000B54      41F0 1258          316          BAL   LINK,CRLF
000B58      41F0 0BE6          317          BAL   LINK,RESPRT        RESTORE
000B5C      4820 0A54          318  OPTIN1   LH    R2,PSW2
000B60      9512               319          EPSR  R1,R2              NO INT. REG SET 15
000B62      41F0 141A          320          BAL   LINK,SETKB         ESTABLISH CONSOLE
000B66      D340 17A2          321          LB    R4,AMSG            OUTPUT AN * TO INDICATE
000B6A      41F0 1280          322          BAL   LINK,OUTCHR        COMMAND MODE ESTABLISHED
000B6E      2541               323          LCS   R4,1               X'FF'
000B70      41F0 1280          324          BAL   LINK,OUTCHR
000B74      C8C0 133E          325          LHI   R12,QUESTN         SET UP R12 FOR ERR ROUTINE
000B78      C800 2020          326          LHI   R0,X'2020'         BLANK OUT COMMAND BUFFER
000B7C      4000 2ADC          327          STH   R0,OPTBUF          WHICH WILL CONTAIN OPTION
000B80      4000 2ADE          328          STH   R0,OPTBUF+2        NAME
000B84      4000 2AE0          329          STH   R0,OPTBUF+4
000B88      2410               330          LIS   R1,0               CLEAR OPTBUF INDEX
000B8A      41F0 130E          331  RDCHR    BAL   R15,GETCHR         GET A CHAR IN R4
000B8E      C540 0060          332          CLHI  R4,X'60'           UPPER CASE ALPHA ?
000B92      2183      =000B98  333          BLS   RDCHAR0            BRANCH IF NO.
000B94      CB40 0020          334          SHI   R4,X'20'           CONVERT TO LOWER CASE
000B98      C540 0023          335  RDCHAR0  CLHI  R4,X'23'           IS IT # ?
*000B9C     2135      =000BA6  336          BNE   RDCHR2             NO
000B9E      41F0 0BE6          337          BAL   LINK,RESPRT        RESTORE
000BA2      4300 0B50          338          B     OPTIN
000BA6      C540 005F          339  RDCHR2   CLHI  R4,X'5F'           LEFT ARROW, UNDERLINE, OR DELETE??
000BAA      2334      =000BB2  340          BES   RDCHAR1
000BAC      C540 0008          341          CLHI  R4,X'08'           BACK SPACE ?
000BB0      213C      =000BC8  342          BNES  RDCHR1             NO, BRANCH
000BB2      2711               343  RDCHAR1  SIS   R1,1               YES, DECREMENT INDEX
*000BB4     2314      =000BBC  344          BNZ   RDCHR3
000BB6      41F0 0BE6          345          BAL   LINK,RESPRT        RESTORE
000BBA      030C               346          BR    R12                UNDERFLOW EXIT
000BBC      C800 0020          347  RDCHR3   LHI   R0,X'20'
000BC0      D201 2ADC          348          STB   R0,OPTBUF(R1)
000BC4      4300 0B8A          349          B     RDCHR
000BC8      C540 000D          350  RDCHR1   CLHI  R4,X'0D'           IS IT CR ?
000BCC      4330 0BF0          351          BE    LOOKUP             YES, TRY MATCH
000BD0      C540 0020          352          CLHI  R4,X'20'           SPACE??
*000BD4     233E      =000BF0  353          BE    LOOKUP             TRY LOOKUP
000BD6      C510 0006          354          CLHI  R1,6               7 CHARACTERS INPUT ?
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
000BDA    038C                  355          BNLR   R12                 IF YES, ERROR
000BDC    D241 2ADC             356          STB    R4,OPTBUF(R1)       STORE CURRENT BYTE
000BE0    2611                  357          AIS    R1,1                BUMP BUFFER INDEX
000BE2    4300 0B8A             358          B      RDCHR               READ NEXT CHARACTER
                                359   *
                                360   * RESTORE PRINT PARAMETERS
                                361   *
000BE6    48E0 17C4             362   RESPRT  LH     R14,DUSAVE1         LOAD VALUE
000BEA    40E0 17C0             363          STH    R14,DUSAVE          RESTORE
000BEE    030F                  364          BR     LINK                RETURN
                                365   *----------------------------------
                                366   *   OPTION MATCH ROUTINE
                                367   *
000BF0    41F0 0BE6             368   LOOKUP  BAL    LINK,RESPRT         RESTORE
000BF4    C810 17C8             369          LHI    R1,OPT              LOAD ADDRESS OF OPTION TABLE
000BF8    2430                  370   LOOK1   LIS    R3,0                CLEAR BUFFER INDEX
000BFA    0861                  371          LDAR   R6,R1               SET OPTION WORD INDEX
000BFC    4856 0000             372   LOOK2   LH     R5,0(R6)
000C00    021C                  373          BMR    R12                 IF MINUS, THEN NO MATCH = ERROR
000C02    4553 2ADC             374          CLH    R5,OPTBUF(R3)       COMPARE TO OPTBUF HW
*000C06   2333       =000C0C    375          BE     LOOK3
000C08    261C                  376          AIS    R1,12
*000C0A   2209       =000BF8    377          B      LOOK1
000C0C    2632                  378   LOOK3   AIS    R3,2                TRY NEXT HW
000C0E    2662                  379          AIS    R6,2
000C10    C530 0006             380          CLHI   R3,6                3 MATCHING HW FOUND ?
*000C14   208C       =000BFC    381          BL     LOOK2
                                382   *
000C16    C510 184C             383          CLHI   R1,RUN              RUN COMMAND ?
000C1A    4330 0DE0             384          BE     RUNIT
000C1E    C510 1840             385          CLHI   R1,OPTION           OPTION CMD ?
000C22    4230 0D3A             386          BNE    LOOK4               NO, LOOK FURTHER
                                387   *----------------------------
                                388   *   TO PROCESS INPUT COMMAND 'OPTION'
                                389   *
000C26    41F0 0B24             390          BAL    LINK,FORPRT         FORCE PRINT
000C2A    C540 000D             391          CLHI   R4,X'0D'            CR ?
*000C2E   233B       =000C44    392          BE     OPTEXX              YES, BRANCH
000C30    41E0 1118             393          BAL    R14,CPTVAL          NO, GET OPTION DEV. PRINTOUT NUM.
000C34    C560 0006             394          CLHI   R6,6                IS DEVICE NUMBER VALID ?
000C38    2386       =000C44    395          BNLS   OPTEXX              NO, BRANCH
*000C3A   244A                  396          LHI    R4,X'0A'            YES, LOAD AN LF CHARACTER
000C3C    41F0 1280             397          BAL    LINK,OUTCHR         WRITE IT TO THE CONSOLE
000C40    D260 2AE3             398          STB    R6,IOSAVE+1         CHANGE THE LIST DEVICE
000C44    4820 1848             399   OPTEXX  LH     R2,OPTION+8         CHECK FOR SPECIAL ROUTINE
000C48    0232                  400          BNZR   R2                  LINK TO ROUTINE
                                401   *
000C4A    C830 17C8             402   OPTRTN  LHI    R3,TEST             RETURN HERE
000C4E    C8E0 0CD4             403          LHI    R14,OPTCMD8
000C52    41F0 1258             404          BAL    LINK,CRLF
000C56    2420                  405   OPTCMD  LIS    R2,0                RESET COUNTER
000C58    D342 17C8             406   OPTCMD1 LB     R4,OPT(R2)          TO PRINT TEST
000C5C    41F0 1280             407          BAL    LINK,OUTCHR
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
000C60      2621                  408           AIS    R2,1
000C62      C520 0006             409           CLHI   R2,6
*000C66     2087      =000C58     410           BL     OPTCMD1
000C68      C840 0020             411           LHI    R4,C' '           OUTPUT 1 SPACE
000C6C      41F0 1280             412           BAL    LINK,OUTCHR       TO PRINT SELECTED TEST NUMBERS
000C70      2450                  413           LIS    R5,0
000C72      4050 16BC             414           STH    R5,FIRST
000C76      4823 0006             415           LH     R2,6(R3)          FIRST TEST WORD
000C7A      2440                  416  OPTCMD2   LIS    R4,0              START WITH TEST 0
000C7C      4040 2AE4             417           STH    R4,TEMP
000C80      9121                  418  OPTCMD3   SLHLS  R2,1
000C82      4380 0CB4             419           BNC    OPTCMD7
000C86      4040 2AE4             420  OPTCMD4   STH    R4,TEMP           OPTION VALUE FOUND.
000C8A      4800 16BC             421           LH     R0,FIRST          IS IT FIRST ?
*000C8E     2335      =000C98     422           BZ     OPTCMD5
000C90      C840 002C             423           LHI    R4,C','           NO, OUTPUT COMMA
000C94      41F0 1280             424           BAL    LINK,OUTCHR
000C98      40F0 16BC             425  OPTCMD5   STH    LINK,FIRST
000C9C      0855                  426           LDAR   R5,R5             TEST VALUE FROM SECOND HW
*000C9E     2335      =000CA8     427           BZ     OPTCMD6           NO
000CA0      C840 0031             428           LHI    R4,C'1'           YES,OUTPUT '1'
000CA4      41F0 1280             429           BAL    LINK,OUTCHR
000CA8      4840 2AE4             430  OPTCMD6   LH     R4,TEMP           RESTORE R4
000CAC      D344 170C             431           LB     R4,HEXTAB(R4)     CONVERT
000CB0      41F0 1280             432           BAL    LINK,OUTCHR       OUTPUT 0-F
000CB4      4840 2AE4             433  OPTCMD7   LH     R4,TEMP           RESTORE
000CB8      2641                  434           AIS    R4,1              INCREMENT TEST #
000CBA      4040 2AE4             435           STH    R4,TEMP
000CBE      C540 0010             436           CLHI   R4,16
000CC2      4280 0C80             437           BL     OPTCMD3
000CC6      0855                  438  OPTCMD71  LDAR   R5,R5             DONE ?
000CC8      023E                  439           BNZR   R14
000CCA      4823 0008             440           LH     R2,8(R3)          SECOND TEST WORD
000CCE      2451                  441           LIS    R5,1              R5 = 1 FOR SECOND TEST HW
000CD0      4300 0C7A             442           B      OPTCMD2
                                  443  *-------------------------------------
                                  444  *   TO OUTPUT OTHER OPTION NAMES & VALUES
                                  445  *
000CD4      41F0 1258             446  OPTCMD8   BAL    LINK,CRLF
000CD8      2461                  447           LIS    R6,1              SET LINE COUNTER
000CDA      C820 17D4             448           LHI    R2,OPT+12         R2 POINTS TO THE NAME
000CDE      2436                  449  OPTCMD9   LIS    R3,6
000CE0      D342 0000             450  OPTCMD10  LB     R4,0(R2)
000CE4      41F0 1280             451           BAL    LINK,OUTCHR       OUTPUT OPTION NAME CHAR
000CE8      2621                  452           AIS    R2,1
000CEA      2731                  453           SIS    R3,1              6 CHARACTERS OUTPUT ?
000CEC      2026      =000CE0     454           BPS    OPTCMD10          NO,LOOP
000CEE      C840 0020             455           LHI    R4,C' '
000CF2      41F0 1280             456           BAL    LINK,OUTCHR       OUTPUT ONE SPACE
000CF6      4852 0000             457           LH     R5,0(R2)          R5 = OPTION VALUE
000CFA      2404                  458           LIS    R0,4
000CFC      41F0 117C             459           BAL    LINK,R5HEX        WRITE OPTION VALUE IN HEX (4 DIGITS)
000D00      D300 0A10             460           LB     R0,IO
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
 000D04      2701                      461           SIS    R0,1            CONSOLE = CRT ?
*000D06      213D        =000D20       462           BNZ    OPTCMD12        BRANCH: NO.
 000D08      2661                      463           AIS    R6,1            INCREMENT LINE COUNTER.
 000D0A      C560 0014                 464           CLHI   R6,20           PAGE FULL ?
 000D0E      2189        =000D20       465           BLS    OPTCMD12        NO
 000D10      2460                      466           LIS    R6,0            INITIALIZE LINE COUNT
 000D12      41F0 130E                 467  OPTCMD11 BAL    LINK,GETCHR
 000D16      274D                      468           SIS    R4,13           CR ?
 000D18      4330 0B5C                 469           BZ     OPTIN1          TO ACCEPT NEXT COMMAND
 000D1C      2643                      470           AIS    R4,3            LF ?
 000D1E      2036        =000D12       471           BNZS   OPTCMD11        IF YES, PRINT NEXT PAGE
 000D20      41F0 1258                 472  OPTCMD12 BAL    LINK,CRLF
 000D24      41F0 1358                 473           BAL    LINK,TSTBRK     EXIT IF 'BREAK' PRESSED.
 000D28      2626                      474           AIS    R2,6
 000D2A      C520 1828                 475           CLHI   R2,OPTEND2      ALL PRINTING OPTIONS DONE ?
 000D2E      4280 0CDF                 476           BL     OPTCMD9         NO,LOOP FOR NEXT ONE
 000D32      41F0 0BE6                 477           BAL    LINK,RESPRT     RESTORE
 000D36      4300 0B50                 478           B      OPTIN           TO ACCEPT NEXT COMMAND
                                       479  *------------------------------
 000D3A      C510 17C8                 480  LOOK4    CLHI   R1,TEST         'TEST' OPTION ?
 000D3E      4330 0D8E                 481           BE     TESTOP
 000D42      C510 1858                 482           CLHI   R1,CON          CONSOLE?
 000D46      4330 18E0                 483           BE     STOP.TST        YES, BRANCH
                                       484  *
                                       485  *  TO PROCESS COMMANDS OTHER THAN 'TEST', 'OPTION'.
                                       486  *
 000D4A      274D                      487           SIS    R4,13           OPT FOLLOWED BY CR ?
 000D4C      033C                      488           BZR    R12             YES, ERROR
 000D4E      41E0 1118                 489           BAL    R14,OPTVAL      GET OPTION VALUE IN R6
 000D52      274D                      490           SIS    R4,13           TERMINATED BY CR ?
 000D54      023C                      491           BNZR   R12             IF NO, BRANCH
 000D56      48E1 0008                 492           LH     R14,8(R1)       GET OPTION CHECK ROUTINE ADDRESS
*000D5A      2332        =000D5F       493           BZ     LOOK5
 000D5C      01FE                      494           BALR   R15,R14         LINK OPTION CHECK ROUTINE
                                       495  *                              RETURN HERE
 000D5E      4061 0006                 496  LOOK5    STH    R6,6(R1)        STORE OPTION VALUE
 000D62      4860 17F2                 497           LH     R6,NOMSG+6      LOAD VALUE
 000D66      4060 17C0                 498           STH    R6,DUSAVE       SAVE TO FLAG
 000D6A      4300 0B50                 499           B      OPTIN           TO ACCEPT NEXT COMMAND
                                       500  *
 000D6E      C560 0003                 501  ZERONE2  CLHI   R6,3            MAXIMUM+1
 000D72      038C                      502           BNLR   R12             ERROR RETURN
 000D74      030F                      503           BR     R15             OKAY
                                       504  *
 000D76      C360 FFFE                 505  ZERONE   THI    R6,X'FFFE'      IGNORE LSB
 000D7A      033F                      506           BZR    R15             OKAY
 000D7C      030C                      507           BR     R12             ERROR RETURN
                                       508  *
 000D7E      C560 0400                 509  ADR      CLHI   R6,X'400'       (R6) = 10 BIT DEVICE ADDRESS
 000D82      028F                      510           BLR    R15             RETURN TO LOOK5
 000D84      030C                      511           BR     R12
                                       512  *
 000D86      C560 000F                 513  LEVEL    CLHI   R6,15           (R6) = INTERRUPT LEVEL HEX DIGIT
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
000D8A      028F                   514           BLR    R15              RETURN TO LOOK5
000D8C      030C                   515           BR     R12
000D8C                             516           IFZ    SDECHEX-1
                                   517    *----------------------------------
                                   518    * TO CHECK THAT OPTION ENTRY IN R6 IS IN DECIMAL DIGITS.
                                   519    * TO CONVERT DECIMAL ENTRY IN R6 TO HEX VALUE AND
                                   520    * STORE IT @ 0(R5).
                                   521    *
                                   522   DECHEX   STM    R0,RSAVE
                                   523           LIS    R0,0             ACCUMULATOR
                                   524           LIS    R1,0             TABLE INDEX
                                   525           LIS    R2,0             SHIFT COUNTER
                                   526   DECLP1   LDAR   R3,R6            COPY INPUT VALUE
                                   527           SRAL   R3,0(R2)
                                   528           BZ     DECHEX1          TO RETURN
                                   529           NHI    R3,15
                                   530           CLHI   R3,10            VALID DECIMAL DIGIT ?
                                   531           BNLR   R12              IF NOT, ERROR.
                                   532           LDA    R7,DECTAB(R1)    1,10,....,10000
                                   533   DECLP2   SIS    R3,1
                                   534           BM     DECLP3
                                   535           AAR    R0,R7            ADD IN CURRENT VALUE
                                   536           B      DECLP2
                                   537   DECLP3   AIS    R2,4             INCREMENT SHIFTER
                                   538           AIS    R1,ADC           INCREMENT POINTER
                                   539           B      DECLP1
                                   540   DECHEX1  STH    R0,0(R5)         STORE HEX OPTION VALUE
                                   541           LM     R0,RSAVE
                                   542           BR     LINK             RETURN
                                   543           ENDC
                                   544    *----------------------------
                                   545    *   TEST OPTION PROCESS ROUTINE
                                   546    *
000D8E      274D                   547   TESTOP   SIS    R4,13            'TEST' FOLLOWED BY (CR) ?
000D90      213B        =000DA6    548           BNZS   TSTOP1
000D92      4800 1B58              549           LH     R0,DEFTESTS      YES, SET TEST OPTION TO
000D96      4000 17CE              550           STH    R0,TEST+6        FIRST TEST WORD
000D9A      4800 1B5A              551           LH     R0,DEFTESTS+2    ALL DEFAULT TESTS IN PROGRAM
000D9E      4000 17D0              552           STH    R0,TEST+8        SECOND TEST WORD
000DA2      4300 0B50              553           B      OPTIN            TO ACCEPT NEXT COMMAND
                                   554    *
000DA6      4850 1B5C              555   TSTOP1   LH     R5,MAXTST
000DAA      2470                   556           LIS    R7,0             TEST BIT ACCUMULATORS
000DAC      2480                   557           LIS    R8,0
000DAE      41E0 1118              558   TSTOP2   BAL    R14,OPTVAL       GET OPTION VALUE IN R6
000DB2      0556                   559           CLAR   R5,R6
000DB4      028C                   560           BLR    R12              ERROR: INVALID TEST NUMBER
000DB6      C560 0010              561           CLHI   R6,16            R6 < 16 ?
000DBA      2385        =000DC4    562           BNLS   TSTOP3           NO
000DBC      41E0 1154              563           BAL    R14,UNARY        GET UNARY OPERAND IN R3
000DC0      0673                   564           OAR    R7,R3            SET CURRENT BIT
*000DC2     2306        =000DCE    565           B      TSTOP4
000DC4      CB60 0010              566   TSTOP3   SHI    R6,16            R6 = 0-F
```

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```
000DC8      41E0 1154           567              BAL     R14,UNARY
000DCC      0683                568              OAR     R8,R3            SET CURRENT BIT
000DCE      274D                569     TSTOP4   SIS     R4,13           TERMINATED BY CR ?
000DD0      4230 0DAE           570              BNZ     TSTOP2
000DD4      4070 17CE           571              STH     R7,TEST+6       STORE VALID SELECTED TESTS
000DD8      4080 17D0           572              STH     R8,TEST+8
000DDC      4300 0B5C           573              B       OPTIN           TO ACCEPT NEXT COMMAND
                                574     *-----------------------------
                                575     *
000DE0      24F0                576     RUNIT    LIS     LINK,0
000DE2      40F0 16EC           577              STH     LINK,BRKFLG      CLEAR FLAG
000DE6      40F0 16E2           578              STH     LINK,PPTFLG      CLEAR FLAG
000DEA      41F0 1258           579              BAL     LINK,CRLF
000DEE      24F0                580              LIS     R15,0
000DF0      40F0 16EA           581              STH     R15,WASDU        RESET DU FLAGS
000DF4      40F0 16EC           582              STH     R15,WASDU1
000DF8      240F                583              LIS     R0,15            TO FIND HIGHEST SELECTED TEST  NO.
000DFA      4810 17D0           584              LH      R1,TEST+8        CHECK SECOND TEST HW
000DFE      1011                585     KEEP1    SRLS    R1,1
*000E00     218B     =000E16    586              BC      FOUND1           R0 = F-0
000E02      2701                587              SIS     R0,1
*000E04     2213     =000DFE    588              BNM     KEEP1            TRY NEXT DIGIT
000E06      240F                589              LIS     R0,15            INITIALIZE AGAIN
000E08      4810 17CE           590              LH      R1,TEST+6        CHECK FIRST TEST HW
000E0C      1011                591     KEEP2    SRLS    R1,1
*000E0E     2186     =000E1A    592              BC      FOUND2           R0 = F-0 = TEST #
000E10      2701                593              SIS     R0,1
*000E12     2213     =000E0C    594              BNM     KEEP2            LOOP
000E14      030C                595              BR      R12              TEST NOT SELECTED
000E16      CA00 0010           596     FOUND1   AHI     R0,16            ADJUST TEST # FOR SECOND HW
000E1A      4000 16E9           597     FOUND2   STH     R0,SELTST        HIGHEST SELECTED TEST NUMBER
000E1E      4800 0A10           598              LH      R0,IO
000E22      4000 2AE2           599              STH     R0,IOSAVE        RESTORE USER'S I/O CHOICE
000E26      41F0 1258           600              BAL     LINK,CRLF
000E2A      41F0 18E5           601              BAL     LINK,INIT        LINK USER INITIALIZATION ROUTINE
                                602     *
                                603     *
                                604     *   RESET TEST PARAMETERS
                                605     *
000E2E      2400                606     INITRET  LIS     R0,0             RETURN HERE FROM USER'S INIT ROUTINE
000E30      4000 16E4           607              STH     R0,ISITERR       RESET ERROR FLAG
000E34      4000 16EE           608              STH     R0,TOTAL         RESET TOTAL
000E38      4000 16EA           609              STH     R0,WASDU         RESET WASDU
000E3C      C810 3030           610              LHI     R1,C'00'
000E40      4010 1722           611              STH     R1,MTESTNO       RESET THESE FLAGS TO C'00'
000E44      4010 172C           612              STH     R1,ETESTNO
000E48      4010 172E           613              STH     R1,ERRNO
000E4C      41F0 145C           614              BAL     LINK,LCORE       SET UP LOW CORE
                                615     *
                                616     *   START SELECTION FROM TEST 0
                                617     *
000E50      2400                618     KEEP3    LIS     R0,0
000E52      4000 16F2           619              STH     R0,BTESTNO       RESET BINARY TEST NUMBER
```

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```
000E56        4000 16F6         620           STH   R0,NEXTST        RESET NEXT TEST #
                                621  *
                                622  *  TO FIND THE NEXT SELECTED TEST.
                                623  *
000E5A        4820 16F6         624  KEEP4     LH    R2,NEXTST        GET NEXT TEST #
000E5E        2408              625  KEEP41    LIS   R0,8
000E60        910C              626           SLHLS R0,12             R0 = X'8000'
000E62        CC02 0000         627           SRHL  R0,0(R2)         R0 = NEXT TEST BIT
000E66        C520 0010         628           CLHI  R2,X'10'         NEXT TEST < 16
*000E6A       2185     =000E74  629           BL    KEEP42
000E6C        4400 17D0         630           NH    R0,TEST+8        LOOK AT TEST HW 2
*000E70       2137     =000E7E  631           BNZ   KEEP5
*000E72       2304     =000E7A  632           B     KEEP43
000E74        4400 17CE  ——     633  KEEP42    NH    R0,TEST+6        LOOK AT TEST HW 1
*000E78       2133     =000E7E  634           BNZ   KEEP5
000E7A        2621              635  KEEP43    AIS   R2,1
*000E7C       220F     =000E5E  636           B     KEEP41           LOOP FOR NEXT TEST #
000E7E        4020 16F2         637  KEEP5     STH   R2,BTESTNO       CURRENT TEST #
000E82        0812              538           LDAR  R1,R2            R1 = TEST # IN BINARY
000E84        2621              639           AIS   R2,1
000E86        4020 16F6         640           STH   R2,NEXTST
000E8A        2402              641           LIS   R0,2             SET DIGITS TO PRINT = 2
000E8C        C820 1722         642           LHI   R2,MTESTNO       R2 = A(MTESTNO)
000E90        41F0 11A4         643           BAL   LINK,HEXASC      STORE TEST # IN ASCII @ MTESTNO
000E94        4820 1722         644           LH    R2,MTESTNO
000E98        4020 172C         545           STH   R2,ETESTNO       STORE TEST # IN ASCII @ ETESTNO
000E9C        41F0 1358         646           BAL   LINK,TSTBRK      TEST BREAK
000EA0        C850 171C         647           LHI   R5,TSTMSG
000EA4        41F0 11CC         648           BAL   LINK,PRINT       PRINT 'TEST NN'
000EA8        2400              649           LIS   R0,0
000EAA        4000 16E6         650           STH   R0,NOERR         RESET ERROR FLAG
000EAE        4000 16F4         651           STH   R0,COUNT         RESET COUNT
000EB2        4810 0A52         652  KEEP6     LH    R1,PSW           ENABLE INTERRUPTS
000EB6        9501              653           EPSR  R0,R1
000EB8        4820 16F2         654           LH    R2,BTESTNO       R2 = TEST #
000EBC        1122              655           SLLS  R2,LADC
000EBE        5812 1B60         656           LDA   R1,TESTS(R2)
000EC2        0301              657           BR    R1               GO TO TEST MODULE
                                658  *-----------------------------
                                659  *
                                660  *  TEST MODULE END ROUTINE
                                661  *
000EC4        4810 0A54         662  TSTEND    LH    R1,PSW2
000EC8        9501              663           EPSR  R0,R1            DISABLE INT @ PROCESSOR LEVEL
000ECA        4800 16F4         664           LH    R0,COUNT
000ECE        2601              665           AIS   R0,1             INCREMENT COUNT
000ED0        4000 16F4         666           STH   R0,COUNT
000ED4        4500 17DA         667           CLH   R0,LOOP+6        IF COUNT > LOOP,
000ED8        2385     =000EE2  668           BNLS  KEEP7            GO TO NEXT TEST MODULE
000EDA        41F0 1358         669           BAL   LINK,TSTBRK      IF BREAK GO TO OPTIN
000EDE        4300 0EB2         670           B     KEEP6            OTHERWISE, REPEAT SAME TEST
000EE2        4800 16E6         671  KEEP7     LH    R0,NOERR         LOOK @ ERROR FLAG
*000EE6       2135     =000EF0  672           BNZ   KEEP71
```

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```
000EE8    C850 1742        673          LHI    R5,NOERMSG
000EEC    41F0 11CC        674          BAL    LINK,PRINT        PRINT "NO ERROR"
000EF0    4810 16F2        675   KEEP71 LH     R1,BTESTNO        GET TEST #
000EF4    4510 16E8        676          CLH    R1,SELTST         IS THE LAST SELECTED TEST DONE ?
000EF8    4280 0E5A        677          BL     KEEP4             NO, GO SELECT NEXT TEST
                           678   *
                           679   *  ALL THE SELECTED TESTS HAVE NOW RUN
                           680   *
000EFC    4200 0EFC        681   ABORT  NOP    *                 COME HERE TO ABORT TEST SEQUENCE.
000F00    4810 0A54        682          LH     R1,PSW2
000F04    9501             683          EPSR   R0,R1             PSW = 30F0
000F04                     684          IFZ    $DISPLAY-1
                           685          BAL    LINK,DISPLAY      DISPLAY TOTAL & TOTERR
                           686          DC     Z(TOTAL),Z(TOTERR)
                           687          ENDC
000F06    41F0 13F4        689          BAL    LINK,TSTDU        RETURN WITH R1 = DU BIT
000F0A    4230 0F46        689          BNZ    KEEP9             IF DU, DISPLAY TOTAL
000F0E    4810 16EC        690          LH     R1,WASDU1         WAS IT EVER ?
000F12    4230 0F74        691          BNZ    KEEP92            YES, PRINT TOTAL, TOTERR
000F16    41F0 1358        692          BAL    LINK,TSTBRK
000F1A    4810 17E6        693          LH     R1,CONTIN+6       IF CONTIN = 1,
000F1E    4230 0F4A        694          BNZ    ABORT2            INCREMENT & GO TO TEST 0
000F22    41F0 141A        695          BAL    LINK,SETKB        KB DEVICE = LIST DEVICE
000F26    4810 180A        696          LH     R1,TALLY+6        IS TALLY OPTION SET        ******
*000F2A   2333    =000F30  697          BZ     EOTEM             NO,BRANCH           ******
000F2C    41F0 2754        698          BAL    LINK,ERRLISTC     GO & PRINT TALLY TABLE
000F30    C850 1792        699   EOTEM  LHI    R5,EOTMSG
000F34    4050 16E4        700          STH    R5,ISITERR        (FORCE PRINTING)
000F38    41F0 11CC        701          BAL    LINK,PRINT        'END OF TEST'
000F3C    24F0             702          LIS    R15,0
000F3E    40F0 16E4        703          STH    R15,ISITERR       (RESET PRINTING FLAG)
000F42    4300 0B50        704          B      OPTIN
                           705   *
                           706   *-------------------------------------
                           707   *  ROUTINE INCREMENTS,DISPLAYS & CHECKS 'TOTAL'
                           708   *
000F46    4010 16EA        709   KEEP9  STH    R1,WASDU          SET 'WASDU' FLAG
000F4A    4810 16EE        710   ABORT2 LH     R1,TOTAL          INCREMENT TOTAL
000F4E    2611             711          AIS    R1,1
000F50    4010 16EE        712          STH    R1,TOTAL
000F54    4200 0000        713   KEEP91 NOP
000F54                     714          IFZ    $DISPLAY-1
                           715          BAL    LINK,DISPLAY      DISPLAY TOTAL & TOTERR
                           716          DC     Z(TOTAL),Z(TOTERR)
                           717          ENDC
000F58    4810 16EE        718          LH     R1,TOTAL
000F5C    C510 7FFF        719          CLHI   R1,X'7FFF'        TOTAL < MAX RETAINABLE ?
*000F60   238A    =000F74  720          BNL    KEEP92
000F62    4800 16F2        721          LH     R0,BTESTNO        R0 = CURRENT TEST #
000F66    4500 16E8        722          CLH    R0,SELTST         IS IT LAST TEST ?
000F6A    4280 0E5A        723          BL     KEEP4             NO, GO TO NEXT TEST
000F6E    4300 0E50        724          B      KEEP3             GO TO TEST 0
                           725   *
```

```
            0000 0F72        726  HALT9   EQU    *
000F72      8800             727          DCX    8800              BREAK POINT, GO TO MICROCODE
                             728  *                                CONSOLE ROUTINE
                             729  *
000F74      41F0 13F4        730  KEEP92  BAL    LINK,TSTDU        SEE IF LIST DEV IS ON
000F78      2033   =000F72   731          BNZS   HALT9             NO, LOOP
000F7A      2400             732  KEEP10  LIS    P0,0
000F7C      4000 16EA        733          STH    R0,WASDU          RESET FLAG
000F80      41F0 0B24        734          BAL    LINK,FORPRT       FORCE PRINT
000F84      41F0 1258        735          BAL    LINK,CRLF
000F88      C850 1732        736          LHI    R5,TOTMSG
000F8C      4050 16E4        737          STH    R5,ISITERR
000F90      41F0 11CC        738          BAL    LINK,PRINT        PRINT 'TOTAL   TOTERR'
000F94      2404             739          LIS    R0,4              TO PRINT 4 HEX DIGITS
000F96      4850 16EE        740          LH     R5,TOTAL
000F9A      41F0 117C        741          BAL    LINK,R5HEX        PRINT TOTAL IN HEX
000F9E      2434             742          LIS    R3,4
000FA0      C840 0020        743          LHI    R4,C' '           SPACE
000FA4      41F0 1280        744  KEEP101 BAL    LINK,OUTCHR       OUTPUT IT
000FA8      2731             745          SIS    R3,1
*000FAA     2023   =000FA4   746          BP     KEEP101           4 TIMES
000FAC      2404             747          LIS    R0,4              TO PRINT 4 HEX DIGITS
000FAE      4850 16F0        748          LH     R5,TOTERR
000FB2      41F0 117C        749          BAL    LINK,R5HEX        PRINT TOTERR IN HEX
000FB6      41F0 0BE6        750          BAL    LINK,RESPRT       RESTORE
000FBA      4300 0B50        751          B      OPTIN             GO TO BEGINNING
000FBA                       752          IFZ    $DISPLAY-1
                             753  ***********************************
                             754  *
                             755  DISPLAY LIS    R0,1              DISPLAY PANEL ADDRESS
                             756          OC     R0,INCR           INCREMENTAL MODE
                             757          LH     R1,2(LINK)        GET 2ND PARAMETER ADDRESS
                             758          LH     R1,0(R1)          GET DATA
                             759          EXBR   R1,R1
                             760          WHR    R0,R1             WRITE DATA
                             761          LH     R1,0(LINK)        GET 1ST PARAMETER ADDRESS
                             762          LH     R1,0(R1)          GET DATA
                             763          EXBR   R1,R1
                             764          WHR    R0,R1             WRITE DATA TO D1,D2
                             765          CC     R0,NORM           NORMAL MODE
                             766          B      4(LINK)           RETURN
                             767  *
                             768          ENDC
                             769  ***********************************
                             770  *
                             771  *  ERROR ROUTINES               (OVERRIDE NOMSG OPTION)
                             772  *
000FBE      D000 2BB0        773  ERR     STM    R0,ERRSAVE        STORE REGISTERS
000FC2      4120 1048        774          BAL    R2,ERRCOM         RETURN IF LIST DEVICE IS ON
000FC6      41E0 107C        775          BAL    RET,ERR1          PRINT 'ERROR TTNN'
000FCA      2400             776  ERRCOM2 LIS    R0,0
000FCC      4000 16E4        777          STH    R0,ISITERR        RESET ERROR FLAG
000FD0      4820 0A52        778          LH     R2,PSW
```

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```
000FD4    9502                779          EPSR   R0,R2
000FD6    D100 2BB0           780          LM     R0,ERRSAVE        RESTORE REGISTERS
000FDA    030F                781          BR     LINK              RETURN TO TEST
000FDC    D000 2BB0           782   ERRD   STM    R0,ERRSAVE        STORE REGISTERS
000FE0    4120 1048           783          BAL    R2,ERRCOM         RETURN IF LIST DEVICE IS ON
000FE4    41E0 107C           784          BAL    RET,ERR1          PRINT 'ERROR TTNN'
000FE8    41E0 1086           785          BAL    RET,ERRD1         PRINT 'DEV DDD'
000FEC    4300 0FCA           786          B      ERRCOM2
000FF0    D000 2BB0           787   ERRS   STM    R0,ERRSAVE        STORE REGISTERS
000FF4    4120 1048           788          BAL    R2,ERRCOM         RETURN IF LIST DEVICE IS ON
000FF8    41E0 107C           789          BAL    RET,ERR1          PRINT 'ERROR TTNN'
000FFC    41E0 109E           790          BAL    RET,ERRS1         PRINT 'STA SS'
001000    4300 0FCA           791          B      ERRCOM2
001004    D000 2BB0           792   ERRDS  STM    R0,ERRSAVE        STORE REGISTERS
001008    4120 1048           793          BAL    R2,ERRCOM         RETURN IF LIST DEVICE IS ON
00100C    41E0 107C           794          BAL    RET,ERR1          PRINT 'ERROR TTNN'
001010    41E0 10B6           795          BAL    RET,ERRDS1        PRINT 'DEV DDD STA SS'
001014    4300 0FCA           796          B      ERRCOM2
001018    D000 2BB0           797   ERRL   STM    R0,ERRSAVE        STORE REGISTERS
00101C    40F0 16CE           798          STH    R15,OLOC          STORE ERROR LOC TO PRINT
001020    4120 1048           799          BAL    R2,ERRCOM         RETURN IF LIST DEVICE IS ON
001024    41E0 107C           800          BAL    RET,ERR1          PRINT 'ERROR TTNN'
001028    41E0 10DC           801          BAL    RET,ERRL1         PRINT 'LOC LLLL'
00102C    4300 0FCA           802          B      ERRCOM2
001030    D000 2BB0           803   ERRALL STM    R0,ERRSAVE        STORE REGISTERS
001034    4120 1048           804          BAL    R2,ERRCOM         RETURN IF LIST DEVICE IS ON
001038    41E0 107C           805          BAL    RET,ERR1          PRINT 'ERROR TTNN'
00103C    41E0 10B6           806          BAL    RET,ERRDS1        PRINT 'DEV DDD STA SS'
001040    41E0 10F4           807          BAL    RET,ERRPL1        PRINT 'PSW PPPP  LOC LLLL'
001044    4300 0FCA           808          B      ERRCOM2
                              809   *
                              810   *  COMMON ERROR ROUTINE
                              811   *
001048    5020 1708           812   ERRCOM STA    R2,COMRET         STORE RETURN ADDRESS
00104C    4810 0A54           813          LH     R1,PSW2
001050    9501                814          EPSR   R0,R1             DISABLE INT. @ PROCESSOR LEVEL
001052    41F0 13F4           815          BAL    LINK,TSTDU        GET LIST DEVICE DU BIT IN R1
001056    2138     =001066    816          BNZS   ERRCOM1           BRANCH IF OFF-LINE
001058    4020 16E4           817          STH    R2,ISITERR        SET ERROR FLAG
00105C    4020 16E6           818          STH    R2,NCERR
001060    5820 1708           819          LDA    R2,COMRET
001064    0302                820          BR     R2                GO, PRINT ERROR MESSAGE
                              821   *
001066    4810 16F0           822   ERRCOM1 LH    R1,TOTERR         LIST DEVICE IS OFF
00106A    2611                823          AIS    R1,1
00106C    4010 16F0           824          STH    R1,TOTERR         INCREMENT TOTERR
001070    C510 7FFF           825          CLHI   R1,X'7FFF'        TOTERR < MAX RETAINABLE ?
001074    4280 0F54           826          BL     KEEP91            NO, ABORT CURRENT TEST & GOTO NEXT
001078    4300 0F74           827          B      KEEP92            GO PRINT TOTAL & TOTAL ERROR
                              828   *------------------------------
                              829   * MESSAGE PRINT ROUTINES        (DO NOT OVERRIDE NOMSG OPTION)
                              830   *
                              831   *  TO PRINT 'ERROR TTNN'
```

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```
                                    832   *
00107C        C850 1726            833   ERR1    LHI    R5,ERRMSG
001080        41F0 11CC            834           BAL    LINK,PRINT          PRINT 'ERROR TTNN'
                                    835   *                                 TT = TEST #, NN = ERROR #
001084        030E                 836           BR     RET                 RETURN
                                    837   *
                                    838   *  TO PRINT 'DEV DDD'
                                    839   *
001086        2403                 840   ERRD1   LIS    R0,3                SET UP DIGITS = 3
001088        4810 16D0            841           LH     R1,ERRDEV           R1 = ERROR DEV # IN BINARY
00108C        C820 1760            842           LHI    R2,ASCIDEV2
001090        41F0 11A4            843           BAL    LINK,HEXASC         CONVERT IT TO ASCII
001094        C850 175C            844           LHI    R5,DEVMSG2
001098        41F0 11CC            845           BAL    LINK,PRINT          PRINT 'DEV DD'
00109C        030E                 846           BR     RET                 RETURN
                                    847   *
                                    848   *  TO PRINT 'STA SS'
                                    849   *
00109E        2402                 850   ERRS1   LIS    R0,2                SET UP DIGITS = 2
0010A0        D310 16D2            851           LB     R1,ERRSTA           R1 = ERROR STATUS
0010A4        C820 1758            852           LHI    R2,ASCISTA
0010A8        41F0 11A4            853           BAL    LINK,HEXASC         CONVERT IT TO ASCII
0010AC        C850 1754            954           LHI    R5,STAMSG
0010B0        41F0 11CC            855           BAL    LINK,PRINT          PRINT 'STA SS'
0010B4        030E                 856           BR     RET                 RETURN
                                    857   *
                                    858   *  TO PRINT 'DEV DDD STA SS'
                                    859   *
0010B6        2403                 860   ERRDS1  LIS    R0,3                SET UP DIGITS = 3
0010B8        4810 16D0            861           LH     R1,ERRDEV           R1 = ERROR DEV #
0010BC        C820 1750            862           LHI    R2,ASCIDEV
0010C0        41F0 11A4            863           BAL    LINK,HEXASC         CONVERT IT TO ASCII
0010C4        2402                 864           LIS    R0,2                SET UP DIGITS = 2
0010C6        D310 16D2            865           LB     R1,ERRSTA           R1 = ERROR STATUS
0010CA        C820 1758            866           LHI    R2,ASCISTA
0010CE        41F0 11A4            867           BAL    LINK,HEXASC         CONVERT IT TO ASCII
0010D2        C850 174C            868           LHI    R5,DEVMSG
0010D6        41F0 11CC            869           BAL    LINK,PRINT          PRINT 'DEV DD STA SS'
0010DA        030E                 870           BR     RET                 RETURN
                                    871   *
                                    872   *  TO PRINT 'LOC LLLL'
                                    873   *
0010DC        2404                 874   ERRL1   LIS    R0,4                SET UP DIGITS = 4
0010DE        4810 16CE            975           LH     R1,OLOC             R1= OLD LOC
0010E2        C820 1774            876           LHI    R2,ASCILOC
0010E6        41F0 11A4            877           BAL    LINK,HEXASC         CONVERT IT TO ASCII
0010EA        C850 1770            378           LHI    R5,LOCMSG
0010EE        41F0 11CC            879           BAL    LINK,PRINT          PRINT 'LOC LLLL'
0010F2        030E                 880           BR     RET                 RETURN
                                    881   *
                                    882   *  TO PRINT 'PSW PPPP  LOC LLLL'
                                    883   *
0010F4        2404                 884   ERRPL1  LIS    R0,4                SET UP DIGITS = 4
```

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```
0010F6      4810 16CA          885          LH     R1,OPSW        R1 = OLD PSW
0010FA      C820 176A          886          LHI    R2,ASCIPSW
0010FE      41F0 11A4          887          BAL    LINK,HEXASC    CONVERT IT TO ASCII
001102      4810 16CE          888          LH     R1,OLOC        R1= OLD LOC
001106      C820 1774          889          LHI    R2,ASCILOC
00110A      41F0 11A4          890          BAL    LINK,HEXASC    CONVERT IT TO ASCII
00110E      C850 1766          891          LHI    R5,PSWMSG
001112      41F0 11CC          892          BAL    LINK,PRINT     PRINT 'PSW PPPP  LOC LLLL'
001116      030E               893          BR     RET            RETURN
                               894   * *****************************
                               895   *   TO OBTAIN OPTION VALUE IN R6   (16 BITS, TARGT 15)
                               896   *
001118      2460               897   OPTVAL  LIS    R6,0           INITIALIZE ACCUMULATOR
00111A      41F0 130E          898          BAL    R15,GETCHR     GET A CHAR IN R4
00111E      24FF               899   OPTVAL0 LIS    R15,15
001120      D44F 170C          900   OPTVAL1 CLB    R4,HEXTAB(R15) SCAN TABLE
001124      2334      =00112C  901          BES    OPTVAL2        MATCH
001126      27F1               902          SIS    R15,1
001128      2214      =001120  903          BNMS   OPTVAL1
00112A      030C               904          BR     R12            ERROR; VALUE NOT IN TABLE.
00112C      1164               905   OPTVAL2 SLLS   R6,4           SHIFT LEFT 4
00112E      066F               906          CAR    R6,R15         OP IN CURRENT DIGIT
001130      41F0 130E          907   OPTVAL3 BAL    R15,GETCHR     GET NEXT CHAR
001134      C540 005F          908          CLHI   R4,X'5F'       IS IT LEFT ARROW ?
001138      2334      =001140  909          BES    OPTVAL5        YES, BRANCH
00113A      C540 0008          910          CLHI   R4,X'08'       BACK SPACE ?
00113E      2133      =001144  911          BNES   OPTVAL4        NO, BRANCH
001140      1064               912   OPTVAL5 SRLS   R6,4           THROW AWAY LAST HEX ENTRY
001142      2209      =001130  913          BS     OPTVAL3
001144      C540 000D          914   OPTVAL4 CLHI   R4,13          EXIT IF CR
001148      033E               915          BER    R14
00114A      C540 002C          916          CLHI   R4,X'2C'       OR COMMA
00114E      4230 111E          917          BNE    OPTVAL0        LOOP TO PROCESS
001152      030E               918          BR     R14            RETURN
                               919   *----------------------------------
                               920   * TO CONVERT (R6) FROM BINARY TO UNARY PATTERN, IN R3
                               921   *
001154      2431               922   UNARY   LIS    R3,1           INITIALIZE
001156      C560 000F          923   UNARY1  CLHI   R6,15          DONE ?
00115A      033E               924          BER    R14            RETURN
00115C      0A33               925          AAR    R3,R3          NO. SHIFT R3.
00115E      2661               926          AIS    R6,1           INCREMENT COUNTER
*001160      2205      =001156  927          B      UNARY1
001162                         928          IFZ    SCLOCK-1
                               929   *-----------------------------
                               930   *   TO PROVIDE # OF MILLISECONDS DELAY SPECIFIED BY R0
                               931   *
001162      D000 2AE8          932   TIMER   STM    R0,RSAVE       SAVE REGISTERS
001166      2410               933   STIMER1 LIS    R1,0
001168      2421               934          LIS    R2,1
00116A      4830 0A4E          935          LH     R3,TIME        R3 = TIME CONSTANT FOR 1 MS DELAY
00116E      C110 116E          936          BXLE   R1,*
001172      2701               937          SIS    R0,1
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
*001174      2037      =001166      938           BNZ    $TIMER1         LOOP TILL SPECIFIED DELAY
 001176      D100 2AE8              939           LM     R0,RSAVE        RESTORE REGISTERS
 00117A      030F                   940   $TIMXT  BR     LINK            RETURN
                                    941           ENDC
 00117C                             942           IFZ    $CLOCK-3
                                    943   *----------------------------
                                    944   *  TO PROVIDE # OF MILLISECONDS DELAY SPECIFIED BY R0
                                    945   *
                                    946   STIMER  STM    R0,RSAVE        SAVE REGISTERS
                                    947   STIMER1 LIS    R1,0
                                    948           LIS    R2,1
                                    949           LH     R3,TIME         R3 = TIME CONSTANT FOR 1 MS DELAY
                                    950           BXLE   R1,*
                                    951           SIS    R0,1
                                    952           BNZ    $TIMER1         LOOP TILL SPECIFIED DELAY
                                    953           LM     R0,RSAVE        RESTORE REGISTERS
                                    954   $TIMXT  BR     LINK            RETURN
                                    955   HTIMER  NOP
                                    956           BR     LINK
                                    957   CLOCK   DCX    6C
                                    958           ENDC
 00117C                             959           IFZ    $CLOCK-2
                                    960   TIMER   NOP
                                    961           BR     LINK
                                    962   CLOCK   DCX    6C
                                    963           ENDC
                                    964   *----------------------------
                                    965   *  R5HEX PRINTS CONTENTS OF R5 IN HEX
                                    966   *         PRINTS UPTO 4 DIGITS        (8 DIGITS, TARGT 32)
                                    967   *
 00117C      D000 2AE8              968   R5HEX   STM    R0,RSAVE        STORE REGISTERS
 001180      0820                   969           LDAR   R2,R0           R2 = # OF DIGITS TO BE PRINTED
 001182      2721                   970           SIS    R2,1
*001184      211D      =00119F      971           BM     R5XB
 001186      1122                   972           SLLS   R2,2            R2 = 4(DIGITS-1)
 001188      0845                   973   R5X     LDAR   R4,R5
 00118A      EC42 0000              974           SRAL   R4,0(R2)
 00118E      C440 000F              975           NHI    R4,15           R4 = HEX DIGIT
 001192      D344 170C              976           LB     R4,HEXTAB(R4)
 001196      41F0 1280              977   R5XA    BAL    R15,OUTCHR
 00119A      2724                   978           SIS    R2,4
*00119C      221A      =001188      979           BNM    R5X             LOOP TILL ALL DIGITS
 00119E      D100 2AE8              980   R5XB    LM     R0,RSAVE        RESTORE REGISTERS
 0011A2      030F                   981           BR     LINK            RETURN
 0011A2                             982           IFZ    $R5BIN-1
                                    983   *----------------------------
                                    984   *  R5BIN PRINTS CONTENTS OF R5 IN BINARY
                                    985   *         PRINTS UPTO 16 DIGITS
                                    986   *
                                    987   R5BIN   STM    R0,RSAVE        STORE REGISTERS
                                    988           LDAR   R3,R0           R3 = # OF DIGITS TO BE PRINTED
                                    989           LHI    R1,16
                                    990           SAR    R1,R3
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                    991            BM    R5B2              EXIT
                                    992            SLHL  R5,0(R1)          R5 = DATA TO BE PRINTED
                                    993   R5B      LHI   R4,C'0'
                                    994            SLHLS R5,1
                                    995            BNC   R5B1
                                    996            AIS   R4,1              IF CARRY, PRINT 1
                                    997   R5B1     BAL   LINK,OUTCHR
                                    998            SIS   R3,1              R3 = # OF REMAINING DIGITS
                                    999            BP    R5B3
                                    1000  R5B2     LM    R0,RSAVE          RESTORE REGISTERS
                                    1001           BR    LINK              RETURN
                                    1002  R5B3     THI   R3,3              4,8 OR 12 DIGITS LEFT ?
                                    1003           BNZ   R5B4              NO
                                    1004           LHI   R4,C' '           YES, OUTPUT ONE SPACE
                                    1005           BAL   R15,OUTCHR
                                    1006  R5B4     B     R5B               LOOP FOR NEXT DIGIT
                                    1007           ENDC
                                    1008  *-----------------------------
                                    1009  *  TO CONVERT HEXADECIMAL DATA IN R1 TO ASCII CHAR & STORE @ 0(R2)
                                    1010  *
0011A4      D000 2AE8              1011  HEXASC   STM   R0,RSAVE          STORE REGISTERS
0011A8      0830                   1012           LDAR  R3,R0             R3 = DIGITS
0011AA      1132                   1013           SLLS  R3,2
0011AC      2734                   1014           SIS   R3,4              R3 = 4(DIGITS)-4
0011AE      0841                   1015  HEXASC1  LDAR  R4,R1             R4 = HEX DATA
0011B0      EC43 0000              1016           SRAL  R4,0(R3)
0011B4      C440 000F              1017           NHI   R4,15             R4 = HEX DIGIT TO BE CONVERTED
0011B8      D344 170C              1018           LB    R4,HEXTAB(R4)
0011BC      D242 0000              1019           STB   R4,0(R2)          STORE ASCII CHAR
0011C0      2621                   1020           AIS   R2,1
0011C2      2734                   1021           SIS   R3,4
*0011C4     221B        =0011AE    1022           BNM   HEXASC1           LOOP TILL ALL DIGITS
0011C6      D100 2AE8              1023           LM    R0,RSAVE          RESTORE REGISTERS
0011CA      030F                   1024           BR    LINK              RETURN
0011CA                             1025           IFZ   SDECASC-1
                                    1026  *-----------------------------
                                    1027  *  TO CONVERT BINARY DATA IN R1 INTO DECIMAL DIGITS
                                    1028  *     AND STORE THEM IN ASCII @ 0(R2)
                                    1029  *
                                    1030  DECASC   STM   R0,RSAVE
                                    1031           LDAR  R3,R0             COPY DIGIT COUNT
                                    1032           SLLS  R3,LADC           &ESTABLISH DECTAB INDEX.
                                    1033           SIS   R3,ADC
                                    1034  $DEC1    LIS   R4,0              CLEAR MODULUS COUNTER
                                    1035           LDA   R5,DECTAB(R3)     LOAD LARGEST REQ. POWER OF 10.
                                    1036  $DEC2    CLAR  R1,R5             EXCEEDS TEST VALUE ?
                                    1037           BLS   $DEC3             BRANCH IF YES.
                                    1038           SAR   R1,R5             DECREMENT TEST VALUE
                                    1039           AIS   R4,1              INCREMENT MODULUS COUNTER
                                    1040           CLHI  R4,10             VALID DECIMAL DIGIT ?
                                    1041           BL    $DEC2             BRANCH IF YES; EL E
                                    1042           SIS   R4,10             FORCE VALID DIGIT,
                                    1043           BS    $DEC2             REPEAT DECREMENT.
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                    1044  SDEC3    LB     R4,HEXTAB(R4)      CONVERT MODULUS COUNT TO ASCII
                                    1045           STB    R4,0(R2)           AND STORE AT DESTINATION MSB.
                                    1046           AIS    R2,1              INCREMENT DESTINATION POINTER
                                    1047           SIS    R3,ADC             DECREMENT DECTAB POINTER
                                    1048           BNM    SDEC1              FALL THROUGH ON DECTAB UNDERFLOW.
                                    1049           LM     R0,RSAVE           RESTORE USER'S REGISTERS
                                    1050           BR     LINK               RETURN.
                                    1051           ENDC
                                    1052  *---------------------------------
                                    1053  *   TO PRINT THE ASCII MESSAGE
                                    1054  *
  0011CC      D000 2AE8             1055  PPINT    STM    R0,RSAVE           STORE REGISTERS
  0011D0      41F0 13F4             1056           BAL    LINK,TSTDU
  0011D4      40F0 16E2             1057           STH    LINK,PRTFLG        SET FLAG
  0011D8      2337       =0011E6    1058           BZS    P1
  0011DA      4010 16EA             1059           STH    R1,WASDU           SET WASDU FLAGS
  0011DE      4010 16EC             1060           STH    R1,WASDU1
  0011E2      4300 1240             1061           B      PRINT5             EXIT
  0011E6      4820 16EA             1062  P1       LH     R2,WASDU
 *0011EA      233B       =001200    1063           BZ     P3
  0011EC      2541                  1064           LCS    R4,1               CHARACTER = X'FF'
  0011EE      4040 16EC             1065           STH    R4,WASDU1
  0011F2      2434                  1066           LIS    R3,4
  0011F4      41F0 1280             1067  P2       BAL    LINK,OUTCHR
  0011F8      2731                  1068           SIS    R3,1
 *0011FA      2023       =0011F4    1069           BP     P2
  0011FC      4300 0F7A             1070           B      KEEP10             PRINT TOTAL, TOTERR
  001200      4800 17C0             1071  P3       LH     R0,DUSAVE
 *001204      2335       =00120F    1072           BZ     PRINT2             NO, PRINT ALL MESSAGES
  001206      4800 16E4             1073           LH     R0,ISITERR
  00120A      4330 1240             1074           BZ     PRINT5             NOT AN ERROR MSG. EXIT
                                    1075  *
  00120E      2462                  1076  PRINT2   LIS    R6,2               LOAD "LOOK" COUNT
  001210      D345 0000             1077  PRINT2A  LB     R4,0(R5)           GET A MESSAGE BYTE
  001214      41F0 1280             1078           BAL    LINK,OUTCHR        OUTPUT IT
  001218      274D                  1079           SIS    R4,13              CR ?
 *00121A      2337       =001228    1080           BZ     PRINT3             MSG OVER
  00121C      2651                  1081           AIS    R5,1
  00121E      2761                  1082           SIS    R6,1               DECRIMENT COUNT
 *001220      2038       =001210    1083           BNZ    PRINT2A            CONTINUE
  001222      41F0 1358             1084           BAL    R15,TSTBRK
  001226      220C       =00120E    1085           BS     PRINT2             LOOP FOR NEXT CHAR
  001228      244A                  1086  PRINT3   LIS    R4,10              LF
  00122A      D310 2AE3             1087           LB     R1,IOSAVE+1        GET LIST DEV IDENTIFIER
  00122E      2713                  1088           SIS    R1,3               LINE PRINTER ?
 *001230      2335       =00123A    1089           BZ     PRINT3A            BRANCH IF YES.
  001232      41F0 1280             1090           BAL    LINK,OUTCHR        LF
  001236      2541                  1091           LCS    R4,1               DEL
  001238      2302       =00123C    1092           BS     PRINT3B
  00123A      2441                  1093  PRINT3A  LIS    R4,1               YES, OUTPUT X'01'
  00123C      41F0 1280             1094  PRINT3B  BAL    LINK,OUTCHR        TERMINAL CHARACTER
  001240      24F0                  1095  PRINT5   LIS    LINK,0
  001242      40F0 16E2             1096           STH    LINK,PRTFLG        CLEAR FLAG
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
001246       41F0 1358            1097           BAL    LINK,TSTBRK
00124A       48F0 16E0            1098           LH     LINK,BRKFLG
00124E       4230 0B3A            1099           BNZ    OPTIN2            BREAK HAS OCCURRED
001252       D100 2AE8            1100           LM     R0,RSAVE          RESTORE REGISTERS
001256       030F                 1101           BR     LINK              RETURN
                                  1102    *----------------------------------
                                  1103    *   SMALL SUPPORT ROUTINES
                                  1104    *
                                  1105    *   TO OUTPUT CR,LF TO LIST DEVICE
                                  1106    *
001258       D000 2AE8            1107    CRLF     STM    R0,RSAVE          STORE REGISTERS
00125C       244D                 1108           LIS    R4,13
00125E       41F0 1280            1109           BAL    LINK,OUTCHR       OUTPUT CR
001262       244A                 1110           LIS    R4,10             LF
001264       D310 2AE3            1111           LB     R1,IOSAVE+1       GET LIST DEV IDENTIFIER
001268       2713                 1112           SIS    R1,3              LINE PRINTER ?
00126A       2335      =001274    1113           BZS    PRINT3A1          BRANCH IF YES.
00126C       41F0 1280            1114           BAL    LINK,OUTCHR       LF
001270       2541                 1115           LCS    R4,1              DEL
*001272      2302      =001276    1116           B      PRINT3B1
001274       2441                 1117    PRINT3A1 LIS   R4,1              YES, OUTPUT X'01'
001276       41F0 1280            1118    PRINT3B1 BAL   LINK,OUTCHR       TERMINAL CHARACTER
00127A       D100 2AE8            1119           LM     R0,RSAVE          RESTORE REGISTERS
00127E       030F                 1120           BR     LINK              RETURN
                                  1121    *----------------------------------
                                  1122    *   TO OUTPUT A CHARACTER TO THE LIST DEVICE
                                  1123    *
001280       50F0 16FC            1124    OUTCHR   STA    R15,OUT.SAV       SAVE RETURN ADDRESS
001284       D300 2AE3            1125           LB     R0,IOSAVE+1
001288       2704                 1126           SIS    R0,4
00128A       4230 12C8            1127           BNZ    OUTCHR2           BRANCH IF NOT CAROUSEL
00128E       40C0 16FA            1128           STH    R0,PAUSE
001292       41F0 13F4            1129    OTC.0    BAL    LINK,TSTDU        ON LINE ?
001296       4230 1304            1130           BNZ    OUT0              NO, BRANCH
00129A       9D01                 1131           SSR    R0,R1             GET CAROUSEL STATUS
*00129C      2386      =0012A8    1132           BFC    8,OTC.2           BRANCH IF CHAR. IS TO BE READ
00129E       4810 16FA            1133    OTC.1    LH     R1,PAUSE          PAUSED NOW ?
0012A2       203B      =001292    1134           BNZS   OTC.0             YES, LOOP
0012A4       4300 12C8            1135           B      OUTCHR2           NO, GO OUTPUT CHARACTER
0012A8       9B01                 1136    OTC.2    RDR    R0,R1             GET CAROUSEL CHARACTER
0012AA       C410 007F            1137           NHI    R1,X'7F'
0012AE       C910 0012            1138           SHI    R1,X'12'          DC2 ?
*0012B2      2134      =0012BA    1139           BNZ    OTC.3
0012B4       4010 16FA            1140           STH    R1,PAUSE
0012B8       2308      =0012C8    1141           BS     OUTCHR2
0012BA       2712                 1142    OTC.3    SIS    R1,2              DC4 ?
0012BC       4230 1292            1143           BNZ    OTC.0             NO, GO WAIT FOR DC2
0012C0       40F0 16FA            1144           STH    LINK,PAUSE
0012C4       4300 1292            1145           B      OTC.0
                                  1146    *
0012C8       4010 16FA            1147    OUTCHR2  STH    R1,PAUSE          RESET FLAG
0012CC       41F0 13F4            1148           BAL    LINK,TSTDU        OFF-LINE ?
0012D0       4230 1304            1149           BNZ    OUT0              BRANCH IF OFF-LINE
```

        EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
        0012D4      4110 1444            1150            BAL   R1,SETUP          SET UP FOR OUTPUT
        0012D8      9D01                 1151    OTC.4   SSR   R0,R1             WAIT FOR NOT BUSY
        0012DA      4230 1304            1152            BTC   3,OUTO            BRANCH IF OFF-LINE
        0012DE      C510 000C            1153            CLHI  R1,12             PASLA OFFLINE ?
        0012E2      4330 1304            1154            BE    OUTO             BRANCH: YES.
        0012E6      C310 0008            1155            THI   R1,8              BUSY ?
       *0012EA      2039     =0012D8     1156            BNZ   OTC.4            WAIT FOR NOT BUSY.
        0012EC      9A04                 1157            WDR   R0,R4             OUTPUT DATA BYTE
        0012EE      41F0 13F4            1158    OTC.5   BAL   LINK,TSTDU
       *0012F2      2139     =001304     1159            BNZ   OUTO
        0012F4      D310 2AE3            1160            LB    R1,IOSAVE+1
        0012F8      9112                 1161            SLHLS R1,2
        0012FA      4801 0A10            1162            LH    R0,IO(R1)         GET CONSOLE WRITE ADDRESS
        0012FE      9D01                 1163            SSR   R0,R1
       *001300      2089     =0012EE     1164            BTC   8,OTC.5          WAIT FOR BUSY TO DROP
       *001302      2303     =001308     1165            B     OUT1
        001304      4010 16EA            1166    OUTO    STH   R1,WASDU          SET FLAG
        001308      58F0 16FC            1167    OUT1    LDA   R15,OUT.SAV
        00130C      030F                 1168            BR    R15               RETURN AS SET UP ABOVE
                                         1169    *------------------------------
                                         1170    *   TO GET A CHAR FROM KEYBOARD (IN REG R4)
                                         1171    *
        00130E      4140 1428            1172    GETCHR  BAL   R4,KBREAD         PUT KB DEVICE IN READ MODE
        001312      0890                 1173            LDAR  R9,R0             SAVE CONSOLE ADDRESS
        001314      9D04                 1174            SSR   R0,R4
        001316      2081     =000001     1175            BTBS  8,1               IF BUSY, LOOP (POSSIBLE HANG)
        001318      9B04                 1176            RDR   R0,R4             READ A CHAR IN R4
                                         1177    * TO ECHO RECEIVED CHARACTERS TO CONSOLE DEVICE IN FDX MODE
        00131A      4500 0A22            1178    ECHO    CLH   R0,MICROBUS
        00131E      233C     =001336     1179            BES   ECHO1            IF MICROBUS, BRANCH
        001320      D390 0A2E            1180            LB    R9,CONRD
        001324      D490 0A40            1181            CLB   R9,CARRD          CAROUSEL?
       *001328      2138     =001338     1182            BNE   ECHRTN           DO NOT ECHO
        00132A      4890 0A2C            1183            LH    R9,CONWADR        GET CONSOLE WRITE ADDRESS
        00132E      DD90 16D6            1184            SS    R9,SINK
        001332      4280 0002            1185            BTC   8,2
        001336      9A94                 1186    ECHO1   WDR   R9,R4             ECHO RECEIVED BYTE
        001338      C440 007F            1187    ECHRTN  NHI   R4,X'7F'          REMOVE PARITY BIT
        00133C      030F                 1188            BR    LINK              RETURN
                                         1189    *------------------------------
                                         1190    *   TO OUTPUT '?' TO CONSOLE
                                         1191    *
        00133E      41F0 1258            1192    QUESTN  BAL   LINK,CRLF
        001342      40F0 16E4            1193            STH   LINK,ISITERR      SET FLAG
        001346      C850 17A0            1194            LHI   R5,QMSG
        00134A      41F0 11CC            1195            BAL   LINK,PRINT        PRINT '?'
        00134E      2400                 1196            LIS   R0,0
        001350      4000 16E4            1197            STH   R0,ISITERR
        001354      4300 0B5C            1198            B     OPTIN1            TO ACCEPT COMMAND INPUT
                                         1199    *------------------------------
                                         1200    * IF BREAK KEY DEPRESSED, GO TO 'OPTIN' OR (BRKVECT); ELSE RETURN.
                                         1201    *
        001358      D000 2B28            1202    TSTBRK  STM   R0,RSAVE+64       STORE REGISTERS
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EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
00135C      50F0 1700              1203            STA    LINK,BRK.SAV       SAVE RETURN ADDRESS
001360      48F0 16E0              1204            LH     LINK,BRKFLG        ALREADY SET??
001364      4230 13D6              1205            BNZ    TSTBRK3            YES,EXIT
001368      48F0 17C0              1206            LH     LINK,DUSAVE        DU??
00136C      C5F0 0002              1207            CLHI   LINK,2
001370      4330 13D6              1208            BE     TSTBRK3            YES,DON'T RESPOND IF KEY DEPRESSED
001374      D310 2AE2              1209            LB     R1,IOSAVE          LOAD CONSOLE READ DEVICE
001378      9112                   1210            SLHLS  R1,2
00137A      2712                   1211            SIS    R1,2
00137C      4811 0A10              1212            LH     R1,IO(R1)
001380      4010 16D6              1213            STH    R1,SINK            SAVE ADDRESS
001384      D310 2AE2              1214            LB     R1,IOSAVE          RE-LOAD DEVICE IDENTIFIER
001388      C510 0002              1215            CLHI   R1,2               TTY??
*00138C     233F        =0013AA    1216            BE     TSTBRK1            YES
00138E      C510 0005              1217            CLHI   R1,5               MICRO-BUS??
*001392     233C        =0013AA    1218            BE     TSTBRK1            YES
001394      4810 16D6              1219            LH     R1,SINK            RE-LOAD CONSOLE ADDRESS
001398      9D12                   1220            SSR    R1,R2
00139A      4280 13D6              1221            BTC    8,TSTBRK3          NO KEY DEPRESSED = NO BREAK
00139E      9B12                   1222            RDR    R1,R2              DUMMY READ
0013A0      9B12                   1223            RDR    R1,R2              READ KEY DEPRESSED
0013A2      0822                   1224            LR     R2,R2
*0013A4     233B        =0013BA    1225            BZ     TSTBRK2            ZERO CHARACTER = BREAK
0013A6      4300 13D6              1226            B      TSTBRK3            NO BREAK
0013AA      4810 16D6              1227   TSTBRK1  LH     R1,SINK            RE-LOAD CONSOLE ADDRESS
0013AE      9D12                   1228            SSR    R1,R2
0013B0      C320 0020              1229            THI    R2,X'20'           BREAK STATUS??
0013B4      4230 13E8              1230            BNZ    TSTBRK4            YES, WAIT UNTIL RELEASED
*0013B8     230F        =0013D6    1231            B      TSTBRK3            NO
0013BA      48F0 16DE              1232   TSTBRK2  LH     R15,BRKVECT        CHECK FOR SPECIAL ROUTINE
0013BE      4230 13E0              1233            BNZ    TSTBRK5            HOUSE-KEEP BEFORE SPECIAL EXIT
0013C2      24FF                   1234            LIS    LINK,LINK
0013C4      40F0 16E0              1235            STH    LINK,BRKFLG        SET FLAG
0013C8      48F0 16E2              1236            LH     LINK,PRTFLG        LOAD FLAG
0013CC      4330 0B3A              1237            BZ     OPTIN2             NOT PRINTING, EXIT
*0013D0     2303        =0013D6    1238            B      TSTBRK3            PSEUDO NO BREAK EXIT
0013D2      50F0 1700              1239   TSTBRK6  STA    R15,BRK.SAV        SETUP FOR EXIT
0013D6      D100 2B28              1240   TSTBRK3  LM     R0,RSAVE+64        RESTORE REGISTERS
0013DA      58F0 1700              1241            LDA    LINK,BRK.SAV
0013DE      030F                   1242            BR     LINK               RETURN TO PROGRAM
0013E0      2420                   1243   TSTBRK5  LIS    R2,0
0013E2      4020 16E0              1244            STH    R2,BRKFLG          CLEAR FLAG
*0013E6     220A        =0013D2    1245            B      TSTBRK6
0013E8      9D12                   1246   TSTBRK4  SSR    R1,R2              SENSE STATUS
0013EA      C320 0020              1247            THI    R2,X'20'           BREAK STATUS STILL SET??
0013EE      2033        =0013E8    1248            BNZS   TSTBRK4            WAIT UNTIL RELEASED
0013F0      4300 13BA              1249            B      TSTBRK2            EXIT
                                   1250   *------------------------------
                                   1251   * SEE IF CURRENT LIST DEVICE IS OFF-LINE (R1 & CC NON-ZERO IF OFF)
                                   1252   *
0013F4      D310 2AE3              1253   TSTDU    LB     R1,IOSAVE+1        GET I/O POINTER FOR LIST DEVICE
0013F8      9112                   1254            SLHLS  R1,2
0013FA      2712                   1255            SIS    R1,2
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
0013FC      4811 0A10           1256              LH     R1,IO(R1)        GET DEVICE ADDRESS
001400      4010 16D6           1257              STH    R1,SINK          AND SAVE IT
001404      4810 17C0           1258              LH     R1,DUSAVE        GET PARAMETER
001408      C510 0002           1259              CLHI   R1,2             DU??
*00140C     2332       =001410  1260              BE     $TSTDU2
00140E      2511                1261              LCS    R1,1             "NOT DU" EXIT: R1=CC=0
001410      4800 16D6           1262  $TSTDU2     LH     R0,SINK          PUT DEVICE ADDRESS IN R0
001414      C710 FFFF           1263              XHI    R1,-1            "DU" EXIT:R1=CC<>0
001418      030F                1264              BR     LINK             RETURN
                                1265       * --------------------------------
                                1266       * TO DIRECT INPUT AND OUTPUT TO CONSOLE DEVICE
                                1267       *
00141A      D300 0A10           1268  SETKB       LB     R0,IO            GET KEYBOARD DEVICE
00141E      9410                1269              EXBR   R1,R0
001420      0610                1270              OAR    R1,R0
001422      4010 2AE2           1271              STH    R1,IOSAVE        KB DEVICE = LIST DEVICE
001426      030F                1272              BR     LINK             RETURN
                                1273       *--------------------------------
                                1274       *   TO PUT KEYBOARD DEVICE IN READ MODE
                                1275       *
001428      4800 0A2A           1276  KBREAD      LH     R0,CONRADR
00142C      DE00 0A2E           1277              OC     R0,CONRD         OC CONSOLE - READ COMMAND
001430      DB00 16D6           1278              RD     R0,SINK          READ A DUMMY CHARACTER (SET BUSY)
001434      4890 16DA           1279              LH     R9,PASFLG        PASLA ?
001438      4200 1438           1280              NOP    *                FOR SPECIAL KB DEVICE
*00143C     2333       =001442  1281  TTYGET      BZ     KBXIT            NO, BRANCH TO EXIT
00143E      DE00 0A48           1282              OC     R0,CONRQ2S       YES, CC (REQUEST TO SEND)
001442      0304                1283  KBXIT       BR     R4               RETURN
001442                          1284              IFZ    SKBINT-1
                                1285       *--------------------------------
                                1286       *   TO SET UP KEYBOARD DEV TO READ WITH INT ENABLED
                                1287       *
                                1288  KBRD        STM    R0,RSAVE         SAVE REGISTERS
                                1289              LH     R0,CONRADR       GET KB DEV ADR
                                1290              LH     R1,PASFLG        PASLA ?
                                1291              BZ     KBRD1
                                1292              OC     R0,CONRQ2S
                                1293  KBRD1       OC     R0,CONENRD       CONSOLE : ENABLE, READ
                                1294              LM     R0,RSAVE         RESTORE REGISTERS
                                1295              BR     LINK             RETURN
                                1296              ENDC
                                1297       *--------------------------------
                                1298       *   LIST DEVICE SET UP ROUTINE
                                1299       *
001444      5010 1704           1300  SETUP       STA    R1,SET.RTN
001448      D310 2AE3           1301              LB     R1,IOSAVE+1      GET LIST DEVICE IDENTIFIER
00144C      9112                1302              SLHLS  R1,2             HW INDEX
00144E      4801 0A10           1303              LH     R0,IO(R1)        GET LIST DEVICE WRITE ADDRESS
001452      DE01 0A31           1304              OC     R0,CONCMD-1(R1)
001456      5810 1704           1305              LDA    R1,SET.RTN
00145A      0301                1306              BR     R1               RETURN
                                1307       * ****************************
                                1308       * LOW CORE SET UP ROUTINE
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                 1309  *
00145C      2410                 1310  LCORE    LIS   R1,0
00145E      2422                 1311           LIS   R2,2
001460      C830 004E            1312           LHI   R3,X'4E'
001464      2400                 1313           LIS   R0,0
001466      4001 0000            1314  ZERO1    STH   R0,0(R1)
00146A      C110 1466            1315           BXLE  R1,ZERO1        ZERO CORE FROM 0 THRU X'4E'
00146E      C810 0080            1316           LHI   R1,X'80'
001472      C830 00CE            1317           LHI   R3,X'CE'
001476      4001 0000            1318  ZERO2    STH   R0,0(R1)
00147A      C110 1476            1319           BXLE  R1,ZERO2        ZERO CORE FROM X'80' THRU X'CF'
00147E      C800 14D4            1320           LHI   R0,XI32         INTERRUPT HANDLER ROUTINE
001482      C830 08CE            1321           LHI   R3,X'8CE'
001486      4001 0000            1322  ZERO3    STH   R0,0(R1)
00148A      C110 1486            1323           BXLE  R1,ZERO3        SET UP INT SERVICE POINTER TABLE
00148E      C830 15AE            1324           LHI   R3,II
001492      4030 0036            1325           STH   R3,X'36'        ILL INST INT NEW PSW LOC
001496      C840 15D4            1326           LHI   R4,MM
00149A      4040 003E            1327           STH   R4,X'3E'        M. M. INT NEW PSW LOC
00149E      C830 1590            1328           LHI   R3,AF
0014A2      4030 004E            1329           STH   R3,X'4E'        ARITHMETIC FAULT NEW PSW LOC(32-BIT)
                                 1330  *                             FIXED PT DIVIDE FAULT NEW PSW LOC
                                 1331  *
0014A6      C830 1692            1332           LHI   R3,DFF          DATA FORMAT FAULT
0014AA      4030 00CE            1333           STH   R3,X'CE'
                                 1334  *
0014AE      C840 2AE8            1335           LHI   R4,RSAVE
0014AE                           1336           IFZ   ADC-2
                                 1337           LH    R1,MCD32
                                 1338           BNZ   LCORE32
                                 1339  *
                                 1340  *   SET UP LOW CORE FOR 16 BIT MACHINE
                                 1341  *
                                 1342           STH   R4,X'22'        REG SAVE POINTER
                                 1343           LHI   R3,FP
                                 1344           STH   R3,X'2E'        FLOATING PT FAULT INT NEW PSW LOC
                                 1345           LH    R5,PSW2
                                 1346           STH   R5,X'44'        HW EXT INT NEW PSW STATUS
                                 1347           LHI   R5,XI16
                                 1348           STH   R5,X'46'        EXT INT NEW PSW LOC
                                 1349           BR    LINK
                                 1350           ENDC
                                 1351  *
                                 1352  *   SET UP LOW CORE FOR 32 BIT MACHINE
                                 1353  *
0014B2      4040 0086            1354  LCORE32  STH   R4,X'86'        REG SAVE POINTER
0014B6      C830 157C            1355           LHI   R3,RP
0014BA      4030 0096            1356           STH   R3,X'96'        RELOC/PROTECT INT NEW PSW LOC
0014BA                           1357           IFZ   $KBINT-1
                                 1358           LH    R1,CONRADR      LOAD CONSOLE I/O ADDRESS
                                 1359           AAR   R1,R1
                                 1360           LHI   R0,KBINTO       R0 = A(KEYBOARD INT HANDLER)
                                 1361           STH   R0,X'D0'(R1)    STORE @ X'D0'+2(KB DEV ADR)
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                    1362          ENDC
0014BE      2410                    1363          LIS    R1,0              TO SET UP SERVICE POINTER TABLE
0014C0      C830 14D4               1364          LHI    R3,XI32
0014C4      4821 1B1C               1365 LCORE32A LH     R2,DEVSADR(R1)    GET DEV ADR FROM TABLE
0014C8      021F                    1366          BMR    LINK              DONE. RETURN
0014CA      0A22                    1367          AAR    R2,R2
0014CC      4032 00D0               1368          STH    R3,X'D0'(R2)      STORE @  X'D0'+2(DEV ADR)
0014D0      2612                    1369          AIS    R1,2
*0014D2     2207      =0014C4       1370          B      LCORE32A
0014D2                              1371          IFZ    SKBINT-1
                                    1372 *------------------------------------
                                    1373 *  KEYBOARD INTERRUPT HANDLER
                                    1374 *
                                    1375 KBINT0   THI    R3,X'20'          IS BREAK KEY DEPRESSED ?
                                    1376          BZ     KBINT1            NO
                                    1377          LB     R0,IO
                                    1378          CLHI   R0,5              IS IT MICROBUS ?
                                    1379          BNE    KBINTOB           NO, BRANCH
                                    1380          OC     R2,MREADC         YES, ISSUE READ
                                    1381          SSR    R2,R3
                                    1382          BTBS   8,1
                                    1383 KBINTOC  RDR    R2,R4             KNOCK DOWN BREAK
                                    1384          SSR    R2,R3
                                    1385          THI    R3,X'20'          BREAK STILL THERE ?
                                    1386          BNZ    KBINTOC           YES, KNOCK IT DOWN AGAIN
                                    1387          B      RETOPSW           NO, RETURN ON OLD PSW
                                    1388 KBINTOB  LH     R5,PASFLG         CONSOLE ON PASLA ?
                                    1389          BZ     KBINTOA           BRANCH IF NO.
                                    1390          RDR    R2,R4
                                    1391          SSR    R2,R3
                                    1392          BFBS   8,1
                                    1393          IDAR   R4,R4
                                    1394          BNZ    RETOPSW           IGNORE FRERR ONLY
                                    1395 KBINTOO  B      KBINT3
                                    1396 KBINTOA  SSR    R2,R3
                                    1397          THI    R3,X'20'
                                    1398          BTC    3,KBINTOA         WAIT FOR BREAK RELEASE
                                    1399          BS     KBINTOC           GO TO COMMAND MODE
                                    1400 KBINT1   CLHI   R0,5              IS IT MICROBUS ?
                                    1401          BNE    KBINT3            NO, BRANCH
                                    1402          OC     R2,MREADC         READ COMMAND TO MICROBUS
                                    1403          SSR    R2,R3
                                    1404          BTBS   8,1
                                    1405          RDR    R2,R4             KNOCK DOWN INTERRUPT
                                    1406          B      RETOPSW           RETURN
                                    1407 KBINT3   STH    R2,INTDEV
                                    1408          STB    R3,INTSTA
                                    1409          IFZ    ADC-2
                                    1410          LH     R4,MCD32
                                    1411          BZS    KBINT2
                                    1412          ENDC
                                    1413          STH    R0,OPSW           STORE OLD PSW OF 32-BIT PROCESSOR
                                    1414          STH    R1,OLOC           IN ORDER TO RETURN BACK TO TEST
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                   1415 KBINT2   RDR   R2,R4
                                   1416          BAL   LINK,ECHO        ECHO RECEIVED BYTE
                                   1417          LH    R9,KBINT         IF ZERO,IGNORE; ELSE
                                   1418          BNZR  R9               GO,PROCESS KB INT FURTHER
                                   1419 * --------------------------------
                                   1420 *   TO RETURN ON OLD PSW
                                   1421 *
                                   1422          IFZ   ADC-2
                                   1423 RETOPSW  LH    R9,MOD32
                                   1424          BNZ   RETOPSW1
                                   1425          LM    R0,INTSAV        RESTORE REGISTERS
                                   1426          LPSW  X'40'            RETURN ON OLD PSW AFTER KB INT
                                   1427 *
                                   1428 RETOPSW1 LPSW  OPSW32
                                   1429          ELSE
                                   1430 RETOPSW  LPSW  OPSW32
                                   1431          FNDC
                                   1432          ENDC
                                   1433 *
                                   1434 * ******************************************************
                                   1435 *   EXTERNAL INTERRUPT HANDLER
  0014D4                           1436          IFZ   ADC-2
                                   1437 XI16     STM   R0,INTSAV        FOR 16-BIT PROCESSOR
                                   1438          ACKR  R2,R3            ACKNOWLEDGE THE INTERRUPT
                                   1439          IFZ   SKBINT-1
                                   1440          CLH   R2,CONRADR       FROM KEYBOARD DEVICE ?
                                   1441          BE    KBINT0
                                   1442          ENDC
                                   1443          ENDC
                                   1444 *
                                   1445 *                              FOR 32-BIT PROCESSOR
  0014D4   95AA                    1446 XI32     EPSR  R10,R10          CAPTURE CURRENT PSW
  0014D6   40A0 16C0              1447          STH   R10,INTPSW
  0014DA   4020 16D0              1448          STH   R2,INTDEV        STORE INTERRUPTING DEVICE ADDRESS
  0014DE   D230 16D2              1449          STB   R3,INTSTA        STORE INTERRUPTING DEVICE STATUS
  0014DE                           1450          IFZ   ADC-2
                                   1451          LH    R5,MOD32
                                   1452          BNZ   XI32A
                                   1453          LH    R0,X'40'         16-BIT OLD PSW
                                   1454          LH    R1,X'42'
                                   1455          ENDC
  0014E2   4000 16CA              1456 XI32A    STH   R0,OPSW          STORE OLD PSW STATUS
  0014E6   4010 16CE              1457          STH   R1,OLOC          STORE OLD PSW LOC
  0014E6                           1458          IFZ   ADC-2
                                   1459          LDAR  R5,R5            MOD32 = 0 ?
                                   1460          BZS   XI16A            BRANCH IF YES.
                                   1461          ENDC
  0014EA   4820 0A54              1462          LH    R2,PSW2
  0014EE   9512                    1463          EPSR  R1,R2            SELECT USER REGISTER SET
  0014F0   D000 2B70              1464          STM   R0,INTSAV        SAVE USER REGISTERS
  0014F4   4820 16D0              1465          LH    R2,INTDEV
  0014F8   48A0 16C0              1466          LH    R10,INTPSW
                                   1467 *
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
0014FC      2450                   1468  XI16A    LIS   R5,0
0014FE      4865 1B1C              1469  XI1      LH    R6,DEVSADR(R5)        GET DEV ADRS FROM TABLE
001502      4210 1548              1470           BM    XIERR                 TABLE OVERFLOW.
001506      0562                   1471           CLAR  R6,R2                 COMPARE INTERRUPTING DEVICE ADDRESS
001508      2333       =00150E     1472           BES   XI2
00150A      2652                   1473           AIS   R5,2
00150C      2207       =0014FE     1474           BS    XI1
00150E      4865 1B20              1475  XI2      LH    R6,DEVINT(R5)         GET INTERRUPT HANDLER ADDRESS
001512      4330 1548              1476           BZ    XIERR                 INTERRUPT NOT EXPECTED
001516      4060 1546              1477           STH   R6,XIEXIT
                                   1478  *
001516                             1479           IFZ   ADC-2
                                   1480           IFNZ  SCLOCK-2
                                   1481           LH    R6,MOD32              32-BIT MACHINE ?
                                   1482           BZ    XI3                   BRANCH IF NO.
                                   1483           ENDC
                                   1484           ENDC
00151A      1051                   1485           SRLS  R5,1
00151C      10A4                   1486           SRLS  R10,4
00151E      C4A0 000F              1487           NHI   R10,15
001522      D4A5 1B22              1488           CLB   R10,INTLVL(R5)        CHECK PROPER INTERRUPT LEVEL
001526      4230 1558              1489           BNE   LVLERR
                                   1490  *
00152A                             1491           IFNZ  SCLOCK-2
00152A      4860 16CE              1492  XI3      LH    R6,OLOC               GET PSW AT TIME OF INTERRUPT
00152E      C560 1166              1493           CLHI  R6,$TIMER1
001532      2187       =001540     1494           BLS   XI4                   WAS INTERRUPT IN TIMER ROUTINE ?
001534      C560 117A              1495           CLHI  R6,$TIMXT
*001538     2384       =001540     1496           BNL   XI4                   BRANCH IF NO
00153A      D100 2AE8              1497           LM    R0,RSAVE              YES, RESTORE FROM 'TIMER' ENTRY
*00153E     2303       =001544     1498           B     XI5
                                   1499           ENDC
001540      D100 2B70              1500  XI4      LM    R0,INTSAV             RESTORE FROM XI16/XI32 ENTRY
                                   1501           NOSQZ
001544      4300 1544              1502  XI5      B     *                     AND GO TO INTERRUPT HANDLER
                                   1503           SQUEZ
            0000 1546              1504  XIEXIT   EQU   XI5+2                 NOTE:  16 KB RESTRICTION !
                                   1505  *------------------------------------
                                   1506  *   EXTERNAL INTERRUPT ERROR ROUTINE
                                   1507  *
001548      C860 4634              1508  XIERR    LHI   R6,C'F4'              ERROR # F4
00154C      4060 172E              1509           STH   R6,ERRNO
001550      41F0 1030              1510           BAL   LINK,ERRALL           'ERROR XXF4', 'DEV DDD STA SS'
                                   1511  *                                    'PSW PPPP  LOC LLLL'
001554      4300 0B5C              1512           B     OPTIN1                TO ENTER COMMAND MODE
                                   1513  *------------------------------------
                                   1514  * DEVICE INTERRUPTED IN WRONG INTERRUPT LEVEL
                                   1515  *
001558      C860 4636              1516  LVLERR   LHI   R6,C'F6'              ERROR # F6
00155C      4060 172E              1517           STH   R6,ERRNO
001560      D3AA 170C              1518           LB    R10,HEXTAB(R10)       CONVERT TO ASCII
001564      D2A0 178F              1519           STB   R10,ERRLVL            AND STORE ERROR LEVEL IN MESSAGE
001568      41F0 1030              1520           BAL   LINK,ERRALL           'ERROR XXF6', 'DEV DDD STA SS'
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                    1521  *                              'PSW PPPP  LOC LLLL'
00156C      C850 177A               1522        LHI   R5,INTLVLM
001570      4050 16E4               1523        STH   R5,ISITERR         SET FLAG TO OVERRIDE NOMSG OPTION
001574      41F0 11CC               1524        BAL   LINK,PRINT         'INTERRUPTED IN LEVEL  N'
001578      4300 0B5C               1525        B     OPTIN1             ENTER COMMAND MODE.
                                    1526  *-----------------------------
                                    1527  *  SPURIOUS INTERRUPT HANDLERS
                                    1528  *
                                    1529  *
001578                              1530        IFZ   ADC-2
                                    1531  *  FLOATING-PT ARITH FAULT INT TRAP  (16 BIT PROCESSOR)
                                    1532  *
                                    1533  FP     LH    R14,X'28'          OLD PSW (16-BIT PROCESSOR)
                                    1534        LH    R15,X'2A'          OLD LOC
                                    1535        ENDC
                                    1536  *
                                    1537  *  RELOCATION/PROTECTION INT TRAP
                                    1538  *
00157C      C820 4635               1539  RP     LHI   R2,C'F5'
001580      4020 172E               1540        STH   R2,ERRNO           SET ERROR # F5
001584      50C0 283C               1541        ST    R12,VIRTADRS       SAVE VIRTUAL ADDRESS
001588      50D0 2838               1542        ST    R13,FCODE          SAVE FAULT CODE
00158C      4300 1656               1543        B     MMCOM3             BRANCH TO PRINT
                                    1544  *
                                    1545  *  ARITHMETIC FAULT INT (32-BIT PROCESSOR) TRAP
                                    1546  *
001590      C820 4631               1547  AF     LHI   R2,C'F1'
001594      4020 172E               1548        STH   R2,ERRNO           SET ERROR # F1
001598      40E0 16CA               1549        STH   R14,OPSW
00159C      40F0 16CE               1550        STH   R15,OLOC
0015A0      2400                    1551        LIS   R0,0
0015A2      5000 283C               1552        ST    R0,VIRTADRS        ZERO VIRTADRS
0015A6      50D0 2838               1553        ST    R13,FCODE          FAULT CODE
0015AA      4300 1656               1554        B     MMCOM3
                                    1555  *
                                    1556  *  ILLEGAL INSTRUCTION INTERRUPT TRAP
                                    1557  *
0015AE      C820 4632               1558  II     LHI   R2,C'F2'
0015B2      4020 172E               1559        STH   R2,ERRNO           SET ERROR # F2
0015B2                              1560        IFZ   ADC-2
                                    1561        LH    R2,MOD32
                                    1562        BNZ   II32
                                    1563        LH    R14,X'30'          OLD PSW
                                    1564        LH    R15,X'32'          OLD LOC
                                    1565        ENDC
0015B6      40E0 16CA               1566  COMM   STH   R14,OPSW
0015BA      40F0 16CE               1567        STH   R15,OLOC
0015BE      4800 0A54               1568  COMM1  LH    R0,PSW2
0015C2      9520                    1569        EPSR  R2,R0              NO INT. , REG SET 15
0015C4      41F0 0FBE               1570        BAL   LINK,ERR           PRINT 'ERROR XXFN'
0015C8      40F0 16E4               1571        STH   LINK,ISITERR       FORCE PRINT
0015CC      41E0 10F4               1572        BAL   RET,ERRPL1         PRINT 'PSW PPPP  LOC LLLL'
0015D0      4300 0B5C               1573        B     OPTIN1             ENTER COMMAND MODE
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                     1574  *
                                     1575  *   MACHINE MALFUNCTION INTERRUPT TRAP
                                     1576  *
0015D4     95AA                      1577  MM      EPSR    R10,R10           CAPTURE MMINT PSW
0015D6     C820 4633                 1578          LHI     R2,C'F3'
0015DA     4020 172E                 1579          STH     R2,ERRNO          SET ERROR # F3
0015DE     48E0 0022                 1580          LH      R14,X'22'         OLD PSW ( 32-BIT PROCESSOR)
0015E2     48F0 0026                 1581          LH      R15,X'26'         OLD LOC
0015E2                               1582          IFZ     ADC-2
                                     1583          LH      R2,MOD32
                                     1584          BNZ     MM32
                                     1585          LH      R14,X'38'         OLD PSW (16 BIT PROCESSOR)
                                     1586          LH      R15,X'3A'         OLD LOC
                                     1587          ENDC
0015E6     40E0 16CA                 1588  MM32    STH     R14,OPSW
0015EA     40F0 16CE                 1589          STH     R15,OLOC
0015EE     58D0 0040                 1590          L       R13,X'40'         GET FAULT CODE
0015F2     50D0 2838                 1591          ST      R13,FCODE
0015F6     F4D0 C000 0000            1592          NI      R13,Y'C0000000'
0015FC     2333        =001602       1593          BZS     MM31
0015FE     24C0                      1594          LIS     R12,0
001600     2303        =001606       1595          BS      MM33
001602     58C0 0044                 1596  MM31    L       R12,X'44'         GET VIRTUAL ADDRESS
001606     50C0 283C                 1597  MM33    ST      R12,VIRTADRS
001606                               1598          IFZ     ADC-2
                                     1599          LHI     R1,X'7FFF'
                                     1600  MM16    SIS     R1,1
                                     1601          BP      MM16
                                     1602          ENDC
                                     1603  *
00160A     D320 0A10                 1604  MMCOM1  LB      R2,IO             GET INPUT DEVICE POINTER
00160E     2725                      1605          SIS     R2,5             IS IT MICRO I/O BUS
001610     2334        =001618       1606          BZS     MMCOM1A           YES, BRANCH
001612     4820 16DA                 1607          LH      R2,PASFLG         IS CONSOLE ON PASLA?
001616     233B        =00162C       1608          BZS     MMCOM2            NO, BRANCH
001618     4820 0A2C                 1609  MMCOM1A LH      R2,CONWADR
00161C     DE20 0A30                 1610          OC      R2,CON2ND         ISSUE 2ND/RESET COMMAND
001620     4820 0A2A                 1611          LH      R2,CONRADR        GET RECEIVE ADDRESS
001624     DE20 0A2E                 1612          OC      R2,CONRD          OUTPUT READ CMD
001628     DB20 16D6                 1613          RD      R2,SINK           DUMMY READ TO SET BUSY
                                     1614  *
00162C     D320 0A11                 1615  MMCOM2  LB      R2,IO+1           GET LIST DEVICE POINTER
001630     2725                      1616          SIS     R2,5             IS IT MICRO I/O BUS?
001632     2334        =00163A       1617          BZS     MMCOM2A           YES, BRANCH
001634     4820 16DC                 1618          LH      R2,PASFLG2        IS LIST DEVICE ON PASLA
001638     233F        =001656       1619          BZS     MMCOM3            NO,BRANCH
00163A     D310 0A11                 1620  MMCOM2A LB      R1,IO+1           YES, GET LIST POINTER
00163E     D320 0A10                 1621          LB      R2,IO             GET CONSOLE POINTER
001642     0512                      1622          CLAR    R1,R2             CONSOLE =LIST DEVICE?
001644     2339        =001656       1623          BES     MMCOM3            YES,BRANCH
001646     9112                      1624          SLHLS   R1,2
001648     4821 0A10                 1625          LH      R2,IO(R1)         GET LIST DEVICE TRANSMIT ADDRESS
00164C     DE21 0A32                 1626          OC      R2,CONCMD(R1)     ISSUE 2ND/RESET CMD
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
001650      2711              1627           SIS    R1,1
001652      DE21 0A32         1628           OC     R2,CONCMD(R1)       ISSUE LIST WRITE COMMAND
001656      2408              1629    MMCOM3  LIS    R0,8
001658      5810 2838         1630           L      R1,FCODE            GET THE FAULT CODE
00165C      C820 29D5         1631           LHI    R2,MSG11+1
001660      41F0 11A4         1632           BAL    LINK,HEXASC         CONVERT TO ASCII
001664      2408              1633           LIS    R0,8
001666      5810 283C         1634           L      R1,VIRTADRS         GET VIRTUAL ADDRESS
00166A      C820 29E3         1635           LHI    R2,MSG11+15
00166E      41F0 11A4         1636           BAL    LINK,HEXASC         CONVERT TO ASCII
001672      41F0 0FBE         1637           BAL    LINK,ERR            PRINT ERR NUMBER
001676      40F0 16E4         1638           STH    LINK,ISITERR        FORCE PRINT
00167A      41E0 10F4         1639           BAL    RET,ERRPL1          PRINT PSW,LOC
00167E      C850 29B6         1640           LHI    R5,MSG10            PRINT 'FAULT CODE    VIRTUAL ADDRESS'
001682      41F0 11CC         1641           BAL    LINK,PRINT
001686      C850 29D4         1642           LHI    R5,MSG11
00168A      41F0 11CC         1643           BAL    LINK,PRINT
00168E      4300 0B50         1644           B      OPTIN
                              1645    *
                              1646    *    DATA   FORMAT   FAULT   INTERRUPT   TRAP
                              1647    *
001692      C820 4637         1648    DFF     LHI    R2,C'F7'            ERROR TTF7
001696      4020 172E         1649           STH    R2,ERRNO
00169A      40E0 16CA         1650           STH    R14,OPSW            OLD PSW
00169E      40F0 16CE         1651           STH    R15,OLOC            OLD LOC
0016A2      50D0 2838         1652           ST     R13,FCODE           SAVE FAULT CODE
0016A6      C5D0 0006         1653           CLHI   R13,6
*0016AA     2335      =0016B4 1654           BE     DFF1
0016AC      C5D0 0007         1655           CLHI   R13,7
0016B0      2332      =0016B4 1656           BES    DFF1
0016B2      24C0              1657           LIS    R12,0
0016B4      50C0 283C         1658    DFF1    ST     R12,VIRTADRS
0016B8      4300 1656         1659           B      MMCOM3
                              1660    *
                              1661    *
                              1662    *
                              1663    * ***************************
                              1664    *    ETPE CONSTANTS & TABLES
                              1665    *
0016BC      0000              1666    FIRST   DCX    0
0016BE      0000              1667    MOD32   DCX    0                   FLAG FOR 32-BIT M/C(NON-ZERO)
0016C0      0000              1668    INTPSW  DCX    0                   (FOR 32-BIT M/C ONLY)
0016C8                        1669           ALIGN  8
                              1670    *---------------------
0016C8      0000              1671    OPSW32  DCX    0                   OLD PSW STORAGE AREA
0016CA      0000              1672    OPSW    DCX    0
0016CC      0000              1673           DCX    0
0016CE      0000              1674    OLOC    DCX    0
                              1675    *---------------------
0016D0      0000              1676    INTDEV  DCX    0                   INTERRUPTING DEV ADR
            0000 16D0         1677    ERRDEV  EQU    INTDEV              ERROR DEVICE #
0016D2      00                1678    INTSTA  DB     0                   INTERRUPTING DEV STATUS
            0000 16D2         1679    ERRSTA  EQU    INTSTA              ERRONEOUS STATUS
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
0016D3      80                    1680  NORM     DB    X'80'
0016D4      40                    1681  INCR     DB    X'40'
0016D5      00                    1582           DB    *              (ALIGN ON HW BOUNDRY)
0016D6      0000 0000             1683  SINK     DC    0              BIT BUCKET
0016DA      0000                  1684  PASFLG   DCX   0              SET WHEN CONSOLE ON PASLA/PALM
0016DC      0000                  1685  PASFLG2  DCX   0              SET WHEN LIST DEVICE ON PASLA
                                  1686  * --------------------
0016DE                            1687           IFZ   $KBINT-1
                                  1688  KBINT    DC    Z(RETOPSW)     KEYBOARD INT RETURN ADR
                                  1689           ENDC
0016DE      0000                  1690  BRKVECT  DC    Z(0)           BREAK KEY VECTOR
0016E0      0000                  1691  BRKFLG   DCX   0
0016E2      0000                  1692  PRTFLG   DCX   0
0016E4      0000                  1693  ISITERR  DCX   0
0015E6      0000                  1694  NOERR    DCX   0
0016E8      0000                  1695  SELTST   DCX   0              HIGHEST SELECTED TEST #
0016EA      0000                  1696  WASDU    DCX   0              1 IF KEYBOARD DEVICE WAS OFF
0016EC      0000                  1697  WASDU1   DCX   0              NON-ZERO IF TOTAL,TOTERR TO PRINT
0016EE      0000                  1698  TOTAL    DCX   0              # OF TIMES THE SELECTED TESTS RUN
0016F0      0000                  1699  TOTERR   DCX   0              TOTAL ERRORS DETECTED WHILE DU
0016F2      0000                  1700  BTESTNO  DCX   0              CURRENT TEST # IN BINARY
0016F4      0000                  1701  COUNT    DCX   0
0016F6      0000                  1702  NEXTST   DCX   0              NEXT TEST #
0016F8      0000                  1703  SNULL    DCX   0              NULL HW FOR DISPLAY USE
0016FA      0000                  1704  PAUSE    DCX   0              SET DURING TRANSMISSION PAUSE (C300)
0016FC      0000 0000             1705  OUT.SAV  DAC   0              OUTCHR RETURN ADDRESS SAVE
001700      0000 0000             1706  BRK.SAV  DAC   0              TSTBRK RETURN ADDRESS SAVE
001704      0000 0000             1707  SET.RTN  DAC   0              SETUP RETURN ADDRESS SAVE
001708      0000 0000             1708  COMRET   DAC   0              ERRCOM RETURN ADDRESS SAVE
                                  1709  *
00170C                            1710           IFZ   SDECTAB-1
                                  1711  DECTAB   DC    1,10,100,1000,10000
                                  1712           ENDC
00170C      3031 3233 3435 3637   1713  HEXTAB   DB    C'0123456789ABCDEF'
001714      3839 4142 4344 4546
                                  1714  *---------------------------------
                                  1715  *   ETPE MESSAGES
                                  1716  *
00171C      5445 5354 2020 2A2A   1717  TSTMSG   DC    C'TEST  **',X'0D00'
001724      0D00
            0000 1722             1718  MTESTNO  EQU   TSTMSG+6
001726      4552 524F 5220 2A2A   1719  ERRMSG   DC    C'ERROR ****',X'0D00'
00172E      2A2A
001730      0D00
            0000 172C             1720  ETESTNO  EQU   ERRMSG+6       STORED BY ETPE
            0000 172E             1721  ERRNO    EQU   ERRMSG+8       STORE ERRNO AS CHAR CONSTANT
001732      544F 5441 4C20 2020   1722  TOTMSG   DC    C'TOTAL    TOTERR',X'0D00'
00173A      544F 5445 5252
001740      0D00
001742      4E4F 2045 5252 4F52   1723  NOERMSG  DC    C'NO ERROR',X'0D00'
00174A      0D00
00174C      4445 5620 2A2A 2A20   1724  DEVMSG   DC    C'DEV *** STA **',X'0D00'
001754      5354 4120 2A2A
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
00175A      0D00
            0000 1750              1725  ASCIDEV   EQU    DEVMSG+4
            0000 1754              1726  STAMSG    EQU    DEVMSG+8
            0000 1758              1727  ASCISTA   EQU    DEVMSG+12
00175C      4445 5620 2A2A 2A20    1728  DEVMSG2   DC     C'DEV ***',X'0D00'
001764      0D00
            0000 1760              1729  ASCIDEV2  EQU    DEVMSG2+4
001766      5053 5720 2A2A 2A2A    1730  PSWMSG    DC     C'PSW ****   LOC ****',X'0D00'
00176E      2020 4C4F 4320 2A2A
001776      2A2A
001778      0D00
            0000 176A              1731  ASCIPSW   EQU    PSWMSG+4
            0000 1770              1732  LOCMSG    EQU    PSWMSG+10
            0000 1774              1733  ASCILOC   EQU    PSWMSG+14
00177A      494E 5445 5252 5550    1734  INTLVLM   DC     C'INTERRUPTED IN LEVEL *',X'0D00'
001782      5445 4420 494E 204C
00178A      4556 454C 202A
001790      0D00
            0000 178F              1735  ERRLVL    EQU    INTLVLM+21
001792      454E 4420 4F46 2054    1736  EOTMSG    DC     C'END OF TEST',X'0D00'
00179A      4553 5420
00179E      0D00
0017A0      3F0D                   1737  QMSG      DC     X'3F0D'
0017A2      2A0D                   1738  AMSG      DC     X'2A0D'
0017A4      FFFF                   1739  BRKMSG    DCX    FFFF,FFFF
0017A6      FFFF
0017A8      FFFF                   1740            DC     X'FFFF',X'0A8D',C'BREAK TERMINATION',X'FF0D'
0017AA      0A8D
0017AC      4252 4541 4B20 5445
0017B4      524D 494E 4154 494F
0017BC      4E20
0017BE      FF0D
0017C0      0000 0000              1741  DUSAVE    DC     0
0017C4      0000 0000              1742  DUSAVE1   DC     0
                                   1743  *
                                   1744  *ETPE FILE **END**
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                        1746  *-------------------------------
                                        1747  *   OPTION/COMMAND TABLE
                                        1748  *
                      0000 17C8         1749  OPT      EQU   *
0017C8        5445 5354 2020            1750  TEST     DC    C'TEST  ',X'FE40',X'0000',X'0000'
0017CE        FE40
0017D0        0000
0017D2        0000
0017D4        4C4F 4F50 2020            1751  LOOP     DC    C'LOOP  ',X'0000',X'0000',X'0000'
0017DA        0000
0017DC        0000
0017DE        0000
0017E0        434F 4E54 494E            1752  CONTIN   DC    C'CONTIN',X'0000',Z(ZERONE),X'0000'
0017E6        0000
0017E8        0D76
0017EA        0000
0017EC        4E4F 4D53 4720            1753  NOMSG    DC    C'NOMSG ',X'0000',Z(ZERONE2),X'0000'
0017F2        0000
0017F4        0D6E
0017F6        0000
0017F8        4D4F 4445 2020            1754  MODE     DC    C'MODE  ',X'0000',Z(ZERONE),X'0000'
0017FE        0000
001800        0D76
001802        0000
001804        5441 4C4C 5920            1755  TALLY    DC    C'TALLY ',X'0000',Z(ZERONE),X'0000'
00180A        0000
00180C        0D76
00180E        0000
001810        5743 534C 4F20            1756  WCSLO    DC    C'WCSLO ',X'0800',Z(VALCHK),X'0000'
001816        0800
001818        1870
00181A        0000
                      0000 1816         1757  DCSLO    EQU   *-6
00181C        5743 5348 4920            1758  WCSHI    DC    C'WCSHI ',X'1000',Z(VALCK1),X'0000'
001822        1000
001824        1894
001826        0000
                      0000 1822         1759  DCSHI    EQU   *-6
                                        1760           NCSQZ
                      0000 1828         1761  OPTEND2  EQU   *              END OF PRINTING OPTIONS
001828        494E 544C 4556            1762  INTLEV   DC    C'INTLEV',X'0000',Z(LEVEL),X'0000'
00182E        0000
001830        0D86
001832        0000
001834        4657 4F52 4420            1763  FWORD    DC    C'FWORD ',X'2020',Z(FWCHK),X'0000'
00183A        2020
00183C        1868
00183E        0000
001840        4F50 5449 4F4E            1764  OPTION   DC    C'OPTION',X'0000',Z(TABPRINT),X'0000'
001846        0000
001848        18BA
00184A        0000
                      0000 1840         1765  OPTEND   EQU   OPTION
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                  1766  *
001184C       5255 4E20 2020      1767  RUN      DC    C'RUN   ',X'0000',X'0000',X'0000'
001852        0000
001854        0000
001856        0000
001858        434F 4E20 2020      1768  CON      DC    C'CON   ',X'0000',X'0000',X'0000'
00185E        0000
001860        0000
001862        0000
001864        FFFF FFFF           1769           DC    -1                    END OF OPTION TABLE
                                  1770  *-------------------------------------
              0000 1868           1771  FWCHK    EQU   *
001868        5060 2848           1772           ST    R6,CONST1             STORE OPTION VALUE
00186C        4300 0B50           1773           B     OPTIN
                                  1774  *
                                  1775  *
              0000 1870           1776  VALCHK   EQU   *
001870        0856                1777           LR    R5,R6                 GET WCS LOW ADDRESS
001872        C450 00FF           1778           NHI   R5,X'0FF'             IS IT ON A 256 WORD BOUNDARY
001876        4230 133E           1779           BNZ   QUESTN                NO, ERROR
00187A        C560 0800           1780           CLHI  R6,X'800'
00187E        4280 133E           1781           BL    QUESTN
001882        C560 1000           1782           CLHI  R6,X'1000'
001886        4220 133E           1783           BP    QUESTN
00188A        4560 1922           1784           CLH   R6,DCSHI              LESS THAN WCS HIGH ADDRESS
00188E        028F                1785           BLR   R15                   YES, RETURN
001890        4300 133E           1786           B     QUESTN               ERROR
                                  1787  *
              0000 1894           1788  VALCK1   EQU   *
001894        0856                1789           LR    R5,R6                 GET WCSHI
001896        C450 00FF           1790           NHI   R5,X'0FF'             IS IT ON 256 WORD BOUNDARY
00189A        4230 133E           1791           BNZ   QUESTN                NO, BRANCH
00189E        C560 0800           1792           CLHI  R6,X'800'
0018A2        4280 133E           1793           BL    QUESTN
0018A6        C560 1000           1794           CLHI  R6,X'1000'
0018AA        4220 133E           1795           BP    QUESTN
0018AE        4850 1816           1796           LH    R5,DCSLO              GET WCS LOW ADDRESS
0018B2        0556                1797           CLR   R5,R6                 IS WCSHI GREATER THAN WCSLO
0018B4        028F                1798           BLR   R15                   YES, BRANCH
0018B6        4300 133E           1799           B     QUESTN               NO ERROR
                                  1800  *
                                  1801  *
              0000 18BA           1802  TABPRINT EQU   *
0018BA        41F0 1258           1803           BAL   LINK,CRLF
0018BE        C820 1834           1804           LHI   R2,FWORD
0018C2        2437                1805           LIS   R3,7
0018C4        D342 0000           1806  TABPRT1  LB    R4,0(R2)
0018C8        41F0 1280           1807           BAL   LINK,OUTCHR
0018CC        2621                1808           AIS   R2,1
0018CE        2731                1809           SIS   R3,1
0018D0        2026      =0018C4   1810           BPS   TABPRT1
0018D2        5850 2848           1811           L     R5,CONST1
0018D6        2408                1812           LIS   R0,8
```

```
0018D8      41F0 117C       1813              BAL    LINK,R5HEX
0018DC      4300 0C4A       1814              B      OPTRTN
                            1815   *
                            1816   *
            0000 18E0       1817   STOP.TST EQU    *
0018F0      8800            1818              DCX    8800                 BREAK POINT
0018E2      4300 0A60       1819              B      START1              GO TO BEGINNING OF TEST
                            1820   *
                            1821   *-----------------------------------------------
                            1822   *
            0000 18E6       1823   INIT     EQU    *
                            1824   *
                            1825   * * * * * * * * * * * * * * * * * * * * * * * *
                            1826   *                                              *
                            1827   * THIS ROUTINE CHECKS THE BDCS AND RDCS        *
                            1828   * INSTRUCTIONS IN USER AND SUPERVISOR MODE.    *
                            1829   * THEN THE FIRST WORD OF THE WCS IS TESTED     *
                            1830   * AND IF WCS IS PRESENT, THE PROGRAM PRINTS THE *
                            1831   * MESSAGES 'WCS FOUND' AND 'TEST EXECUTION      *
                            1832   * STARTED' AND BEGINS EXECUTION OF THE TEST.    *
                            1833   * IF NOT PRESENT,THE PROGRAM PRINTS THE MESSAGE *
                            1834   * 'WCS NOT FOUND' AND RETURNS TO COMMAND MODE.  *
                            1835   *
                            1836   * * * * * * * * * * * * * * * * * * * * * * * *
                            1837   *
0018E6      C870 275C       1838              LHI    DAT,ERRLIST
0018EA      4070 16DE       1839              STH    DAT,BRKVECT          EXIT TO ERRLIST ON BREAK
0018EE      4870 1816       1840              LH     DAT,DCSLO            GET WCSLO ADDRESS
0018F2      4890 1822       1841              LH     STAT,DCSHI           GET WCSHI ADDRESS
0018F6      0B97            1842              SR     STAT,DAT             HI-LO
0018F8      4090 2854       1843              STH    STAT,DELTA           STORE DIFFERENCE
0018FC      C870 00F0       1844              LHI    DAT,X'00F0'
001900      9597            1845              EPSR   STAT,DAT             SELECT REG SET F
001902      C870 2A2A       1846              LHI    DAT,C'**'
001906      4070 172C       1847              STH    DAT,ETESTNO          STORE PROMPT FOR TEST NUMBER
00190A      4110 280A       1848              BAL    RET2,CLRTBL          CLEAR ERROR TALLY TABLE
                            1849   *
00190E      2440            1850              LIS    ZERO,0
001910      4040 16E4       1851              STH    ZERO,ISITERR
001914      4040 16E6       1852              STH    ZERO,NOFRR           CLEAR ENC ERROR FLAG
001918      4040 16F0       1853              STH    ZERO,TOTERR          ZERO TOTAL ERROR
                            1854   * SUPERVISOR START
00191C      5040 0030       1855              ST     ZERO,X'30'           SET UP
001920      E670 194A       1856              LA     DAT,TESTB            ILPSW FOR TRAP
001924      5070 0034       1857              ST     DAT,X'34'
                            1858   *
001928      2451            1859              LIS    ONE,1
00192A      C890 01F0       1860              LHI    STAT,X'01F0'         SWITCH TO
00192E      9509            1861              EPSR   0,STAT               USER MODE
                            1862   *
                            1863   * IN USER MODE, BDCS SHOULD BE ILLEGAL (PRIVILEGED)
                            1864   *
001930      E570 0005       1865   TESTA    BDCS   DAT,X'005'           BRANCH TO DO A LHI
```

```
                                      1866  *
                                      1867  * IF FALL THRU, ERROR 00
                                      1868  *
001934        E670 193C               1869          LA    DAT,ERR00
001938        5070 0034               1870          ST    DAT,X'34'          SET UP ILPSW
00193C        C870 3030               1871  ERR00   LHI   DAT,C'00'
001940        4070 172E               1872          STH   DAT,ERRNO          SET ERRNO TO 00
001944        2470                    1873          LIS   DAT,0
001946        41F0 26F6               1874          BAL   LINK,TALLI         PRINT 'ERROR **00'
                                      1875  *                                AND ALSO TALLY IT
                                      1876  *
00194A        E670 196E               1877  TESTB   LA    DAT,ERR01          SET UP ILPSW
00194E        5070 0034               1878          ST    DAT,X'34'
                                      1879  *
                                      1880  * IN SUPERVISOR MODE, BDCS SHOULD BE LEGAL
                                      1881  *
001952        E570 0005               1882          BDCS  DAT,X'005'         LBRANCH TO DO A LHI
                                      1883  *
                                      1884  * IF FALL THRU, BDCS WORKED
                                      1885  * ADDRESS '005 IN THE FIXED CONTROL STORE
                                      1886  * IS A BRANCH TO USER'S LHI INSTRUCTION SEQUENCE.
                                      1887  * REGISTER DAT SHOULD NOW CONTAIN X'0005'
                                      1888  *
001956        C570 0005               1889  TESTC   CLHI  DAT,X'0005'
00195A        4330 197C               1890          BE    TESTD             IT DOES, CONTINUE
                                      1891  *
                                      1892  * SOMETHING WENT WRONG, DATA IS INCORRECT
                                      1893  *
00195E        C870 3032               1894          LHI   DAT,C'02'
001962        4070 172E               1895          STH   DAT,ERRNO          STORE ERROR NUMBER '02'
001966        2472                    1896          LIS   DAT,02
001968        41F0 26F6               1897          BAL   LINK,TALLI         PRINT 'ERROR **02'
                                      1898  *                                AND ALSO TALLY IT
00196C        2308       =00197C      1899          BS    TESTD
                                      1900  *
                                      1901  *
00196E        C870 3031               1902  ERR01   LHI   DAT,C'01'
001972        4070 172E               1903          STH   DAT,ERRNO          STORE 01
001976        2471                    1904          LIS   DAT,X'01'
001978                                1905          CNOP  4                 ALIGN CALL  PARAMETER
001978        41F0 26F6               1906          BAL   LINK,TALLI         PRINT ERROR **01
                                      1907  *                                AND ALSO TALLY IT
                                      1908  *
                                      1909  *
00197C        C890 01F0               1910  TESTD   LHI   STAT,X'01F0'
001980        9509                    1911          EPSR  0,STAT            SWITCH TO USER MODE
001982        E670 19AC               1912          LA    DAT,TESTE
001986        5070 0034               1913          ST    DAT,X'34'          SET UP ILPSW
                                      1914  *
                                      1915  * IN USER MODE, RDCS SHOULD BE ILLEGAL (PRIVILEGED)
                                      1916  *
00198A        C820 0005               1917          LHI   2,X'0005'
00198E        2431                    1918          LIS   3,1               2 FULLWORDS
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
001990        E640 2A5C          1919          LA    4,BUFF              TARGET
                                 1920  *
001994        E824               1921          RDCS  4
                                 1922  *
                                 1923  * IF FALL THRU, ERROR 03
                                 1924  *
001996        E670 199E          1925          LA    DAT,ERR03
00199A        5070 0034          1926          ST    DAT,X'34'           SET UP ILPSW
00199E        C870 3033          1927  ERR03   LHI   DAT,C'03'
0019A2        4070 172E          1928          STH   DAT,ERRNO           STORE
0019A6        2473               1929          LIS   DAT,X'03'
0019A8                           1930          CNOP  4                   ALIGN CALL PARAMETER
0019A8        41F0 26F6          1931          BAL   LINK,TALLI          PRINT ERROR **03
                                 1932  *                                AND TALLY IT
                                 1933  *
                                 1934  *
0019AC        C890 00F0          1935  TESTE   LHI   STAT,X'00F0'
0019B0        9579               1936          EPSR  DAT,STAT            SELECT REG SET F
0019B2        2431               1937          LIS   3,1                 TWO FULLWORDS
0019B4        E670 1AF2          1938          LA    DAT,ERR04
0019B8        5070 0034          1939          ST    DAT,X'34'           SET UP ILPSW
                                 1940  *
                                 1941  * IN SUPERVISOR MODE, RDCS SHOULD BE LEGAL
                                 1942  * RDCS  CAN READ ONLY WCS ADDRESSES (X'800' & ABOVE)
                                 1943  * THIS TEST IS TO CHECK ONLY IF R3 IS DECREMENTED CORRECTLY.
                                 1944  *
0019BC        E824               1945          RDCS  4
                                 1946  *
0019BE        C530 FFFF          1947          CLHI  3,X'FFFF'           CHECK COUNT
0019C2        2339      =0019D4  1948          BES   TESTEF1
                                 1949  *
                                 1950  * COUNT INCORRECT
                                 1951  *
0019C4        C870 3035          1952          LHI   DAT,C'05'
0019C8        4070 172E          1953          STH   DAT,ERRNO
0019CC        2475               1954          LIS   DAT,X'05'
0019CE        0200               1955          CNOP  4                   ALIGN CALL PARAMETER
0019D0        41F0 26F6          1956          BAL   LINK,TALLI          PRINT ERROR **05
                                 1957  *                                AND ALSO TALLY IT
                                 1958  *
                                 1959  *
                                 1960  *
0019D4        07CC               1961  TESTEF1 XR    POINT,POINT
0019D6        E670 1A00          1962          LA    DAT,LPEND1
0019DA        5070 0034          1963          ST    DAT,X'34'           SET UP ILPSW
                                 1964  *
0019DE        40C0 2824          1965  INSTLP1 STH   POINT,TSAVE
0019E2        487C 28E0          1966          LH    DAT,INSTAB(POINT)
0019E6        4070 19EA          1967          STH   DAT,INSTR1          ILLEGAL INSTRUCTION
                                 1968  *
                                 1969  * IF FALL THROUGH, ERROR. UNUSED R/WDCS OPCODES (E.G. E81)
                                 1970  * SHOULD BE ILLEGAL IN SUPERVISOR MODE.
                                 1971  *
```

EXEC - ETPF R04   (W/CONDITIONAL ASSEMBLY)

```
                                  1972  *
0019EA    E810                    1973  INSTR1   DCX   E810,0200,0200      SHOULD BE ILLEGAL
0019EC    0200
0019EE    0200
0019F0    C870 3039               1974  ERR09.1  LHI   DAT,C'09'
0019F4    4070 172E               1975           STH   DAT,ERRNO
0019F8    2479                    1976           LIS   DAT,X'09'
0019FA    0200                    1977           CNOP  4                   ALIGN CALL PARAMETER
0019FC    41F0 26F6               1978           BAL   LINK,TALLI          PRINT ERROR **09
                                  1979  *                                  AND ALSO TALLY IT
                                  1980  *
001A00    48C0 2824               1981  LPEND1   LH    POINT,TSAVE
001A04    26C2                    1982           AIS   POINT,2
001A06    C5C0 001C               1983           CLHI  POINT,28            ALL INSTRS TESTED ?
001A0A    4280 19DE               1984           BL    INSTLP1             NO.
                                  1985  *
                                  1986  *
001A0E    07CC                    1987  TESTEF2  XR    POINT,POINT
                                  1988  *
001A10    40C0 2824               1989  INSTLP2  STH   POINT,TSAVE
001A14    E670 1A48               1990           LA    DAT,LPEND2
001A18    5070 0034               1991           ST    DAT,X'34'           SET UP ILPSW
001A1C    487C 28E0               1992           LH    DAT,INSTAB(POINT)
001A20    4070 1A2A               1993           STH   DAT,INSTR2          ILLEGAL INSTRUCTION
001A24    C890 01F0               1994           LHI   STAT,X'01F0'
001A28    9579                    1995           EPSR  DAT,STAT            ENTER PROTECT MODE
                                  1996  *
                                  1997  * IF FALL THROUGH, ERROR. UNUSED R/WDCS OPCODES (E.G. E81)
                                  1998  * SHOULD ALSO BE ILLEGAL IN PROTECT MODE.
                                  1999  *
                                  2000  *
001A2A    E810                    2001  INSTR2   DCX   E810,0200,0200      SHOULD BE ILLEGAL
001A2C    0200
001A2E    0200
                                  2002  *
001A30    E670 1A30               2003  ERR09.2  LA    DAT,ERR09.2
001A34    5070 0034               2004           ST    DAT,X'34'           SET UP ILPSW
001A38    C870 3039               2005           LHI   DAT,C'09'
001A3C    4070 172E               2006           STH   DAT,ERRNO
001A40    2479                    2007           LIS   DAT,X'09'
001A42    0200                    2008           CNOP  4                   ALIGN CALL PARAMETER
001A44    41F0 26F6               2009           BAL   LINK,TALLI          PRINT ERROR **09
                                  2010  *                                  AND ALSO TALLY IT
                                  2011  *
001A48    48C0 2824               2012  LPEND2   LH    POINT,TSAVE
001A4C    26C2                    2013           AIS   POINT,2
001A4E    C5C0 001C               2014           CLHI  POINT,28            ALL INSTRS TESTED ?
001A52    4280 1A10               2015           BL    INSTLP2
                                  2016  *
                                  2017  *
001A56    E670 1A9C               2018  TESTF    LA    DAT,TESTG
001A5A    5070 0034               2019           ST    DAT,X'34'           SET UP ILPSW
001A5E    C890 01F0               2020           LHI   STAT,X'01F0'
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
001A62    9509                  2021          EPSR  0,STAT            USER MODE
001A64    F870 5050 5050        2022          LI    DAT,Y'50505050'
001A6A    5070 2844             2023          ST    DAT,CONST          DATA PATTERN
001A6E    E670 2844             2024          LA    DAT,CONST
001A72    4800 1816             2025          LH    0,DCSLO            START POINT
001A76    0711                  2026          XR    1,1                IN USER MODE, WDCS
001A78    E807         .        2027          WDCS  DAT                SHOULD BE ILLEGAL
                                2028  *
                                2029  * IF FALL THROUGH, ERROR 07
                                2030  *
001A7A    E670 1A82             2031          LA    DAT,ERR07
001A7E    5070 0034             2032          ST    DAT,X'34'
001A82    C870 3037             2033  ERR07   LHI   DAT,C'07'
001A86    4070 172E             2034          STH   DAT,ERRNO
001A8A    2477                  2035          LIS   DAT,7
001A8C                          2036          CNOP  4                  ALIGN CALL PARAMETER
001A8C    41F0 26F6             2037          BAL   LINK,TALLI         PRINT ERROR **07
                                2038  *
001A90    E670 1B04             2039  TESTG   LA    DAT,ERR08
001A94    5070 0034             2040          ST    DAT,X'34'          SET ILPSW
001A98    C870 00F0             2041          LHI   DAT,X'00F0'
001A9C    9597                  2042          EPSR  STAT,DAT           SELECT REG SET F
001A9E    E670 2844             2043          LA    DAT,CONST
001AA2    E6C0 2A5C             2044          LA    POINT,BUFF
                                2045  *
001AA6    0711                  2046  TDCSS1  XR    1,1                1 FULLWORD
001AA8    E807                  2047          WDCS  DAT                WRITE DATA PATTERN
001AAA    0820                  2048          LR    2,0
001AAC    0733                  2049          XR    3,3
001AAE    E82C                  2050          RDCS  POINT              READ IT BACK
001AB0    58B0 2A5C             2051          L     CHAR,BUFF
001AB4    F5B0 5050 5050        2052          CLI   CHAR,Y'50505050'   PATTERN CAME BACK?
001ABA    4330 1AD0             2053          BE    FNDLO
                                2054  *
                                2055  *   DID NOT FIND ANY WCS.
                                2056  *
001ABE    C850 2936             2057  NODCS   LHI   R5,MSG5            'NO WCS FOUND'
001AC2    0200                  2058          CNOP  4                  ALIGN CALL PARAMETER
001AC4    4050 16E4             2059          STH   R5,ISITERR         FORCE PRINT
001AC8    41F0 11CC             2060          BAL   LINK,PRINT         PRINT IT
001ACC    4300 0B50             2061          B     OPTIN
                                2062  *
001AD0    C850 2944             2063  FNDLO   LHI   R5,MSG4            'WCS FOUND'
001AD4    41F0 11CC             2064          BAL   LINK,PRINT
001AD8    4850 16E6             2065          LH    R5,NOERR           ANY ERRORS?
001ADC    2335      =001AE6     2066          BZS   FNDL1              NO BRANCH
001ADE    4850 17FE             2067          LH    R5,MODE+6          MODE SET?
001AE2    4330 0B50             2068          BZ    OPTIN              NO,GO TO COMMAND MODE
001AE6    C850 2952             2069  FNDL1   LHI   R5,MSG6            'TEST EXECUTION STARTED'
001AEA    41F0 11CC             2070          BAL   LINK,PRINT
001AEE    4300 0E2E             2071          B     INITRET            RETURN TO ETPE
                                2072  *
001AF2    C870 3034             2073  ERR04   LHI   DAT,C'04'
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
001AF6      4070 172E      2074           STH    DAT,ERRNO
001AFA      2474           2075           LIS    DAT,X'04'
001AFC                     2076           CNOP   4                    ALIGN CALL PARAMETER
001AFC      41F0 26F6      2077           BAL    LINK,TALLI           PRINT ERROR **04
                           2078  *                                   AND TALLY IT
001B00      4300 1A56      2079           B      TESTF
                           2080  *
001B04      C890 00F0      2081  ERR08    LHI    STAT,X'00F0'
001B08      9579           2082           EPSR   DAT,STAT
001B0A      C870 3038      2083           LHI    DAT,C'08'
001B0E      4070 172E      2084           STH    DAT,ERRNO
001B12      2478           2085           LIS    DAT,X'08'
001B14                     2086           CNOP   4                    ALIGN CALL PARAMETER
001B14      41F0 26F6      2087           BAL    LINK,TALLI           PRINT ERROR **08
001B18      4300 1ABE      2088           B      NODCS
                           2089  *
```

EXEC - ETPE R04   (W/CONDITIONAL ASSEMBLY)

```
                                         2091  *
                                         2092  *
001B1C          FFFF FFFF                2093  DEVSADR  DC     -1
                                         2094  *
001B20          0000                     2095  DEVINT   DC     X'0'
                                         2096  *
001B22          0000                     2097  INTLVL   DB     0,0
                                         2098  *
                                         2099  *
001B24          4D4F 4445 4C20 3332      2100  TITLE    DC     C'MODEL 3220   WRITEABLE CONTROL STORE TEST 06-232R00'
001B2C          3230 2020 5752 4954
001B34          4541 424C 4520 434F
001B3C          4E54 524F 4C20 5354
001B44          4F52 4520 5445 5354
001B4C          2030 362D 3233 3252
001B54          3030
001B56          0D0A                     2101           DCX    0D0A
                                         2102  *
001B58          FE40                     2103  DEFTESTS DC     X'FE40',X'0000'    DEFINEES TESTS 0,1..6,9 AS DEFAULT
001B5A          0000
                                         2104  *                                 TESTS
                                         2105  *
001B5C          0009                     2106  MAXTST   DC     H'9'               DEFINES TEST # 9 TO BE THE LAST TEST
                                         2107  *
                                         2108  * TESTS TABLE FOR A TEST PROGRAM COMPRISED OF 10 TESTS
                                         2109  *
001B60                                   2110           ALIGN  ADC               MANDATORY FOR TARGT 32 !
001B60          0000 1B88                2111  TESTS    DC     TEST0,TEST1,TEST2,TEST3,TEST4,TEST5,TEST6,TEST7,TEST8
001B64          0000 1C04
001B68          0000 1C6C
001B6C          0000 1D26
001B70          0000 1D76
001B74          0000 1E3C
001B78          0000 1EEE
001B7C          0000 20C0
001B80          0000 2152
001B84          0000 217A                2112           DC     TEST9
```

```
                                       2114  * * * * * * * * * * * * * * * * * * * * * * * *
                                       2115  *                                            *
                                       2116  *            T E S T   M O D U L E   0 0     *
                                       2117  *                                            *
                                       2118  * THE ADDRESS OF EACH FULLWORD OF WCS IS     *
                                       2119  * WRITTEN AS DATA INTO THAT FULLWORD. EACH   *
                                       2120  * FULLWORD IS THEN READ OUT AND CHECKED. THEN*
                                       2121  * THE COMPLEMENT OF THE ADDRESS OF EACH FULL-*
                                       2122  * WORD OF WCS IS WRITTEN AS DATA INTO THAT   *
                                       2123  * FULLWORD. EACH FULLWORD IS THEN READ OUT AND*
                                       2124  *  CHECKED.                                  *
                                       2125  *                                            *
                                       2126  * * * * * * * * * * * * * * * * * * * * * * * *
                                       2127  *
                     0000 1B88         2128  TEST0     EQU   *
                                       2129  *
001B88        0744                     2130  TEST00    XR    ZERO,ZERO
001B8A        4040 2856                2131            STH   ZERO,PASS
001B8E        4870 1816                2132            LH    DAT,DCSLO       WCS START ADRS
001B92        5074 2A9C                2133  TST00A    ST    DAT,IMAGE(ZERO) WRITE ADDRESS
001B96        2671                      2134            AIS   DAT,1           AS DATA INTO
001B98        2644                      2135            AIS   ZERO,4          WCS IMAGE
001B9A        C540 0040                2136            CLHI  ZERO,64
001B9E        2086       =001B92       2137            BLS   TST00A
                                       2138  *
001BA0        0744                     2139            XR    ZERO,ZERO
001BA2        41F0 25F8                2140            BAL   LINK,WRITD      COPY IMAGE TO DCS
001BA6        41F0 260A                2141            BAL   LINK,READD      READ IT BACK
                                       2142  *
001BAA        4870 2856                2143            LH    DAT,PASS
001BAE        CA70 0010                2144            AHI   DAT,16
001BB2        4070 2856                2145            STH   DAT,PASS
001BB6        4A70 1816                2146            AH    DAT,DCSLO
001BBA        4570 1822                2147            CLH   DAT,DCSHI       SEE IF DONE
001BBE        4280 1B92                2148            BL    TST00A          LOOP
                                       2149  *
001BC2        4040 2856                2150            STH   ZERO,PASS
001BC6        4870 1816                2151            LH    DAT,DCSLO       WCS START ADRS
001BCA        0817                      2152  TST00B    LR    1,DAT           WRITE COMPLEMENT
001BCC        C710 FFFF                2153            XHI   1,X'FFFF'       OF ADDRESS
001BD0        5014 2A9C                2154            ST    1,IMAGE(ZERO)   AS DATA INTO
001BD4        2671                      2155            AIS   DAT,1           WCS IMAGE
001BD6        2644                      2156            AIS   ZERO,4
001BD8        C540 0040                2157            CLHI  ZERO,64
001BDC        2089       =001BCA       2158            BLS   TST00B
                                       2159  *
001BDE        0744                     2160            XR    ZERO,ZERO
001BE0        41F0 25F8                2161            BAL   LINK,WRITD      COPY IMAGE TO DCS
001BE4        41F0 260A                2162            BAL   LINK,READD      READ IT BACK
001BE8        4870 2856                2163            LH    DAT,PASS
001BEC        CA70 0010                2164            AHI   DAT,16
001BF0        4070 2856                2165            STH   DAT,PASS
001BF4        4A70 1916                2166            AH    DAT,DCSLO
```

EXEC - ETPE R04P0   TEST MODULES

```
001BF8      4570 1822       2167            CLH    DAT,DCSHI
001BFC      4280 1BCA       2168            BL     TST00B
001C00      4300 0EC4       2169            B      TSTEND                    EXIT
                            2170   * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                            2171   *                                                   *
                            2172   *           T E S T   M O D U L E   0.1             *
                            2173   *                                                   *
                            2174   *   ZEROS ARE WRITTEN INTO ALL WCS. THEN A FULL-    *
                            2175   *   WORD IS READ, AND TESTED FOR ZERO AND ONES      *
                            2176   *   ARE WRITTEN INTO THE NEXT SEQUENTIAL FULL-      *
                            2177   *   WORD. WHEN THIS IS FINISHED,  EVERY EVEN        *
                            2178   *   ADDRESS CONTAINS ZERO AND EVERY ODD ADDRESS     *
                            2179   *   CONTAINS ONES. THEN EACH ODD LOCATION IS        *
                            2180   *   READ AND TESTED FOR ONES AND ZEROS ARE          *
                            2181   *   WRITTEN INTO THE PREVIOUS EVEN LOCATION.        *
                            2182   *                                                   *
                            2183   * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                            2184   *
            0000 1C04       2185   TEST1   EQU    *
                            2186   *
001C04      41F0 25CC       2187   TEST01  BAL    LINK,CLRIMJ               CLEAR IMAGE
001C08      41F0 25E0       2188           BAL    LINK,COPY                 CLEAR ALL WCS
                            2189   *
001C0C      48D0 1816       2190           LH     ADRS,DCSLO
001C10      080D            2191   TST01B  LR     0,ADRS                    ADDRESS
001C12      0711            2192           XR     1,1
001C14      082D            2193           LR     2,ADRS
001C16      0733            2194           XR     3,3
                            2195   *
001C18      E670 2828       2196           LA     DAT,DSAVE                 SET-UP
001C1C      E6C0 2850       2197           LA     POINT,ONES                POINTERS
001C20      E827            2198           RDCS   DAT                       READ ZEROS
001C22      2601            2199           AIS    0,1                       GET ODD ADDRESS
001C24      E80C            2200           WDCS   POINT                     WRITE ONES
                            2201   *
001C26      07EE            2202           XR     TST,TST                   DATA EXPECTED
001C28      5870 2828       2203           L      DAT,DSAVE                 DATA OBSERVED
001C2C      41F0 267C       2204           BAL    LINK,CHKDAT               TEST IT
                            2205   *
001C30      26D2            2206           AIS    ADRS,2                    BUMP ADDRESS
001C32      45D0 1822       2207           CLH    ADRS,DCSHI
001C36      4280 1C10       2208           BL     TST01B
                            2209   *
001C3A      48D0 1816       2210           LH     ADRS,DCSLO
001C3E      080D            2211   TST01C  LR     0,ADRS                    ADDRESS
001C40      0711            2212           XR     1,1
001C42      082D            2213           LR     2,ADRS
001C44      0733            2214           XR     3,3
001C46      2621            2215           AIS    2,1
                            2216   *
001C48      E670 2828       2217           LA     DAT,DSAVE                 SET-UP
001C4C      E6C0 284C       2218           LA     POINT,ZEROS               POINTERS
                            2219   *
```

EXEC - ETPE R04P0   TEST MODULES

```
001C50      E827                    2220          RDCS    DAT              READ ONES
001C52      E80C                    2221          WDCS    POINT            WRITE ZEROS
                                    2222   *
001C54      25E1                    2223          LCS     TST,1            DATA EXPECTED
001C56      5870 2828               2224          L       DAT,DSAVE        DATA OBSERVED
001C5A      41F0 267C               2225          BAL     LINK,CHKDAT      TEST IT
                                    2226   *
001C5E      26D2                    2227          AIS     ADRS,2           BUMP ADDRESS
001C60      45D0 1822               2228          CLH     ADRS,DCSHI
001C64      4280 1C3E               2229          BL      TST01C
001C68      4300 0EC4               2230          B       TSTEND           EXIT
                                    2231   * * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2232   *                                                 *
                                    2233   *          T E S T   M O D U L E   0 2            *
                                    2234   *                                                 *
                                    2235   *   THE DATA PATTERNS 80000000, 40000000,...      *
                                    2236   *   ...00000002, 00000001 ARE WRITTEN INTO        *
                                    2237   *   EVERY 16-FULLWORD BLOCK OF WCS FROM THE       *
                                    2238   *   LOWEST WCS ADDRESS TO THE HIGHEST. THE        *
                                    2239   *   DATA WRITTEN IS THEN READ BACK AND            *
                                    2240   *   CHECKED. THEN THE COMPLEMENT OF THE TEST      *
                                    2241   *   PATTERN IS LOADED INTO WCS STARTING AT THE    *
                                    2242   *   HIGHEST WCS ADRS AND ENDING AT THE LOWEST.    *
                                    2243   *   THE DATA IS READ BACK AND CHECKED.            *
                                    2244   *                                                 *
                                    2245   * * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2246   *
            0000 1C6C               2247   TEST2    EQU    *
                                    2248   *
001C6C      F870 8000 0000          2249          LI      DAT,Y'80000000'
                                    2250   *
001C72      5074 2A9C               2251   TST02A   ST     DAT,IMAGE(ZERO)  STORE PATTERN
001C76      2644                    2252          AIS     ZERO,4           BUMP INDEX
001C78      1071                    2253          SRLS    DAT,1            SHIFT PATTERN
001C7A      C540 0040               2254          CLHI    ZERO,64
001C7E      2086         =001C72    2255          BLS     TST02A
                                    2256   *
001C80      41F0 25E0               2257          BAL     LINK,COPY        PROPAGATE THROUGH WCS
001C84      41F0 263E               2258          BAL     LINK,READCS      COMPARE WCS TO IMAGE
                                    2259   *
001C88      0744                    2260          XR      ZERO,ZERO
001C8A      F870 0000 8000          2261          LI      DAT,Y'00008000'
001C90      5074 2A9C               2262   TST02B   ST     DAT,IMAGE(ZERO)  STORE PATTERN
001C94      2644                    2263          AIS     ZERO,4
001C96      1071                    2264          SRLS    DAT,1
001C98      C540 0040               2265          CLHI    ZERO,64
001C9C      2086         =001C90    2266          BLS     TST02B
                                    2267   *
001C9E      41F0 25E0               2268          BAL     LINK,COPY
001CA2      41F0 263E               2269          BAL     LINK,READCS
                                    2270   *
001CA6      0744                    2271          XR      ZERO,ZERO
001CA8      F870 7FFF FFFF          2272          LI      DAT,Y'7FFFFFFF'
```

EXEC - ETPE R04P0   TEST MODULES

```
001CAE      5074 2A9C          2273   TST02F    ST    DAT,IMAGE(ZERO)      SET-UP IMAGE
001CB2      1071               2274             SRLS  DAT,1                SHIFT PATTERN
001CB4      F670 8000 0000     2275             OI    DAT,Y'80000000'
001CBA      2644               2276             AIS   ZERO,4
001CBC      C540 0040          2277             CLHI  ZERO,64
001CC0      2089      =001CAE  2278             BLS   TST02F
                               2279   *
001CC2      4800 1822          2280             LH    0,DCSHI
001CC6      E670 2860          2281   TST02D    LA    DAT,PATERN
001CCA      0711               2282   TST02E    XR    1,1                  WRITE PATTERN
001CCC      2701               2283             SIS   0,1                  TO BOTTOM
001CCE      E807               2284             WDCS  DAT                  FROM TOP OF WCS
001CD0      2674               2285             AIS   DAT,4
001CD2      C570 28A0          2286             CLHI  DAT,PATERN+64
001CD6      2086      =001CCA  2287             BLS   TST02E
001CD8      4500 1816          2288             CLH   0,DCSLO
001CDC      228B      =001CC6  2289             BNLS  TST02D
                               2290   *
001CDE      41F0 25E0          2291             BAL   LINK,COPY
001CE2      41F0 263E          2292             BAL   LINK,READCS          COMPARE ALL OF WCS TO IMAGE
                               2293   *
001CE6      0744               2294             XR    ZERO,ZERO
001CE8      F870 FFFF 7FFF     2295             LI    DAT,Y'FFFF7FFF'
001CEE      5074 2A9C          2296   TST02C    ST    DAT,IMAGE(ZERO)
001CF2      EE70 0001          2297             SRA   DAT,1
001CF6      2644               2298             AIS   ZERO,4
001CF8      C540 0040          2299             CLHI  ZERO,64
001CFC      2087      =001CEE  2300             BLS   TST02C
                               2301   *
001CFE      4800 1822          2302             LH    0,DCSHI
001D02      E670 28A0          2303   TST02H    LA    DAT,PATERN+64        TO WRITE PATTERN
001D06      0711               2304   TST02J    XR    1,1                  FROM TOP TO BOTTOM
001D08      2701               2305             SIS   0,1
001D0A      E807               2306             WDCS  DAT
001D0C      2674               2307             AIS   DAT,4
001D0E      C570 28E0          2308             CLHI  DAT,PATERN+128
001D12      2086      =001D06  2309             BLS   TST02J
001D14      4500 1816          2310             CLH   0,DCSLO
001D18      228B      =001D02  2311             BNLS  TST02H
                               2312   *
001D1A      41F0 25E0          2313             BAL   LINK,COPY
001D1E      41F0 263E          2314             BAL   LINK,READCS
001D22      4300 0EC4          2315             B     TSTEND               EXIT
                               2316   * * * * * * * * * * * * * * * * * * * * * * * * * *
                               2317   *                                                 *
                               2318   *           T E S T   M O D U L E   0 3           *
                               2319   *                                                 *
                               2320   *   ZEROS ARE WRITTEN INTO ALL WCS. THEN EACH     *
                               2321   *   SUCCESSIVE FULLWORD IS READ, CHECKED FOR      *
                               2322   *   ZERO AND THEN RE-WRITTEN WITH ONES. ALL WCS   *
                               2323   *   IS THEN TESTED FOR ONES. THEN, STARTING AT    *
                               2324   *   THE TOP OF WCS, EACH FULLWORD IS READ.        *
                               2325   *   CHECKED FOR ONES AND THEN REWRITTEN WITH      *
```

```
                                    2326  *  ZERO. FINALLY, ALL WCS IS TESTED FOR ZERO    *
                                    2327  *                                               *
                                    2328  * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2329  *
                 0000 1D26          2330  TEST3     EQU    *
                                    2331  *
001D26           41F0 25CC          2332  TEST03    BAL    LINK,CLRIMJ         CLEAR IMAGE
001D2A           41F0 25E0          2333            BAL    LINK,COPY           CLEAR ALL WCS
                                    2334  *
001D2E           48D0 1816          2335            LH     ADRS,DCSLO
001D32           25E1               2336  TST03A    LCS    TST,1               'FFFFFFFF'
001D34           41F0 25AE          2337            BAL    LINK,RANDW          READ ZEROS,WRITE ONES
001D38           07EE               2338            XR     TST,TST
001D3A           41F0 267C          2339            BAL    LINK,CHKDAT         SEE IF ZEROS READ
                                    2340  *
001D3E           26D1               2341            AIS    ADRS,1              BUMP ADDRESS
001D40           45D0 1822          2342            CLH    ADRS,DCSHI
001D44           2089       =001D32 2343            BLS    TST03A
                                    2344  *
001D46           2571               2345            LCS    DAT,1               FILL IMAGE
001D48           41F0 25CE          2346            BAL    LINK,CLRILP         WITH 'FFFFFFFF'
001D4C           41F0 263E          2347            BAL    LINK,READCS         TEST FOR ALL ONES
                                    2348  *
                                    2349  *
001D50           48D0 1822          2350            LH     ADRS,DCSHI
001D54           27D1               2351            SIS    ADRS,1
001D56           07EE               2352  TST03B    XR     TST,TST
001D58           41F0 25AE          2353            BAL    LINK,RANDW          READ ONES,WRITE ZEROS
001D5C           25E1               2354            LCS    TST,1
001D5E           41F0 267C          2355            BAL    LINK,CHKDAT         SEE IF ONES READ
                                    2356  *
001D62           27D1               2357            SIS    ADRS,1              BUMP ADDRESS
001D64           45D0 1816          2358            CLH    ADRS,DCSLO
001D68           2289       =001D56 2359            BNLS   TST03B
                                    2360  *
001D6A           41F0 25CC          2361            BAL    LINK,CLRIMJ
001D6E           41F0 263E          2362            BAL    LINK,READCS         TEST FOR ALL ZEROS
001D72           4300 0EC4          2363            B      TSTEND              EXIT
                                    2364  * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2365  *                                               *
                                    2366  *          T E S T   M O D U L E   04           *
                                    2367  *                                               *
                                    2368  *  ZEROS ARE WRITTEN INTO ALL OF WCS. THEN ONES *
                                    2369  *  ARE WRITTEN INTO ONE PAGE AT A TIME AND ALL   *
                                    2370  *  OTHER PAGES ARE TESTED FOR ZERO. THE TEST     *
                                    2371  *  THEN REPEATS WITH ALL ONES IN WCS AND A PAGE  *
                                    2372  *  AT A TIME EQUAL TO ZERO.                      *
                                    2373  *                                               *
                                    2374  * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2375  *
                 0000 1D76          2376  TEST4     EQU    *
                                    2377  *
001D76           0744               2378            XR     ZERO,ZERO
```

EXEC - ETPE R04P0   TEST MODULES

```
001D78      4040 285C             2379          STH    ZERO,FLIP
                                  2380   *
001D7C      4870 285C             2381  TST04A   LH     DAT,FLIP        SET IMAGE TO
001D80      41F0 25CE             2382          BAL    LINK,CLRILP     BACKGROUND VALUE
001D84      41F0 25E0             2383          BAL    LINK,COPY       PROPAGATE THROUGH WCS
                                  2384   *
001D88      48C0 1816             2385          LH     POINT,DCSLO
001D8C      40C0 285A             2386          STH    POINT,IPAGE     START ADRS
001D90      4040 2858             2387          STH    ZERO,DPAGE      INDEX
                                  2388   *
001D94      4870 285C             2389  TST04B   LH     DAT,FLIP        SET IMAGE EQUAL
001D98      C770 FFFF             2390          XHI    DAT,X'FFFF'      TO COMPLEMENT OF
001D9C      41F0 25CE             2391          BAL    LINK,CLRILP     BACKGROUND PATTERN
001DA0      E670 2A9C             2392          LA     DAT,IMAGE
001DA4      4800 285A             2393          LH     0,IPAGE
                                  2394   *
001DA8      241F                  2395  TST04C   LIS    1,15            WRITE A PAGE OF
001DAA      E807                  2396          WDCS   DAT             WCS  EQUAL TO
001DAC      CA00 0010             2397          AHI    0,16            COMPLEMENT OF
001DB0      C300 00FF             2398          THI    0,X'00FF'       BACKGROUND PATTERN
001DB4      2036        =001DA8   2399          BNZS   TST04C
                                  2400   *
001DB6      4870 285C             2401          LH     DAT,FLIP
001DBA      41F0 25CE             2402          BAL    LINK,CLRILP     IMAGE=BACKGROUND
001DBE      4040 2856             2403          STH    ZERO,PASS
                                  2404   *
001DC2      4870 2856             2405  TST04D   LH     DAT,PASS        TEST ALL OTHER
001DC6      4570 2858             2406          CLH    DAT,DPAGE       PAGES FOR BACKGROUND
001DCA      2139        =001DDC   2407          BNES   TST04E
001DCC      CA70 0100             2408          AHI    DAT,256
001DD0      4070 2856             2409          STH    DAT,PASS
001DD4      4570 2854             2410          CLH    DAT,DELTA
001DD8      4380 1DFA             2411          BNL    TST04F
                                  2412   *
001DDC      41F0 260A             2413  TST04E   BAL    LINK,READD      TEST 16 FULLWORDS
001DE0      4870 2856             2414          LH     DAT,PASS
001DE4      CA70 0010             2415          AHI    DAT,16          NEXT 16
001DE8      4070 2856             2416          STH    DAT,PASS
001DEC      C370 00FF             2417          THI    DAT,X'00FF'     FINISHED A PAGE?
001DF0      2135        =001DFA   2418          BNZS   TST04F          LOOP
001DF2      4570 2854             2419          CLH    DAT,DELTA
001DF6      4280 1DC2             2420          BL     TST04D          NEXT PAGE
                                  2421   *
001DFA      4800 285A             2422  TST04F   LH     0,IPAGE
001DFE      E670 2A9C             2423          LA     DAT,IMAGE
                                  2424   *
001E02      241F                  2425  TST04G   LIS    1,15            RESTORE PAGE
001E04      E807                  2426          WDCS   DAT             TO BACKGROUND
001E06      CA00 0010             2427          AHI    0,16            VALUE
001E0A      C300 00FF             2428          THI    0,X'00FF'
001E0E      2036        =001E02   2429          BNZS   TST04G
                                  2430   *
001E10      4000 285A             2431          STH    0,IPAGE         NEXT PAGE
```

EXEC - ETPE RO4PO TEST MODULES

```
001E14      4870 2858        2432           LH    DAT,DPAGE
001E18      CA70 0100        2433           AHI   DAT,256
001E1C      4070 2858        2434           STH   DAT,DPAGE
001E20      4570 2854        2435           CLH   DAT,DELTA
001E24      4280 1D94        2436           BL    TST04B            LOOP
                             2437     *
                             2438     * END OF PASS
                             2439     *
001E28      4870 285C        2440           LH    DAT,FLIP          COMPLEMENT
001E2C      C770 FFFF        2441           XHI   DAT,X'FFFF'       BACKGROUND
001E30      4070 285C        2442           STH   DAT,FLIP          PATTERN
001E34      4230 1D7C        2443           BNZ   TST04A            DO 2ND PASS
001E38      4300 0EC4        2444           B     TSTEND            EXIT
                             2445     * * * * * * * * * * * * * * * * * * * * * * * *
                             2446     *                                            *
                             2447     *          T E S T   M O D U L E   0 5       *
                             2448     *                                            *
                             2449     *  ALL WCS IS LOADED WITH '55555555', THEN EACH *
                             2450     *  SUCCESSIVE FULLWORD IS READ OUT, TESTED FOR   *
                             2451     *  '55555555' AND RE-WRITTEN WITH 'AAAAAAAA'.    *
                             2452     *  THE FULLWORD IS READ AGAIN  AND TESTED FOR    *
                             2453     *  'AAAAAAAA', AND FINALLY IS RE-WRITTEN         *
                             2454     *  WITH '55555555'.                             *
                             2455     *                                              *
                             2456     *  NEXT, ALL ONES ARE WRITTEN INTO WCS. THEN,    *
                             2457     *  FOR EACH WORD OF WCS, THE PATTERNS 7FFFFFFF,   *
                             2458     *  BFFFFFFF, .... , FFFFFFFD, AND FFFFFFFE ARE    *
                             2459     *  WRITTEN, THEN READ BACK AND TESTED. THE        *
                             2460     *  FULLWORD IS THEN RE-WRITTEN WITH ALL ONES.     *
                             2461     *  THE SEQUENCE IS THEN REPEATED WITH ALL ZEROS  *
                             2462     *  IN WCS, AND A SINGLE BIT SET TO 1.            *
                             2463     *                                              *
                             2464     * * * * * * * * * * * * * * * * * * * * * * * *
                             2465     *
            0000 1E3C        2466     TEST5   EQU   *
                             2467     *
001E3C      F870 5555 5555   2468           LI    DAT,Y'55555555'   FILL IMAGE
001E42      41F0 25CE        2469           BAL   LINK,CLRILP       WITH '55555555'
001E46      41F0 25E0        2470           BAL   LINK,COPY         COPY IMAGE TO WCS
                             2471     *
001E4A      48D0 1816        2472           LH    ADRS,DCSLO
001E4E      F8E0 AAAA AAAA   2473     TST05A  LI    TST,Y'AAAAAAAA'
001E54      41F0 25AE        2474           BAL   LINK,RANDW        READ FIVES,WRITE ABLES
001E58      F8E0 5555 5555   2475           LI    TST,Y'55555555'
001E5E      41F0 267C        2476           BAL   LINK,CHKDAT       TEST IF FIVES READ
                             2477     *
001E62      41F0 25AE        2478           BAL   LINK,RANDW        READ ABLES,WRITE FIVES
001E66      F8E0 AAAA AAAA   2479           LI    TST,Y'AAAAAAAA'
001E6C      41F0 267C        2480           BAL   LINK,CHKDAT       TEST IF ABLES READ
                             2481     *
001E70      26D1             2482           AIS   ADRS,1            BUMP ADDRESS
001E72      45D0 1822        2483           CLH   ADRS,DCSHI
001E76      4280 1E4E        2484           BL    TST05A
```

```
                                    2485  *
001E7A        2571                  2486           LCS   DAT,1              FILL IMAGE
001E7C        41F0 25CE             2487           BAL   LINK,CLRILP        WITH 'FFFFFFFF'
001E80        41F0 25E0             2488           BAL   LINK,COPY          COPY IMAGE TO WCS
                                    2489  *
001E84        48D0 1816             2490           LH    ADRS,DCSLO
001E88        F8E0 7FFF FFFF        2491  TST05B   LI    TST,Y'7FFFFFFF'
001E8E        41F0 2590             2492  TST05C   BAL   LINK,WANDR         WRITE AND READ PATTERN
001E92        41F0 267C             2493           BAL   LINK,CHKDAT        SEE IF PATTERN CAME BACK
                                    2494  *
001E96        58E0 2824             2495           L     TST,TSAVE
001E9A        C5E0 FFFF             2496           CLHI  TST,X'FFFF'
001E9E        2336      =001EAA     2497           BES   TST05D             NEXT LOCATION
001EA0        10E1                  2498           SRLS  TST,1              SHIFT PATTERN
001EA2        F6E0 8000 0000        2499           OI    TST,Y'80000000'    SET MSB
001EA8        220D      =001E8E     2500           BS    TST05C             LOOP ON LOCATION
                                    2501  *
001EAA        26D1                  2502  TST05D   AIS   ADRS,1             NEXT LOCATION
001EAC        41F0 1358             2503           BAL   LINK,TSTBRK        IF BREAK EXIT
001EB0        45D0 1822             2504           CLH   ADRS,DCSHI
001EB4        4280 1E88             2505           BL    TST05B
                                    2506  *
001EB8        41F0 25CC             2507           BAL   LINK,CLRIMJ        CLEAR IMAGE
001EBC        41F0 25E0             2508           BAL   LINK,COPY          COPY IMAGE TO WCS
                                    2509  *
001EC0        48D0 1816             2510           LH    ADRS,DCSLO
001EC4        F8E0 8000 0000        2511  TST05E   LI    TST,Y'80000000'    PATTERN
001ECA        41F0 2590             2512  TST05F   BAL   LINK,WANDR         WRITE AND READ PATTERN
001ECE        41F0 267C             2513           BAL   LINK,CHKDAT        SEE IF PATTERN CAME BACK
                                    2514  *
001ED2        58E0 2824             2515           L     TST,TSAVE
001ED6        2333      =001EDC     2516           BZS   TST05G             NEXT LOCATION
001ED8        10E1                  2517           SRLS  TST,1              SHIFT PATTERN
001EDA        2208      =001ECA     2518           BS    TST05F             LOOP ON LOCATION
                                    2519  *
001EDC        26D1                  2520  TST05G   AIS   ADRS,1             NEXT LOCATION
001EDE        41F0 1358             2521           BAL   LINK,TSTBRK        IF BREAK ,EXIT
001EE2        45D0 1822             2522           CLH   ADRS,DCSHI
001EE6        4280 1EC4             2523           BL    TST05E
001EEA        4300 0EC4             2524           B     TSTEND             EXIT
                                    2525  * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2526  *                                               *
                                    2527  *         T E S T    M O D U L E   0 6          *
                                    2528  *                                               *
                                    2529  *  A MICRO-CODE SUBROUTINE IS EXECUTED FROM      *
                                    2530  *  EACH AVAILABLE FULLWORD IN WCS. BDCS AND ECS  *
                                    2531  *  INSTRUCTIONS ARE USED TO ACCESS THE ROUTINE.  *
                                    2532  *  A MICRODE ROUTINE TO TEST BRANCH & YDP1 IS    *
                                    2533  *  ALSO EXECUTED.                                *
                                    2534  *                                               *
                                    2535  * * * * * * * * * * * * * * * * * * * * * * * * *
                                    2536  *
              0000 1EEE             2537  TEST6    EQU   *
```

```
                                      2538  *
001EEE      C800 0800                 2539  TEST06   LHI    0,X'800'          GET WCS LOW ADRESS (X'800')
001EF2      4000 1F3C                 2540  TST06H   STH    0,TST06D+2
001EF6      C870 E902                 2541           LHI    DAT,X'E902'       INITIALIZE
001EFA      4070 1F18                 2542           STH    DAT,TST06B        ECS INSTRUCTION
001EFE      C8C0 0010                 2543           LHI    POINT,X'0010'     ECS INCREMENT
001F02      4000 2856                 2544           STH    0,PASS
                                      2545  *
001F06      E670 2040                 2546           LA     DAT,GLOBAL        ADDRESS OF MICRO-CODE
001F0A      C810 000F                 2547           LHI    1,15              16 FULLWORDS
001F0E      E807                      2548           WDCS   DAT               WRITE FIRST 16 WORDS
                                      2549  *
001F10      247F                      2550           LIS    DAT,15
                                      2551  *
001F12      5070 2828                 2552  TST06A   ST     DAT,DSAVE
001F16      0722                      2553           XR     2,2
001F18      E902 0001                 2554  TST06B   ECS    0,1(2)            ENTER CONTROL STORE
001F1C      0527                      2555           CLR    2,DAT
001F1E      233B        =001F34       2556           BES    TST06C            OK
001F20      C870 3132                 2557           LHI    DAT,C'12'
001F24      4070 172E                 2558           STH    DAT,ERRNO
001F28      C870 0012                 2559           LHI    DAT,X'12'
001F2C                                2560           CNOP   4                 ALIGN CALL PARAMETER
001F2C      41F0 26F6                 2561           BAL    LINK,TALLI
001F30      5870 2828                 2562           L      DAT,DSAVE
                                      2563  *
001F34      61C0 1F18                 2564  TST06C   AHM    POINT,TST06B      INCREMENT FUNCTION
001F38      0722                      2565           XR     2,2
001F3A      E502 0800                 2566  TST06D   BDCS   0,X'800'(R2)      BRANCH TO CONTROL STORE
001F3E      0527                      2567           CLR    2,DAT
001F40      233C        =001F58       2568           BES    TST06E            OK
001F42      C870 3133                 2569           LHI    DAT,C'13'
001F46      4070 172E                 2570           STH    DAT,ERRNO
001F4A      C870 0013                 2571           LHI    DAT,X'13'
001F4E      0200                      2572           CNOP   4                 ALIGN CALL PARAMETER
001F50      41F0 26F6                 2573           BAL    LINK,TALLI        PRINT 'ERROR TT13'
001F54      5870 2828                 2574           L      DAT,DSAVE
                                      2575  *
001F58      2441                      2576  TST06E   LIS    ZERO,1
001F5A      6140 1F3C                 2577           AHM    ZERO,TST06D+2
001F5E      2771                      2578           SIS    DAT,1             DECREMENT TEST WORD
001F60      4310 1F12                 2579           BNM    TST06A            LOOP
                                      2580  *
                                      2581  * FIRST 16 WORDS TESTED
                                      2582  *
001F64      0744                      2583           XR     ZERO,ZERO
001F66      4800 2856                 2584           LH     0,PASS
001F6A      CA00 0010                 2585           AHI    0,16
001F6E      4000 2856                 2586           STH    0,PASS            NEXT 16 WORDS
001F72      CA00 0010                 2587           AHI    0,16
001F76      4500 1822                 2588           CLH    0,DCSHI
001F7A      4380 1FB2                 2589           BNL    TT6BRN            NO MORE WCS, BRANCH
                                      2590  *
```

```
                                    2591   * GENERATE ECS VECTOR TABLE
                                    2592   *
001F7E      07CC                    2593            XR     POINT,POINT
001F80      4870 2856               2594            LH     DAT,PASS          WCS ADDRESS
001F84      1174                    2595            SLLS   DAT,4             POSITION TO ADDRESS FIELD -
001F86      F670 0E02 0000          2596            OI     DAT,Y'0E020000'   BUILD U-CODE 'BAL' INSTR
001F8C      507C 2080               2597   TST06F   ST     DAT,ECSVCT(POINT)
001F90      CA70 0010               2598            AHI    DAT,X'0010'       INCREMENT ADDRESS FIELD BY 1
001F94      26C4                    2599            AIS    POINT,4
001F96      C5C0 0040               2600            CLHI   POINT,64
001F9A      2087       =001F8C      2601            BLS    TST06F
                                    2602   *
                                    2603   *
001F9C      4800 1816               2604            LH     0,DCSLO
001FA0      C810 000F               2605            LHI    1,15              ECS VECTORS
001FA4      E670 2080               2606            LA     DAT,ECSVCT        TO FIRST 16
001FA8      E807                    2607            WDCS   DAT               LOCATIONS
                                    2608   *
001FAA      4800 2856               2609            LH     0,PASS
001FAE      4300 1EF2               2610            B      TST06H
                                    2611   *
                                    2612   * THIS TEST CHECKS BRANCHING & INCRMENTIN YD FIELD WITHIN
                                    2613   * THE WCS. REGISTERS 13,14,15  ARE STORED AT ERRIND AFTER
                                    2514   * EXECUTING THE MICRODE .
            0000 1FB2               2615   TT6BRN   EQU    *
001FB2      C800 0800               2616            LHI    R0,X'800'         GET WCS LOW ADDRESS
001FB6      4000 2856               2617            STH    R0,PASS           SAVE
001FBA      24D0                    2618   TT16.NEW LIS    R13,0             ZERO REGISTERS 13-15
001FBC      24E0                    2619            LIS    R14,0
001FBE      24F0                    2620            LIS    R15,0
001FC0      D0D0 2034               2621            STM    R13,ERRIND        ZERO TABLE
001FC4      F810 0E00 0002          2622            LI     R1,Y'0E000002'    INITIALIZE MICROCODE SUBROUTINE
001FCA      4820 2856               2623            LH     R2,PASS
001FCE      2623                    2624            AIS    R2,3
001FD0      1124                    2625            SLLS   R2,4
001FD2      0612                    2626            OR     R1,R2             FORM NEW BRANCH ADDRESS
001FD4      5010 2024               2627            ST     R1,BRAWCS         STORE IN TABLE
001FD8      E670 2024               2628            LA     DAT,BRAWCS
001FDC      2413                    2629            LIS    1,3               4 FULL WORDS
001FDE      4800 2856               2630            LH     0,PASS            GET ADDRESS
001FE2      E807                    2631            WDCS   DAT
001FE4      0850                    2632            LR     R5,R0
001FE6      E5D5 0000               2633            BDCS   13,0(R5)          BRANCH TO CONTROL STORE  (YD =R13)
001FEA      D0D0 2034               2634            STM    R13,ERRIND        SAVE R13,R14,R1#5
001FEE      08DD                    2635            LR     R13,R13           IS R13 =0
001FF0      4230 1FFC               2636            BNZ    TT6ERR            NO, ERROR
001FF4      C5E0 0001               2637            CLHI   R14,1             IS R14 = 1
001FF8      4330 200C               2638            BE     TT6BRN1           YES, BRANCH
                                    2639   *
001FFC      C870 3041               2640   TT6ERR   LHI    DAT,C'0A'         ERROR 050A *****
002000      4070 172E               2641            STH    DAT,ERRNO
002004      C870 000A               2642            LHI    DAT,X'0A'
002008      41F0 26F6               2643            BAL    LINK,TALLI        PRINT OR TALLY ERROR
```

EXEC - ETPE R04P0 TEST MODULES

```
                                     2644  *
00200C        4870 2856             2645  TT6BRN1  LH    DAT,PASS
002010        2674                  2646           AIS   DAT,4            INCREMENT WCS ADDRESS
002012        4070 2856             2647           STH   DAT,PASS
002016        2674                  2648           AIS   DAT,4
002018        4570 1822             2649           CLH   DAT,DCSHI        EXECUTED VIA ALL WCS
00201C        4380 0EC4             2650           BNL   TSTEND           YES, EXIT
002020        4300 1FBA             2651           B     TT16.NEW         LOOP BACK
                                     2652  *
002024        0E00 8032             2653  BRAWCS   DCY   0E008032         B *+3,YDP1
002028        0068 800F             2654           DCY   0068800F         LI YD,F
00202C        006C 0172             2655           DCY   006C0172         L NULL,NULL,YDP1
002030        D068 8001             2656           DCY   D0688001         LI YD,1,IR
                                     2657  *
002034                              2658  ERRIND   DS    12               REGISTER SAVE AREA
                                     2659  *
                                     2660  * GLOBAL MICROCODE
                                     2661  *
002040                              2662           ALIGN 4
002040                              2663  GLOBAL   DO    15
002040        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002044        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002048        0009 D001             2664           DCY   0009D001         AI YS,YS,1
00204C        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002050        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002054        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002058        0009 D001             2664           DCY   0009D001         AI YS,YS,1
00205C        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002060        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002064        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002068        0009 D001             2664           DCY   0009D001         AI YS,YS,1
00206C        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002070        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002074        0009 D001             2664           DCY   0009D001         AI YS,YS,1
002078        0009 D001             2664           DCY   0009D001         AI YS,YS,1
00207C        D06C 0170             2665           DCY   D06C0170         L NULL,NULL,IR
                                     2666  *
                                     2667  * ECS VECTOR POINTS, INITIAL VALUES
                                     2668  *
002080        0E02 8100             2669  ECSVCT   DCY   0E028100         LINK,810
002084        0E02 8110             2670           DCY   0E028110         LINK,811
002088        0E02 8120             2671           DCY   0E028120         LINK,812
00208C        0E02 8130             2672           DCY   0E028130         LINK,813
002090        0E02 8140             2673           DCY   0E028140         LINK,814
002094        0E02 8150             2674           DCY   0E028150         LINK,815
002098        0E02 8160             2675           DCY   0E028160         LINK,816
00209C        0E02 8170             2676           DCY   0E028170         LINK,817
0020A0        0E02 8180             2677           DCY   0E028180         LINK,818
0020A4        0E02 8190             2678           DCY   0E028190         LINK,819
0020A8        0E02 81A0             2679           DCY   0E0281A0         LINK,81A
0020AC        0E02 81B0             2680           DCY   0E0281B0         LINK,81B
0020B0        0E02 81C0             2681           DCY   0E0281C0         LINK,81C
0020B4        0E02 81D0             2682           DCY   0E0281D0         LINK,81D
```

EXEC - ETPE RO4PO   TEST MODULES

```
0020B8      0E02 81E0              2683           DCY    0E0281E0            LINK,81E
0020BC      0E02 81F0              2684           DCY    0E0281F0            LINK,81F
                                   2685   * * * * * * * * * * * * * * * * * * * * * * * *
                                   2686   *                                           *
                                   2687   *          T E S T   M O D U L E   0 7      *
                                   2688   *                                           *
                                   2689   *   A RANDOM WCS ADDRESS IS SELECTED AND A  *
                                   2690   *   RANDOM NUMBER IS WRITTEN INTO IT, READ  *
                                   2691   *   BACK AND TESTED.                        *
                                   2692   *                                           *
                                   2693   * * * * * * * * * * * * * * * * * * * * * * * *
                                   2694   *
            0000 20C0              2695   TEST7    EQU    *
                                   2696   *
0020C0      C870 1234              2697   TEST07   LHI    DAT,X'1234'         INITIALIZE
0020C4      4070 213C              2698            STH    DAT,RN1             RANDOM
0020C8      C870 5678              2699            LHI    DAT,X'5678'         NUMBER
0020CC      4070 2140              2700            STH    DAT,RN7             GENERATOR
                                   2701   *
                                   2702   *
0020D0      41F0 20FC              2703   TST07A   BAL    LINK,RANDOM
0020D4      48D0 213C              2704            LH     ADRS,RN1
0020D8      58E0 2140              2705            L      TST,RN7
0020DC      45D0 1816              2706            CLH    ADRS,DCSLO          GOOD WCS ADDRESS?
0020E0      2088       =0020D0     2707            BLS    TST07A              NO
0020E2      45D0 1822              2708            CLH    ADRS,DCSHI
0020E6      228B       =0020DC     2709            BNLS   TST07A              NO
                                   2710   *
                                   2711   * RANDOM ADDRESS IS WITHIN AVAILABLE WCS
                                   2712   *
0020E8      50D0 2844              2713            ST     ADRS,CONST
0020EC      41F0 2590              2714            BAL    LINK,WANDR          WRITE & READ PATTERN
0020F0      41F0 267C              2715            BAL    LINK,CHKDAT         TEST IT
                                   2716   *
0020F4      41F0 1358              2717            BAL    LINK,TSTBRK
0020F8      4300 20D0              2718            B      TST07A              LOOP BACK
                                   2719   *
                                   2720   * * * * * * * * * * * * * * * * * * * * * * * *
                                   2721   *                                           *
                                   2722   *   SUBROUTINE GENERATES TWO RANDOM NUMBERS *
                                   2723   *   IN LOCATIONS RN1 AND RN7. CALLING SEQUENCE *
                                   2724   *   IS: BAL  LINK,RANDOM                    *
                                   2725   *                                           *
                                   2726   * * * * * * * * * * * * * * * * * * * * * * * *
                                   2727   *
0020FC      D0A0 2120              2728   RANDOM   STM    10,RNSAVE           SAVE REGISTERS
002100      D1A0 2138              2729            LM     10,RN6              LOAD VALUES
002104      08AC                   2730            LR     10,12               SAVE INITIAL VALUES
002106      08BD                   2731            LR     11,13               OF R1&R7 IN R1&R8
002108      0ACF                   2732            AR     12,15
00210A      2382       =000002     2733            BFFS   8,2                 NO CARRY TO ADD IN
00210C      26D1                   2734            AIS    13,1                CARRY
00210E      0ADE                   2735            AR     13,14               R7,R1 + R10,R11
```

```
002110      08EA                  2736            LR     14,10
002112      08FB                  2737            LR     15,11
002114      D0A0 2138             2738            STM    10,RN6              SAVE VALUES
002118      D1A0 2120             2739            LM     10,RNSAVE           RESTORE REGISTERS
00211C      030F                  2740            BR     LINK                RETURN
                                  2741    *
002120                            2742            ALIGN  4
002120                            2743    RNSAVE   DS     24
002138      0000 0000             2744    RN6      DAC    0
00213C      0000 1234             2745    RN1      DAC    X'1234'
002140      0000 5678             2746    RN7      DAC    X'5678'
002144      0000 8888             2747    RN10     DAC    X'8888'
002148      0000 1111             2748    RN11     DAC    X'1111'
00214C                            2749             DS     6                  BUFFER ZONE
                                  2750    * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  2751    *                                               *
                                  2752    *       T E S T   M O D U L E   08             *
                                  2753    *                                               *
                                  2754    *   TEST CONTINUOUSLY WRITES A SPECIFIED        *
                                  2755    * FULLWORD TO WCS LOCATIONS BETWEEN A           *
                                  2756    *   SPECIFIED LOW & HIGH LIMIT                  *
                                  2757    *                                               *
                                  2758    * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  2759    *
            0000 2152             2760    TEST8    EQU    *
                                  2761    *
002152      4820 1816             2762            LH     2,DCSLO             GET LOW WCS ADDRESS
002156      4830 1822             2763            LH     3,DCSHI             GET HIGH WCS ADDRESS
                                  2764    *
                                  2765    *
00215A      0802                  2766    TST08H   LR     0,2                START ADRS
00215C      0883                  2767            LR     TAB,3              FINAL ADRS
00215E      2681                  2768            AIS    TAB,1              PLUS 1
002160      0B80                  2769            SR     TAB,0              MINUS START
                                  2770    *
002162      E6C0 2848             2771            LA     POINT,CONST1
002166      2451                  2772    TST08L   LIS    ONE,1
002168      0711                  2773            XR     1,1                ONE FULLWORD TO TRANSFER
00216A      E80C                  2774            WDCS   POINT              WRITE PATTERN
                                  2775    *
00216C      41F0 1358             2776            BAL    LINK,TSTBRK
                                  2777    *
002170      0A05                  2778            AR     0,ONE              INCREMENT
002172      0B85                  2779            SR     TAB,ONE            DECREMENT COUNT
002174      2037      =002166     2780            BNZS   TST08L             LOOP
002176      4300 215A             2781            B      TST08H             REPEAT LOOP
                                  2782    *
                                  2783    * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  2784    *
                                  2785    *       T E S T    M O D U L E    09            *
                                  2786    *
                                  2787    *    DATA PATTERN Y'00000001' IS WRITTEN INTO A  *
                                  2788    *    MICROREGISTER. ALL THE OTHER MICROREGISTERS *
```

EXEC - ETPE R04P0 TEST MODULES

```
                                  2789  *      ARE ZEROED. DATA IS READ BACK FROM ALL       *
                                  2790  *      MICROREGISTERS (BOTH FROM A & B STACKS)      *
                                  2791  *      AND CHECKED. TEST  IS REPEATED AGAIN WITH    *
                                  2792  *      THE SAME DATA FOR ALL MICROREGISTERS         *
                                  2793  *      TEST IS ALSO EXECUTED AS ABOVE WITH DATA     *
                                  2794  *      PATTERNS OF Y'00000003', Y'00000007'         *
                                  2795  *      ....Y'FFFFFFFF' (MARCHING ONES)  & WITH      *
                                  2796  *      DATA PATTERNS OF '7FFFFFFF',Y'3FFFFFF'....   *
                                  2797  *      Y'00000000' (MARCHING ZEROES THRU 1'S).      *
                                  2798  *      THE TEST ALSO USES THE WORST CASE PATTERNS   *
                                  2799  *      OF A'S  &  5'S TO CHECK THE MICRO-REGISTERS  *
                                  2800  *      MICRO REGISTERS: MR0-MR3                     *
                                  2801  *
                                  2802  * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  2803  *
                 0000 217A        2804  TEST9   EQU   *
00217A           C800 0800        2805          LHI   R0,X'800'
00217E           C810 02AF        2806          LHI   R1,MICTBL2-MICTBL-1
002182           C820 2200        2807          LHI   R2,MICTBL
002186           E802             2808          WDCS  R2
002188           2450             2809          LIS   R5,0              ZERO ERROR NUMBER
00218A           2431             2810          LIS   R3,1              (R3)= DATA PATTERN
00218C           E530 0800        2811          BDCS  R3,X'800'         BRANCH TO CONTROL STROE
002190           0855             2812          LR    R5,R5             ANY ERRORS?
002192           4230 21BA        2813          BNZ   TST9.ERR          YES, BRANCH
                                  2814  *
                                  2815  *
002196           C800 0800        2816          LHI   R0,X'800'
00219A           C810 00DF        2817          LHI   R1,MICTBL2E-MICTBL2
00219E           C820 24B0        2818          LHI   R2,MICTBL2
0021A2           E802             2819          WDCS  R2
0021A4           F830 AAAA AAAA   2820          LI    R3,Y'AAAAAAAA'    DATA PATTERNS
0021AA           F860 5555 5555   2821          LI    R6,Y'55555555'    USED IN TEST
0021B0           E530 0800        2822          BDCS  R3,X'800'
0021B4           0855             2823          LR    R5,R5             ANY ERRORS
0021B6           4330 0EC4        2824          BZ    TSTEND            NO,EXIT
                                  2825  *
                                  2826  *
0021BA           0815             2827  TST9.ERR LR   R1,R5             GET ERROR NUMBER
0021BC           2402             2828          LIS   R0,2              CONVERT TO ASCII AND STORE 2 ERRNO
0021BE           E620 172E        2829          LDAI  R2,ERRNO
0021C2           41F0 11A4        2830          BAL   LINK,HEXASC       CONVERT TO ASCII
0021C6           2408             2831          LIS   R0,8
0021C8           0813             2832          LR    R1,R3             DATA PATTERN USED
0021CA           E620 299C        2833          LDAI  R2,MSG9+2
0021CE           41F0 11A4        2834          BAL   LINK,HEXASC
0021D2           0814             2835          LR    R1,R4
0021D4           E620 29AA        2836          LDAI  R2,MSG9+16        ERROR BIT IN MICRO REGISTER
0021D8           41F0 11A4        2837          BAL   LINK,HEXASC
0021DC           0875             2838          LR    DAT,R5
0021DE           41F0 26F6        2839          BAL   LINK,TALLI
0021E2           4810 180A        2840          LH    R1,TALLY+6        IS TALLY OPTION SET?
0021E6           4230 0EC4        2841          BNZ   TSTEND            YES, EXIT
```

EXEC - ETPE R04P0 TEST MODULES

```
0021EA    C850 297E    2842         LHI    R5,MSG8        PRINT TEST PATTERN USED AND
0021EE    41F0 11CC    2843         BAL    LINK,PRINT     ERROR BITS IN REGISTER
0021F2    C850 299A    2844         LHI    R5,MSG9
0021F6    41F0 11CC    2845         BAL    LINK,PRINT
0021FA    4300 0EC4    2846         B      TSTEND
                       2847  *
                       2848  *
002200                 2849         ALIGN 4
                       2850  *
                       2851  * MICROCODE TO TEST THE MICROREGISTERS USING DATA PATTERNS OF
                       2852  * MARCHING ONE'S AND ZEROE'S.
                       2853  *
          0000 2200    2854  MICTBL  EQU    *
002200    0061 0170    2855         DCY    00610170        L     MR1,NULL
002204    0062 0170    2856         DCY    00620170        L     MR2,NULL
002208    0063 0170    2857         DCY    00630170        L     MR3,NULL
00220C    0065 0082    2858         DCY    00650082        L MDR,YD,YDP1
002210    0068 0050    2859         DCY    00680050        L  YD,MDR
002214    0060 0050    2860         DCY    00600050        TST9.M00  L  MR0,MDR
002218    0048 0080    2861         DCY    00480080        X     YD,MR0,YD
00221C    0E78 80A0    2862         DCY    0E7860A0        BF    C+V+G+L,TST9.M01
002220    006C 0002    2863         DCY    006C0002        L     NULL,MR0,YDP1
002224    D068 8014    2864         DCY    D0688014        LI    YD,'14',IR
002228    0068 0050    2865         DCY    00680050        TST9.M01  L YD,MDR
00222C    0048 4000    2866         DCY    00484000        X     YD,YD,MR0
002230    0E78 80F0    2867         DCY    0E7880F0        BF    C+V+G+L,TST9.M05
002234    006C 0002    2868         DCY    006C0002        L     NULL,MR0,YDP1
002238    D068 8015    2869         DCY    D0688015        LI    YD,'15',IR
00223C    0068 0170    2870         DCY    00680170        TST9.M05 L    YD,NULL
002240    0048 1080    2871         DCY    00481080        X     YD,MR1,YD
002244    0E78 8140    2872         DCY    0E788140        BF    C+V+G+L,TST9.M10
002248    006C 0012    2873         DCY    006C0012        L     NULL,MR1,YDP1
00224C    D068 8016    2874         DCY    D0688016        LI    YD,'16',IR
002250    0048 4010    2875         DCY    00484010        TST9.M10 X    YD,YD,MR1
002254    0E78 8180    2876         DCY    0E788180        BF    C+V+G+L,TST9.M15
002258    006C 0012    2877         DCY    006C0012        L     NULL,MR1,YDP1
00225C    D068 8017    2878         DCY    D0688017        LI    YD,'17',IR
002260    0048 2080    2879         DCY    00482080        TST9.M15 X    YDMR2,YD
002264    0E78 81C0    2880         DCY    0E7881C0        BF    C+V+G+L,TST9.M20
002268    006C 0022    2881         DCY    006C0022        L     NULL,MR2,YDP1
00226C    D068 8018    2882         DCY    D0688018        LI    YD'18',IR
002270    0048 4020    2883         DCY    00484020        TST9.M20 X    YD,YD,MR2
002274    0E78 8200    2884         DCY    0E788200        BF    C+V+G+L,TST9.M25
002278    006C 0022    2885         DCY    006C0022        L     NULL,MR2,YDP1
00227C    D068 8019    2886         DCY    D0688019        LI    YD,'19',IR
002280    0048 3080    2887         DCY    00483080        TST9.M25 X    YD,MR3,YD
002284    0E78 8240    2888         DCY    0E788240        BF    C+V+G+L,TST9.M30
002288    006C 0032    2889         DCY    006C0032        L     NULL,MR3,YDP1
00228C    D068 801A    2890         DCY    D068801A        LI    YD,'1A',IR
002290    0048 4030    2891         DCY    00484030        TST9.M30 X    YD,YD,MR3
002294    0E78 8280    2892         DCY    0E788280        BF    C+V+G+L,TST9.M35
002298    006C 0032    2893         DCY    006C0032        L     NULL,MR3,YDP1
00229C    D068 801B    2894         DCY    D068801B        LI    YD,'1B',IR
```

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0022A0	0060 0170	2895	DCY	00600170	TST9.M35 L MR0,NULL
0022A4	0061 0050	2896	DCY	00610050	L MR1,MDR
0022A8	0068 0050	2897	DCY	00680050	L YD,MDR
0022AC	0048 1080	2898	DCY	00481080	X YD,MR1,YD
0022B0	0E78 82F0	2899	DCY	0E7882F0	BF C+V+G+L,TST9.M40
0022B4	006C 0012	2900	DCY	006C0012	L NULL,MR1,YDP1
0022B8	D068 801C	2901	DCY	D068801C	LI YD,H1C',IR
0022BC	0068 0050	2902	DCY	00680050	TST9.M40 L YD,MDR
0022C0	0048 4010	2903	DCY	00484010	X YD,YD,MR1
0022C4	0E78 8340	2904	DCY	0E788340	BF C+V+G+L,TST9.M45
0022C8	006C 0012	2905	DCY	006C0012	L NULL,MR1,YDP1
0022CC	D068 801D	2906	DCY	D068801D	LI YD,'1D',IP
0022D0	0048 0080	2907	DCY	00480080	TST9.M45 X YD,MR0,YD
0022D4	0E78 8380	2908	DCY	0E788380	BF C+V+G+L,TST9.M50
0022D8	006C 0002	2909	DCY	006C0002	L NULL,MR0,YDP1
0022DC	D068 801E	2910	DCY	D068801E	LI YD,'1E',IR
0022E0	0048 4000	2911	DCY	00484000	TST9.M50 X YD,YD,MR0
0022E4	0E78 83C0	2912	DCY	0E7883C0	BF C+V+G+L,TST9.M55
0022E8	006C 0002	2913	DCY	006C0002	L NULL,MR0,YDP1
0022EC	D068 801F	2914	DCY	D068801F	LI YD,'1F',IR
0022F0	0048 2080	2915	DCY	00482080	TST9.M55 X YD,MR2,YD
0022F4	0E78 8400	2916	DCY	0E788400	BF C+V+G+L,TST9.M60
0022F8	006C 0022	2917	DCY	006C0022	L NULL,MR2,YDP1
0022FC	D058 8020	2918	DCY	D0688020	LI YD,'20',IR
002300	0048 4020	2919	DCY	00484020	TST9.M60 X YD,YD,MR2
002304	0E78 8440	2920	DCY	0E788440	BF C+V+G+L,TST9.M65
002308	006C 0022	2921	DCY	006C0022	L NULL,MR2,YDP1
00230C	D068 8021	2922	DCY	D0688021	LI YD,'21',IR
002310	0048 3080	2923	DCY	00483080	TST9.M65 X YD,MR3,YD
002314	0E78 8480	2924	DCY	0E788480	BF C+V+G+L,TST9.M70
002318	006C 0032	2325	DCY	006C0032	L NULL,MR3,YDP1
00231C	D068 8022	2326	DCY	D0688022	LI YD,'22',IR
002320	0048 4030	2927	DCY	00484030	TST9.M70 X YD,YD,MR3
002324	0E78 84C0	2929	DCY	0E7884C0	BF C+V+G+L,TST9.M75
002328	006C 0032	2929	DCY	006C0032	L NULL,MR3,YDP1
00232C	D068 8023	2930	DCY	D0688023	LI YD,'23',IR
002330	0061 0170	2931	DCY	00610170	TST9.M75 L MR1,NULL
002334	0062 0050	2932	DCY	00620050	L MR2,MDR
002338	0068 0050	2933	DCY	00680050	L YD,MDR
00233C	0048 2080	2934	DCY	00482080	X YD,MR2,YD
002340	0E78 8530	2935	DCY	0E788530	BF C+V+G+L,TST9.M80
002344	006C 0022	2936	DCY	006C0022	L NULL,MR2,YDP1
002348	D068 8024	2937	DCY	D0688024	LI YD,'24',IR
00234C	0068 0050	2938	DCY	00680050	TST9.M80 L YD,MDR
002350	0048 4020	2939	DCY	00484020	X YD,YD,MR2
002354	0E78 8580	2940	DCY	0E788580	BF C+V+G+L,TST9.M85
002358	006C 0022	2941	DCY	006C0022	L NULL,MR2,YDP1
00235C	D068 8025	2942	DCY	D0688025	LI YD,'25',IR
002360	0048 0080	2943	DCY	00480080	TST9.M85 X YD,MR0,YD
002364	0E78 85C0	2944	DCY	0E7885C0	BF C+V+G+L,TST9.M90
002368	006C 0002	2945	DCY	006C0002	L NULL,MR0,YDP1
00236C	D068 8026	2946	DCY	D0688026	LI YD,'26',IR
002370	0048 4000	2947	DCY	00484000	TST9.M90 X YD,YD,MR0

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002374	0E78 8500	2948	DCY	0E788600	BF	C+V+G+L,TST9.M95
002378	006C 0002	2949	DCY	006C0002	L	NULL,MR0,YDP1
00237C	D068 8027	2950	DCY	D0688027	LI	YD,'27',IR
002380	0048 1080	2951	DCY	00481080	TST9.M95 X	YD,MR1,YD
002384	0E78 8640	2952	DCY	0E786640	BF	C+V+G+L,TST9.MA0
002388	006C 0012	2953	DCY	006C0012	L	NULL,MR1,YDP1
00238C	D068 8028	2954	DCY	D0688028	LI	YD,'28',IR
002390	0048 4010	2955	DCY	00484010	TST9.MA0 X	YD,YD,MR1
002394	0F78 8680	2956	DCY	0F788680	BF	C+V+G+L,TST9.MA5
002398	006C 0012	2957	DCY	006C0012	L	NULL,MR1,YDP1
00239C	D068 8029	2958	DCY	D0688029	LI	YD,'29',IR
0023A0	0048 3080	2959	DCY	00483080	TST9.MA5 X	YD,MR3,YD
0023A4	0E78 86C0	2960	DCY	0E7886C0	BF	C+V+G+L,TST9.MA8
0023A8	006C 0032	2961	DCY	006C0032	L	NULL,MR3,YDP1
0023AC	D068 802A	2962	DCY	D068802A	LI	YD,'2A',IR
0023B0	0048 4030	2963	DCY	00484030	TST9.MA8 X	YD,YD,MR3
0023B4	0E78 8700	2964	DCY	0E788700	BF	C+V+G+L,TST9.MAA
0023B8	006C 0032	2965	DCY	006C0032	L	NULL,MR3,YDP1
0023BC	D069 802B	2966	DCY	D068802B	LI	YD,'2B',IR
0023C0	0062 0170	2967	DCY	00620170	TST9.MAA L MR2,NULL	
0023C4	0063 0050	2968	DCY	00630050	L MR3,MDR	
0023C8	0058 0050	2969	DCY	00680050	L YD,MDR	
0023CC	0048 3080	2970	DCY	00483080	X	YDMR3,YD
0023D0	0E78 8770	2971	DCY	0E788770	BF	C+V+G+L,TST9.MAB
0023D4	006C 0032	2972	DCY	006C0032	L	NULL,MR3,YDP1
0023D8	D068 802C	2973	DCY	D068802C	LI	YD,'2C',IR
0023DC	0068 0050	2974	DCY	00680050	TST9.MAB L YD,MDR	
0023E0	0048 4030	2975	DCY	00484030	X	YD,YD,MR3
0023E4	0E78 87C0	2976	DCY	0E7887C0	BF	C+V+G+L,TST9.MEA
0023E8	006C 0032	2977	DCY	006C0032	L	NULL,MR3,YDP1
0023EC	D068 802D	2978	DCY	D068802D	LI	YD'2D',IR
0023F0	0048 0080	2979	DCY	00480080	TST9.MEA X	YD,MR0,YD
0023F4	0E78 8800	2980	DCY	0E788800	BF	C+V+G+L,TST9.MB0
0023F8	006C 0002	2981	DCY	006C0002	L	NULL,MR0,YDP1
0023FC	D068 802E	2982	DCY	D068802E	LI	YD,'2E',IR
002400	0048 4000	2983	DCY	00484000	TST9.MB0 X	YD,YD,MR0
002404	0E78 8840	2984	DCY	0E788840	BF	C+V+G+L,TST9.MB2
002408	006C 0002	2985	DCY	006C0002	L	NULL,MR0,YDP1
00240C	D068 802F	2986	DCY	D068802F	LI	YD,'2F',IR
002410	0048 1080	2987	DCY	00481080	TST9.MB2 X	YD,MR1,YD
002414	0E78 8880	2988	DCY	0E788880	BF	C+V+G+L,TST9.MB4
002418	006C 0012	2989	DCY	006C0012	L	NULL,M1,YDP1
00241C	D068 8030	2990	DCY	D0688030	LI	YD,'30',IR
002420	0048 4010	2991	DCY	00484010	TST9.MB4 X	YD,YD,MR1
002424	0E78 88C0	2992	DCY	0E7888C0	BF	C+V+G+L,TST9.MB6
002428	006C 0022	2993	DCY	006C0022	L	NULL,MR2,YDP1
00242C	D068 8031	2994	DCY	D0688031	LI	YD'31',IR
002430	0048 2080	2995	DCY	00482080	TST9.MB6 X	YD,MR2,YD
002434	0E78 8900	2996	DCY	0E788900	BF	C+V+G+L,TST9.MB8
002438	006C 0022	2997	DCY	006C0022	L	NULL,MR2,YDP1
00243C	D068 8032	2998	DCY	D0688032	LI	YD,'32',IR
002440	0048 4020	2999	DCY	00484020	TST9.MB8 X	YD,YD,MR2
002444	0E78 8940	3000	DCY	0E788940	BF	C+V+G+L,TST9.MBA

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```
002448      006C 0022        3001        DCY   006C0022        L     NULL,MR2,YDP1
00244C      D068 8033        3002        DCY   D0688033        LI    YD,'33',IR
002450      0063 0172        3003        DCY   00630172        TST9.MBA  L  MR3,NULL,YDP1
002454      0068 0083        3004        DCY   00680083        L  YD,YD,YDM1
002458      0C08 8A30        3005        DCY   0C088A30        BT L,TST9.MBB
00245C      0068 0050        3006        DCY   00680050        L  YD,MDR
002460      0065 0A80        3007        DCY   00650A80        SLL MDR,YD
002464      0C40 8A00        3008        DCY   0C408A00        BT C,TST9.MBD
002468      0068 0050        3009        DCY   00680050        L YD,MDR
00246C      0035 C001        3010        DCY   0035C001        OI  MDR,YD,'1'
002470      006C 0173        3011        DCY   006C0173        L   NULL,NULL,YDM1
002474      0068 0052        3012        DCY   00680052        L   YD,MDR,YDP1
002478      0058 0050        3013        DCY   00680050        L   YD,MDR
00247C      0E00 8050        3014        DCY   0E008050        B   TST9.M00
002480      006C 0172        3015        DCY   006C0172        TST9.MBD  L NULL,NULL,YDP1
002484      0018 4085        3016        DCY   00184085        SDEC YD,YD,YD
002488      006C 0173        3017        DCY   006C0173        L NULL,NULL,YDM1
00248C      0068 0050        3018        DCY   00680050        TST9.MBB  L  YD,MDR
002490      0065 0E80        3019        DCY   00650E80        SRL MDR,YD
002494      0E38 8AA0        3020        DCY   0E388AA0        BF V+G+L,TST9.MBC
002498      005C 0173        3021        DCY   006C0173        L NULL,NULL,YDM1
00249C      0068 0052        3022        DCY   00680052        L YD,MDR,YDP1
0024A0      0068 0050        3023        DCY   00680050        L YD,MDR
0024A4      0EC0 8050        3024        DCY   0E008050        B TST9.M00
0024A8      0068 0172        3025        DCY   00680172        TST9.MBC L YD,NULL,YDP1
0024AC      D068 0170        3026        DCY   D0680170        L  YD,NULL,IR
            3027  *
            3028  *  MICROCODE TO TEST THE MICOREGISTERS USING DATA PATTERNS OF
            3029  *  A'S AND 5'S.
            3030  *
            0000 24B0        3031  MICTBL2 EQU   *
0024B0      0065 0080        3032        DCY   00650080        L     MDR,YD
0024B4      0060 0082        3033        DCY   00600082        TST9.N00 L     MR0,YD,YDP1
0024B8      0068 0050        3034        DCY   00680050        L     YD,MDR
0024BC      0048 0080        3035        DCY   00480080        X     YD,MR0,YD
0024C0      0E78 8070        3036        DCY   0E788070        BF    C+G+V+L,TST9.N05
0024C4      006C 0002        3037        DCY   006C0002        L     NULL,MR0,YDP1
0024C8      D068 8014        3038        DCY   D0688014        LI    YD,'14',IR
0024CC      0068 0050        3039        DCY   00680050        TST9.N05 L     YD,MDR
0024D0      0048 4000        3040        DCY   00484000        X     YD,YD,MR0
0024D4      0E78 80C0        3041        DCY   0E7880C0        BF    C+G+V+L,TST9.N10
0024D8      006C 0002        3042        DCY   006C0002        L     NULL,MR0,YDP1
0024DC      D068 8015        3043        DCY   D0688015        LI    YD,'15',IR
0024E0      0061 0050        3044        DCY   00610050        TST9.N10 L     MR1,MDR
0024E4      0068 0050        3045        DCY   00680050        L     YD,MDR
0024E8      0048 1080        3046        DCY   00481080        X     YD,MR1,YD
0024EC      0E78 8120        3047        DCY   0E788120        BF    C+G+V+L,TST9.N15
0024F0      006C 0012        3048        DCY   006C0012        L     NULL,MR1,YDP1
0024F4      D068 801C        3049        DCY   D068801C        LI    YD,'1C',IR
0024F8      0068 0050        3050        DCY   00680050        TST9.N15 L     YD,MDR
0024FC      0048 4010        3051        DCY   00484010        X     YD,YD,MR1
002500      0E78 8170        3052        DCY   0E788170        BF    C+G+V+L,TST9.N20
002504      006C 0022        3053        DCY   006C0022        L     NULL,MR2,YDP1
```

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```
002508      D068 801D                    3054        DCY    D068801D        LI    YD,'1D',IR
00250C      0068 0050                    3055        DCY    00680050        TST9.N20 L      YD,MDR
002510      0062 0050                    3056        DCY    00620050        L     MR2,MDR
002514      0048 2080                    3057        DCY    00482080        X     YD,MR2,YD
002518      0E78 81D0                    3058        DCY    0E7881D0        BF    C+G+V+L,TST9.N25
00251C      006C 0022                    3059        DCY    006C0022        L     NULL,MR2,YDP1
002520      D068 8024                    3060        DCY    D0688024        LI    YD,'24',IR
002524      0068 0050                    3061        DCY    00680050        TST9.N25 L      YD,MDR
002528      0048 4020                    3062        DCY    00484020        X     YD,YD,MR2
00252C      0E78 8220                    3063        DCY    0E788220        BF    C+G+V+L,TST9.N30
002530      006C 0022                    3064        DCY    006C0022        L     NULL,MR2,YDP1
002534      D068 8025                    3065        DCY    D0688025        LI    YD,'25',IR
002538      0068 0050                    3066        DCY    00680050        TST9.N30 L      YD,MDR
00253C      0063 0050                    3067        DCY    00630050        L     MR3,MDR
002540      0048 3080                    3068        DCY    00483080        X     YD,MR3,YD
002544      0E78 8280                    3069        DCY    0E788280        BF    C+G+V+L,TST9.N35
002548      006C 0032                    3070        DCY    006C0032        L     NULL,MR3,YDP1
00254C      D068 802C                    3071        DCY    D068802C        LI    YD,'2C',IR
002550      0068 0050                    3072        DCY    00680050        TST9.N35 L      YD,MDR
002554      0048 4030                    3073        DCY    00484030        X     YD,YD,MR3
002558      0E78 82D0                    3074        DCY    0E7882D0        BF    C+G+V+L,TST9.N40
00255C      006C 0032                    3075        DCY    006C0032        L     NULL,MR3,YDP1
002560      D068 802D                    3076        DCY    D068802D        LI    YD,'2D',IR
002564      006C 0172                    3077        DCY    006C0172        TST9.N40 L NULL,NULL,YDP1
002568      006C 0172                    3078        DCY    006CC172        L NULL,NULL,YDP1
00256C      0045 4050                    3079        DCY    00454050        X MDR,YD,MDR
002570      0E78 8360                    3080        DCY    0E788360        BF C+V+G+L,TST9.N50
002574      0065 0083                    3081        DCY    00650083        L  MDR,YD,YDM1
002578      006C 0173                    3082        DCY    006C0173        L  NULL,NULL,YDM1
00257C      006C 0173                    3083        DCY    006C0173        L  NULL,NULL,YDM1
002580      0068 0050                    3084        DCY    00680050        L  YD,MDR
002584      0E00 8010                    3085        DCY    0E008010        B  TST9.N00
002588      006C 0173                    3086        DCY    006C0173        TST9.N50  L NULL,NULL,YDM1
00258C      D068 0170                    3087        DCY    D0680170        L YD,NULL,IR
            0000 258F                    3088    MICTBL2E EQU    *-1
```

EXEC -ETPE R04P0   TEST SUBROUTINES

```
                                  3090  *---------------------------------------------------------------
                                  3091  *
                                  3092  * T E S T    P R O G R A M    S U B R O U T I N E S
                                  3093  *
                                  3094  *---------------------------------------------------------------
                                  3095  *
                                  3096  * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  3097  *                                                       *
                                  3098  *   SUBROUTINE WRITES THE CONTENTS OF REGISTER          *
                                  3099  * TST INTO THE WCS LOCATION WHOSE ADDRESS IS            *
                                  3100  *   IN REGISTER ADRS, THEN READS THE LOCATION           *
                                  3101  *   BACK AND PLACES THE RETURNED DATA IN DAT            *
                                  3102  *                                                       *
                                  3103  * A SLOW WCS FIXED ROM BIT MAY CAUSE THE                *
                                  3104  * PROCESSOR TO BEHAVE UNPREDICTABLY WHILE               *
                                  3105  * EXECUTING THIS ROUTINE IN AN EXHAUSTIVE TEST.         *
                                  3106  *                                                       *
                                  3107  * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  3108  *
002590       080D                 3109  WANDR     LR    0,ADRS              ADDRESS
002592       0711                 3110            XR    1,1
002594       50E0 2824            3111            ST    TST,TSAVE           TEST DATA
002598       E670 2824            3112            LA    DAT,TSAVE
00259C       E807                 3113            WDCS  DAT                 WRITE IT
00259E       082D                 3114            LR    2,ADRS
0025A0       0733                 3115            XR    3,3
0025A2       E670 2828            3116            LA    DAT,DSAVE
0025A6       E827                 3117            RDCS  DAT                 READ IT BACK
0025A8       5870 2828            3118            L     DAT,DSAVE           DATA RETURNED.
0025AC       030F                 3119            BR    LINK
                                  3120  *
                                  3121  * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  3122  *                                                       *
                                  3123  * SUBROUTINE READS THE WCS LOCATION WHOSE               *
                                  3124  * ADDRESS IS IN REGISTER ADRS. THE DATA READ IS         *
                                  3125  * RETURNED IN REGISTER DAT. THEN THE LOCATION           *
                                  3126  * IS RE-WRITTEN WITH THE CONTENTS OF REG. TST.          *
                                  3127  *                                                       *
                                  3128  * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                                  3129  *
0025AE       082D                 3130  RANDW     LR    2,ADRS              ADDRESS
0025B0       0733                 3131            XR    3,3
0025B2       E670 2828            3132            LA    DAT,DSAVE
0025B6       E827                 3133            RDCS  DAT                 READ IT
0025B8       080D                 3134            LR    0,ADRS
0025BA       50E0 2824            3135            ST    TST,TSAVE
0025BE       E670 2824            3136            LA    DAT,TSAVE
0025C2       0711                 3137            XR    1,1
0025C4       E807                 3138            WDCS  DAT
0025C6       5870 2828            3139            L     DAT,DSAVE
0025CA       030F                 3140            BR    LINK
                                  3141  *
                                  3142  * SUBROUTINE CLEARS DCS IMAGE
```

EXEC -ETPE R04P0   TEST SUBROUTINES

```
                                     3143  *
0025CC      0777                     3144  CLRIMJ  XR    DAT,DAT
0025CE      0744                     3145  CLRILP  XR    ZERO,ZERO
0025D0      5074 2A9C                3146  CLRILP1 ST    DAT,IMAGE(ZERO)
0025D4      2644                     3147          AIS   ZERO,4
0025D6      C540 0040                3148          CLHI  ZERO,64        16 FULLWORDS
0025DA      2085        =0025D0      3149          BLS   CLRILP1
0025DC      0744                     3150          XR    ZERO,ZERO
0025DE      030F                     3151          BR    LINK
                                     3152  *
                                     3153  * SUBROUTINE PROPROGATES IMAGE THROUGH ALL WCS
                                     3154  *
0025E0      E6C0 2A9C                3155  COPY    LA    POINT,IMAGE
0025E4      4800 1816                3156          LH    0,DCSLO
0025E8      241F                     3157  COPYL   LIS   1,15           16 FULLWORDS
0025EA      E80C                     3158          WDCS  POINT          WRITE IMAGE
0025EC      CA00 0010                3159          AHI   0,16
0025F0      4500 1822                3160          CLH   0,DCSHI        DONE?
0025F4      2086        =0025E6      3161          BLS   COPYL          NO
0025F6      030F                     3162          BR    LINK
                                     3163  *
                                     3164  * * * * * * * * * * * * * * * * * * * * * * * * *
                                     3165  *                                               *
                                     3166  * SUBROUTINE WRITES THE 16 FULLWORD IMAGE TO    *
                                     3167  * THE WCS LOCATION WHOSE ADDRESS IS (DCSLO)     *
                                     3168  * PLUS (PASS).  CALLING SEQUENCE IS:            *
                                     3169  *   BAL  LINK,WRITD                             *
                                     3170  *                                               *
                                     3171  * * * * * * * * * * * * * * * * * * * * * * * * *
                                     3172  *
0025F8      4800 1816                3173  WRITD   LH    0,DCSLO        CALCULATE START ADRS
0025FC      4A00 2856                3174          AH    0,PASS
002600      241F                     3175          LIS   1,15           16 FULLWORDS
002602      E670 2A9C                3176          LA    DAT,IMAGE
002606      E807                     3177          WDCS  DAT            WRITE IT
002608      030F                     3178          BR    LINK
                                     3179  *
                                     3180  * * * * * * * * * * * * * * * * * * * * * * * * *
                                     3181  *                                               *
                                     3182  * SUBROUTINE COMPARES WCS OUTPUT AGAINST        *
                                     3183  *   THE WCS INPUT IMAGE.                         *
                                     3184  *                                               *
                                     3185  * * * * * * * * * * * * * * * * * * * * * * * * *
                                     3186  *
00260A      50F0 2840                3187  READD   ST    LINK,CRET
00260E      4820 2856                3188          LH    2,PASS         CALCULATE
002612      4A20 1816                3189          AH    2,DCSLO        DCS START ADDRESS
002616      243F                     3190          LIS   3,15           16 FULLWORDS
002618      E670 2A5C                3191          LA    DAT,BUFF
00261C      E827                     3192          RDCS  DAT            READ
00261E      0788                     3193          XR    TAB,TAB
002620      08D2                     3194          LR    ADRS,2
002622      58E8 2A9C                3195  COMPRL  L     TST,IMAGE(TAB) DATA WRITTEN
```

EXEC -ETPE R04P0   TEST SUBROUTINES

```
002626        5878 2A5C              3196            L     DAT,BUFF(TAB)       DATA READ
00262A        41F0 267C              3197            BAL   LINK,CHKDAT         COMPARE
00262E        26D1                   3198            AIS   ADRS,1
002630        2684                   3199            AIS   TAB,4               BUMP INDEX
002632        C580 0040              3200            CLHI  TAB,64
002636        208A      =002622      3201            BLS   COMPRL              LOOP
002638        58F0 2840              3202            L     LINK,CRET           RETURN
00263C        030F                   3203            BR    LINK
                                     3204  *
                                     3205  * SUBROUTINE COMPARES ALL WCS TO THE IMAGE
                                     3206  *
00263E        0744                   3207  READCS    XR    ZERO,ZERO
002640        4040 2856              3208            STH   ZERO,PASS
002644        50F0 2840              3209            ST    LINK,CRET
002648        48D0 1816              3210            LH    ADRS,DCSLO          START ADRS
00264C        082D                   3211  RDCSL     LR    2,ADRS
00264E        E670 2A5C              3212            LA    DAT,BUFF
002652        243F                   3213            LIS   3,15                16 FULLWORDS
002654        E827                   3214            RDCS  DAT                 READ
002656        0788                   3215            XR    TAB,TAB
002658        58E8 2A9C              3216  CMPRL     L     TST,IMAGE(TAB)      DATA EXPECTED
00265C        5878 2A5C              3217            L     DAT,BUFF(TAB)       DATA OBSERVED
002660        41F0 267C              3218            BAL   LINK,CHKDAT         COMPARE
002664        2684                   3219            AIS   TAB,4               BUMP INDEX
002666        26D1                   3220            AIS   ADRS,1              INCREMENT ADDRESS
002668        C580 0040              3221            CLHI  TAB,64
00266C        208A      =002658      3222            BLS   CMPRL               LOOP
00266E        45D0 1822              3223            CLH   ADRS,DCSHI
002672        4280 264C              3224            BL    RDCSL               LOOP
002676        58F0 2840              3225            L     LINK,CRET
00267A        030F                   3226            BR    LINK               RETURN
                                     3227  * * * * * * * * * * * * * * * * * * * * * * * * *
                                     3228  *   SUBROUTINE COMPARES REGISTERS TST AND DAT    *
                                     3229  *   IF DIFFERENT, REGISTERS ADRS, TST, AND DAT   *
                                     3230  *   ARE CONVERTED TO ASCII IN MSG3.              *
                                     3231  *   CALLING SEQUENCE IS:  BAL   LINK,CHKDAT      *
                                     3232  *                                               *
                                     3233  * * * * * * * * * * * * * * * * * * * * * * * * *
                                     3234  *
00267C        05E7                   3235  CHKDAT    CLR   TST,DAT             COMPARE
00267E        033F                   3236            BER   LINK               OK
002680        50F0 2830              3237            ST    LINK,LINKSAV        SAVE RETURN ADDRESS
                                     3238  *
002684        50D0 2820              3239            ST    ADRS,ASAVE         SAVE REGISTERS
002688        50E0 2824              3240            ST    TST,TSAVE
00268C        5070 2828              3241            ST    DAT,DSAVE
002690        50C0 282C              3242            ST    POINT,PSAVE
                                     3243  *
002694        2408                   3244            LIS   R0,8
002696        5810 2820              3245            L     R1,ASAVE           M
00269A        E620 291A              3246            LA    R2,MSG3            DESTINATION
00269E        41F0 11A4              3247            BAL   LINK,HEXASC        ADDRESS
0026A2        5810 2824              3248            L     R1,TSAVE           M
```

```
0026A6      E620 2923           3249          LA    R2,MSG3+9           DESTINATION
0026AA      41F0 11A4           3250          BAL   LINK,HEXASC         DATA EXPECTED
0026AE      5810 2828           3251          L     R1,DSAVE            M
0026B2      E620 292C           3252          LA    R2,MSG3+18          DESTINATION
0026B6      41F0 11A4           3253          BAL   LINK,HEXASC         DATA OBSERVED
                                3254    *
                                3255    *
0026BA      C870 3041           3256          LHI   DAT,C'0A'           COMPARE ERROR
0026BE      4070 172E           3257          STH   DAT,ERRNO
0026C2      247A                3258          LIS   DAT,X'0A'
0026C4                          3259          CNOP  4
0026C4      41F0 26F6           3260          BAL   LINK,TALLI          PRINT 'ERROR TT0A'
0026C8      4870 180A           3261          LH    DAT,TALLY+5         M
0026CC      4230 26E0           3262          BNZ   CHKEXT             NO ERROR MESSAGE
0026D0      C850 28FC           3263          LHI   R5,MSG2
0026D4      41F0 11CC           3264          BAL   LINK,PRINT          PRINT MESSAGE
0026D8      C850 291A           3265          LHI   R5,MSG3
0026DC      41F0 11CC           3266          BAL   LINK,PRINT
                                3267    *
0026E0      58F0 2830           3268  CHKEXT  L     LINK,LINKSAV
0026E4      58D0 2820           3269          L     ADRS,ASAVE          RESTORE REGISTERS
0026E8      58E0 2924           3270          L     TST,TSAVE
0026EC      5870 2828           3271          L     DAT,DSAVE
0026F0      58C0 282C           3272          L     POINT,PSAVE
0026F4      030F                3273          BR    LINK                RETURN
                                3274    *
                                3275    *
                                3276    *
                                3277    *
                                3278    * SUBROUTINE TALLYS ERRORS AND PRINT ERROR MESSAGES
                                3279    *
                                3280    *
0026F6      50F0 2834           3281  TALLI   ST    LINK,LINKSAV1       SAVE RETURN ADDRESS
0026FA      40F0 16E6           3282          STH   LINK,NOERR          SET NO ERROR FLAG
0026FE      D000 2AE8           3283          STM   R0,RSAVE
002702      48B0 180A           3284          LH    CHAR,TALLY+6        TALLY OPTION SET?
002706      4230 2712           3285          BNZ   TALLIO              YES, BRANCH
00270A      41F0 0FBE           3286          BAL   LINK,ERR            PRINT ERROR NUMBER
00270E      4300 274A           3287          B     TALLI2
002712      1171                3288  TALLIO  SLLS  DAT,1               SHIFT ERRNO NUMBER ONCE
002714      C8B0 29F2           3289          LHI   CHAR,ERROR00        GET ADDRESS OF ERROR TABLE
002718      0AB7                3290          AR    CHAR,DAT            BUILD ADDRESS
00271A      C570 0014           3291          CLHI  DAT,X'14'           ERROR 0A?
00271E      2135       =002728  3292          BNES  TALLI1              NO, BRANCH
002720      4870 16F2           3293          LH    DAT,BTESTNO         YES, GET TEST NUMBER
002724      1171                3294          SLLS  DAT,1               DOUBLE
002726      0AE7                3295          AR    CHAR,DAT            FORM TALLY ADDRESS
002728      2451                3296  TALLI1  LIS   ONE,1
00272A      615B 0000           3297          AHM   ONE,0(CHAR)         INCRMENT TALLY
00272E      4810 16F0           3298          LH    R1,TOTERR
002732      2611                3299          AIS   R1,1                INCRMENT TOTAL ERROR
002734      4010 16F0           3300          STH   R1,TOTERR
002738      F510 0000 8000      3301          CLI   R1,X'8000'          ERROR EXCEEDS '7FFF' ?
```

EXEC -ETPE R04P0   TEST SUBROUTINES

```
00273E    4280 274A        3302            BL    TALLI2           NO, BRANCH
002742    41F0 2754        3303            BAL   LINK,ERRLISTC    PRINT ERROR TABLE
002746    4300 0F74        3304            B     KEEP92           PRINT TOTAL & TOTERR
00274A    D100 2AE8        3305    TALLI2  LM    R0,RSAVE
00274E    58F0 2834        3306            L     LINK,LINKSAV1
002752    030F             3307            BR    LINK
                           3308    *
                           3309    *
                           3310    * ROUTINE PRINTS ERRORS TALLIED WHEN BREAK KEY IS DEPRESSED,
                           3311    * CLEARS THE ERROR TABLE AND RETURNS TO THE COMMAND MODE.
                           3312    *
                           3313    *
002754    2480             3314    ERRLISTC LIS  TAB,0
002756    50F0 2834        3315            ST    LINK,LINKSAV1
00275A    2304    =0C2762  3316            BS    ERRLISTA
00275C    2480             3317    ERRLIST LIS   TAB,0
00275E    5080 2834        3318            ST    TAB,LINKSAV1     ZERO LINK ADDRESS
002762    4080 16DE        3319    ERRLISTA STH  TAB,BRKVECT      CLEAR BREAK VECTOR
002766    48B8 29F2        3320    ERRLIST1 LH   CHAR,ERROR00(TAB)
00276A    213C    =002782  3321            BNZS  ERRLIST2
00276C    2682             3322    ERRLIST0 AIS  TAB,2
00276E    C580 0067        3323            CLHI  TAB,ERREND-ERROR00
002772    2086    =002766  3324            BLS   ERRLIST1
002774    4110 280A        3325            BAL   RET2,CLRTBL      CLEAR ERROR TABLE
002778    58F0 2834        3326            L     LINK,LINKSAV1
00277C    4330 0E3A        3327            BZ    OPTIN2           GO, PRINT BREAK TERMINATION
002780    030F             3328            BR    LINK             RETURN TO CALL
002782    0878             3329    ERRLIST2 LR   DAT,TAB
002784    1071             3330            SRLS  DAT,1
002786    C570 000A        3331            CLHI  DAT,X'0A'
00278A    4280 27B0        3332            BL    ERRLIST5
00278E    277A             3333    ERRLIST3 SIS  DAT,X'0A'
002790    C570 000A        3334            CLHI  DAT,X'0A'        IS IT ERROR 14 OR GREATER?
002794    4380 27C8        3335            BNL   ERRLIST9
002798    C570 0008        3336            CLHI  DAT,8            IS IT ERROR 12 OR 13
00279C    4380 27BA        3337            BNL   ERRLIST7         NO,BRANCH
0027A0    C670 3030        3338    ERRLIST4 CHI  DAT,X'3030'
0027A4    4070 172C        3339            STH   DAT,ETESTNO
0027A8    C870 000A        3340            LHI   DAT,X'0A'
0027AC    4300 27D4        3341            B     ERRLIST6
0027B0    C830 2A2A        3342    ERRLIST5 LHI  R3,C'**'
0027B4    4030 172C        3343            STH   R3,ETESTNO
0027B8    230E    =0027D4  3344            BS    ERRLIST6
0027BA    2436             3345    ERRLIST7 LIS  R3,6             TEST 06
0027BC    C630 3030        3346            OHI   R3,X'3030'
0027C0    4030 172C        3347            STH   R3,ETESTNO       STORE TEST NUMBER
0027C4    267A             3348            AIS   DAT,X'0A'
0027C6    2307    =0027D4  3349            BS    ERRLIST6
0027C8    2439             3350    ERRLIST9 LIS  R3,9             TEST 09
0027CA    C630 3030        3351            OHI   R3,X'3030'
0027CE    4030 172C        3352            STH   R3,ETESTNO
0027D2    267A             3353            AIS   DAT,X'0A'
0027D4    2402             3354    ERRLIST6 LIS  R0,2
```

EXEC -ETPE R04P0   TEST SUBROUTINES

```
0027D6        0817          3355              LR      P1,DAT
0027D8        C820 172E     3356              LHI     R2,ERRNO
0027DC        41F0 11A4     3357              BAL     LINK,HEXASC        CONVERT ERROR NUMBER TO ASCII
0027E0        41F0 1258     3358              BAL     LINK,CRLF
0027E4        40F0 16E4     3359              STH     LINK,ISITERR       FORCE PRINT
0027E8        41E0 107C     3360              BAL     RET,ERR1           PRINT ERROR TTNN
0027EC        2404          3361              LIS     R0,4
0027EE        081B          3362              LR      R1,CHAR
0027F0        C820 2978     3363              LHI     R2,MSG7+14
0027F4        41F0 11A4     3364              BAL     LINK,HEXASC        CONVERT TO ASCII
0027F8        C850 296A     3365              LHI     R5,MSG7
0027FC        41F0 11CC     3366              BAL     LINK,PRINT         PRINT TOTAL NUMBER OF TIMES ERROR OCC
002800        24F0          3367              LIS     LINK,0
002802        40F0 16E4     3368              STH     LINK,ISITERR       ZERO FLAG
002806        4300 276C     3369              B       ERRLIST0
                            3370     *
                            3371     *
                            3372     * SUBROUTINE CLEAR ERROR TALLY TABLE
                            3373     *
                            3374     *
              0000 280A     3375     CLRTBL   EQU     *
00280A        E6C0 29F2     3376              LA      POINT,ERROR00      GET TABLE ADDRESS
00280E        0744          3377              XR      ZERO,ZERO
002810        404C 0000     3378     CLRTBL1  STH     ZERO,0(POINT)
002814        26C2          3379              AIS     POINT,2
002816        C5C0 2A59     3380              CLHI    POINT,ERREND
00281A        0221          3381              BPR     RET2
00281C        4300 2810     3382              B       CLRTBL1
```

EXEC-TEST CONSTANTS & TABLES

```
                                        3384  *----------------------------------------------------------------
                                        3385  *   TEST CONSTANTS & TABLES
002820                                  3386            ALIGN 4
002820          0000 0000               3387  ASAVE    DC    0
002824          0000 0000               3388  TSAVE    DC    0
002828          0000 0000               3389  DSAVE    DC    0
00282C          0000 0000               3390  PSAVE    DC    0
002830          0000 0000               3391  LINKSAV  DC    0
002834          0000 0000               3392  LINKSAV1 DC    0
002838          0000 0000               3393  FCODE    DCY   0
00283C          0000 0000               3394  VIRTADRS DCY   0
002840                                  3395  CRET     DS    4
002844                                  3396  CONST    DS    4
002848          A0A0                    3397  CONST1   DC    X'A0A0',X'A0A0'
00284A          A0A0
00284C          0000 0000               3398  ZEROS    DC    0
002850          FFFF FFFF               3399  ONES     DC    -1
                                        3400  *
002854          0800                    3401  DELTA    DCX   0800                  DIFFERENCE OF WCS HI & LOW
002856          0000                    3402  PASS     DCX   0
002858          0000                    3403  DPAGE    DCX   0
00285A          0000                    3404  IPAGE    DCX   0
00285C          0000                    3405  FLIP     DCX   0
                                        3406  *
002860          FFFF FFFE               3407  PATERN   DCY   FFFFFFFE,FFFFFFFD,FFFFFFFB,FFFFFFF7
002864          FFFF FFFD
002868          FFFF FFFB
00286C          FFFF FFF7
002870          FFFF FFEF               3408           DCY   FFFFFFEF,FFFFFFDF,FFFFFFBF,FFFFFF7F
002874          FFFF FFDF
002878          FFFF FFBF
00287C          FFFF FF7F
002880          FFFF FEFF               3409           DCY   FFFFFEFF,FFFFFDFF,FFFFFBFF,FFFFF7FF
002884          FFFF FDFF
002888          FFFF FBFF
00288C          FFFF F7FF
002890          FFFF EFFF               3410           DCY   FFFFEFFF,FFFFDFFF,FFFFBFFF,FFFF7FFF
002894          FFFF DFFF
002898          FFFF BFFF
00289C          FFFF 7FFF
0028A0          FFFE FFFF               3411           DCY   FFFEFFFF,FFFDFFFF,FFFBFFFF,FFF7FFFF
0028A4          FFFD FFFF
0028A8          FFFB FFFF
0028AC          FFF7 FFFF
0028B0          FFEF FFFF               3412           DCY   FFEFFFFF,FFDFFFFF,FFBFFFFF,FF7FFFFF
0028B4          FFDF FFFF
0028B8          FFBF FFFF
0028BC          FF7F FFFF
0028C0          FEFF FFFF               3413           DCY   FEFFFFFF,FDFFFFFF,FBFFFFFF,F7FFFFFF
0028C4          FDFF FFFF
0028C8          FBFF FFFF
0028CC          F7FF FFFF
0028D0          EFFF FFFF               3414           DCY   EFFFFFFF,DFFFFFFF,BFFFFFFF,7FFFFFFF
```

EXEC-TEST CONSTANTS & TABLES

```
0028D4      DFFF FFFF
0028D8      BFFF FFFF
0028DC      7FFF FFFF
0028E0      E810                           3415  INSTAB  DCX   E810,E830,E840,E850,E860,E870,E880
0028E2      E830
0028E4      E840
0028E6      F850
0028E8      E860
0028EA      E870
0028EC      E880
0028EE      E890                           3416          DCX   E890,E8A0,E8B0,E8C0,E8D0,E8E0,E8F0
0028F0      E8A0
0028F2      E8B0
0028F4      E8C0
0028F6      E8D0
0028F8      E8E0
0028FA      E8F0
                                           3417  *
0028FC      0000                           3418  MSG2    DC    X'0000',C'ADDRESS  EXPECTED OBSERVED',X'0D00'
0028FE      4144 4452 4553 5320
002906      2045 5850 4543 5445
00290E      4420 4F42 5345 5256
002916      4544
002918      0D00
00291A      2020 2020 2020 2020            3419  MSG3    DC    C'                                  '
002922      2020 2020 2020 2020
00292A      2020 2020 2020 2020
002932      2020
002934      0D0A                           3420          DC    X'0D0A'
002936      4E4F 2057 4353 2046            3421  MSG5    DC    C'NO WCS FOUND',X'0D00'
00293E      4F55 4E44
002942      0D00
002944      5743 5320 4445 5445            3422  MSG4    DC    C'WCS DETECTED',X'0D00'
00294C      4354 4544
002950      0D00
002952      5445 5354 2045 5845            3423  MSG6    DC    C'TEST EXECUTION STARTED',X'0D00'
00295A      4355 5449 4F4E 2053
002962      5441 5254 4544
002968      0D00
00296A      544F 5441 4C20 434F            3424  MSG7    DC    C'TOTAL COUNT =   ',X'0D00'
002972      554E 5420 3D20 2020
00297A      2020
00297C      0D00
00297E      5445 5354 2050 4154            3425  MSG8    DC    C'TEST PATTERN   ERROR BITS ',X'0D00'
002986      5445 524E 2020 2045
00298E      5252 4F52 2042 4954
002996      5320
002998      0D00
00299A      2020 2020 2020 2020            3426  MSG9    DC    C'            -            ',X'0D00'
0029A2      2020 2020 202D 2020
0029AA      2020 2020 2020 2020
0029B2      2020
0029B4      0D00
```

EXEC-TEST CONSTANTS & TABLES

```
0029B6    4641 554C 5420 434F    3427  MSG10     DC    C'FAULT CODE  VIRTUAL ADDRESS ',X'0D00'
0029BE    4445 2020 5649 5254
0029C6    5541 4C20 4144 4452
0029CE    4553 5320
0029D2    0D00
0029D4    2020 2020 2020 2020    3428  MSG11     DC    C'                              ',X'0D00'
0029DC    2020 2020 2020 2020
0029E4    2020 2020 2020 2020
0029EC    2020 2020
0029F0    0D00
                                 3429  *
0029F2    0000                   3430  ERROR00   DCX   0                ERROR **00
0029F4    0000                   3431  ERROR01   DCX   0                ERROR **01
0029F6    0000                   3432  ERROR02   DCX   0                ERROR **02
0029F8    0000                   3433  ERROR03   DCX   0                ERROR **03
0029FA    0000                   3434  ERROR04   DCX   0                ERROR **04
0029FC    0000                   3435  ERROR05   DCX   0                ERROR **05
0029FE    0000                   3436  ERROR06   DCX   0                ERROR **06
002A00    0000                   3437  ERROR07   DCX   0                ERROR **07
002A02    0000                   3438  ERROR08   DCX   0                ERROR **08
002A04    0000                   3439  ERROR09   DCX   0                ERROR **09
002A06    0000                   3440  ERR000A   DCX   0                ERROR 000A
002A08    0000                   3441  ERR010A   DCX   0                ERROR 010A
002A0A    0000                   3442  ERR020A   DCX   0                ERROR 020A
002A0C    0000                   3443  ERR030A   DCX   0                ERROR 030A
002A0E    0000                   3444  ERR040A   DCX   0                ERROR 040A
002A10    0000                   3445  ERR050A   DCX   0                ERROR 050A
002A12    0000                   3446  ERR060A   DCX   0                ERROR 060A
002A14    0000                   3447  ERR070A   DCX   0                ERROR 070A
002A16    0000                   3448  ERROR12   DCX   0                ERROR 0612
002A18    0000                   3449  ERROR13   DCX   0                ERROR 0613
002A1A    0000                   3450  ERROR14   DCX   0                ERROR 0914
002A1C    0000                   3451  ERROR15   DCX   0                ERROR 0915
002A1E    0000                   3452  ERROR16   DCX   0                ERROR 0916
002A20    0000                   3453  ERROR17   DCX   0                ERROR 0917
002A22    0000                   3454  ERROR18   DCX   0                ERROR 0918
002A24    0000                   3455  ERROR19   DCX   0                ERROR 0919
002A26    0000                   3456  ERROR1A   DCX   0                ERROR 091A
002A28    0000                   3457  ERROR1B   DCX   0                ERROR 091B
002A2A    0000                   3458  ERROR1C   DCX   0                ERROR 091C
002A2C    0000                   3459  ERROR1D   DCX   0                ERROR 091D
002A2E    0000                   3460  ERROR1E   DCX   0                ERROR 091E
002A30    0000                   3461  ERROR1F   DCX   0                ERROR 091F
002A32    0000                   3462  ERROR20   DCX   0                ERROR 0920
002A34    0000                   3463  ERROR21   DCX   0                ERROR 0921
002A36    0000                   3464  ERROR22   DCX   0                ERROR 0922
002A38    0000                   3465  ERROR23   DCX   0                ERROR 0923
002A3A    0000                   3466  ERROR24   DCX   0                ERROR 0924
002A3C    0000                   3467  ERROR25   DCX   0                ERROR 0925
002A3E    0000                   3468  ERROR26   DCX   0                ERROR 0926
002A40    0000                   3469  ERROR27   DCX   0                ERROR 0927
002A42    0000                   3470  ERROR28   DCX   0                ERROR 0928
002A44    0000                   3471  ERROR29   DCX   0                ERROR 0929
```

EXEC-TEST CONSTANTS & TABLES

```
002A46      0000                    3472  ERROR2A  DCX   0              ERROR 092A
002A48      0000                    3473  ERROR2B  DCX   0              ERROR 092B
002A4A      0000                    3474  ERROR2C  DCX   0              ERROR 092C
002A4C      0000                    3475  ERROR2D  DCX   0              ERROR 092D
002A4E      0000                    3476  ERROR2E  DCX   0              ERROR 092E
002A50      0000                    3477  ERROR2F  DCX   0              ERROR 092F
002A52      0000                    3478  ERROR30  DCX   0              ERROR 0930
002A54      0000                    3479  ERROR31  DCX   0              ERROR 0931
002A56      0000                    3480  ERROR32  DCX   0              ERROR 0932
002A58      0000                    3481  ERROR33  DCX   0              ERROR 0933
            0000 2A59               3482  ERREND   EQU   *-1
                                    3483  *
                                    3484  *-----------------------------------
                                    3485  *
            0000 2A59               3486  LNZB     EQU   *-1
                                    3487  *-----------------------------------
```

EXEC - ALL TEST PROGRAM STORAGE AREA

```
                              3489  *   EXEC & TEST PROGRAM (COMMON) STORAGE AREA
                              3490  *
                              3491  *
                              3492  **CHKSUM
                              3493  *   START OF CHKSUM FILE
                              3494  *
                              3495  *
                              3496  *
002A5C                        3497            ALIGN 4
002A5C                        3498  BUFF      DS    64
002A9C                        3499  IMAGE     DS    64
002ADC                        3500  OPTBUF    DS    6                OPTION INPUT BUFFER
002AE2                        3501  IOSAVE    DS    2
002AE4                        3502  TEMP      DS    2                TEMPORARY STORAGE LOC
002AE8                        3503            ALIGN 8
002AE8                        3504  RSAVE     DS    136              REGISTER SAVE & PSW SAVE AREA
002B70                        3505  INTSAV    DS    64               REGISTERS ON EXT/IMM INTERRUPT
002BB0                        3506  ERRSAVE   DS    64               REG STORAGE FOR ERROR ROUTINES
002BF0                        3507            DS    256              REG SETS 4-F, 8/32 WITH 8 SETS
002CF0                        3508            DS    64               DOUBLE PRECISION FP REG SAVE AREA
```

CHKSUM/M17 PUNCHER

```
002D30      2400              3510   SCHKSUM  LIS   R0,0              PUNCH M17 TAPE WITH CHECKSUM
002D32      9510              3511            EPSR  R1,R0             SELECT REG. SET 0
                             3512   *
002D34      E610 0A00         3513            LDAI  R1,ORIGIN1        START
002D38      2421              3514            LIS   R2,1              INCREMENT
002D3A      E630 2A59         3515            LDAI  R3,LNZB           FINAL
002D3E      2440              3516            LIS   R4,0              CHECKSUM BYTE
002D40      D351 0000         3517   SGEN     LB    R5,0(R1)
002D44      0745              3518            XAR   R4,R5
002D46      C110 2D40         3519            BXLE  R1,SGEN
002D4A      D240 0099         3520            STB   R4,MN+3           CHECKSUM BYTE TO BOOT LOADER
                             3521   *
002D4E      C810 0080         3522   STAPE    LHI   R1,X'0080'
002D52      9E21              3523            OCR   R2,R1             DISPLAY : NORMAL MODE
002D54      9444              3524            EXBR  R4,R4
002D56      9824              3525            WHR   R2,R4             CHECKSUM BYTE TO D1
002D58      9411              3526            EXBR  R1,R1
002D5A      9501              3527            EPSR  R0,R1             HALT PROCESSOR.
                             3528   *
                             3529   *------------------------------------------
                             3530   *
002D5C      D360 007A         3531   SPUNCH   LB    R6,X'7A'          GET BOUTDV (PUNCH) ADDRESS.
002D60      DE60 007B         3532            OC    R6,X'7B'          START TAPE PUNCH
002D64      9D60              3533            SSR   R6,R0
002D66      2081       =000001 3534          BTBS  8,1
002D68      41F0 2DAA         3535            BAL   R15,STAPL         PUNCH LEADER
002D6C      9411              3536            EXBR  R1,R1             (R1) = X'0080'
002D6E      C830 00CF         3537            LHI   R3,X'CF'
002D72      DA61 0000         3538   SPNCH1   WD    R6,0(R1)          PUNCH BOOT LOADER
002D76      9D60              3539            SSR   R6,R0
002D78      2081       =000001 3540          BTBS  8,1
002D7A      C110 2D72         3541            BXLE  R1,SPNCH1
002D7E      41F0 2DB0         3542            BAL   R15,STAPL1        PUNCH ONE-FOLD GAP.
                             3543   *
002D82      D340 0099         3544            LB    R4,MN+3           GET CHECKSUM BYTE
002D86      E610 0A00         3545            LDAI  R1,ORIGIN1        (NORMALLY X'A00')
002D8A      E630 2A59         3546            LDAI  R3,LNZB
002D8E      D351 0000         3547   SPNCH2   LB    R5,0(R1)          PUNCH PROGRAM
002D92      0745              3548            XAR   R4,R5
002D94      9A65              3549            WDR   R6,R5
002D96      9401              3550            EXBR  R0,R1
002D98      9820              3551            WHR   R2,R0             DATA ADDRESS TO DISPLAY.
002D9A      9D60              3552            SSR   R6,R0
002D9C      2081       =000001 3553          BTBS  8,1
002D9E      C110 2D8E         3554            BXLE  R1,SPNCH2
002DA2      41F0 2DAA         3555            BAL   R15,STAPL         PUNCH TRAILER.
002DA6      4300 2D4E         3555            B     STAPE             DISPLAY CHECKSUM, HALT PROCESSOR.
```

```
                                   3558  *    CHKSUM/M17 PUNCHER  (CONTINUED)
                                   3559  *
                                   3560  *
002DAA        C800 0100            3561  STAPL    LHI   R0,256           TO PUNCH BLANK LEADER
002DAE        2303       =002DB4   3562           BS    STAPLP
                                   3563  *
002DB0        C800 0080            3564  STAPL1   LHI   R0,128           TO PUNCH 1-FOLD GAP+
                                   3565  *
002DB4        2701                 3566  STAPLP   SIS   R0,1
002DB6        032F                 3567           BNPR  R15              RETURN
002DB8        2430                 3568           LIS   R3,0
002DBA        9A63                 3569           WDR   R6,R3            PUNCH BLANK FRAME
002DBC        9D68                 3570           SSR   R6,R8
002DBE        2081       =000001   3571           BTBS  8,1
002DC0        2206       =002DB4   3572           BS    STAPLP           CONTINUE.
                                   3573  *
002DC2                             3574           END
```

SYMBOL TABLE & CROSS REFERENCE LIST

ASSEMBLED BY CAL/32 03-338P00-00

START OPTIONS: T=32,ERLST

    NO CAL ERRORS
    NO CAL WARNINGS
    6 PASSES

TABLE SPACE USED :   15K   DISC SECTORS :   0

Symbol	Addr 1	Addr 2	Refs											
SCHKSUM	0000	2D30	3510*											
SCLOCK	0000	0001	89*	928	942	959	1491							
SDECASC	0000	0000	87*	1025										
SDECHEX	0000	0000	86*	516										
SDECTAB	0000	0000	85*	1710										
SDISPLAY	0000	0000	90*	684	714	752								
SGEN	0000	2D40	3517*	3519										
SKBINT	0000	0000	88*	1284	1357	1371	1687							
SNULL	0000	16F8	1703*											
SPNCH1	0000	2D72	3538*	3541										
SPNCH2	0000	2D8E	3547*	3554										
SPUNCH	0000	2D5C	3531*											
SR5BIN	0000	0000	84*	982										
STAPE	0000	2D4E	3522*	3556										
STAPL	0000	2DAA	3535	3555	3561*									
STAPL1	0000	2DB0	3542	3564*										
STAPLP	0000	2DB4	3562	3566*	3572									
STIMER1	0000	1166	933*	938	1493									
STIMXT	0000	117A	940*	1495										
STSTDU2	0000	1410	1260	1262*										
ABORT	0000	0EFC	681*											
ABORT2	0000	0F4A	694	710*										
ABSTOP	0000	2DC2												
ADC	0000	0004	146	224	239	1336	1436	1450	1458	1479	1530	1560	1582	1508
			2110											
ADR	0000	0D7E	509*											
ADRS	0000	000D	56*	2190	2191	2193	2206	2207	2210	2211	2213	2227	2228	2335
			2341	2342	2350	2351	2357	2358	2472	2482	2483	2490	2502	2504
			2510	2520	2522	2704	2706	2708	2713	3109	3114	3130	3134	3194
			3198	3210	3211	3220	3223	3239	3269					
AF	0000	1590	1328	1547*										
AMSG	0000	17A2	321	1738*										
ASAVE	0000	2620	3239	3245	3269	3387*								
ASCIDEV	0000	1750	862	1725*										
ASCIDEV2	0000	1760	842	1729*										
ASCILOC	0000	1774	876	889	1733*									
ASCIPSW	0000	176A	886	1731*										
ASCISTA	0000	1758	852	866	1727*									
BOOT	0000	0088	115	117*										
BRAWCS	0000	2024	2627	2628	2653*									
BRK.SAV	0000	1700	1203	1239	1241	1706*								
BRKFLG	0000	16E0	310	577	1098	1204	1235	1244	1691*					
BRKMSG	0000	17A4	312	1739*										

SYMBOL TABLE & CROSS REFERENCE LIST

BRKVECT	0000 16DE	1232	1690*	1839	3319							
BTESTNO	0000 16F2	619	637	654	675	721	1700*	3293				
BUFF	0000 2A5C	1919	2044	2051	3191	3196	3212	3217	3498*			
C300ADR	0000 0A1E	166*										
CAR2ND	0000 0A42	197*										
CARRD	0000 0A40	196*	1181									
CARRQ2S	0000 0A4C	206*										
CHAR	0000 000B	54*	2051	2052	3284	3289	3290	3295	3297	3320	3362	
CHKDAT	0000 267C	2204	2225	2339	2355	2476	2480	2493	2513	2715	3197	3218	3235*
CHKEXT	0000 26E0	3262	3268*									
CLIF2ND	0000 0A3A	193*										
CLIFADR	0000 0A16	162*										
CLIFRD	0000 0A38	192*										
CLRILP	0000 25CE	2346	2382	2391	2402	2469	2487	3145*				
CLRILP1	0000 25D0	3146*	3149									
CLRINJ	0000 25CC	2187	2332	2361	2507	3144*						
CLRTBL	0000 280A	1848	3325	3375*								
CLRTBL1	0000 2810	3378*	3382									
CMPRL	0000 2658	3216*	3222									
COMM	0000 15B6	1566*										
COMM1	0000 15BE	1568*										
COMPRL	0000 2622	3195*	3201									
COMRET	0000 1708	812	819	1708*								
CON	0000 1858	482	1768*									
CON2ND	0000 0A30	187*	188	273	1610							
CONCMD	0000 0A32	189*	260	270	272	1304	1626	1628				
CONENRD	0000 0A31	188*										
CONRADR	0000 0A2A	182*	267	1276	1611							
CONRD	0000 0A2E	185*	186	271	282	1180	1277	1612				
CONRQ2S	0000 0A48	202*	254	275	276	1282						
CONST	0000 2844	2023	2024	2043	2713	3396*						
CONST1	0000 2848	1772	1811	2771	3397*							
CONTIN	0000 1750	693	1752*									
CONWADR	0000 0A2C	183*	269	1183	1609							
CONWRT	0000 0A2F	186*										
COPY	0000 25E0	2188	2257	2268	2291	2313	2333	2383	2470	2488	2508	3155*
COPYL	0000 25E8	3157*	3161									
COUNT	0000 16F4	651	664	666	1701*							
CRET	0000 2840	3187	3202	3209	3225	3395*						
CRLF	0000 1258	289	316	404	446	472	579	600	735	1107*	1192	1803	3359
CRT2ND	0000 0A36	191*										
CRTRD	0000 0A34	190*										
CRTRQ2S	0000 0A49	203*										
DAT	0000 0007	49*	1838	1839	1840	1842	1844	1845	1846	1847	1856	1857	1865
		1869	1870	1871	1872	1873	1877	1878	1882	1889	1894	1895	1896
		1902	1903	1904	1912	1913	1925	1926	1927	1928	1929	1936	1939
		1939	1952	1953	1954	1962	1963	1966	1967	1974	1975	1976	1990
		1991	1992	1993	1995	2003	2004	2005	2006	2007	2018	2019	2022
		2023	2024	2027	2031	2032	2033	2034	2035	2039	2040	2041	2042
		2043	2047	2073	2074	2075	2082	2083	2084	2085	2132	2133	2134
		2143	2144	2145	2146	2147	2151	2152	2155	2163	2164	2165	2166
		2167	2196	2198	2203	2217	2220	2224	2249	2251	2253	2261	2262
		2264	2272	2273	2274	2275	2281	2284	2285	2286	2295	2296	2297

SYMBOL TABLE & CROSS REFERENCE LIST

```
                            2303    2306    2307    2308    2345    2381    2389    2390    2392    2396    2401    2405
                            2406    2408    2409    2410    2414    2415    2416    2417    2419    2423    2426    2432
                            2433    2434    2435    2440    2441    2442    2468    2486    2541    2542    2546    2548
                            2550    2552    2555    2557    2558    2559    2562    2567    2569    2570    2571    2574
                            2578    2594    2595    2596    2597    2598    2605    2607    2628    2631    2640    2641
                            2642    2645    2646    2647    2648    2649    2697    2698    2699    2700    2838    3112
                            3113    3116    3117    3118    3132    3133    3136    3138    3139    3144    3144    3146
                            3176    3177    3191    3192    3196    3212    3214    3217    3235    3241    3256    3257
                            3258    3261    3271    3288    3290    3291    3293    3294    3295    3329    3330    3331
                            3333    3334    3336    3338    3339    3340    3348    3353    3355
DCSHI     0000 1822        1759*   1784    1841    2147    2167    2207    2229    2280    2302    2342    2350    2483
                            2504    2522    2588    2649    2708    2763    3160    3223
DCSLO     0000 1816        1757*   1796    1840    2025    2132    2146    2151    2166    2190    2210    2288    2310
                            2335    2358    2385    2472    2490    2510    2604    2706    2762    3156    3173    3189
                            3210
DEFTESTS  0000 1B58         549     551    2103*
DELTA     0000 2854        1843    2410    2419    2435    3401*
DEVINT    0000 1B20        1475    2095*
DEVMSG    0000 174C         868    1724*   1725    1726    1727
DEVMSG2   0000 175C         844    1728*   1729
DEVSADR   0000 1B1C        1365    1469    2093*
DFF       0000 1692        1332    1648*
DFF1      0000 16B4        1654    1656    1658*
DPAGE     0000 2858        2387    2406    2432    2434    3403*
DSAVE     0000 2828        2196    2203    2217    2224    2552    2562    2574    3116    3118    3132    3139    3241
                            3251    3271    3389*
DUSAVE    0000 17C0         292     299     304     363     498    1071    1206    1258    1741*
DUSAVE1   0000 17C4         300     362    1742*
ECHO      0000 131A        1178*
ECHO1     0000 1336        1179    1186*
ECHRTN    0000 1338        1182    1187*
ECSVCT    0000 2080        2597    2606    2669*
EOTEM     0000 0F30         697     699*
EOTMSG    0000 1792         699    1736*
ERR       0000 0FBE         773*   1570    1637    3286
ERR00     0000 193C        1869    1871*
ERR000A   0000 2A06        3440*
ERR01     0000 196E        1877    1902*
ERR010A   0000 2A08        3441*
ERR020A   0000 2A0A        3442*
ERR03     0000 199E        1925    1927*
ERR030A   0000 2A0C        3443*
ERR04     0000 1AF2        1938    2073*
ERR040A   0000 2A0E        3444*
ERR050A   0000 2A10        3445*
ERR060A   0000 2A12        3446*
ERR07     0000 1A82        2031    2033*
ERR070A   0000 2A14        3447*
ERR08     0000 1B04        2039    2081*
ERR09.1   0000 19F0        1974*
ERR09.2   0000 1A30        2003*   2003
ERR1      0000 107C         775     784     789     794     800     805     833*   3360
ERRALL    0000 1030         803*   1510    1520
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
ERRCOM     0000 1048        774     783     788     793     799     804     812*
ERRCOM1    0000 1066        816     822*
ERRCOM2    0000 0FCA        776*    786     791     796     802     808
ERRD       0000 0FDC        782*
ERRD1      0000 1086        785     840*
ERRDEV     0000 16D0        841     861    1677*
ERRDS      0000 1004        792*
ERRDS1     0000 10B6        795     806     860*
ERREND     0000 2A59       3323    3380    3482*
ERRIND     0000 2034       2621    2634    2658*
ERRL       0000 1018        797*
ERRL1      0000 10DC        801     874*
ERRLIST    0000 275C       1838    3317*
ERRLIST0   0000 276C       3322*   3369
ERRLIST1   0000 2766       3320*   3324
ERRLIST2   0000 2782       3321    3329*
ERRLIST3   0000 278E       3333*
ERRLIST4   0000 27A0       3338*
ERRLIST5   0000 27B0       3332    3342*
ERRLIST6   0000 27D4       3341    3344    3349    3354*
ERRLIST7   0000 27BA       3337    3345*
ERRLIST9   0000 27C8       3335    3350*
ERRLISTA   0000 2762       3316    3319*
ERRLISTC   0000 2754        698    3303    3314*
ERRLVL     0000 178F       1519    1735*
ERRMSG     0000 1726        833    1719*   1720    1721
ERRNO      0000 172E        613    1509    1517    1540    1548    1559    1579    1649    1721*   1872    1895    1903
                           1928    1953    1975    2006    2034    2074    2084    2558    2570    2641    2829    3257
                           3356
ERROR00    0000 29F2       3289    3320    3323    3376    3430*
ERROR01    0000 29F4       3431*
ERROR02    0000 29F6       3432*
ERROR03    0000 29F8       3433*
ERROR04    0000 29FA       3434*
ERROR05    0000 29FC       3435*
ERROR05    0000 29FE       3436*
ERROR07    0000 2A00       3437*
ERROR08    0000 2A02       3438*
ERROR09    0000 2A04       3439*
ERROR12    0000 2A16       3448*
ERROR13    0000 2A18       3449*
ERROR14    0000 2A1A       3450*
ERROR15    0000 2A1C       3451*
ERROR16    0000 2A1E       3452*
ERROR17    0000 2A20       3453*
ERROR18    0000 2A22       3454*
ERROR19    0000 2A24       3455*
ERROR1A    0000 2A26       3456*
ERROR1B    0000 2A28       3457*
ERROR1C    0000 2A2A       3458*
ERROR1D    0000 2A2C       3459*
ERROR1E    0000 2A2E       3460*
ERROR1F    0000 2A30       3461*
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
ERROR20    0000 2A32        3462*
ERROR21    0000 2A34        3463*
ERROR22    0000 2A36        3464*
ERROR23    0000 2A38        3465*
ERROR24    0000 2A3A        3466*
ERROR25    0000 2A3C        3467*
ERROR26    0000 2A3E        3468*
ERROR27    0000 2A40        3469*
ERROR28    0000 2A42        3470*
ERROR29    0000 2A44        3471*
ERROR2A    0000 2A46        3472*
ERROR2B    0000 2A48        3473*
ERROR2C    0000 2A4A        3474*
ERROR2D    0000 2A4C        3475*
ERROR2E    0000 2A4E        3476*
ERROR2F    0000 2A50        3477*
ERROR30    0000 2A52        3478*
ERROR31    0000 2A54        3479*
ERROR32    0000 2A56        3480*
ERROR33    0000 2A58        3481*
ERRPL1     0000 10F4         807     884*   1572   1639
ERRS       0000 0FF0         787*
ERRS1      0000 109E         790     850*
ERRSAVE    0000 2BB0         773     780     782     787     792     797     803    3506*
ERRSTA     0000 16D2         851     865    1679*
ETESTNO    0000 172C         612     645    1720*   1847    3339    3343    3347    3352
FCODE      0000 2838        1542    1553    1591    1630    1652    3393*
FIRST      0000 16BC         414     421     425    1666*
FLAG       0000 000A          53*
FLIP       0000 285C        2379    2381    2389    2401    2440    2442    3405*
FNDL1      0000 1AE6        2066    2069*
FNDLO      0000 1AD0        2053    2063*
FORPRT     0000 0B24         299*    311     315     390     734
FOUND1     0000 0E16         586     596*
FOUND2     0000 0E1A         592     597*
FOUR       0000 000A          52*
FWCHK      0000 1868        1763    1771*
FWORD      0000 1834        1763*   1804
GETCHR     0000 130E         331     467     898     907    1172*
GLOBAL     0000 2040        2546    2663*
HALT9      0000 0F72         726*    731
HEXASC     0000 11A4         643     843     853     863     867     877     887     890   1011*  1632   1636   2830
                            2834    2837    3247    3250    3253    3357    3364
HEXASC1    0000 11AE        1015*   1022
HEXTAB     0000 170C         431     900     976    1018    1518    1713*
II         0000 15AE        1324    1558*
IMAGE      0000 2A9C        2133    2154    2251    2262    2273    2296    2392    2423   3146   3155   3176   3195
                            3216    3499*
IMPTOP     0000 0000:I
INCR       0000 16D4        1681*
INIT       0000 18E6         601    1823*
INITRET    0000 0E2E         606*   2071
INSTAB     0000 28E0        1966    1992    3415*
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
INSTLP1    0000 19DE      1965*    1984
INSTLP2    0000 1A10      1989*    2015
INSTR1     0000 19EA      1967     1973*
INSTR2     0000 1A2A      1993     2001*
INTDEV     0000 16D0      1448     1465     1676*    1677
INTLEV     0000 1828      1762*
INTLVL     0000 1B22      1488     2097*
INTLVLM    0000 177A      1522     1734*    1735
INTPSW     0000 16C0      1447     1466     1668*
INTSAV     0000 2B70      1464     1500     3505*
INTSTA     0000 16D2      1449     1678*    1679
IO         0000 0A10      159*     243      244      252      253      259      266      268      460      598      1162     1212
                          1256     1268     1303     1604     1615     1620     1621     1625
IO.OK1     0000 0A90      247      249*
IO.OK2     0000 0A96      250      252*
IO.OK3     0000 0AB4      257      262*
IO.OK4     0000 0AF4      279      282*
IOSAVE     0000 2AE2      398      599      1087     1111     1125     1160     1209     1214     1253     1271     1301     3501*
IPAGE      0000 285A      2386     2393     2422     2431     3404*
ISITERR    0000 16E4      302      607      700      703      737      777      817      1073     1193     1197     1523     1571
                          1638     1693*    1851     2059     3359     3368
KBREAD     0000 1428      1172     1276*
KBXIT      0000 1442      1281     1283*
KEEP1      0000 0DFE      585*     588
KEEP10     0000 0F7A      294      732*     1070
KEEP101    0000 0FA4      744*     746
KEEP2      0000 0E0C      591*     594
KEEP3      0000 0E50      618*     724
KEEP4      0000 0E5A      624*     677      723
KEEP41     0000 0E5E      625*     636
KEEP42     0000 0E74      629      633*
KEEP43     0000 0E7A      632      635*
KEEP5      0000 0E7E      631      634      637*
KEEP6      0000 0EB2      652*     670
KEEP7      0000 0EE2      668      671*
KEEP71     0000 0EF0      672      675*
KEEP9      0000 0F46      689      709*
KEEP91     0000 0F54      713*     826
KEEP92     0000 0F74      691      720      730*     827      3304
LADC       0000 0002      655
LCORE      0000 145C      285      614      1310*
LCORE32    0000 14B2      1354*
LCORE32A   0000 14C4      1365*    1370
LEADER     0000 00A2      124*     128
LEVEL      0000 0D86      513*     1762
LINK       0000 000F      108*     262      285      289      305      309      310      311      313      314      315      316
                          317      320      322      324      337      345      364      368      390      397      404      407
                          412      424      425      429      432      446      451      456      459      467      472      473
                          477      576      577      578      579      600      601      614      643      646      648      659
                          674      688      692      695      698      701      730      734      735      738      741      744
                          749      750      781      815      834      843      845      853      855      863      867      869
                          877      879      887      890      892      940      981      1024     1056     1057     1067     1078
                          1090     1094     1095     1096     1097     1098     1101     1109     1114     1118     1120     1129
```

```
                                  1144    1148    1158    1188    1192    1193    1195    1203    1204    1206    1207    1234
                                  1234    1235    1236    1241    1242    1264    1272    1366    1510    1520    1524    1570
                                  1571    1632    1636    1637    1638    1641    1643    1803    1807    1813    1874    1897
                                  1906    1931    1956    1978    2009    2037    2050    2064    2070    2077    2087    2140
                                  2141    2161    2162    2187    2188    2204    2225    2257    2258    2268    2269    2291
                                  2292    2313    2314    2332    2333    2337    2339    2346    2347    2353    2355    2361
                                  2362    2382    2383    2391    2402    2413    2469    2470    2474    2476    2478    2480
                                  2487    2488    2492    2493    2503    2507    2508    2512    2513    2521    2561    2573
                                  2643    2703    2714    2715    2717    2740    2776    2830    2834    2837    2839    2843
                                  2845    3119    3140    3151    3152    3178    3187    3197    3202    3203    3209    3218
                                  3225    3226    3236    3237    3247    3250    3253    3260    3264    3266    3268    3273
                                  3281    3282    3286    3303    3306    3307    3315    3326    3328    3357    3358    3359
                                  3364    3366    3367    3368
LINKSAV    0000 2830               3237    3268    3391*
LINKSAV1   0000 2834               3281    3306    3315    3318    3326    3392*
LNZB       0000 2A59                118    3486*   3515    3546
LOAD       0000 00AC                129*    137
LOCMSG     0000 1770                878    1732*
LOOK1      0000 0BF8                370*    377
LOOK2      0000 0BFC                372*    381
LOOK3      0000 0C0C                375     378*
LOOK4      0000 0D3A                386     480*
LOOK5      0000 0D5E                493     496*
LOOKUP     0000 0BF0                351     353     368*
LOOP       0000 17D4                667    1751*
LPADR      0000 0A1A                164*
LPEND1     0000 1A00               1962    1981*
LPEND2     0000 1A48               1990    2012*
LPWRT      0000 0A3C                194*
LVLERR     0000 1558               1489    1516*
MAXTST     0000 1B5C                555    2106*
MICROBUS   0000 0A22                168*   1178
MICTBL     0000 2200               2806    2807    2854*
MICTBL2    0000 24B0               2806    2817    2818    3031*
MICTBL2E   0000 258F               2817    3088*
MM         0000 15D4               1326    1577*
MM31       0000 1602               1593    1596*
MM32       0000 15E6               1588*
MM33       0000 1606               1595    1597*
MMCOM1     0000 160A               1604*
MMCOM1A    0000 1618               1606    1609*
MMCOM2     0000 162C               1608    1615*
MMCOM2A    0000 163A               1617    1620*
MMCOM3     0000 1656               1543    1554    1619    1623    1629*   1659
MN         0000 0096                121*   3520    3544
MOD32      0000 16BE               1667*
MODE       0000 17F8               1754*   2067
MREADC     0000 0A44                198*
MSG10      0000 29B6               1640    3427*
MSG11      0000 29D4               1631    1635    1642    3428*
MSG2       0000 28FC               3263    3418*
MSG3       0000 291A               3246    3249    3252    3265    3419*
MSG4       0000 2944               2063    3422*
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
MSG5       0000 2936       2057    3421*
MSG6       0000 2952       2069    3423*
MSG7       0000 296A       3363    3365    3424*
MSG8       0000 297E       2842    3425*
MSG9       0000 299A       2833    2836    2844    3426*
MTESTNO    0000 1722       611     642     644     1718*
NEXTST     0000 16F6       620     624     640     1702*
NODCS      0000 1ABE       2057*   2088
NOERMSG    0000 1742       673     1723*
NOERR      0000 16E6       650     671     818     1694*   1852    2065    3282
NOMSG      0000 17EC       497     1753*
NORM       0000 16D3       1680*
OLOC       0000 16CE       798     875     888     1457    1492    1550    1567    1589    1651    1674*
ONE        0000 0005       47*     1859    2772    2778    2779    3296    3297
ONES       0000 2850       2197    3399*
OPSW       0000 16CA       885     1456    1549    1566    1588    1650    1672*
OPSW32     0000 16C8       1671*
OPT        0000 17C8       369     406     448     1749*
OPTBUF     0000 2ADC       327     328     329     348     356     374     3500*
OPTCMD     0000 0C56       405*
OPTCMD1    0000 0C58       406*    410
OPTCMD10   0000 0CE0       450*    454
OPTCMD11   0000 0D12       467*    471
OPTCMD12   0000 0D20       462     465     472*
OPTCMD2    0000 0C7A       416*    442
OPTCMD3    0000 0C80       418*    437
OPTCMD4    0000 0C86       420*
OPTCMD5    0000 0C98       422     425*
OPTCMD6    0000 0CA8       427     430*
OPTCMD7    0000 0CB4       419     433*
OPTCMD71   0000 0CC6       438*
OPTCMD8    0000 0CD4       403     446*
OPTCMD9    0000 0CDE       449*    476
OPTEND     0000 1840       1765*
OPTEND2    0000 1828       475     1761*
OPTEXX     0000 0C44       392     395     399*
OPTIN      0000 0B50       295     315*    338     478     499     553     573     704     751     1644    1773    2061
                           2068
OPTIN1     0000 0B5C       318*    469     1198    1512    1525    1573
OPTIN2     0000 0B3A       309*    1099    1237    3327
OPTION     0000 1840       385     399     1764*   1765
OPTRTN     0000 0C4A       402*    1814
OPTVAL     0000 1118       393     489     558     897*
OPTVAL0    0000 111E       899*    917
OPTVAL1    0000 1120       900*    903
OPTVAL2    0000 112C       901     905*
OPTVAL3    0000 1130       907*    913
OPTVAL4    0000 1144       911     914*
OPTVAL5    0000 1140       909     912*
ORIGIN1    0000 0A00       117     145*    3513    3545
ORIGIN2    0000 0A04       151*
OTC.0      0000 1292       1129*   1134    1143    1145
OTC.1      0000 129E       1133*
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
OTC.2       0000 12A8      1132    1136*
OTC.3       0000 12BA      1139    1142*
OTC.4       0000 12D8      1151*   1156
OTC.5       0000 12EE      1158*   1164
OUT.SAV     0000 16FC      1124    1167    1705*
OUT0        0000 1304      1130    1149    1152    1154    1159    1166*
OUT1        0000 1308      1165    1157*
OUTCHR      0000 1280       322     324     397     407     412     424     429     432     451     456     744     977
                           1067    1078    1090    1094    1109    1114    1118    1124*   1807
OUTCHR2     0000 12C8      1127    1135    1141    1147*
P1          0000 11E6      1058    1062*
P2          0000 11F4      1067*   1069
P3          0000 1200      1063    1071*
PASFLG      0000 16DA       277    1279    1607    1684*
PASFLG2     0000 16DC       255    1618    1685*
PASLADR     0000 0A12       160*
PASS        0000 2856      2131    2143    2145    2150    2163    2165    2403    2405    2409    2414    2416    2544
                           2584    2586    2594    2609    2617    2623    2630    2645    2647    3174    3188    3208
                           3402*
PATERN      0000 2860      2281    2286    2303    2308    3407*
PAUSE       0000 16FA      1128    1133    1140    1144    1147    1704*
POINT       0000 000C        55*   1961    1961    1965    1966    1981    1982    1983    1987    1987    1989    1992
                           2012    2013    2014    2044    2050    2197    2200    2218    2221    2385    2386    2543
                           2564    2593    2593    2597    2599    2600    2771    2774    3155    3158    3242    3272
                           3376    3378    3379    3380
PRINT       0000 11CC       291     313     548     674     701     738     834     845     855     869     879     892
                           1055*   1195    1524    1641    1643    2060    2064    2070    2843    2845    3264    3266
                           3366
PRINT2      0000 120E      1072    1076*   1085
PRINT2A     0000 1210      1077*   1083
PRINT3      0000 1228      1080    1086*
PRINT3A     0000 123A      1089    1093*
PRINT3A1    0000 1274      1113    1117*
PRINT3B     0000 123C      1092    1094*
PRINT3B1    0000 1276      1116    1118*
PRINT5      0000 1240      1061    1074    1095*
PRTFLG      0000 16E2       578    1057    1096    1236    1692*
PSAVE       0000 282C      3242    3272    3390*
PSW         0000 0A52       211*    652     778
PSW2        0000 0A54       212*    222     318     662     682     813    1462    1568
PSWMSG      0000 1766       891    1730*   1731    1732    1733
PURETOP     0000 0000:P
QMSG        0000 17A0      1194    1737*
QUESTN      0000 133E       325    1192*   1779    1781    1783    1786    1791    1793    1795    1799
R0          0000 0000        91*    259     260     263     274     286     287     288     326     327     328     329
                            347     348     421     458     460     461     549     550     551     552     583     587
                            589     593     596     597     598     599     606     607     608     609     618     619
                            620     625     626     627     630     633     641     649     650     651     653     663
                            664     665     666     667     671     683     721     722     732     733     739     747
                            773     776     777     779     780     782     787     792     797     803     814     840
                            850     860     864     874     884     932     937     939     968     969     980    1011
                           1012    1023    1055    1071    1073    1100    1107    1119    1125    1126    1128    1131
                           1136    1151    1157    1152    1163    1173    1174    1176    1179    1196    1197    1202
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
                              1240    1262    1268    1269    1270    1276    1277    1278    1282    1303    1304    1313
                              1314    1318    1320    1322    1456    1464    1497    1500    1551    1552    1568    1569
                              1629    1633    1812    2616    2617    2632    2805    2816    2828    2831    3244    3283
                              3305    3354    3361    3510    3511    3527    3533    3539    3550    3551    3552    3561
                              3564    3566
R1        0000 0001             92*    117     129     130     132     137     220     221     233     243     246     248
                               252     263     264     265     266     268     270     272     274     275     319     330
                               343     348     354     356     357     369     371     376     383     385     480     482
                               492     496     584     585     590     591     610     611     612     613     638     652
                               653     656     657     662     663     675     676     682     683     690     693     696
                               709     710     711     712     718     719     813     814     822     823     824     825
                               841     851     861     865     875     885     888     933     936    1015    1059    1060
                              1087    1088    1111    1112    1131    1133    1136    1137    1138    1140    1142    1147
                              1150    1151    1153    1155    1160    1161    1162    1163    1156    1209    1210    1211
                              1212    1212    1213    1214    1215    1217    1219    1220    1222    1223    1227    1228
                              1246    1253    1254    1255    1256    1256    1257    1258    1259    1261    1263    1269
                              1270    1271    1300    1301    1302    1303    1304    1305    1306    1310    1314    1315
                              1316    1318    1319    1322    1323    1363    1365    1369    1457    1463    1620    1622
                              1624    1625    1626    1627    1628    1630    1634    2622    2626    2627    2806    2817
                              2827    2832    2835    2840    3245    3248    3251    3298    3299    3300    3301    3355
                              3362    3511    3513    3517    3519    3522    3523    3526    3526    3527    3536    3536
                              3538    3541    3545    3547    3550    3554
R10       0000 000A            101*   1446    1446    1447    1466    1486    1487    1488    1518    1518    1519    1577
                              1577
R11       0000 000B            102*
R12       0000 000C            103*    325     346     355     373     488     491     502     507     511     515     560
                               595     904    1541    1594    1596    1597    1657    1658
R13       0000 000D            104*   1542    1553    1590    1591    1592    1652    1653    1655    2618    2621    2634
                              2635    2635
R14       0000 000E            105*    299     300     301     301     302     303     304     362     363     393     403
                               439     489     492     494     558     563     567     915     918     924    1549    1566
                              1580    1588    1650    2619    2637
R15       0000 000F            107*    283     291     292     293     331     494     503     506     510     514     530
                               581     582     702     703     798     898     899     900     902     906     907     977
                              1084    1124    1167    1168    1232    1239    1550    1567    1581    1589    1651    1785
                              1798    2620    3535    3542    3555    3567
R2        0000 0002             93*    114     133     139     222     223     232     234     244     249     251     253
                               254     258     259     260     270     271     272     273     280     280     281     318
                               319     399     400     405     406     408     409     415     418     440     448     450
                               452     457     474     475     624     627     628     635     637     638     639     640
                               642     644     645     654     655     656     774     778     779     783     788     793
                               799     804     812     817     818     819     820     842     852     862     866     876
                               886     889     934     969     970     972     974     978    1019    1020    1062    1220
                              1222    1223    1224    1224    1228    1229    1243    1244    1246    1247    1311    1365
                              1367    1367    1368    1448    1462    1463    1465    1471    1539    1540    1547    1548
                              1558    1559    1569    1578    1579    1604    1605    1607    1609    1610    1611    1612
                              1613    1615    1616    1618    1621    1622    1625    1626    1628    1531    1635    1648
                              1649    1804    1806    1808    2566    2623    2624    2625    2626    2807    2808    2818
                              2819    2829    2833    2836    3246    3249    3252    3356    3363    3514    3523    3525
                              3551
R3        0000 0003             94*    118     119     120     245     246     249     266     267     268     269     281
                               282     283     370     374     378     380     402     415     440     449     453     564
                               568     742     745     922     925     925     935    1012    1013    1014    1016    1021
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SYMBOL TABLE & CROSS REFERENCE LIST

```
                              1066    1068    1312    1317    1321    1324    1325    1328    1329    1332    1333    1355
                              1356    1364    1368    1449    1805    1809    2810    2811    2820    2822    2832    3342
                              3343    3345    3346    3347    3350    3351    3352    3515    3537    3546    3568    3569
R4          0000 0004           95*    122     123     124     126     134     136     275     276     277     278     278
                               321     323     332     334     335     339     341     350     352     356     391     396
                               406     411     416     417     420     423     428     430     431     431     433     434
                               435     436     450     455     468     470     487     490     547     569     743     900
                               908     910     914     916     973     974     975     976     976    1015    1016    1017
                              1018    1018    1019    1064    1065    1077    1079    1086    1091    1093    1108    1110
                              1115    1117    1157    1172    1174    1176    1186    1187    1283    1326    1327    1335
                              1354    1806    2835    3516    3518    3520    3524    3524    3525    3544    3548
R5          0000 0005           96*    124     126     127     127     129     130     131     134     136     290     312
                               372     374     413     414     426     426     438     438     441     457     555     559
                               647     673     699     700     736     737     740     748     833     844     854     868
                               878     891     973    1077    1081    1194    1468    1469    1473    1475    1485    1488
                              1522    1523    1640    1642    1777    1778    1789    1790    1796    1797    1811    2057
                              2059    2063    2065    2067    2069    2632    2633    2809    2812    2812    2823    2823
                              2827    2838    2842    2844    3263    3265    3365    3517    3518    3547    3548    3549
R5HEX       0000 117C          459     741     749     968*   1813
R5X         0000 1188          973*    979
R5XA        0000 1196          977*
R5XB        0000 119E          971     980*
R6          0000 0006           97*    121     131     138     254     255     256     256     371     372     379     394
                               398     447     463     464     466     496     497     498     501     505     509     513
                               559     561     566     897     905     906     912     923     926    1076    1082    1469
                              1471    1475    1477    1492    1493    1495    1508    1509    1516    1517    1772    1777
                              1780    1782    1784    1789    1792    1794    1797    2821    3531    3532    3533    3538
                              3539    3549    3552    3569    3570
R7          0000 0007           98*    556     564     571
R8          0000 0008           99*    132     133     138     139     557     568     572    3570
R9          0000 0009          100*   1173    1180    1181    1183    1184    1186    1279
RANDOM      0000 20FC         2703    2728*
RANDW       0000 25AE         2337    2353    2474    2478    3130*
RDCHAR0     0000 0B98          333     335*
RDCHAR1     0000 0BB2          340     343*
RDCHR       0000 0B8A          331*    349     358
RDCHR1      0000 0BC8          342     350*
RDCHR2      0000 0BA6          336     339*
RDCHR3      0000 0BBC          344     347*
RDCSL       0000 264C         3211*   3224
READCS      0000 263E         2258    2269    2292    2314    2347    2362    3207*
READD       0000 260A         2141    2162    2413    3187*
RESPRT      0000 0BE6          314     317     337     345     362*    368     477     750
RET         0000 000E          106*    775     784     785     789     790     794     795     800     801     805     806
                               807     836     846     856     870     880     893    1572    1639    3360
RET2        0000 0001           45*   1848    3325    3381
RN1         0000 213C         2698    2704    2745*
RN10        0000 2144         2747*
RN11        0000 2148         2748*
RN6         0000 2138         2729    2738    2744*
RN7         0000 2140         2700    2705    2746*
RNSAVE      0000 2120         2728    2739    2743*
RP          0000 157C         1355    1539*
```

SYMBOL TABLE & CROSS REFERENCE LIST

```
RSAVE      0000 2AE8      116     932     939     968     980     1011    1023    1055    1100    1107    1119    1202
                          1240    1335    1497    3283    3305    3504*
RUN        0000 184C      383     1767*
RUNIT      0000 0DE0      384     576*
SELTST     0000 16E8      597     676     722     1695*
SET.RTN    0000 1704      1300    1305    1707*
SETKB      0000 141A      262     320     695     1268*
SETUP      0000 1444      1150    1300*
SINK       0000 16D6      1184    1213    1219    1227    1257    1262    1278    1613    1683*
ST         0000 0A6E      232*
STAMSG     0000 1754      854     1726*
START      0000 0A80      232     243*
START1     0000 0A60      145     220*    238     1819
START3     0000 0A7E      151     152     153     238*
STAT       0000 0009      51*     1841    1842    1843    1845    1860    1861    1910    1911    1935    1936    1904
                          1995    2020    2021    2042    2081    2082
STOP.TST   0000 18E0      483     1817*
TAB        0000 0008      50*     2767    2768    2769    2779    3193    3193    3195    3196    3199    3200    3215
                          3215    3216    3217    3219    3221    3314    3317    3318    3319    3320    3322    3323
                          3329
TABPRINT   0000 18BA      1764    1802*
TABPRT1    0000 18C4      1806*   1810
TALLI      0000 26F6      1874    1897    1906    1931    1956    1978    2009    2037    2077    2087    2561    2573
                          2643    2839    3260    3281*
TALLI0     0000 2712      3285    3288*
TALLI1     0000 2728      3292    3295*
TALLI2     0000 274A      3287    3302    3305*
TALLY      0000 1804      696     1755*   2840    3261    3284
TDCSS1     0000 1AA6      2046*
TEMP       0000 2AE4      417     420     430     433     435     3502*
TEST       0000 17C8      402     480     550     552     571     572     584     590     630     633     1750*
TEST0      0000 1B88      2111    2128*
TEST00     0000 1B88      2130*
TEST01     0000 1C04      2187*
TEST03     0000 1D26      2332*
TEST06     0000 1EEE      2539*
TEST07     0000 20C0      2697*
TEST1      0000 1C04      2111    2185*
TEST2      0000 1C6C      2111    2247*
TEST3      0000 1D26      2111    2330*
TEST4      0000 1D76      2111    2376*
TEST5      0000 1E3C      2111    2466*
TEST6      0000 1EEE      2111    2537*
TEST7      0000 20C0      2111    2695*
TEST8      0000 2152      2111    2760*
TEST9      0000 217A      2112    2804*
TESTA      0000 1930      1865*
TESTB      0000 194A      1856    1877*
TESTC      0000 1956      1889*
TESTD      0000 197C      1890    1899    1910*
TESTE      0000 19AC      1912    1935*
TESTEF1    0000 19D4      1948    1961*
TESTEF2    0000 1A0E      1987*
```

SYMBOL TABLE & CROSS REFERENCE LIST

TESTF	0000 1A56	2018*	2079									
TESTG	0000 1A90	2018	2039*									
TESTOP	0000 0D8E	481	547*									
TESTS	0000 1B60	656	2111*									
TIME	0000 0A4E	209*	935									
TIMER	0000 1162	932*										
TITLE	0000 1B24	290	2100*									
TOTAL	0000 16EE	608	710	712	718	740	1698*					
TOTERR	0000 16F0	748	822	824	1699*	1853	3298	3300				
TOTMSG	0000 1732	736	1722*									
TSAVE	0000 2824	1965	1981	1989	2012	2495	2515	3111	3112	3135	3136	3240	3248
		3270	3388*									
TST	0000 000E	57*	2202	2202	2223	2336	2338	2338	2352	2352	2354	2473	2475
		2479	2491	2495	2496	2498	2499	2511	2515	2517	2705	3111	3135
		3195	3216	3235	3240	3270						
TST00A	0000 1B92	2133*	2137	2148								
TST00B	0000 1BCA	2152*	2158	2168								
TST01B	0000 1C10	2191*	2208									
TST01C	0000 1C3E	2211*	2229									
TST02A	0000 1C72	2251*	2255									
TST02B	0000 1C90	2262*	2266									
TST02C	0000 1CEE	2296*	2300									
TST02D	0000 1CC6	2281*	2289									
TST02E	0000 1CCA	2282*	2287									
TST02F	0000 1CAE	2273*	2278									
TST02H	0000 1D02	2303*	2311									
TST02J	0000 1D06	2304*	2309									
TST03A	0000 1D32	2336*	2343									
TST03B	0000 1D56	2352*	2359									
TST04A	0000 1D7C	2381*	2443									
TST04B	0000 1D94	2389*	2436									
TST04C	0000 1DA8	2395*	2399									
TST04D	0000 1DC2	2405*	2420									
TST04E	0000 1DDC	2407	2413*									
TST04F	0000 1DFA	2411	2418	2422*								
TST04G	0000 1E02	2425*	2429									
TST05A	0000 1E4E	2473*	2484									
TST05B	0000 1E88	2491*	2505									
TST05C	0000 1E8E	2492*	2500									
TST05D	0000 1EAA	2497	2502*									
TST05E	0000 1EC4	2511*	2523									
TST05F	0000 1ECA	2512*	2518									
TST05G	0000 1EDC	2516	2520*									
TST06A	0000 1F12	2552*	2579									
TST06B	0000 1F18	2542	2554*	2564								
TST06C	0000 1F34	2556	2564*									
TST06D	0000 1F3A	2540	2566*	2577								
TST06E	0000 1F58	2568	2576*									
TST06F	0000 1F8C	2597*	2601									
TST06H	0000 1EF2	2540	2610*									
TST07A	0000 20D0	2703*	2707	2709	2718							
TST08H	0000 215A	2766*	2781									
TST08L	0000 2166	2772*	2780									

SYMBOL TABLE & CROSS REFERENCE LIST

```
TST9.ERR   0000 21BA        2813    2827*
TSTBRK     0000 1358         473     646     669     692    1084    1097    1202*   2503    2521    2717    2776
TSTBRK1    0000 13AA        1216    1218    1227*
TSTBRK2    0000 13BA        1225    1232*   1249
TSTBRK3    0000 13D6        1205    1208    1221    1226    1231    1238    1240*
TSTBRK4    0000 13E8        1230    1246*   1248
TSTBRK5    0000 13E0        1233    1243*
TSTBRK6    0000 13D2        1239*   1245
TSTDU      0000 13F4         688     730     815    1056    1129    1148    1158    1253*
TSTEND     0000 0EC4         662*   2169    2230    2315    2363    2444    2524    2650    2824    2841    2846
TSTMSG     0000 171C         647    1717*   1718
TSTOP1     0000 0DA6         548     555*
TSTOP2     0000 0DAE         558*    570
TSTOP3     0000 0DC4         562     566*
TSTOP4     0000 0DCE         565     569*
TT16.NEW   0000 1FBA        2618*   2651
TT6BRN     0000 1FB2        2589    2615*
TT6BRN1    0000 200C        2636    2645*
TT6ERR     0000 1FFC        2636    2640*
TTY        0000 0006          48*
TTYGET     0000 143C        1291*
UNARY      0000 1154         563     567     922*
UNARY1     0000 1156         923*    927
VALCHK     0000 1870        1756    1776*
VALCK1     0000 1894        1758    1788*
VIRTADRS   0000 283C        1541    1552    1597    1634    1658    3394*
WANDR      0000 2590        2492    2512    2714    3109*
WASDU      0000 16EA         287     581     609     709     733    1059    1062    1166    1696*
WASDU1     0000 16EC         288     582     690    1060    1065    1697*
WCSHI      0000 181C        1753*
WCSLO      0000 1810        1756*
WRITD      0000 25F8        2140    2151    3173*
XI1        0000 14FE        1469*   1474
XI16A      0000 14FC        1469*
XI2        0000 150E        1472    1475*
XI3        0000 152A        1492*
XI32       0000 14D4        1320    1364    1446*
XI32A      0000 14E2        1456*
XI4        0000 1540        1494    1496    1500*
XI5        0000 1544        1498    1502*   1504
XIERR      0000 1548        1470    1476    1508*
XIEXIT     0000 1546        1477    1504*
ZERO       0000 0004          46*   1850    1851    1852    1853    1855    2130    2130    2131    2133    2135    2136
                            2139    2139    2150    2154    2156    2157    2160    2160    2251    2252    2254    2260
                            2260    2262    2263    2265    2271    2271    2273    2276    2277    2294    2294    2296
                            2298    2299    2378    2378    2379    2387    2403    2576    2577    2583    2583    3145
                            3145    3146    3147    3148    3150    3150    3207    3207    3208    3377    3377    3378
ZERO1      0000 1466        1314*   1315
ZERO2      0000 1476        1318*   1319
ZERO3      0000 1486        1322*   1323
ZERONE     0000 0D76         505*   1752    1754    1755
ZERONE2    0000 0D6E         501*   1753
ZEROS      0000 284C        2218    3398*
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