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DIAGNOSTIC PROGRAM MANUAL

SIGMA 5 AND 7 RELOCATABLE DIAGNOSTIC PROGRAM LOADER

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LIST OF EFFECTIVE PAGES

Total number of pages is 28, as follows:

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LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF RELATED PUBLICATIONS

The following publications contain information not included in this manual, but necessary for a complete understanding of this diagnostic program loader.

Publication Title	Publication No.
SDS Sigma 7 Computer Reference Manual	900950
SDS Sigma 5 Computer Reference Manual	900959
SDS Sigma Card Reader Model 7120 Reference Manual	900970
SDS Sigma Paper Tape Model 7060 Reference Manual	900983
SDS Sigma SYMBOL and METASYMBOL Reference Manual	900952

SECTION I
INTRODUCTION

1-1 SCOPE OF MANUAL

1-2 This manual describes the Relocatable Diagnostic Program Loader used to load I/O diagnostic programs into SDS Sigma 5 and Sigma 7 computer memories. The manual includes loader specifications, detailed setup and loading procedures, loading options, and a detailed description of loader operation.

1-3 Figure 1-1, a detailed flow chart of loader operation, appears on page 1-2.

1-4 A list of related publications at the front of this manual lists documents that provide additional information related to the operation of relocatable loader. The manual concludes with a complete program listing.

1-5 PROGRAM OBJECTIVES

1-6 The Sigma 5/7 Diagnostic Program Relocatable Loader is provided to load relocatable or absolute object programs generated by the Sigma METASYMBOL Assembler and presented to the loader on 80-column punched cards or 8-level paper tape. This loader will load any object program generated by the Sigma METASYMBOL Assembler except one containing external references or definitions. The object program to be loaded must be presented to the loader in the object program format employed by the Sigma METASYMBOL Assembler. (See figure 1-2, Object Program Record Format.)

1-7 The loader is loaded into memory by executing the Standard Load Procedure and is automatically relocated to high order memory (the last 128 memory locations - $XXF80_{16}$ through $XXFFF_{16}$). The bootstrap for the loader utilizes memory locations 20_{16} through $5D_{16}$. During the loading of the object program memory locations 20_{16} through $3F_{16}$ are used as the input buffer. Thus the object program being loaded cannot be stored below 40_{16}. (See figure 1-3, Main Memory Map Allocation.)

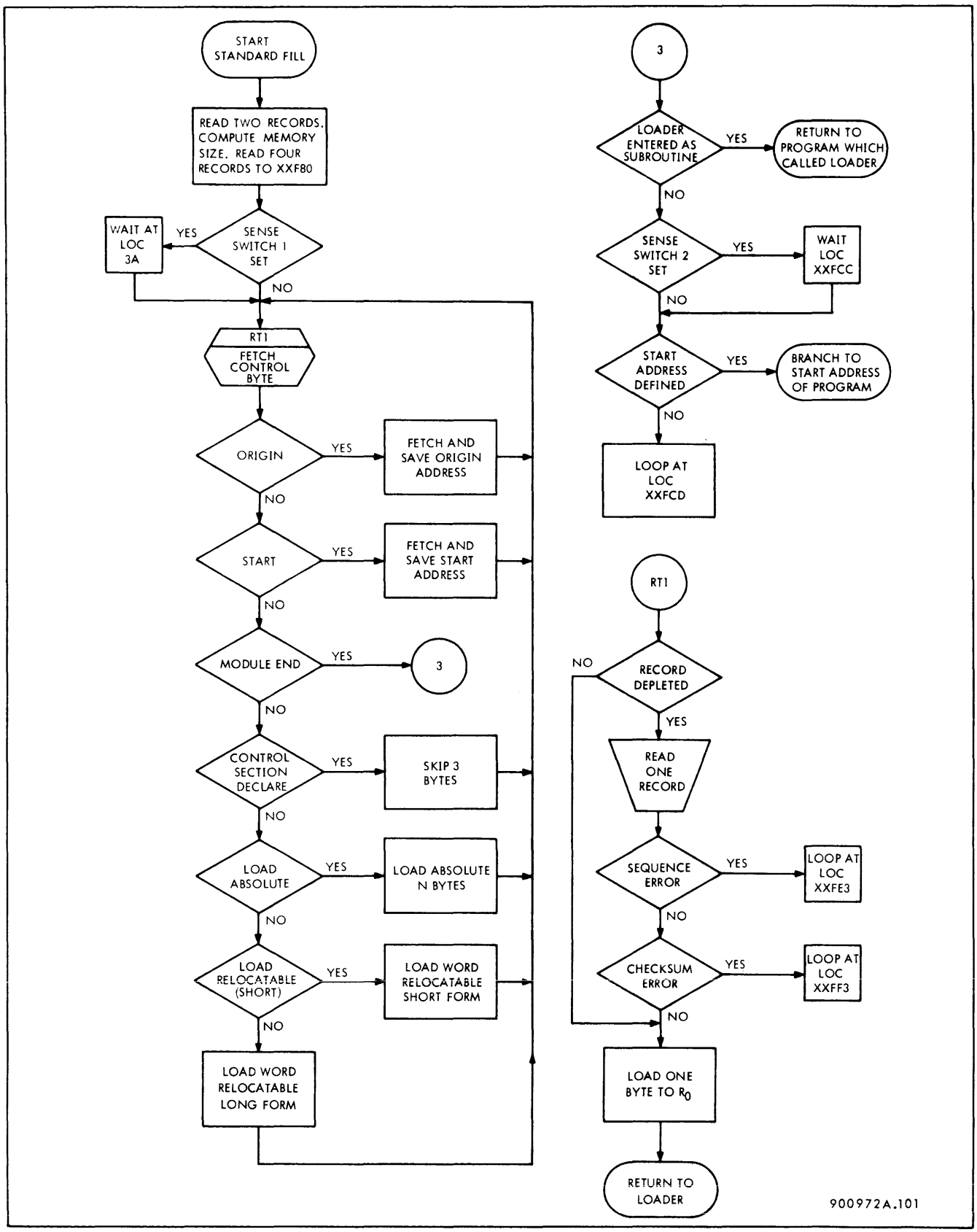
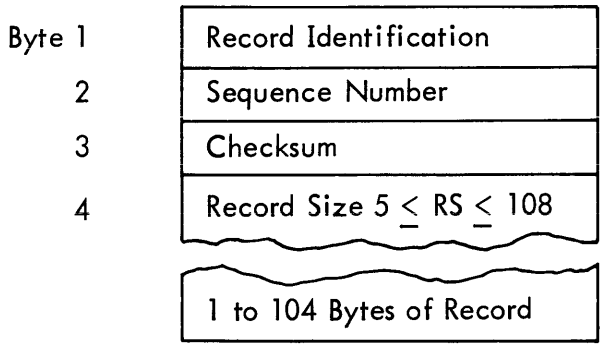


Figure 1-1. Relocatable Diagnostic Program Loader Flow Chart

The first part of each record contains control information. This information is in the first four bytes of each record as follows



Record Identification

The record identification byte is identical for all records, 39_{16} (00111001) with exception of the last record which has a record identification of 19_{16} (00011001)

Sequence Number

The sequence number is zero (0000 0000) for the first record and monitonically increases for each record thereafter. After 255 (FF_{16} - 1111 1111) it recycles to 0. The object program records must be in correct sequential order to successfully load the object program

Checksum

A checksum which is computed as the sum of the bytes comprising the active record not including the checksum itself. Carries out of the most significant bit are ignored, and if the checksum in the record contains all ones the checksum will not be verified

Record Size

The record size is the number of bytes (including the record control byte) which comprises the active record. All excess bytes will be ignored, the record size range is $5 \leq$ Record Size ≤ 108

Record Body

The second part of the record is the record body, which is essentially a string of items that control and define the object program data included in the record body.

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Figure 1-2. Object Program Record Format

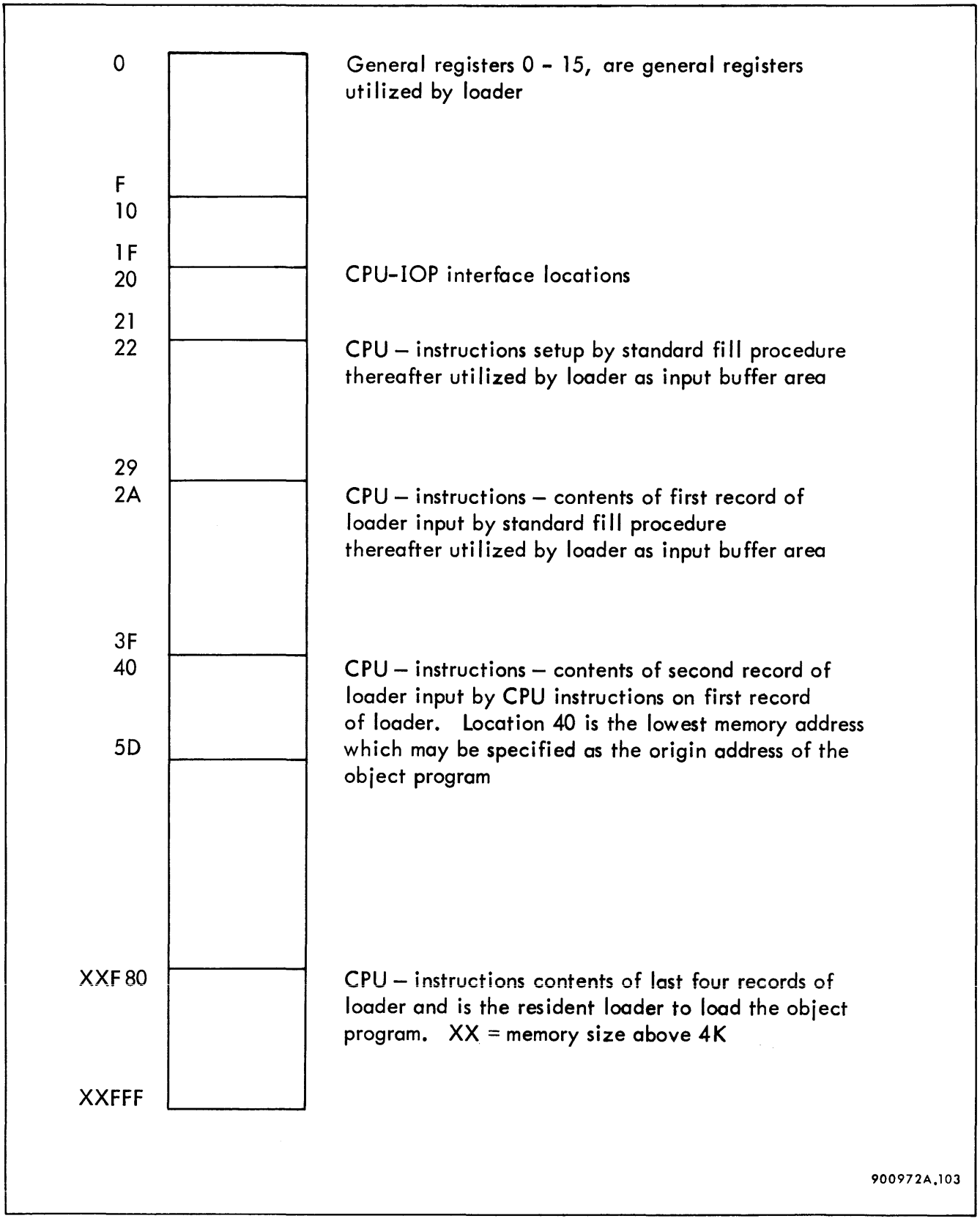

Figure 1-3. Main Memory Map Allocation

1-8 GENERAL SPECIFICATIONS

1-9 Table 1-1 lists general specifications for the relocatable loader.

Table 1-1. General Specifications

Computer Configuration	Sigma 5 or Sigma 7 computer, with 4K memory
Required Equipment	Card reader or paper tape reader as program media input device
Optional Equipment	None
Prerequisites	Sigma 5 or Sigma 7 computer, main memory, I/O system, and input device (card reader or paper tape reader) must be operational
Storage	The Standard Load Procedure utilizes memory locations 20_{16} through $5D_{16}$. The main loader utilizes memory locations 20_{16} through $3F_{16}$ as the input buffer area, with the main loader residing in the last 12810 memory locations, $XXF80_{16}$ through $XXFFF_{16}$
Source Language	Sigma METASYMBOL (see SDS Sigma 5/7 SYMBOL and METASYMBOL Reference Manual, No. 900952)

SECTION II
OPERATING INSTRUCTIONS

2-1 PROGRAM LOADING PROCEDURES

2-2 The following paragraphs contain a detailed setup procedure for the loader and program media input device (card reader or paper tape reader), and operator-initiated action via the processor control panel.

2-3 INPUT DEVICE

2-4 Card Reader (See SDS Sigma Card Reader Model 7120 Reference Manual, No. 900970)

2-5 Operate the card reader according to the following steps:

a. Ensure power is applied by usually checking the OPER'L/POWER indicator switch on the operator control panel. Lighting of the OPER'L/POWER switch and audible mechanical operation indicates ac and dc power are applied and the read station and transport mechanism are operative. Power is applied by depressing the OPER'L/POWER indicator switch.

b. Remove the card weight (and cards, if present) from the input hopper. Press the FAULT/RESET indicator switch to feed the card (if present) from the card read platform into alternate stacker 2. Remove all cards (if present) from the output card stackers.

c. Place the six card loader in front of the object program card deck to be loaded.

d. Place the program deck to be read into the input hopper, face down, row 9 away from the operator), with the card weight on top of the cards.

e. Press the START switch to feed the first card of the program deck from the input hopper to the card read platform. Lighting of the START indicator switch indicates that the card reader is ready-automatic.

2-6 Paper Tape Reader (Reference SDS Sigma Paper Tape Reader Model Reference Manual)

2-7 Operate the paper tape reader according to the following steps:

a. Ensure power is applied by visually checking the POWER indicator switch on the operator control panel. Lighting of the POWER switch and read station lamps and visible detection of mechanical rotation of the reader device capstan indicates ac and dc power are applied and the read station and transport mechanism are operative. Power is applied by pressing the POWER indicator switch.

b. Place the object paper tape program and/or loader on the paper tape input spooler, press the LOAD-RUN bar, insert the loader to the read station, and elevate the mechanical LOAD-RUN bar.

c. Press the START switch to automatically locate the paper tape to the first clock-sprocket hole. Lighting of the START switch indicates the paper tape reader is ready-automatic.

2-8 CONSOLE

2-9 (See SDS Sigma 5 or 7 Computer Reference Manuals.) The operator may initiate a loading operation either from the Processor Control Panel (with the CONTROL MODE switch in the LOCAL position) or from the free-standing console (with the CONTROL MODE switch in the REMOTE position).

2-10 The following procedure outlines the steps to be followed to initiate a LOAD operation from the Processor Control Panel.

a. Set the COMPUTE switch to the IDLE position

b. Press the CPU RESET/CLEAR switch

c. Press the I/O RESET switch

d. Press the CPU RESET CLEAR and SYSTEM RESET CLEAR switches simultaneously to clear main memory

e. Set the UNIT ADDRESS switches to the address of the desired input peripheral device, card reader or paper tape reader

f. Set the WATCHDOG TIMER switch (on Processor Control Panel) to the NORMAL position

g. Set the INTERLEAVE SELECT switch to the desired position – NORMAL or DIAGNOSTIC

h. Set the PARITY ERROR MODE switch to the CONT position

i. Set the CLOCK MODE switch to the CONT position

j. Set the ADDR STOP switch to the off position

k. Set or reset SENSE Switches 1 and 2 for desired control (see table 2-1, SENSE Switch Options)

l. Press the LOAD switch

m. Set the COMPUTE switch to the RUN position

2-11 After the COMPUTE switch is set to the RUN position, the following actions occur: The first two cards (records) are read into memory locations $2A_{16}$ through $5D_{16}$. Memory size is computed in 4K increments, high to low. The remaining four cards (records) are read into the last (highest memory address) 128_{10} memory locations $XXF80_{16}$ through $XXFFF_{16}$. SENSE Switch 1 is interrogated for option of specifying program relocation bias in general register 0 or to facilitate loading object program into paper tape reader if the loader is not supplied as a physical part of the object program paper tape. Control is passed to the main loader located in high order memory to load the object program. Upon successful completion of loading the object program SENSE Switch 2 is interrogated for option to Wait prior to passing control to the program just loaded. Control is passed to the program previously loaded.

2-12 LOADING OPTIONS

2-13 Table 2-1 lists the Diagnostic Program Relocatable Loader SENSE switch options.

Table 2-1. Sense Switch Options

Switch	Status	Function
SS 1	Set	Wait at location $3A_{16}$ after loading loader to input program relocation bias to general register O or to facilitate loading object program on paper tape into paper tape reader. Clear Wait to resume load process

Table 2-1. Sense Switch Options (Cont.)

Switch	Status	Function
	Reset	Bypass Wait at location $3A_{16}$, program relocation bias equals 00000
SS 2	Set	Wait at location $XXFCC_{16}$ upon completion of successful load prior to passing control to program just loaded Clear Wait to start program just loaded
	Reset	Bypass Wait at location $XXFCC_{16}$ Start execution of program just loaded
SS 3	Set	No action
	Reset	No action
SS 4	Set	No action
	Reset	No action

2-14 SUCCESS/ERROR INDICATIONS

2-15 A successful or unsuccessful load operation is dependent upon the loading options selected by the operator, such as setting of SENSE switches. The following paragraphs describe the possible error indications and program recovery procedure.

2-16 Program Waits

2-17 Table 2-2 lists program Waits.

Table 2-2. Program Waits

Location	Indication	Description
0003A	SS 1 set and 6-card (record) loaded successfully	Sense Switch 1 set specifying to Wait to permit entry of program relocation bias to general register O or Wait to facilitate additional loading operations. Clear Wait to proceed

Table 2-2. Program Waits (Cont.)

Location	Indication	Description
XXFCC	SS 2 set and program successfully loaded	Sense Switch 2 set specifying to Wait prior to initiating execution of program just loaded. Clear Wait to initiate execution of program just loaded

XX = Memory Size above 4K

2-18 Program Loops

2-19 Table 2-3 lists program loops.

Table 2-3. Program Loops

Location	Indication	Description
$28\text{-}29_{16}$	Input device malfunction during input of first record of loader	Input device malfunctioned – failure to successfully input record or input device is not in automatic mode
$2C\text{-}2D_{16}$	Input device malfunction during input of any of remaining five records	Failure to successfully input any of remaining five records of loader, or input device is not in automatic mode
$XXFCD_{16}$	No program start address	Program was successfully loaded, but no program start address was specified. The program just loaded must be manually started by setting the starting address into the PSW
$XXFDD\text{-}XXFDE_{16}$	Input device malfunction	Failure to successfully input any record of the object program, or input device is not in automatic mode
XXFE3	Sequence error	The object media input is not in correct sequence. No recovery is possible
XXFF3	Checksum error	A checksum error exists on the current object program media record. No recovery is possible

2-20 Program Printouts

2-21 This program does not print out success/error indications.

SECTION III
PROGRAM LISTING

3-1 GENERAL

3-2 The program listing that appears on the following pages details the contents of the Diagnostic Program Relocatable Loader. It contains a list of memory locations, the contents of the register at each location, and an explanation of the directive called forth by each register code.

3-3 A sample printout of a line from a program listing, with an explanation of what each column represents follows. (There may be as many as nine columns, but not every column will appear in every listing.)

EXAMPLE:

1118	1	003FC	75D2058D	A	ZBTH	STB, R13	ZTEMP1+1, X1	STORE BYTE
a	b	c	d	e	f	g	h	i

a. Line number

b. Indication of memory protection key (applies only to Sigma 5 and 7)

c. Memory address

d. Routine instruction and data

e. Indication whether of absolute origin or not

f. Tag

g. Operation

h. Operand

i. Comments

```
ΔSIGMET SI.LO,BO
      1*                          * CATALOG NO. 704356 SIGMA 5/7 DIAGNOSTIC PROGRAM RELOCATABLE LOADER
      2*                                  SYSTEM   SIG7FDP
      3*                                  SOCW
      4*                          *
      5*                          * CONTENTS OF CARD ONE LOADED BY STANDARD FILL PROCEDURE
      6*                          *
      7*       00000001           X       EQU      1
      8*   1 0002A                        ORG      X'2A'
           1 0002A
      9*   1 0002A    2200001E    START   LI,0     DA(IOC1)
     10*   1 0002B    CC000025 A  P1      SIO,0    *37                 READ
     11*   1 0002C    CD000025 A          TIO,0    *37                  LOADER
     12*   1 0002D    69C0002C            BCS,12   $-1                   CARDS
     13*   1 0002E    68000041    P2      B        P10                 *AWM,2 IOC1*
     14*   1 0002F    6430002B            BDR,3    P1
     15*   1 00030    32300025 A          LW,3     37                  SAVE READER
     16*   1 00031    35320003 A          STW,3    3,X                  ADDRESS
     17*   1 00032    6632005C            AWM,3    ROCA,X
     18*   1 00033    6632005D            AWM,3    ROCB,X
     19*   1 00034    66120004 A          AWM,X    4,X                 SAVE LOADER BIAS
     20*   1 00035    22000000 A          LI,0     0                   RELOCATION BIAS
     21*   1 00036    22B00000 A          LI,11    0                    LOAD MODE
     22*   1 00037    6C000000 A          RD,0     0                   SS 1 SET
     23*   1 00038    6880003A            BCR,8    P3
     24*   1 00039    2E000000 A          WAIT                         ENTER RELOCATION BIAS
     25*   1 0003A    68020004 A  P3      B        4,X                 TO LOADER
     26*   1 0003C                        BOUND    8
     27*   1 0003C    02000100 A  IOC1    DATA     X'02000100'         COMMAND
     28*   1 0003D    0E000078 A          DATA     X'0E000078'          PAIR
     29*       0000000A                   DO       START-$+30          ZERO FILL CARD 1
     30*   1 0003E    00000000 A          DATA     0
     31*                                  FIN
     30*   1 0003F    00000000 A          DATA     0
     31*                                  FIN
     30*   1 00040    00000000 A          DATA     0
     31*                                  FIN
     30*   1 00041    C0000000 A          DATA     0
```

```
      31*                                          FIN
      30*    1 00042     00000000 A               DATA      0
      31*                                          FIN
      30*    1 00043     00000000 A               DATA      0
      31*                                          FIN
      30*    1 00044     00000000 A               DATA      0
      31*                                          FIN
      30*    1 00045     00000000 A               DATA      0
      31*                                          FIN
      30*    1 00046     00000000 A               DATA      0
      31*                                          FIN
      30*    1 00047     00000000 A               DATA      0
      31*                                          FIN
```

```
32*                                          PAGE
33*                                   *
34*                                   * CONTENTS OF CARD TWO INPUT BY CARD ONE
35*                                   *
36*   1 00040                                ORG      64
      1 00040
37*   1 00040     0F000050     LOC40     XPSD,0   P40
38*   1 00041     22120F80 A   P10       LI,1     X'20F80'       COMPUTE
39*   1 00042     3810004E     P11       SW,1     P19             MEMORY
40*   1 00043     B5100001 A             STW,1    *1               SIZE
41*   1 00044     32200001 A             LW,2     1              INITIALIZE
42*   1 00045     25200002 A             SLS,2    2               INPUT BYTE
43*   1 00046     7230003C               LB,3     IOC1              ADDRESS
44*   1 00047     75300002 A             STB,3    2                  FOR LOADER
45*   1 00048     3520003C               STW,2    IOC1
46*   1 00049     3220004F               LW,2     P20            RESET
47*   1 0004A     3520002E               STW,2    P2              BRANCH
48*   1 0004B     22200078 A             LI,2     120            BYTE
49*   1 0004C     22300004 A             LI,3     4               CARD
50*   1 0004D     6800002A               B        START             COUNT
51*   1 0004E     00001000 A   P19       DATA     4096
52*   1 0004F     6620003C     P20       AWM,2    IOC1
53*   1 00050                            BOUND    8
54*   1 00050     00000000 A   P40       DATA     0              XPSD
55*   1 00051     00000000 A             DATA     0               AREA
56*   1 00052     00000042               DATA     P11
57*   1 00053     00000000 A             DATA     0
58*          0000000A                    DO       LOC40-$+30     ZERO FILL CARD 2
59*   1 00054     00000000 A             DATA     0
60*                                      FIN
59*   1 00055     00000000 A             DATA     0
60*                                      FIN
59*   1 00056     00000000 A             DATA     0
60*                                      FIN
59*   1 00057     00000000 A             DATA     0
60*                                      FIN
59*   1 00058     00000000 A             DATA     0
```

```
60*                                          FIN
59*    1 00059    00000000 A                 DATA     0
60*                                          FIN
59*    1 0005A    00000000 A                 DATA     0
60*                                          FIN
59*    1 0005B    00000000 A                 DATA     0
60*                                          FIN
59*    1 0005C    00000000 A                 DATA     0
60*                                          FIN
59*    1 0005D    00000000 A                 DATA     0
60*                                          FIN
```

```
 61*                                  PAGE
 62*                              *
 63*                              * CONTENTS OF CARD THREE THROUGH CARD SIX INPUT VIA CARD ONE AND TWO
 64*                              *
 65*                              * CONTENTS OF CARD NUMBER 3
 66*                              *
 67*    1 00000                       ORG      0
        1 00000
 68*        00000022              L2IN    EQU      X'22'               INPUT ADDRESS
 69*    1 00000    02000088 A     IOCA    DATA     X'02000088'         INPUT AREA
 70*    1 00001    0E000078 A             DATA     X'0E000078'          LOC 22-3F
 71*    1 00002    00000000 A     BIAS    DATA     0                   PROGRAM RELOCATION BIAS
 72*    1 00003    00000000 A     ADDR    DATA     0                   READER ADDRESS
 73*    1 00004    22100000 A     L1      LI,1     0                   LOADER RELOCATION BIAS
 74*    1 00005    35020002               STW,0    BIAS,X
 75*    1 00006    22D00000 A             LI,13    0                   SEQUENCE NUMBER
 76*    1 00007    22E00000 A             LI,14    0                   START ADDRESS
 77*    1 00008    6AF2005A               BAL,15   ROC,X               READ ONE CARD
 78*    1 00009    6802000B               B        $+2,X
 79*    1 0000A    6AF20058       L1A     BAL,15   FOB,X                FETCH ONE BYTE
 80*    1 0000B    21000004 A             CI,0     4                   ORIGIN
 81*    1 0000C    6832003C               BCR,3    L3,X
 82*    1 0000D    2100000D A             CI,0     13                  START
 83*    1 0000E    68320041               BCR,3    L5,X
 84*    1 0000F    2100000E A             CI,0     14                  MODULE END
 85*    1 00010    68320046               BCR,3    L6,X
 86*    1 00011    2100000C A             CI,0     12                  CONTROL SECTION DECLARATION
 87*    1 00012    6832002D               BCR,3    L10,X
 88*    1 00013    32200000 A             LW,2     0
 89*    1 00014    2520007C A             SLS,2    -4
 90*    1 00015    21200004 A             CI,2     4                   LOAD ABSOLUTE
 91*    1 00016    6832004F               BCR,3    L7,X
 92*    1 00017    32C20002               LW,12    BIAS,X
 93*    1 00018    21200008 A     L1B     CI,2     8                   LOAD RELOCATABLE
 94*    1 00019    69420023               BCS,4    L8,X
 95*    1 0001A    32200000 A             LW,2     0                   FIND RELOCATION FOR
 96*    1 0001B    4B220069               AND,2    ROC2,X               BYTE OR
```

```
 97*   1 0001C    25C00002 A            SLS,12   2                  HALF WORD OR
 98*   1 0001D    3A200002 A            LCW,2    2                   WORD OR
 99*   1 0001E    25C40000 A            SLS,12   0,2                  DOUBLE WORD
100*                          *
101*                          * CONTENTS OF CARD NUMBER 4
102*                          *
103*   1 0001F    4B020018              AND,0    L1B,X
104*   1 00020    69320022              BCS,3    $+2,X
105*   1 00021    6AF20058              BAL,15   F0B,X
106*   1 00022    6AF20058              BAL,15   F0B,X
107*                          *
108*                          *        L O A D  R E L O C A T A B L E
109*                          *
110*   1 00023    2560007E A  L8        SLS,6    -2
111*   1 00024    223FFFFC A            LI,3     -4
112*   1 00025    6AF20058    L81       BAL,15   F0B,X              FETCH 4 BYTES
113*   1 00026    75060006 A            STB,0    6,3
114*   1 00027    65320025              BIR,3    L81,X
115*   1 00028    3050000C A            AW,5     12                 ADD BIAS WORD
116*   1 00029    355C0000 A            STW,5    0,6
117*   1 0002A    33100006 A            MTW,1    6
118*   1 0002B    25600002 A            SLS,6    2
119*   1 0002C    6802000A              B        L1A,X
120*                          *
121*                          *        D E C L A R E  C O N T R O L  S E C T I O N
122*                          *
123*   1 0002D    33300007 A  L10       MTW,3    7                  SKIP 3 BYTES
124*   1 0002E    6802000A              B        L1A,X
125*                          *
126*                          *        E X P R E S S I O N  P R O C E S S O R
127*                          *
128*   1 0002F    22500000 A  EXPR      LI,5     0
129*   1 00030    6AF20058    EXPR1     BAL,15   F0B,X              FETCH 1 BYTE
130*   1 00031    21000002 A            CI,0     2
131*   1 00032    E830000C A            BCR,3    *12
132*   1 00033    21000001 A            CI,0     1
133*   1 00034    68320037              BCR,3    EXPR2,X
```

```
134*   1 00035   6AF20058            BAL,15   F0B,X
135*   1 00036   68020030            B        EXPR1,X
136*   1 00037   223FFFFC A  EXPR2    LI,3     -4                FETCH 4 BYTES
137*   1 00038   6AF20058            BAL,15   F0B,X
138*   1 00039   75060006 A          STB,0    6,3
139*   1 0003A   65320038            BIR,3    EXPR2+1,X
140*   1 0003B   68020030            B        EXPR1,X
141*                          *
142*                          * CONTENTS OF CARD NUMBER 5
143*                          *
144*                          *       D E F I N E  L O A D  C O U N T E R
145*                          *
146*   1 0003C   6AC2002F     L3       BAL,12   EXPR,X            FETCH EXPRESSION
147*   1 0003D   32620002             LW,6     BIAS,X
148*   1 0003E   25600002 A           SLS,6    2
149*   1 0003F   30600005 A           AW,6     5
150*   1 00040   6802000A             B        L1A,X
151*                          *
152*                          *       D E F I N E  S T A R T  A D D R E S S
153*                          *
154*   1 00041   6AC2002F     L5       BAL,12   EXPR,X
155*   1 00042   2550007E A           SLS,5    -2
156*   1 00043   30520002             AW,5     BIAS,X
157*   1 00044   3550000E A           STW,5    14
158*   1 00045   6802000A             B        L1A,X
159*                          *
160*                          *       M O D U L E  E N D
161*                          *
162*   1 00046   6AF20058     L6       BAL,15   F0B,X            FETCH SEVERITY BYTE
163*   1 00047   21800000 A           CI,11    0                LOADER CALLED
164*   1 00048   E930000B A           BCS,3    *11               AS LOAD SUBROUTINE
165*   1 00049   6C000000 A           RD,0     0                TEST SS 2
166*   1 0004A   6842004C             BCR,4    $+2,X
167*   1 0004B   2E000000 A           WAIT
168*   1 0004C   21E00000 A           CI,14    0
169*   1 0004D   6832004D             BCR,3    $,X              NO START ADDRESS
170*   1 0004E   E800000E A           B        *14              *TO START PROGRAM*
```

```
171*                                    *
172*                                    *        L O A D   A B S O L U T E
173*                                    *
174*    1 0004F    4B020077        L7   AND,0    R0C5,X              GET
175*    1 00050    69220052             BCS,2    $+2,X                BYTE
176*    1 00051    22000010 A           LI,0     16                    COUNT
177*    1 00052    32300000 A           LW,3     0
178*    1 00053    6AF20058        L71  BAL,15   F0B,X
179*    1 00054    750C0000 A           STB,0    0,6
180*    1 00055    33100006 A           MTW,1    6
181*    1 00056    64320053             BDR,3    L71,X               LOOP
182*    1 00057    6802000A             B        L1A,X
183*                                    *
184*                                    *        F E T C H   O N E   B Y T E
185*                                    *
186*    1 00058    31700009 A      F0B  CW,7     9                   LAST BYTE
187*    1 00059    69320075             BCS,3    R0C4A,X
188*                                    *
189*                                    * CONTENTS OF CARD NUMBER 6
190*                                    *
191*                                    *        R E A D   O N E   C A R D
192*                                    *
193*    1 0005A    32000001 A      R0C  LW,0     1
194*    1 0005B    2500007F A           SLS,0    -1
195*    1 0005C    4C000000 A      R0CA SIO,0    0                   READ ONE CARD
196*    1 0005D    4D000000 A      R0CB TIO,0    0                   WAIT FOR
197*    1 0005E    69C2005D             BCS,12   $-1,X                READY
198*    1 0005F    72800022 A           LB,8     L2IN
199*    1 00060    22700001 A           LI,7     1
200*    1 00061    720E0022 A           LB,0     L2IN,7
201*    1 00062    3100000D A           CW,0     13
202*    1 00063    69320063             BCS,3    $,X                 *SEQUENCE ERROR*
203*    1 00064    30800000 A           AW,8     0
204*    1 00065    33100007 A           MTW,1    7
205*    1 00066    720E0022 A           LB,0     L2IN,7
206*    1 00067    210000FF A      R0C1 CI,0     255                 BYPASS CHECK SUM
207*    1 00068    68320074             BCR,3    R0C4,X
```

```
208*   1 00069   22700003 A   R0C2     LI,7     3
209*   1 0006A   731E000D A             MTB,1    13,7
210*   1 0006B   729E0022 A             LB,9     L2IN,7
211*   1 0006C   72AE0022 A   R0C3     LB,10    L2IN,7
212*   1 0006D   30600004 A             AW,8     10
213*   1 0006E   48820067               AND,8    R0C1,X
214*   1 0006F   33100007 A             MTW,1    7
215*   1 00070   31700009 A             CW,7     9
216*   1 00071   6932006C               BCS,3    R0C3,X
217*   1 00072   31000008 A             CW,0     8
218*   1 00073   69320073               BCS,3    $,X      *CHECK SUM ERROR*
219*   1 00074   22700004 A   R0C4     LI,7     4
220*   1 00075   720E0022 A   R0C4A    LB,0     L2IN,7   LOAD BYTE
221*   1 00076   33100007 A             MTW,1    7
222*   1 00077   E800000F A   R0C5     B        *15      RETURN
223*                                    END
```