Errata

**Document Title:** 3325A Synthesizer / Function Generator and 1000 Computer HP-IB Programming Guide (AN 401-13)

**Part Number:** 5953-2812

**Revision Date:** June 1979

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**HP References in this Application Note**

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Device Introduction

The HP 3325A Synthesizer/Function Generator produces the following signals from a minimum frequency of 1 \( \mu \text{Hz} \) to a maximum frequency of:

- Sine wave: 20 MHz
- Square wave: 10 MHz
- Triangle: 10 kHz
- Positive slope ramp: 10 kHz
- Negative slope ramp: 10 kHz

Frequencies may be selected with up to 11 digits of resolution. Output amplitude is from 1 millivolt to 10 volts peak-to-peak. The output level may also be selected or displayed in RMS volts or in dBm (50 ohms). Any function may be DC offset up to +5 volts. An optional high voltage output produces up to 40 volts peak-to-peak given that the load is more than 500 ohms.

For all functions, frequency sweep is provided in linear or log sweep, at sweep times of 10 milliseconds to 99.99 seconds.

Minimum time is 2 seconds for single sweep and 0.1 seconds for continuous sweep. Single linear sweep may be up or down, while continuous sweep is up/down/up, etc., in the linear mode and up/up, etc., in log mode.

The 3325A can be programmed remotely in the same manner as it is programmed from the front panel. All of the HP-IB messages are available except "trigger," the "status bit" (also known as parallel poll), and "pass control." The 3325A has sophisticated error checking facilities which can be combined with SRQ functions to provide powerful diagnostic analysis of on-line problems.

All applicable functions are programmable using an organized mnemonic message structure. Various 3325A modes can be programmed and tested separately in subroutines, then combined for application-specific problems.

Addressing

The 3325A is normally shipped from the factory with the TALK/LISTEN address set to 21 octal (17 decimal). Its address switches are located inside the top cover near the center of the instrument. The possible HP-IB addresses are shown in figure 13-1.

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*The 3325A Operating and Service Manual (03325-90000) and Application Note 401-1 (5953-2800) should be used in conjunction with this note.*
### ASCII Characters and Address Switches

<table>
<thead>
<tr>
<th>Listen Address</th>
<th>Talk Address</th>
<th>ASCII Characters</th>
<th>Address Switches (Binary Code)</th>
<th>Equivalent Codes (To 5-Bit Binary Switches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP</td>
<td>@</td>
<td>0 0 0 0 0</td>
<td>00 00 00</td>
<td>00 00 00</td>
</tr>
<tr>
<td>#</td>
<td>#</td>
<td>0 0 0 1 1</td>
<td>01 01 01</td>
<td>01 01 01</td>
</tr>
<tr>
<td>$</td>
<td>$</td>
<td>0 0 1 0 1</td>
<td>02 02 02</td>
<td>02 02 02</td>
</tr>
<tr>
<td>%</td>
<td>%</td>
<td>0 0 1 0 0</td>
<td>03 03 03</td>
<td>03 03 03</td>
</tr>
<tr>
<td>&amp;</td>
<td>&amp;</td>
<td>0 0 1 1 0</td>
<td>04 04 04</td>
<td>04 04 04</td>
</tr>
<tr>
<td>(</td>
<td>(</td>
<td>0 1 0 0 0</td>
<td>05 05 05</td>
<td>05 05 05</td>
</tr>
<tr>
<td>)</td>
<td>)</td>
<td>0 1 0 0 1</td>
<td>06 06 06</td>
<td>06 06 06</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
<td>0 1 0 1 1</td>
<td>07 07 07</td>
<td>07 07 07</td>
</tr>
<tr>
<td>/</td>
<td>/</td>
<td>0 1 1 1 1</td>
<td>08 08 08</td>
<td>08 08 08</td>
</tr>
</tbody>
</table>

**Factory Selected Address**: 1

**NOTE**: The Equivalent Codes shown correspond only to the 5-bit binary switch code. These bits are the same for both listen and talk addresses, and the sixth and seventh bits determine whether the address is listen (01) or talk (10). Some controllers distinguish between listen and talk automatically, requiring only the 5-bit code equivalent to designate a device.

![Address Switches Diagram](image)

Figure 13-1. 3325A TALK/LISTEN Addresses
System Preparations

LU Assignment

One LU should be assigned to the 3325A’s TALK/LISTEN address. Assuming the factory set address of 21B will be used, the File Manager command,

:SYLU,16,10,21B

will assign LU 16, mapped through EQT 10, to the 3325A.

Output Buffering

Buffering may be used on output from the HP 1000 to the 3325A once the instrument has been checked out and user software has been thoroughly verified. To unbuffer EQT 10 for hardware and software verification, a File Manager request may be used,

:SYEQ,10,UN

To buffer EQT 10,

:SYEQ,10,BU

Buffering affects all devices on the same EQT. Make sure that timing (on output from the HP 1000) will not be adversely changed for other HP-IB devices.

Time-Out

A time-out occurrence is considered to be an error condition within the 3325A. Triggering is not applicable, and the instrument does not return measurements to the computer. Time-outs may be handled by the operating system by allowing the device configuration word to default to its normal setting. The EQT time-out value may be set as short as one second, but other devices on the same bus must be considered also.

Configuration Word

DMA should not be allocated to the 3325A. The configuration word should be verified or set to reflect this condition. From File Manager,

:CN,16,25B,17000B

will set non-DMA and operating system processing of time-out errors. End-of-record processing is standard in the 3325A and will need no reconfiguration.

Remote

The 3325A must be programmed into remote before data messages will be recognized. The File Manager command,

:CN,16,16B

will set LU 16 into remote. The FORTRAN request,

CALL RMT(16)

will perform the same operation.

Programming

The 3325A communicates in ASCII only. Triggering and taking measurements are not applicable to the 3325A. The instrument may, however, be interrogated for internal status, so the essentials of programming are very simple.

Table 13-1 contains a list of 3325A programming commands. The documentation supplied in the 3325A Operating and Service Manual (03325-90000) is very good and should be read for instrument operation.

The 3325A recognizes programming strings (data messages) of the form shown in figure 13-2. Mnemonics, data, and delimiters are shown in their various columns in Table 13-1. EOS means “end of string” and is handled automatically by the HP 1000 as a carriage return linefeed (CRLF).

NOTE

Programming mode 2 should be used when operating the instrument with the HP 1000. The string “MD2” should be sent first.

| Mnemonic, Data, Delimiter, EOS |
| Mnemonic, Data, EOS |
| Mnemonic, EOS |
| I, Mnemonic, EOS |

Figure 13-2. 3325A Mnemonic Programming Structure
<table>
<thead>
<tr>
<th>Parameter or Operation</th>
<th>Mnemonics ASCII Code</th>
<th>Data</th>
<th>ASCII Code</th>
<th>Delimiters</th>
<th>Approximate Programming Time*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Transfer Mode</td>
<td>= MD = MD</td>
<td>1</td>
<td>NA</td>
<td></td>
<td>MD = 4.5 ms</td>
</tr>
<tr>
<td>Data Mode 1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Mode 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>= FU</td>
<td>0</td>
<td>= DC Only</td>
<td>NA</td>
<td>FU = 1500 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>= Sine</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>= Square</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>= Triangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>= Positive Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>= Negative Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>= FR</td>
<td>≤ 11</td>
<td>HZ = Hertz</td>
<td></td>
<td>FR = 7.0 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digits and Decimal</td>
<td></td>
<td>Each digit or decimal = 2.8 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>KH = KiloHertz</td>
<td></td>
<td>HZ, KH, or MH = 12.5 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MH = MegaHertz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amplitude</td>
<td>= AM</td>
<td>≤ 4</td>
<td>VO = Volts (p-p)</td>
<td></td>
<td>AM = 6.8 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digits and Decimal</td>
<td></td>
<td>Each digit, decimal or decimal = 2.8 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MV = Millivolts (p-p)</td>
<td></td>
<td>VO or MV = 90 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VR = Volts rms</td>
<td></td>
<td>VR or MR = 130 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MR = Millivolts rms</td>
<td></td>
<td>DB = 250 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DB = dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Offset</td>
<td>= OF</td>
<td>≤ 4</td>
<td>VO = Volts</td>
<td></td>
<td>OF = 6.8 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digits and Decimal</td>
<td></td>
<td>Each digit, decimal, or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MV = Millivolts</td>
<td></td>
<td>– sign = 2.8 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VO or MV = 82 ms</td>
</tr>
<tr>
<td>Phase</td>
<td>= PH</td>
<td>≤ 4</td>
<td>DE = Degrees</td>
<td></td>
<td>PH = 5 ms; DE = 28 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digits</td>
<td></td>
<td></td>
<td>Each digit and – sign = 2.8 ms</td>
</tr>
<tr>
<td>Sweep Start Frequency</td>
<td>= ST</td>
<td>≤ 11</td>
<td>HZ = Hertz</td>
<td></td>
<td>ST, SP, or MF = 7.0 ms</td>
</tr>
<tr>
<td>Sweep Stop Frequency</td>
<td>= SP</td>
<td>Digits and Decimal</td>
<td></td>
<td>Each digit or decimal = 2.8 ms</td>
<td></td>
</tr>
<tr>
<td>Sweep Marker Frequency</td>
<td>= MF</td>
<td></td>
<td>KH = KiloHertz</td>
<td></td>
<td>HZ, KH, or MH = 10.3 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MH = MegaHertz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweep Time</td>
<td>= TI</td>
<td>≤ 4</td>
<td>SE = Seconds</td>
<td></td>
<td>TI = 5.5 ms; SE = 7.0 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digits and Decimal</td>
<td></td>
<td>Each digit and decimal = 2.8 ms</td>
<td></td>
</tr>
<tr>
<td>Sweep Mode Linear</td>
<td>= SM</td>
<td>1</td>
<td>NA</td>
<td></td>
<td>SM = 4.5 ms</td>
</tr>
<tr>
<td>Logarithmic</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear or Front Panel Output</td>
<td>= RF</td>
<td>1</td>
<td>NA</td>
<td></td>
<td>RF = 44.5 ms</td>
</tr>
<tr>
<td>Rear Panel</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front Panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Store Program</td>
<td>= SR</td>
<td>1</td>
<td>1 Digit, 0-9</td>
<td>NA</td>
<td>SR = 11 ms; RE = 1700 ms</td>
</tr>
<tr>
<td>Recall Program</td>
<td>= RE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Execution Functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assign Zero Phase</td>
<td>= AP</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td>AP = 5.2 ms</td>
</tr>
<tr>
<td>Perform Auto-Cal</td>
<td>= AC</td>
<td></td>
<td></td>
<td></td>
<td>AC = 1500 ms</td>
</tr>
<tr>
<td>Start Single Sweep</td>
<td>= SS</td>
<td></td>
<td></td>
<td></td>
<td>SS = 300 ms</td>
</tr>
<tr>
<td>Start Continuous Sweep</td>
<td>= SC</td>
<td></td>
<td></td>
<td></td>
<td>SC = 300 ms</td>
</tr>
<tr>
<td>Perform Self-Test</td>
<td>= TE</td>
<td></td>
<td>NA</td>
<td></td>
<td>TE = 10,000 ms</td>
</tr>
<tr>
<td>Interrogate Program Error</td>
<td>= IER</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td>IER = 11.5 ms</td>
</tr>
</tbody>
</table>

*Program times are in addition to the data transfer time of 225 to 250 μs per byte.
Table 13-1. 3325A Programming Commands (Continued)

<table>
<thead>
<tr>
<th>Parameter or Operation</th>
<th>Mnemonics ASCII Code</th>
<th>Data</th>
<th>ASCII Code</th>
<th>Delimiters</th>
<th>Approximate Programming Time*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrogate Entry Parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IFR = 10 ms</td>
</tr>
<tr>
<td>Frequency</td>
<td>= IFR</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td>IAM = 9.8 ms</td>
</tr>
<tr>
<td>Amplitude</td>
<td>= IAM</td>
<td>NA</td>
<td></td>
<td></td>
<td>IOF = 9.8 ms</td>
</tr>
<tr>
<td>Offset</td>
<td>= IOF</td>
<td>NA</td>
<td></td>
<td></td>
<td>IFH = 8 ms</td>
</tr>
<tr>
<td>Phase</td>
<td>= IFH</td>
<td>NA</td>
<td></td>
<td></td>
<td>IST = 10 ms</td>
</tr>
<tr>
<td>Sweep Start Frequency</td>
<td>= IST</td>
<td>NA</td>
<td></td>
<td></td>
<td>ISP = 10 ms</td>
</tr>
<tr>
<td>Sweep Stop Frequency</td>
<td>= ISP</td>
<td>NA</td>
<td></td>
<td></td>
<td>IMF = 10 ms</td>
</tr>
<tr>
<td>Sweep Marker Frequency</td>
<td>= IMF</td>
<td>NA</td>
<td></td>
<td></td>
<td>ITI = 8.5 ms</td>
</tr>
<tr>
<td>Sweep Time</td>
<td>= ITI</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interrogate Function</td>
<td>= IFU</td>
<td>NA</td>
<td></td>
<td></td>
<td>IFU = 1603 ms</td>
</tr>
<tr>
<td>Mask Service Requests</td>
<td>= MS</td>
<td>See Para. 3-144</td>
<td>NA</td>
<td></td>
<td>MS = 4.5 ms</td>
</tr>
<tr>
<td>Binary (ON/OFF) Functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HV = 48 ms</td>
</tr>
<tr>
<td>High Voltage Output</td>
<td>= HV</td>
<td>OFF = 0</td>
<td>NA</td>
<td></td>
<td>MA = 7.0 ms</td>
</tr>
<tr>
<td>Amplitude Modulation</td>
<td>= MA</td>
<td>ON = 1</td>
<td></td>
<td></td>
<td>MP = 7.0 ms</td>
</tr>
<tr>
<td>Phase Modulation</td>
<td>= IMP</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Program times are in addition to the data transfer time of 225 to 250 \(\mu s\) per byte.

The 3325A does not default to mode 2 on power up. For this reason, the instrument should be initialized programmatically before any other operations are attempted. Figure 13-3 shows an example File Manager sequence for 3325A programming.

The output waveform from the 3325A after the sequence should be a sine wave, of amplitude 10 volts, with a frequency of 1000 Hz.

Programming strings may be sent to the 3325A using FORTRAN "WRITE" statements. For example,

```
WRITE(16,10)
10 FORMAT("MD2FU1FR1000.0HZ")
```

will send the ASCII message "MD2FU1FR1000.0HZ" to LU 16. At completion, the 3325A should be set to Mode 2, sine wave function, and a frequency of 1000 Hz.

Figure 13-4 contains a FORTRAN program and several function subprograms which remotely program waveform type, frequency, and amplitude in the 3325A. The program uses an interesting method for sending programming strings to the 3325A. In figure 13-4, strings are concatenated and when complete information has been obtained, the entire set of programming commands is sent using a "CALL EXEC" request.

```
:LL,16 . . . . . . . . . . . Output to the 3325A.
:AN,MD2 . . . . . . . . . . Set Mode 2.
:AN,FU1 . . . . . . . . . . Sine wave.
:AN,FR1000.0HZ . . . . . Frequency 1000.0 Hz.
:AN,AM10V0 . . . . . . . . Amplitude 10 Volts.
:LL,0G . . . . . . . . . . Set output back to user's terminal.
```

Figure 13-3. Example File Manager Sequence
4000       10 친 = 웨이스
        030       20 FORMAT(/"WAVEFORM FUNCTIONS. VALID ENTRIES ARE:"/)
        031       &       " DC = FUNCTION OFF (DC ONLY)"/,
        032       &       " SI = SINE",/,
        033       &       " SQ = SQUARE",/,
        034       &       " TR = TRIANGLE",/,
        035       &       " PS = POSITIVE SLOPE RAMP",/,
        036       &       " NS = NEGATIME SLOPE RAMP",/,
        037       &       " ENTER A FUNCTION: ")
        038       040       REG= EXEC(1,ILU+400B,FUNCTION,1)
        041       044       DO 20 I=1,6
        042       045       20 IF(FTBL(2,I).EQ.FUNCT)FVAL=FTBL(1,I)
        043       046       IF(FVAL.EQ.NO)FUNO=NO
        044       047       RETURN
        045       048       END
        046       049       C
        047       050       C
        048       051       INTEGER FUNCTION FREO(LNTH),02-08-79 (GWG) FREQUENCY
        049       052       C MAY RETURN:
        050       053       C FREQ = YES WHEN VALUES ARE ENTERED
        051       054       C = NO WHEN NOME ENTERED OR JUST RETURN
        052       055       C LNTH = 0 WHEN FREQ = NO
        053       056       C > 0 WHEN FREQ = YES

Figure 13-4. FORTAN Program for the 3325A
0057 C
0058 INTEGER  HERTZ,DVAL(6),MNENM,ISTR,YES,IREG(2)
0059 EQUIVALENCE (ISTR,MNENM),(ISTR(2),DVAL),
0060 & (IREG,IA,IREG),(IREG(2),IB)
0061 COMMON ILU,ILST,IDLU,ISTR(8)
0062 DATA NO/2HNO/,YES/2HYE/
0063 DO 20 I=1,8
0064 20 ISTR(I)=2H
0065 FREQ=NO
0066 MNENM=2HFR
0067 LNH=0
0068 WRITE(ILU,5000)
0069 5000 FORMAT("/FREQUENCY:"/,
0070 & " HZ = HERTZ"/,
0071 & " KH = KILOHERTZ"/,
0072 & " MH = MEGAHERTZ"/,
0073 & "")
0074 REG= REIO(1,ILU+400B,HERTZ,1)
0075 IF(HERTZ.EQ.2PHZ.OR.
0076 & HERTZ.EQ.2PHKH.OR.
0077 & HERTZ.EQ.2PHMH) GO TO 10
0078 RETURN
0079 C
0080 10 WRITE(ILU,5020)
0081 5020 FORMAT("DECIMAL VALUE (12.34 for example) : ")
0082 REG= EXEC(1,ILU+400B,DVAL,6)
0083 WRITE(ILU,144)IB
0084 144 FORMAT(6)
0085 IF(IB.EQ.6)DVAL(6)=IAND(DVAL(6),177400B)+40B
0086 IF(IB.EQ.0) RETURN
0087 LNH=IB+2
0088 DVAL(IB+1)=HERTZ
0089 FREQ=YES
0090 CALL EXEC(2,ILU,ISTR,LNTH)
0091 RETURN
0092 END
0093 C
0094 C
0095 INTEGER FUNCTION AMPL(LNH),02-08-79 (GWG) AMPLITUDE
0096 INTEGER VOLTS,DVAL(2),MNENM,ISTR,YES,IREG(2)
0097 EQUIVALENCE (ISTR,MNENM),(ISTR(2),DVAL),(ISTR(4),VOLTS),
0098 & (REG,IREG,IA),(IREG(2),IB)
0099 COMMON ILU,ILST,IDLU,ISTR(8)
0100 DATA NO/2HNO/,YES/2HYE/
0101 DO 20 I=1,4
0102 20 ISTR(I)=2H
0103 AMPL=NO
0104 MNENM=2HFR
0105 LNH=0
0106 WRITE(ILU,5000)

Figure 13-4. FORTRAN Program for the 3325A (Continued)

13-7
0107      5000 FORMAT(/'AMPLITUDE: '/,
0108          &     VO = VOLTS (p-p)/,
0109          &     MV = MILLIVOLTS'/,
0110          &     VR = VOLTS (rms)/,
0111          &     MR = MILLIVOLTS (rms)/,
0112          &     DB = dBm'/,
0113          &     '? ')
0114       REG= REIC(1,ILU+400B,VOLTS,1)
0115       IF(VOLTS.EQ.2HV0.OR.
0116       & VOLTS.EQ.2HMV.OR.
0117       & VOLTS.EQ.2HVR.OR.
0118       & VOLTS.EQ.2HMR.OR.
0119       & VOLTS.EQ.2HDB)  GO TO 10
0120       RETURN
0121 10  WRITE(ILU,5020)
0122 5020      FORMAT(/'DECIMAL VALUE (12.34 for example) : '_')
0124       REG= EXEC(1,ILU+400B,DVAL,2)
0125       IF(IB.EQ.0) RETURN
0126       Lnth=IB+2
0127       DVAL(IB+2)=VOLTS
0128       AMPL=YES
0129       CALL EXEC(2,ILU,ISTR,LNTH)
0130       RETURN
0131       END
0132  C
0133  C
0134       SUBROUTINE ADSTR(INDX,LEN),02-08-79 (GWG) CONCATENATE
0135       INTEGER OSTR(24)
0136       COMMON ILU,ILST,IDLU,ISTR(0)
0137       IF(LEN.LT.0)GO TO 5
0138       IF(LEN.EQ.0) RETURN
0139  IA=0
0140       LENA=LEN
0141       DD 10 I = 1,LEN
0142  IA=IA+1
0143       IF(INDX+1.LT.24)GO TO 20
0144       CALL EXEC(2,IDLU,OSTR,24)
0145       IND=0
0146  LENA=LEN-IA+1
0147  IA=1
0148       20 OSTR(INDX+IA)=ISTR(1)
0149       10 CONTINUE
0150       IND+INDX=LEMA
0151       RETURN
0152       5 CALL EXEC(2,IDLU,OSTR,INDX)
0153       IND=0
0154       RETURN
0155       END
0156       END$
Subroutines "FUNC", "FREQ", and "AMPL" request the waveform function, frequency, and amplitude, respectively, from the user at a CRT terminal. Each subroutine builds a programming string in "ISTR" (line 4). After each string of characters has been determined, the subroutine "ADSTR" is called which,

1. concatenates the last string received onto the current string "OSTR" (line 136 in subroutine "ADSTR"), or
2. sends the complete string "OSTR" to the 3325A.

A 3325A programming string can be output from subroutine "ADSTR" only when,

1. parameter "LEN" (line 134) is negative, or
2. the number of characters in "OSTR" reaches a length of 48.

In subroutine "FUNC" (lines 23 through 29 of figure 13-4), a correspondence is set up between the 3325A waveform numbers and mnemonic values for each waveform. For example,

0 = DC = DC  
1 = SI = Sine  
2 = SQ = Square  
3 = TR = Triangle  
4 = PS = Positive slope ramp  
5 = NS = Negative slope ramp

Table "FTBL" creates a match for the ASCII translation of "DC" to "0", etc. If a user entered "DC" in answer to the prompt "ENTER A FUNCTION," the subroutine would create the string "FU0".

The programs and subroutines in figure 13-4 do not contain a significant amount of error checking. In fact, erroneous or unrecognizable 3325A program statements may be entered and sent to the instrument. Figure 13-4 should be used with the SRQ error processor program (figure 13-8) discussed under "Service Requests" in this section. The SRQ program will diagnose syntax errors and print the error message on the user's terminal when an input error occurs.

Status and Interrogation Features

Status may be obtained from the 3325A in two ways:

1. Serial Poll, which produces a status byte.
2. Interrogation, when the HP 1000 interrogates program errors, or entry parameters.

Artificial Status

A serial poll may be produced artificially or left to be handled automatically by the service request abilities of the HP 1000 system (discussed under "Service Request" in this section). Status can be produced artificially by calling the subroutine STATS. In FORTRAN,

```
CALL STATS(IDLU,ISTAT)
```

will conduct a serial poll, obtain the instrument status byte, and return the value in ISTAT. A simple program which performs this function is shown in figure 13-5. The format of the 3325A status byte is shown in figure 13-6.

```
0001 FTH4,L
0002 PROGRAM TDYN3, 03-29-79 (GWG) DYNAMIC STATUS
0003 INTEGER DYNs,YES
0004 COMMON ILU, ILST, IDLU
0005 DATA NO/2HNO/, YES/2HYES/
0006 IF(INPRM(ID),EQ.NO) STOP
0007 CALL STATS(IDLU, ISTAT)
0008 WRITE(ILU,10) ISTAT
0009 10 FORMAT(K6)
0010 END
```

Figure 13-5. Obtaining 3325A Status Manually

*Subroutine "STATS" is documented in the HP-IB User's Manual (part number 59310-90064).*
Some 3325A status byte information does not cause an SRQ. "Sweep in progress" is one such example. The sweep flag can be monitored by the HP 1000 to determine when the end of a sweep occurs. The 3325A will dynamically output status while internal processing is in progress.

**Interrogation**

When the "program string error" occurs and is detected within the 3325A status byte, further interrogation may be performed by requesting more error information from the instrument. Table 13-2 shows the numeric values returned when the 3325A is interrogated using the mnemonic "IER" (see "Service Requests").

In figure 13-8, the subroutine PCHK performs a WRITE request in line 63 to send the message "IER". The READ statement in line 65 with format "A2,11" then obtains the error information from the 3325A. The remainder of subroutine PCHK evaluates possible errors.

<table>
<thead>
<tr>
<th>ASCII</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Entry parameter out of bounds (for example,</td>
</tr>
<tr>
<td></td>
<td>Freq ( \geq 61 ) MHz).</td>
</tr>
<tr>
<td>2</td>
<td>Invalid delimiter.</td>
</tr>
<tr>
<td>3</td>
<td>Frequency too large for function (for example,</td>
</tr>
<tr>
<td></td>
<td>Function = Triangle, Freq ( \geq 11 ) kHz).</td>
</tr>
<tr>
<td>4</td>
<td>Sweep time too small or too large.</td>
</tr>
<tr>
<td>5</td>
<td>Offset incompatible with amplitude, or ampli-</td>
</tr>
<tr>
<td></td>
<td>tude incompatible with offset.</td>
</tr>
<tr>
<td>6</td>
<td>Sweep frequency too large for function;</td>
</tr>
<tr>
<td></td>
<td>sweep bandwidth too small; start frequency</td>
</tr>
<tr>
<td></td>
<td>too small (log sweep); start frequency</td>
</tr>
<tr>
<td></td>
<td>greater than stop frequency (log sweep).</td>
</tr>
<tr>
<td>7</td>
<td>Unrecognizable mnemonic received.</td>
</tr>
<tr>
<td>8</td>
<td>Unrecognizable data character received.</td>
</tr>
<tr>
<td>9</td>
<td>Option does not exist (High Voltage or</td>
</tr>
<tr>
<td></td>
<td>Rear/Front).</td>
</tr>
</tbody>
</table>

Table 13-2. 3325A Request "IER"

Subroutine STATS³ can also be used with "S3325" (figure 13-8) to perform a complete 3325A status check.

**Interrogating Past Programming Parameters**

Entry parameters indicating the current frequency, amplitude, phase, etc., may also be interrogated from the 3325A. A typical FORTRAN sequence may be used. The FORTRAN example in figure 13-7 requests the current frequency setting and prints the result on the user's terminal.

Using this feature, a simple application program can be written which will actually learn various states in the 3325A. For example, a user can program the 3325A for various functions from the front panel. A user program is then executed which interrogates the instrument and saves its state in an FMP

³An interesting program which performs a similar function for the 3582A Spectrum Analyzer is shown in AN 401-12 (5953-2811).

---

**Figure 13-6. 3325A Status Byte Format**

- 7 6 5 4 3 2 1 0  Status byte bits
- (8 7 6 5 4 3 2 1  DIO lines)
- F R F x S S S F = Flag; R = Request Service;
- S = Status
- 1 = Program String Error
- 1 = Sweep Stopped
- 1 = Sweep Started
- 1 = System Failure
- (possible component failure), includes:
  - Failed Self "test
  - Failed Ampdt Cal
  - Ext Ref Unlocked
  - Main Osc Unlocked

Sweep Flag. 1 = Sweep in Progress.
Does not cause SRQ.

RQS Message. 1 = Service Request.

Busy Flag. 1 = 3325A busy processing data.
Does not cause SRQ.
disc file. Later this state could be restored using the sub-
routines documented earlier in this application note. This
application may find use in test beds and assembly lines
where many different devices are being tested.

The functions and programs in this section can be combined
to satisfy this application.

Service Requests

The 3325A is capable of generating SRQ's for up to four
conditions:

1. Program Error
2. Sweep Stop
3. Sweep Start
4. System Failure

Any combination of these may also be configured to generate
the request for service (see Table 13-3).

When the 3325A is turned on, all service requests are
masked out. This means that none of the above conditions
will generate a service request. Different configurations can
be enabled by sending the mask request "MS" and the
corresponding ASCII character representing the status op-
tions desired. Table 13-3 shows the correspondence be-
tween the ASCII characters and the available mask options.

A feature known as "automatic program scheduling" may be
used in the HP 1000 to process SRQ occurrences from the
3325A. When a 3325A SRQ occurs, the HP 1000 auto-
matically does a serial poll and reads the 3325A status byte
into memory. The operating system then schedules a user
program previously designed and configured for processing
3325A service requests. One such program is shown in fig-
ure 13-8. This program, when scheduled, retrieves the 3325A
status byte from system memory and analyzes it. Analysis is
performed using subroutine "S3325" which sequentially
checks each bit. When bit zero has been enabled, a pro-
gramming error has occurred and further 3325A interrogation
is required. Subroutine "PCHCK" is then called to do the
required processing.

In program C3325 (figure 13-8), the message "MS0" is sent
to the 3325A in line 28. This enables the instrument to gen-
erate SRQ's for all potential service request situations.

Program C3325 is scheduled once from a user terminal to
prepare the HP 1000 for further automatic SRQ program
scheduling. It is during this first run sequence that the 3325A
mask is enabled for all SRQ situations. Program C3325 then
finishes execution, saving the values of the input terminal LU
(ILU) and the 3325A LU (IDLU) on the HP 1000 mass storage
system disc. (This is called "termination saving resources" by
most programmers.)

```
INTEGER IBFR(20),IREG20
EQUIVALENCE (IREG,REG,1A),(IREG(2),1B)

WRITE(IDLU,10)
10 FORMAT ("IFR")
REG=EXEC(I,IDLU,IBFR,20)
CALL EXEC(2,ILU,IBFR,IB)
NCHAR=IB2

END
```

Figure 13-7. Interrogating Entry Parameters in FORTRAN
Table 13-3. SRQ Mask Configurations

<table>
<thead>
<tr>
<th>ASCII Character</th>
<th>Bits 3 thru 0</th>
<th>System Fail Bit 3</th>
<th>Sweep Start Bit 2</th>
<th>Sweep Stop Bit 1</th>
<th>Program Error Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>@</td>
<td>*0000</td>
<td>Mask</td>
<td>Mask</td>
<td>Mask</td>
<td>Mask</td>
</tr>
<tr>
<td>A</td>
<td>0001</td>
<td>Mask</td>
<td>Mask</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>B</td>
<td>0010</td>
<td>Mask</td>
<td>Mask</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>C</td>
<td>0011</td>
<td>Mask</td>
<td>Enable</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>D</td>
<td>0100</td>
<td>Mask</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
</tr>
<tr>
<td>E</td>
<td>0101</td>
<td>Mask</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
</tr>
<tr>
<td>F</td>
<td>0110</td>
<td>Mask</td>
<td>Enable</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>G</td>
<td>0111</td>
<td>Mask</td>
<td>Enable</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>H</td>
<td>1000</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>I</td>
<td>1001</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
<td>Mask</td>
</tr>
<tr>
<td>J</td>
<td>1010</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
<td>Mask</td>
</tr>
<tr>
<td>K</td>
<td>1011</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>L</td>
<td>1100</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>M</td>
<td>1101</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
<td>Enable</td>
</tr>
<tr>
<td>N</td>
<td>1110</td>
<td>Enable</td>
<td>Enable</td>
<td>Mask</td>
<td>Mask</td>
</tr>
<tr>
<td>O</td>
<td>1111</td>
<td>Enable</td>
<td>Enable</td>
<td>Mask</td>
<td>Enable</td>
</tr>
</tbody>
</table>

*Initial turn-on conditions.

The program C3325 can be used in applications when 3325A program development is being done and on-line error checking is needed. Any error messages will be printed on "ILST".

Performance

Performance data for the 3325A instrument is shown in Table 13-4.

Within the device, a quantum of time is required for each mnemonic and/or ASCII digit. Time is also required for processing the data once received. These times, when combined with setup times in the HP 1000,* will approximate transfer rates. The time required per byte for the 3325A should be compared to the time per byte for the HP 1000. The value which is larger should be used in the equation.

More sophisticated operations using the 3325A become very cumbersome to analyze. The performance information, equations, and programs in Chapters 4 and 5 of Application Note 401-1 (part no. 5953-2800) can be used when a detailed analysis is required.

*See Application Note 201-4, "Performance Evaluation of HP-IB Using RTE Operating Systems." Setup times and performance equations can be found in this document.
<table>
<thead>
<tr>
<th>Function (Waveform)</th>
<th>Mnemonic</th>
<th>Input Data Transfer Time</th>
<th>Device Time</th>
<th>Output Data Transfer Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Digit</td>
<td>FU</td>
<td>450–500 μs</td>
<td>1600 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>225–250 μs each</td>
<td>2.8 ms</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td>Frequency ≤ 11 Digits + Decimal Delimiters</td>
<td>FR</td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>HZ, KH, or MH</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>12.5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Amplitude ≤ 4 Digits + Decimal Delimiters</td>
<td>AM</td>
<td>450–500 μs</td>
<td>6.8 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>VO or MV</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td>VR or MR</td>
<td>450–500 μs</td>
<td>90 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>DB</td>
<td>450–500 μs</td>
<td>130 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>250 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>DC Offset ≤ 4 Digits + Decimal Delimiters</td>
<td>OF</td>
<td>450–500 μs</td>
<td>6.8 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>VO or MV</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>82 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Phase ≤ 4 Digits + Decimal Delimiter</td>
<td>PH</td>
<td>450–500 μs</td>
<td>5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>DE</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>28 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Sweep Start Frequency ≤ 11 Digits + Decimal Delimiters</td>
<td>ST</td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>HZ, KH, or MH</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>10.3 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Sweep Stop Frequency ≤ 11 Digits + Decimal Delimiters</td>
<td>SP</td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>HZ, KH or MH</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>10.3 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Sweep Marker Frequency ≤ 11 Digits + Decimal Delimiters</td>
<td>MF</td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>HZ, KH or MH</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>10.3 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Sweep Time ≤ 4 Digits + Decimal Delimiter</td>
<td>T1</td>
<td>450–500 μs</td>
<td>5.5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td></td>
<td>SE</td>
<td>225–250 μs each</td>
<td>2.8 ms each</td>
<td>225–250 μs each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Store</td>
<td>SR</td>
<td>450–500 μs</td>
<td>11 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Recall</td>
<td>RE</td>
<td>450–500 μs</td>
<td>1700 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Assign Zero Phase</td>
<td>AP</td>
<td>450–500 μs</td>
<td>5.2 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Amped Cal</td>
<td>AC</td>
<td>450–500 μs</td>
<td>1500 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Start Single Sweep</td>
<td>SS</td>
<td>450–500 μs</td>
<td>300 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Start Continuous Sweep</td>
<td>SC</td>
<td>450–500 μs</td>
<td>300 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Interrogate (Add Parameter Mnemonic Time)</td>
<td>I</td>
<td>225–250 μs</td>
<td>3 ms</td>
<td>225–250 μs</td>
</tr>
<tr>
<td>Mask Service Request</td>
<td>MS</td>
<td>450–500 μs</td>
<td>4.5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>High Voltage Output</td>
<td>HV</td>
<td>450–500 μs</td>
<td>48 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Rear/Front Output</td>
<td>RF</td>
<td>450–500 μs</td>
<td>44.5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Self Test</td>
<td>TE</td>
<td>450–500 μs</td>
<td>10,000 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Sweep Mode</td>
<td>SM</td>
<td>450–500 μs</td>
<td>4.5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Data Transfer Mode</td>
<td>MD</td>
<td>450–500 μs</td>
<td>4.5 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Interrogate Function</td>
<td>IFU</td>
<td>675–750 μs</td>
<td>1603 ms</td>
<td>675–750 μs</td>
</tr>
<tr>
<td>Interrogate Error</td>
<td>IER</td>
<td>675–750 μs</td>
<td>11.5 ms</td>
<td>675–750 μs</td>
</tr>
<tr>
<td>Universal Commands</td>
<td>–</td>
<td>225 μs per byte</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Amplitude Modulation</td>
<td>MA</td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
<tr>
<td>Phase Modulation</td>
<td>MP</td>
<td>450–500 μs</td>
<td>7.0 ms</td>
<td>450–500 μs</td>
</tr>
</tbody>
</table>
0001  FTM4,L
0002  PROGRAM C3325(3),02-08-79 (GWG) SRQ PROGRAM
0003  C
0004  C SYSTEM PREPARATIONS:
0005  C SET THE E BIT IN THE DEVICE CONFIGURATION WORD
0006  C UNBUFFER THE EQT
0007  C
0008  C THE RTE SAVE RESOURCES OPTION HAS BEEN
0009  C USED IN THIS PROGRAM. IT IS SCHEDULED
0010  C ONCE MANUALLY FOR SETUP, THEN N TIMES
0011  C BY 3325A INTERRUPTS.
0012  C
0013  C RPMAR IS CALLED N TIMES.
0014  C
0015  C
0016  INTEGER IPM(S),IPRG(4),ISTT(2)
0017  COMMON ILU,ILST,IDLU
0018  DATA NO/2HNO/
0019  DATA IPRG/5,2HC3,2H32,2H5 /,LODP/0/
0020  C
0021  IF(INPRM(ID).EQ.0) GO TO 999
0022  WRITE(ILU,100)IDLU
0023  100 FORMAT(" 3325A: SRQ PROGRAM SETUP","\n" IN PROGRESS FOR FOR LU "12","/)
0024  CALL SRQ(IDLU,17)
0025  CALL SRQ(IDLU,16,IPRG)
0026  IF(IERM(MN).LT.0) GO TO 20
0027  WRITE(ILU,5)
0028  5 FORMAT("MSD")
0029  CALL EXEC(6,0,1)
0030  10 CALL RPMAR(IPM)
0031  CALL S3325(IPM)
0032  GO TO 10
0033  999 WRITE(ILU,130)
0034  130 FORMAT(" :RU,A3325,ILST,IDLU")
0035  STOP
0036  20 END
0037  C
0038  C
0039  C
0040  SUBROUTINE S3325(ISTAT),02-08-79 (GWG) SRQ FUNCTIONS
0041  COMMON ILU,ILST,IDLU
0042  IF(IAND(ISTAT,1).EQ.1)CALL PCHCK
0043  IF(IAND(ISTAT,2).EQ.2)WRITE(ILST,10)
0044  IF(IAND(ISTAT,4).EQ.4)WRITE(ILST,20)
0045  IF(IAND(ISTAT,8).EQ.8)WRITE(ILST,30)
0046  IF(IAND(ISTAT,32).EQ.32)WRITE(ILST,40)
0047  IF(IAND(ISTAT,128).EQ.128)WRITE(ILST,50)
0048  10 FORMAT(" 3325A SWEEP STOPPED.")/
0049  20 FORMAT(" 3325A SWEEP STARTED.")/
0050  30 FORMAT(" 3325A SYSTEM FAILURE. POSSIBILITIES INCLUDE:")/
0051  & " FAILED SELF TEST."/,
0052  & " FAILED AMPLITUDE CALIBRATE."/,
0053  & " EXTERNAL REFERENCE UNLOCKED."/,
0054  & " MAIN OSCILLATOR UNLOCKED."/}

Figure 13-8. SRQ Program to Diagnose Errors
13-14
SUBROUTINE PCHCK, 02-08-79 (GWG) PROGRAM ERRORS
COMMON ILU, ILST, IDLU
WRITE(IDLU, 10)
10 FORMAT("IER")
READ(IDLU, 50) IER, IVAL
50 FORMAT(A2, 11)
IF(IER.EQ.1) WRITE(ILST, 1)
IF(IER.EQ.2) WRITE(ILST, 2)
IF(IER.EQ.3) WRITE(ILST, 3)
IF(IER.EQ.4) WRITE(ILST, 4)
IF(IER.EQ.5) WRITE(ILST, 5)
IF(IER.EQ.6) WRITE(ILST, 6)
IF(IER.EQ.7) WRITE(ILST, 7)
IF(IER.EQ.8) WRITE(ILST, 8)
IF(IER.EQ.9) WRITE(ILST, 9)
1 FORMAT("ENTRY PARAMETER OUT OF BOUNDS.")
2 FORMAT("INVALID PROGRAM DELIMITER.")
3 FORMAT("FREQUENCY TO LARGE FOR FUNCTION.")
4 FORMAT("Sweep time too small or too large.")
5 FORMAT("OFFSET INCOMPATIBLE WITH AMPLITUDE.")
6 FORMAT("Sweep frequency out of range for function.")
7 FORMAT("UNRECOGNIZABLE MNEMONIC RECEIVED.")
8 FORMAT("UNRECOGNIZABLE DATA CHARACTER RECEIVED.")
9 FORMAT("OPTION DOES NOT EXIST.")
RETURN
END

FUNCTION IERR(N), 07-26-78 (GWG) HANDLE BUS ERRORS
COMMON ILU, ILST, IDLU
I = IERR(IDLU)
IF(I.EQ.0) GO TO 10
IF(I.EQ.-1) IERR = I
WRITE(ILU, 30) I, IDLU
30 FORMAT("3437A: BUS ERROR "I2" ON LU ",
&I2," (HP-IB USERS GUIDE)")
10 RETURN
END

INTEGER FUNCTION INPRM(ID), 11-29-78 (GWG) RUN PRM FOR HP-IB
INTEGER ISTRING(40), OSTRING(10), STRT
COMMON ILU, ILST, IDLU

Figure 13-8. SRQ Program to Diagnose Errors (Continued)

13-15
0107 C 'INPRM' GETS:
0108 C
0109 C A. THE INPUT LOGICAL UNIT (INTERACTIVE TERMINAL).
0110 C B. THE LIST LOGICAL UNIT FROM PARAMETER ONE (IT
0111 C SETS THE LIST LU EQUAL TO THE INPUT LU IF THE
0112 C LIST LU IS 0).
0113 C C. THE DEVICE LOGICAL UNIT(INPRM CHECKS TO SEE
0114 C IF IDLU IS NON-ZERO. IF NOT INPRM IS SET TO
0115 C '2HND').
0116 C
0117 C INPRM=2HND
0118 C ILU=LOGLU(ID)
0119 C CALL GETST(ISTRNG,-80,RTNCLN)
0120 C STRT=1
0121 C DO 600 I=1,2
0122 C IF(HAMR(OSTRNG,ISTRNG,RTNCLN,STRT))700,100
0123 C 100 ITYP=IAND(OSTRNG(4),3B)
0124 C IF(I.EQ.1)GO TO 200
0125 C IF(ITYP.NE.1) RETURN
0126 C IDLU=OSTRNG
0127 C GO TO 600
0128 C 200 ILST=OSTRNG
0129 C IF(ITYP.EQ.0) ILST=ILU
0130 C 600 CONTINUE
0131 C 700 IF(IDLU.GT.0)INPRM=2HYE
0132 C RETURN
0133 C END

Figure 13-8. SRQ Program to Diagnose Errors (Continued)