HP 59307A VHF Switch ◄HP-IB► HP 1000 Computer

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Programming Guide

Device Introduction

The HP 59307A[1] provides two DC to 500 MHz, 50 ohm switches (4 pole single throw) which are optimized for fast rise time (one nanosecond) pulse waveforms. These switches can be controlled either manually from front-panel push buttons or remotely from the HP-IB.

Under program control, the switches are operated by addressing the 59307A to listen, and then sending either the ASCII character A or B followed by the switch number (1 through 4). This causes the common switch port for switch A or switch B to be connected to the selected switch position. A local RESET push button lets the operator assume front-panel control of the instrument if a local lockout command has not been applied to the 59307A.

The VHF switch is a listen-only device. Data messages may be sent to the device to select input channels, but the device is not capable of returning messages to the computer.

Addressing

Setting the 59307A address is straightforward. The rear panel can be seen in figure 2-1. Viewed from the back, when the box is rotated onto its left side, the switches can be read in binary. Address 25B is set at the factory. As an aid for address setting, the switches are also described on the underside of the box.

System Preparations

Lu Assignment

One LU will be needed for the 59307A. The File Manager command,

```
:SYLU,22,10,25B
```

will assign LU 22 to EQT 10. The device address of the 59307A will be 25 octal.

Output Buffering

Turn off buffering, until the device is checked out. From File Manager,

```
:SYEQ,10,UN
```

will unbuffer EQT 10. Note that if switch timing is critical, the buffering option may cause timing problems and should be left off.

Time-out

Time-out is an error condition for this device. Remember that time-out errors may be optionally evaluated by the operating system or the user's program by setting the device configuration word. The 59307A will cause a time-out to occur only if the hardware malfunctions, the listen address is set improperly, or the bus is inoperative.

Because operator intervention is usually required to correct these problems, one alternative is to let the operating system process the time-out (i.e., set the 59307A down) when it occurs. The device configuration word defaults to operating system error processing.

The user program can process time-out errors when the E bit of the configuration word is set to one (see figure 2-2). The procedure in this case is to call the subroutine "IBERR" after each I/O request.[2]

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[1]*The 59307A VHF Switch Operating and Service Manual (part number, 59307-90001) contains complete information pertaining to the instrument. This note should also be used in conjunction with Application Note 401-1 (5953-2800).*

[2]*See the HP-IB User's Manual (part no. 59310-90064) for more information. Appendix C of that manual describes %MESS (59310-60011) containing IBERR, RMOTE, and LOCAL.*

Figure 2-1. 59307A Address Switches
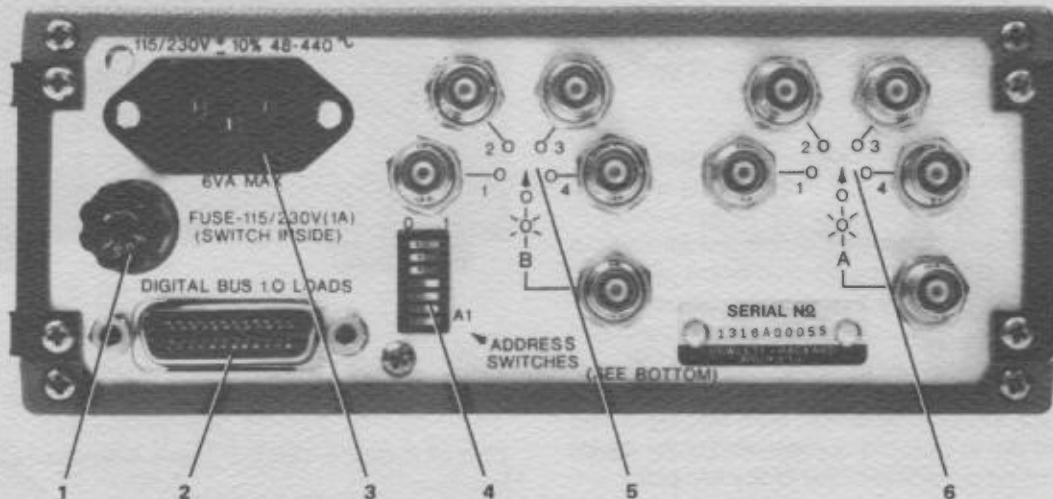
1. **Fuse:** A 0.5 amp slow-blow fuse is required for either 115-volt operation or 230-volt operation.

2. **Digital Bus 1.0 Loads connector:** A 24-pin connector used to convey data and programming instructions to the 59307A. The "1.0 LOADS" label indicates that the instrument represents the normal allowable standard load for one instrument on the Interface Bus (see Table 1-2).

3. **AC Input Connector:** Ac power receptacle. IEC type with offset pin connected to the chassis. Accepts 115-volts ± 10%, 48 to 440 Hz. Maximum power draw is six volt-amperes.

4. **Address Switches:** The bottom five switches are used to assign an address code to the 59307A. Switches 6 and 7 are not used.

5. **Switch B Input/Output Connectors:** Front-panel switch positions or remote programming determines the connection of connectors 1, 2, 3, or 4 to common connector B.

6. **Switch A Input/Output Connectors:** Front-panel switch positions or remote programming determines the connection of connectors 1, 2, 3, or 4 to common connector A.

Configuration Word

The device configuration word (figure 2-2) will default to the correct format when DMA has not been allocated. This can be assured by setting the D bit to zero. From File Manager,

    :CN,22,25B,17000B

specifies no DMA, and system error checking. The File Manager command,

    :CN,22,25B,17400B

specifies no DMA, and user program error checking.

Remote

The 59307A must be set to remote before it can be programmed. From File Manager the request,

    :CN,22,16B

will put the 59307A, LU 22 into remote.[2] From a FORTRAN program,

    CALL REMOTE(22)

will put LU 22 into remote.

Front panel operator control may be restored by returning the instrument to local. The File Manager request,

    :CN,IBLU,17B

or the FORTRAN request,

    CALL LOCAL (IBLU)

will perform the operation.[2] When returning the bus to local, special care must be taken to insure that other devices on the bus are not affected. The local request is not a device-specific command. When the command is sent, all HP-IB devices in remote and on the same bus will be returned to local.

Programming

NOTE

Because end-of-record terminators must be suppressed, using File Manager for sending data messages to the 59307A is not suggested.

The 59307A is a listen-only device that communicates in ASCII. This means that the instrument will perform useful tasks when programmed with ASCII commands, but is not capable of returning any information to the HP 1000 computer.
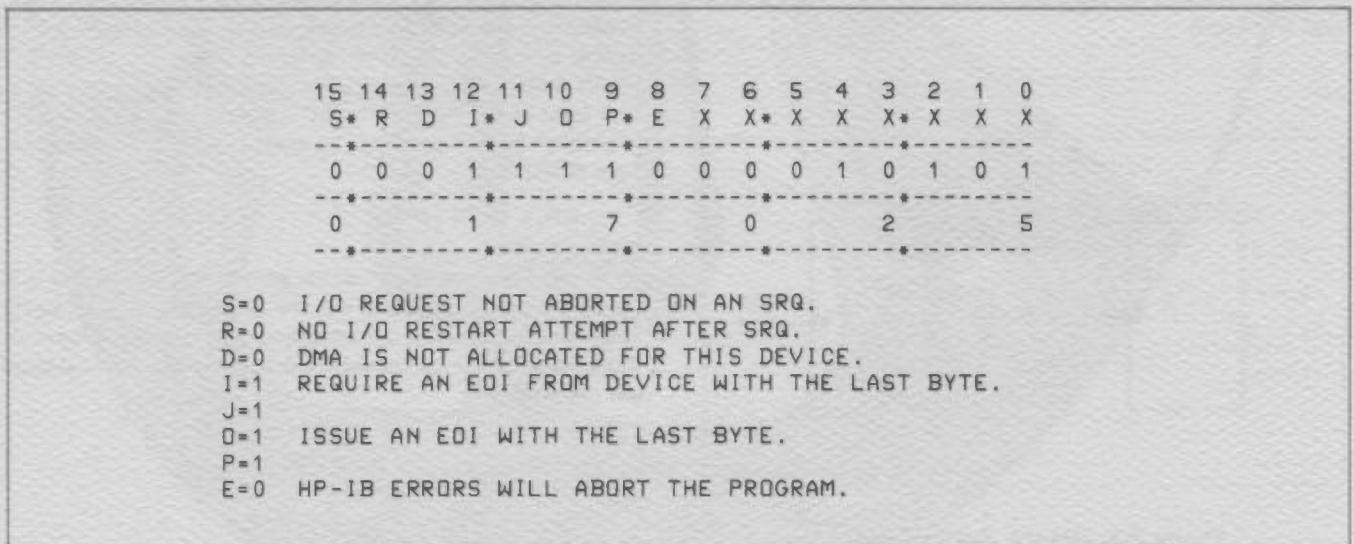
```
    15 14 13 12 11 10  9  8  7  6  5  4  3  2  1  0
    S* R  D  I* J  O  P* E  X  X* X  X  X* X  X  X
    --*--------*--------*--------*--------*--------
    0  0  0  1  1  1  1  0  0  0  0  1  0  1  0  1
    --*--------*--------*--------*--------*--------
    0        1        7        0        2        5
    --*--------*--------*--------*--------*--------

    S=0  I/O REQUEST NOT ABORTED ON AN SRQ.
    R=0  NO I/O RESTART ATTEMPT AFTER SRQ.
    D=0  DMA IS NOT ALLOCATED FOR THIS DEVICE.
    I=1  REQUIRE AN EOI FROM DEVICE WITH THE LAST BYTE.
    J=1
    O=1  ISSUE AN EOI WITH THE LAST BYTE.
    P=1
    E=0  HP-IB ERRORS WILL ABORT THE PROGRAM.
```

Figure 2-2. 59307A Configuration Word Format

The VHF switch is a device which conforms to normal ASCII communication methods except that end-of-record terminators must be suppressed. There is a specific set of ASCII characters which the 59307A recognizes. Other extraneous characters (blanks, commas, carriage returns, linefeeds, etc.) should be avoided.

Table 2-1 shows a complete list of 59307A programming commands. Notice that two channels, A or B are selectable, and that each channel has four switch positions. Figure 2-1 shows a picture of the 59307A rear panel and the switch layouts for channels A and B. Figure 2-3 also shows a schematic diagram. The switch outputs can be connected to one of the four inputs.

To close relay 3 in section A and relay 4 in section B of the VHF switch, the characters "A3B4" should be sent.

Basically the VHF switch operates in one of two modes, Channel A mode or Channel B mode. Once the alphabetic character A is sent, the 59307A remains on Channel "A" until "B" is sent. The numbers 1,2,3, or 4 are then sent, changing the switch position. The alphabetic character need not be repeated while selecting 1, 2, 3, or 4 on the same channel.

When a user program must switch back and forth (figure 2-4), the characters "A" and "B" must be sent.

The program in figure 2-4 is one which may be effectively used to rotate both channels A and B to see if they operate properly. The channel must be selected each time a request is made. Note that the underline character is used at the end of each message to suppress EORs (i.e., carriage returns and linefeeds).
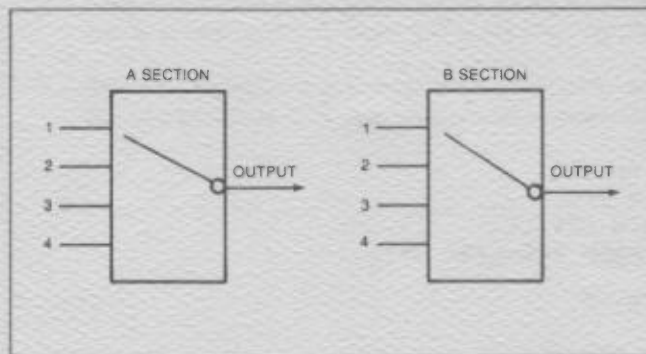
Table 2-1. 59307A Programming Commands

ASCII CODE	59307A RESPONSE
A	Programs instrument to connect one of the A group connectors 1, 2, 3, or 4 to common connector A. Specific connection depends on the succeeding code in program sequence.
B	Programs instrument to connect one of the B group connectors 1, 2, 3, or 4 to common connector B. Specific connection depends on the succeeding code in the program sequence.
1 2 3 4	These codes select which connector (1, 2, 3, or 4) is to be connected to the appropriate common connector A or B. For example, if an ASCII A is succeeded by an ASCII 2, connector 2 and common connector A are connected together.

Local Lockout

The 59307A has on its front panel, a "LOCAL" switch for manually returning the box to front panel control. When the switch is pressed, the 59307A defaults to the Channel A or B positions (1,2,3,4) manually selected on the panel. Note that during this time, the VHF switch will continue accepting HP-IB information, but ignores programming instructions. The front panel button "LOCAL" may be "LOCKED OUT" (disabled) by sending the "LOCAL LOCKOUT" command from FORTRAN,

    CALL LLO(IBLU)

Note that the message must be sent to the bus logical unit (device address zero) and not the device logical unit. Local Lockout is not a device dependent function. All HP-IB devices (addressed or not addressed) which recognize this message will respond.
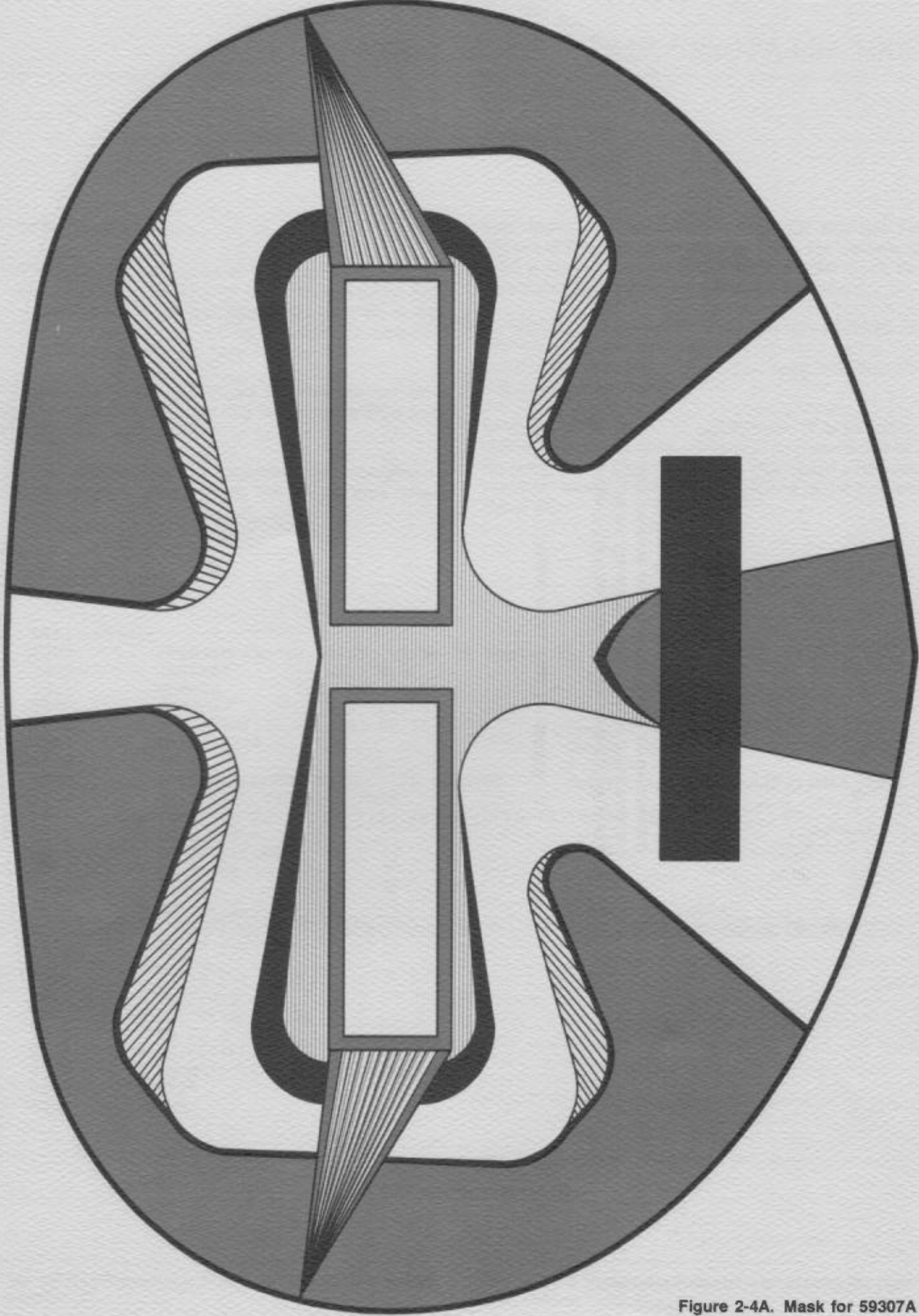

Figure 2-3. 59307A Switch Layout

Figure 2-4A. Mask for 59307A

CUT OUT

CUT OUT

Figure 2-4A. Mask for 59307A

Figure 2-7 is to be used with the test program given in Figure 2-4. Cut out the eyes and head of the mask and tape the mask over the 59307A with the switches protruding through the eyes of the mask. Then run the program in Figure 2-4. If the computer is multiprogramming some other activities you will notice some interesting effects.

Performance

VHF switching response is limited by the speed at which its relays can function. The 59307A specifications indicate that relay settling time is 20 ms, which limits switching to 50 channels per second. This rate may be controlled using HP 1000 software as shown in figure 2-5.

The CALL EXEC statement[3] in line 16 allows the user program to wait for the amount of time determined by IRES and IOF (shown in figure 2-6).

The RTE operating system will schedule B307 again after a time determined by IRES and IOF. The value of IRES is the time resolution (figure 2-6). The value IOF indicates the number of time units determined by IRES. For example, if IRES is set to 2 (i.e., "seconds") and IOF is set to −5, the program will begin execution again in 5 seconds.

Remember that a given offset of time is required to initiate an I/O request in the RTE operating system.[4] Before any 59307A channel may be selected, this "setup" time (typically 2 to 8 ms) will be incurred.

When using the 59307A to switch inputs of a measuring instrument such as a digital voltmeter or time interval counter, the statements to trigger and input a reading to the HP 1000 would be entered after line 16 appearing in the program (figure 2-5).

```
0001   FTN4,L
0002        PROGRAM A307(3,32767),03-08-79 (GWG) TEST 59307A
0003        INTEGER      INPRM,GTDLU
0004        COMMON       ILU,ILST,IDLU
0005        COMMON       /IEROR/YES,NO
0006        IF(INPRM(ID).EQ.YES) GO TO 8          Obtain input parameters.
0007        DNAM=59307.                           Device's model number.
0008        IN=1                                  Instrument number.
0009        IF(GTDLU(DNAM,IN,IDLU).EQ.NO)STOP     Get the device LU. See AN 401-1 (5953-2800).
0010        WRITE(ILU,445)IDLU,DNAM
0011    445 FORMAT(/"DEVICE LU "I2" IS ASSIGNED TO THE HP "F5.0/)
0012      8 DO 9 I=2,4
0013        DO 12 K=1,5000
0014     12 CONTINUE
0015        J=5-I
0016      9 WRITE(IDLU,10)I,J                     Output to the 59307A.
0017     10 FORMAT("A"I1"B"I1"_")                 The "_" is used to suppress the CRLF.
0018        DO 20 J=2,4
0019        I=5-J
0020        DO 13 K=1,5000
0021     13 CONTINUE
0022     20 WRITE(IDLU,10)I,J
0023        GO TO 8
0024    999 WRITE(ILU,11)
0025     11 FORMAT(":RU,A307,ILST,IDLU"/)
0026        STOP
0027        END
```

Figure 2-4. 59307A Test Program

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[3]See the RTE Programmers Manual (for RTE IV, part number 92067-90001).

[4]See AN201-4, "Performance Evaluation of HP-IB Using RTE Operating Systems."

```
0001    FTN4,L
0002            PROGRAM B307(3,32767),01-29-79 (GWG) TEST 59307A
0003            INTEGER      INPRM,GTDLU,IPRG(3)
0004            COMMON       ILU,ILST,IDLU
0005            COMMON       /IEROR/YES,NO
0006    C
0007            IF(INPRM(ID).EQ.YES) GO TO 20          Obtain input parameters.
0008            DNAM=59307.                            Instrument model no.
0009            IN=1                                   Instrument no. on bus.
0010            IF(GTDLU(DNAM,IN,IDLU).EQ.NO)STOP      Get the device LU from the model number.
                                                       See Chapter 6 of AN 401-1 (5953-2800).
0011            IRES=1                                 Time resolution set to 10 ms.
0012            IOF=1                                  Offset = 10. * 10E-3.
0013         5 DO 10 I=1,20
0014            WRITE(ILU,20)I,I                       Output to the 59307A.
0015        20 FORMAT("A"I2"B"I2"_")                   The "_" suppresses the CRLF.
0016            CALL EXEC(12,0,IRES,0,-IOF)            RTE wait statement.
0017    C
0018        10 CONTINUE
0019            WRITE(ILU,30)                          Ask user for new
0020        30 FORMAT(" ENTER: IRES,IOF: ")            resolution and offset.
0021            READ(ILU,*)IRES,IOF
0022            IF(IRES.LT.0) GO TO 40
0023            GO TO 5
0024        40 STOP
0025            END
```

Figure 2-5. 59307A Program Scheduling with Offset

```
    CALL EXEC(12,0,IRES,0,-IOF)

    IRES              Resolution
     1          tens of milliseconds
     2                seconds
     3                minutes
     4                 hours

        IOF in the range 0-4096
```

Figure 2-6. Program Scheduling Using Timed Offset