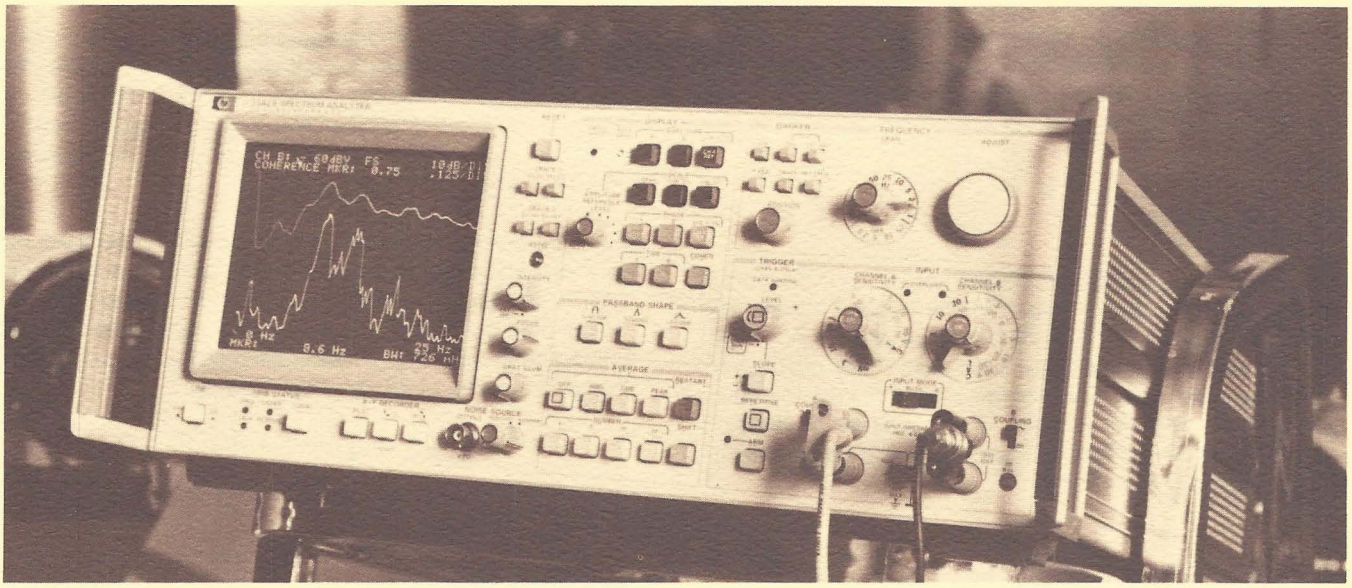
HP 3582A Spectrum Analyzer HP-IB HP 1000 Computer

Programming Guide

HEWLETT hp PACKARD

Application Note 401-12



Device Introduction

The HP 3582A is a dual-channel spectrum analyzer covering the frequency range of 0.02 Hz to 25.6 kHz. Frequency spans from I Hz to 25 kHz full scale allow flexibility in selecting the portion of the spectrum to be analyzed. The spans from 5 Hz up to 25 kHz can be positioned anywhere within the frequency range of the instrument to provide exceptionally good frequency resolution.

Without resorting to external signal conditioning, the instrument can measure input from +30 dBv (31.6 volts) down to −120 dBv (1 microvolt). Even with this high sensitivity, the input circuits are protected against overloads of up to 100 volts. For measurements where the signal of interest exists in the presence of large unwanted signals, the wide 70 dB dynamic range of the instrument is important.

The 3582A can also measure the phase of the various spectral components or the transfer function. Its two input channels operate simultaneously. Also, a built-in pseudo-random noise or a built-in random "band limited white noise" source can be used to drive the device under test when performing low frequency network analysis.

Virtually all of the measurement functions of the 3582A are remotely programmable via the HP-IB. The Operating Manual gives a complete discussion of manual and remote operation, including HP 1000 programming examples (written in BASIC).[1]

In remote operation, the 3582A has even greater flexibility than in manual operation:

- **Remote Front-Panel Programming** — All front panel controls can be controlled in remote operation from the computer.
- **Instrument Data Output** — Display data, alphanumerics, switch settings, and other useful data can be output from the instrument for the purpose of making plots, additional processing, mass storage, etc.
- **Instrument Data Input** — Time record data obtained by external means can be input to the 3582A's processor, and the transform of this data can be obtained. Also, any of the data output by the instrument may be reentered at a later time.
- **Instrument Signal Processing Control and Status** — Additional special HP-IB commands allow limited control of the signal processing. SRQ's may be generated from the 3582A. An eight-bit status word (not a serial poll status byte) is available to indicate various states of the signal processing.

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[1] *This application note should be used in conjunction with the 3582A Operating Manual (03582-90000) and Application Note 401-1 (5953-2800).*

- **Memory access** — The 3582A's memory and memory copying capability is compatible with the HP 1000. Large data arrays (up to 1024 words of time, 512 words of display) may be transferred back amd forth between the computer and the 3582A. Typical speeds (limited by the 3582A) are in the range of 5 kilobytes per second.

Addressing

The single TALK/LISTEN HP-IB address for the instrument is selected by the instrument bus address switch. This switch is the seven section "DIP" switch located on the A2 HP-IB board. This card is under the front right "card nest cover" inside the instrument. The five switches labeled 1 through 5 are used to select the address. The instrument is set to 13 octal at the factory. Refer to figure 12-1 for a visual description of the address switches.

System Preparations

LU Assignment

Because the 3582A has only one TKL/LSTN address, it is a simple matter to assign a corresponding LU number to the instrument. Assuming the factory set address (13B) will be used and LU 15 is available, the File Manager request,

```
:SYLU,15,10,13B
```

will set up a correspondence between LU 15, EQT 10, and the 3582A (address 13B).

Buffering

Buffering may be used on output from HP 1000 to the 3582A. This is a useful feature when large memory arrays are to be restored to the instrument. Make sure that the 3582A is fully operable with the HP 1000 before allocating buffering, however. To unbuffer a 3582A on EQT 10 from File Manager, enter,

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

Once operation has been verified, buffer the 3582A EQT from File Manager by entering,

```
:SYEQ,10,BU
```

to buffer EQT 10. Remember that buffering will affect all of the HP-IB devices on the same EQT.

Time-out

The time-out may be processed as an error condition within the 3582A. Because the time-out value indicates a hardware malfunction within the instrument, the HP 1000 operating system may be left to process the condition. When this happens, the instrument LU is set "down" until an operator intervenes and "fixes" the instrument.

The time-out value should be calculated larger than the worst-case time required for the 3582A to return a measurement. (See the "Performance" section to approximate the proper time-out value.) One time-out value affecting the 3582A and all other instruments on the same bus can then be entered from File Manager. For example,

```
SYTO,10,100
```

sets the time-out on EQT 10 to 1 second.

Configuration

The device configuration word for the 3582A defaults to the correct value for end of record requirements, system error checking, and SRQ handling. The user may wish to allocate DMA when large data arrays will be transferred between the spectrum analyzer and the HP 1000. This may be accomplished from File Manager by using the "CN" request.

```
:CN,15,25B,37000B
```

allocates DMA to LU 15. The "25B" indicates the type of control request. The value "37000B" is the configuration word for the 3582A. From FORTRAN,

```
CALL CNFG(15,1,37000B)
```

will perform the same configuration for LU 15.

Remote

The 3582A should be set to remote for programming. This can be done in File Manager using the "CN" command. For example, LU 15, may be set to remote by entering,

```
:CN,15,16B
```

or,

```
CALL RMOTE(15)
```

may be used in FORTRAN.

ASCII Code Character		Address Switches					5-bit Decimal Code
Listen	Talk	A5	A4	A3	A2	A1	
SP	@	0	0	0	0	0	00
!	A	0	0	0	0	1	01
"	B	0	0	0	1	0	02
#	C	0	0	0	1	1	03
$	D	0	0	1	0	0	04
%	E	0	0	1	0	1	05
&	F	0	0	1	1	0	06
'	G	0	0	1	1	1	07
(	H	0	1	0	0	0	08
)	I	0	1	0	0	1	09
*	J	0	1	0	1	0	10
+	K	0	1	0	1	1	11
,	L	0	1	1	0	0	12
-	M	0	1	1	0	1	13
.	N	0	1	1	1	0	14
/	O	0	1	1	1	1	15
0	P	1	0	0	0	0	16
1	Q	1	0	0	0	1	17
2	R	1	0	0	1	0	18
3	S	1	0	0	1	1	19
4	T	1	0	1	0	0	20
5	U	1	0	1	0	1	21
6	V	1	0	1	1	0	22
7	W	1	0	1	1	1	23
8	X	1	1	0	0	0	24
9	Y	1	1	0	0	1	25
:	Z	1	1	0	1	0	26
;	[	1	1	0	1	1	27
<	\	1	1	1	0	0	28
=	]	1	1	1	0	1	29
>	~	1	1	1	1	0	30

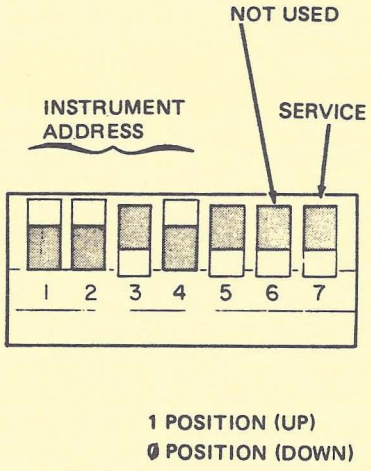

Figure 12-1. 3582A Address Switch Format

Programming

The 3582A Operating Manual[1] contains all of the needed information for programming the 3582A including HP 1000 examples in BASIC. It should be used in conjunction with this section. Table 12-1 shows a complete list of 3582A programming commands.

Early in the programming stage, when the 3582A is being verified for the first time, File Manager may be used to send ASCII commands to the 3582A, and check its various programming functions.

The File Manager annotate (AN) message is used with the logical list (LL) message to send the ASCII commands. See the example in figure 12-2.

Programming the 3582A in FORTRAN is easily accomplished by sending and receiving ASCII data messages. This is done using "READ" and "WRITE" statements which include specifying the 3582A logical unit number.

The 3582A is a sophisticated instrument when used either from the front panel or as an HP-IB device. Most programming operations are application-specific. However, basic concepts can often be applied to many different applications. For example, the ability of the 3582A/HP 1000 team to store and retrieve large amounts of data in a very short period of time allows many spectra to be collected, categorized and saved. Later, these spectra can be recalled and compared to new spectra. Two applications that can use this capability are identification of signals in spectrum surveillance work, and failure analysis and failure prediction through vibration analysis.

In the study of mechanical vibration, the use of appropriate transducers allows force and motion to be analyzed in the frequency domain. An application of growing interest is characterizing the "health" of rotating machinery. Every piece of rotating machinery exhibits a unique vibration pattern or "signature" which can be characterized and recorded in the frequency domain.

These "signatures" can be observed and compared over a period of time and can reveal when preventative maintenance is required or when a mechanical problem is pending. Previously such mechanical problems were only noticed after they had caused economic loss.

Mass Storage Program

The program "RDWRT" (figure 12-3) demonstrates the mass storage and file handling capabilities of the HP 1000 when used with the 3582A Spectrum Analyzer.[2] (This is a user program which prompts the operator to respond to the commands shown in figure 12-4.) RDWRT allows the raw time waveform or the transformed frequency domain waveform from the 3582A to be stored in an HP 1000 disc file. At some time later these files may be restored to the instrument for comparison or they can be re-analyzed. The program allows:

1. Storage and retrieval of frequency spectra.
2. Storage and retrieval of the original time waveforms for:
   a. later analysis,
   b. later analysis of the experiment using different transfer functions (Flat Top, Hanning, or Uniform) or,
   c. modification or preprocessing of the time waveform (i.e., passing it through a simulated filter) before spectrum analysis.

[2]*This program may also be obtained from the contributed library (part number 22683-13324).*

Table 12-1. 3582A Programming Commands

Group	Command		Description
	Function	**Setting**	
Input & Trigger	IM	1–3	Input Mode (A, Both, B)
	AC	1–2	A Coupling (1 = AC, 2 = DC)
	BC	1–2	B Coupling (1 = AC, 2 = DC)
	AS	1–10	CH A Sensitivity: 1 = CAL; 2 = 30 V, +30 dBV; 3 = 10 V, +20 dBV; 4 = 3 V, +10 dBV; 5 = 1 V, +0 dBV; 6 = .3 V, −10 dBV; 7 = .1 V, −20 dBV; 8 = 30 mV, −30 dBV; 9 = 10 mV, −40 dBV; 10 = 3 mV, −50 dBV
	BS	1–10	CH B Sensitivity: 1 = CAL; 2 = 30 V, +30 dBV; 3 = 10 V, +20 dBV; 4 = 3 V, +10 dBV; 5 = 1 V, +0 dBV; 6 = .3 V, −10 dBV; 7 = .1 V, −20 dBV; 8 = 30 mV, −30 dBV; 9 = 10 mV, −40 dBV; 10 = 3 mV, −50 dBV
	SL	1–2	Slope (1 = +, 2 = −)
	AR		Arm
	RP	0–1	Repetitive
	FR	0–1	Free Run
Frequency & Marker	AD	0–24999	Adjust (Frequency) (0 = 0 Hz, 24999 = 24999 Hz)
	MD	1–4	Mode (1 = 0–25 kHz, 2 = 0 Start, 3 = Set Start, 4 = Set Center)
	SP	1–14	Span: 1 = 1 Hz; 2 = 2.5 Hz; 3 = 5 Hz; 4 = 10 Hz; 5 = 25 Hz; 6 = 50 Hz; 7 = 100 Hz; 8 = 250 Hz; 9 = 500 Hz; 10 = 1 kHz; 11 = 2.5 kHz; 12 = 5 kHz; 13 = 10 kHz; 14 = 25 kHz
	MN	0–1	Marker
	MR	0–1	Marker Relative
	MS		Marker Set Ref

Table 12-1. 3582A Programming Commands (Continued)

Group	Command		Description
	Function	Setting	
	MB	0–1	Marker / $\sqrt{BW}$
	MT	0–1	Marker Trace
	MF		Marker Set Freq
	MP	0–255	Marker Position (0–127 for dual channel)
	AA	0–1	Amplitude A
	BB	0–1	Amplitude B
	AX	0–1	Amplitude Transfer Function
	SC	1	Scale Linear
	SC	2	Scale 10 dB/Div.
Display	SC	3	Scale 2 dB/Div.
	PA	0–1	Phase A
	PB	0–1	Phase B
	PX	0–1	Phase Transfer Function
	TA	0–1	Time A
	TB	0–1	Time B
	CH	0–1	Coherence
	AM	1–9	Amplitude Ref. Level (Add –10 dB per step, 2 = –10 dB, 9 = –80 dB)
Passband Shape	PS	1	Flattop
	PS	2	Hanning
	PS	3	Uniform
	AV	1	Off
	AV	2	RMS
	AV	3	Time
	AV	4	Peak
Average	RE		Restart
	NU	1	Number 4/64
	NU	2	Number 8/128
	NU	3	Number 16/256
	NU	4	Number 32/Exp
	SH	0–1	Shift
Trace	TS		Trace 1 Store
Storage	TR	0–1	Trace 1 Recall
&	RS		Trace 2 Store
Recall	RR	0–1	Trace 2 Recall
X–Y	PL		X–Y Plot
Recorder	LL		↓←Lower Left & Reset)
	UR		→↑ (Upper Right)

```
:CN,15,16B              Set the 3582A to remote.
:LL,15                  Set the list device to the 3582A.
:AN,PRS,AD442,AC1       PRS = Preset to turn on conditions.
                        AD442 = Adjust  frequency to 442 Hz.
                        AC1 = Select coupling A and AC input.
```

Figure 12-2. Example File Manager Programming Sequence

```
0001  FTN4,L
0002        PROGRAM RDWRT(3),02-07-79 (GWG) 3582A MASS STORAGE PROGRAM
0003  C
0004  C THIS IS PROGRAM READS AND WRITES MEMORY BUFFERS IN THE 3582A.
0005  C STANDARD 'EXEC' CALLS REPLACE FORTRAN READ AND WRITE
0006  C STATEMENTS. SOME CALLS TRANSMIT ASCII (IDLU AS PARAMETER 2),
0007  C OTHERS TRANSMIT BINARY (IDLU+100B).
0008  C
0009  C THE DISPLAY AND TIME DATA ARE STORED TO DISC FILES
0010  C USING STANDARD BATCH-SPOOL MONITOR CALLS.
0011  C
0012  C THE FILE TAKES THE FOLLOWING FORMAT:
0013  C
0014  C    ************************************************************
0015  C    *HEADER LENGTH IHDL*COMMAND*BLANKS*HEADER*STATUS WORD*BUFFER*
0016  C    ************************************************************
0017  C             W1            W2       W3    NWORDS    SWORDS     XWORDS
0018  C
0019  C  'RU,RDWRT,INPUT LU#,ANALYZER LU#'
0020  C
0021  C  SD --  SAVE THE DISPLAY BUFFER IN A DISC FILE
0022  C  ST --  SAVE THE TIME BUFFER IN A DISC FILE
0023  C  RD --  RESTORE THE DISPLAY BUFFER TO THE 3582A FROM A DISC FILE
0024  C  RT --  RESTORE THE TIME BUFFER TO THE 3582A FROM A DISC FILE
0025  C
0026        DIMENSION IPBUF(33),MBUF(66),IREG(2),IBUF(1024),
0027       &MESS1(31),MESS2(14),MESS3(29),MESS4(11),MESS5(13),
0028       &MESS6(12),MESS8(5),MESS9(11),IDB1(7),IDB2(7),IDB3(6),
0029       &IDB4(8),IDB5(9),IDB6(9),MESS0(28),MES10(15),MES11(13),
0030       &NAME(3),IDCB(144),IPFG(4),IMBUF(66),IDB7(7),
0031       &MES12(11),MES13(19),MES14(19),MES15(23),MES19(20),
0032       &MES16(15),MES17(12),MES18(29),I(5)
0033        EQUIVALENCE (REG,IREG,IA),(IREG(2),IB),(MBUF(4),IMBUF),
0034       &(IPBUF,NAME),(IPBUF(5),ISEC),(IPBUF(6),ICR),
0035       &(IPBUF(7),ITYP),(IPBUF(8),ISIZ),
0036       &(IHDL,MBUF),(ICMD,MBUF(2))
0037        INTEGER CREAT,OPEN,CLOSE,READF,WRITF,YES
0038        COMMON ILU,ILST,IDLU
0039        DATA YES/2HYE/,
0040  C RDWRT: READ AND WRITE TIME AND DISPLAY BUFFERS (3582A).
0041       &MESS0/2HRD,2HWR,2HT:,2H R,2HEA,2HD ,2HAN,2HD ,2HWR,2HIT,
0042       &2HE ,2HTI,2HME,2H A,2HND,2H D,2HIS,2HPL,2HAY,2H B,2HUF,2HFE,
0043       &2HRS,2H (,2H35,2H82,2HA),2H. /,
0044  C RDWRT: ENTER 'COMMAND' OR '??' FOR HELP, 'EN' TO END PROGRAM.
0045       &MESS1/2HRD,2HWR,2HT:,2H E,2HNT,2HER,2H ',2HCO,2HMM,
```

Figure 12-3. Program RDWRT, Mass Storage Program

```
0046        &2HAN,2HD',2H O,2HR ,2H'?,2H?',2H F,2HOR,2H H,2HEL,2HP,,
0047        &2H ',2HEN,2H' ,2HTO,2H E,2HND,2H P,2HRO,2HGR,2HAM,2H. /,
0048  C RDWRT: ':RU,RDWRT,,,IDLU'
0049        &MESS2/2HRD,2HWR,2HT:,2H  ,2H:R,2HU,,2HRD,2HWR,2HT,,2H,I,
0050        &2HDL,2HU ,2H  ,2H  /,
0051  C RDWRT: ASSIGN 3582A LU# THEN ENTER 'GO,RDWRT'.
0052        &MESS3/2HRD,2HWR,2HT:,2H A,2HSS,2HIG,2HN ,2H35,2H82,2HA ,
0053        &2HLU,2H# ,2HTH,2HEN,2H E,2HNT,2HER,2H ',2HGO,2H,R,2HDW,2HRT,
0054        &2H'./,
0055  C RDWRT: ANALYZER LU#?
0056        &MESS4/2HRD,2HWR,2HT:,2H A,2HNA,2HLY,2HZE,2HR ,2HLU,2H#?,2H  /,
0057  C SD -- SAVE DISPLAY BUFFER
0058        &MESS5/2HSD,2H  ,2H--,2H S,2HAV,2HE ,2HDI,2HSP,2HLA,2HY ,
0059        &2HBU,2HFF,2HER/,
0060  C ST -- SAVE TIME BUFFER
0061        &MESS6/2HST,2H  ,2H--,2H S,2HAV,2HE ,2HTI,2HME,2H B,2HUF,
0062        &2HFE,2HR /,
0063  C !
0064        &MESS7/2H!/,
0065  C SAY WHAT?
0066        &MESS8/2HSA,2HY ,2HWH,2HAT,2H? /,
0067  C HLTLFM77454,5
0068        &IDB1/2HHL,2HTL,2HFM,2H77,2H45,2H4,,2H5 /,
0069  C LFM,74000,512
0070        &IDB2/2HLF,2HM,,2H74,2H00,2H0,,2H51,2H2 /,
0071  C WTM,77455,1
0072        &IDB3/2HWT,2HM,,2H77,2H45,2H5,,2H1 /,
0073  C HLTWTM,74000,512
0074        &IDB4/2HHL,2HTW,2HTM,2H,7,2H40,2H00,2H,5,2H12/,
0075  C PREMATURE TERMINATION!
0076        &MESS9/2HPR,2HEM,2HAT,2HUR,2HE ,2HTE,2HRM,2HIN,2HAT,
0077        &2HIO,2HN!/,
0078  C RD -- RESTORE DISPLAY BUFFER
0079        &MES10/2HRD,2H  ,2H--,2H R,2HES,2HTO,2HRE,2H D,2HIS,2HPL,
0080        &2HAY,2H B,2HUF,2HFE,2HR /,
0081  C RT -- RESTORE TIME BUFFER
0082        &MES11/2HRT,2H  ,2H--,2H R,2HES,2HTO,2HRE,2H T,2HIM,2HE ,
0083        &2HBU,2HFF,2HER/,
0084  C HLTLFM,70000,1024
0085        &IDB5/2HHL,2HTL,2HFM,2H,7,2H00,2H00,2H,1,2H02,2H4 /,
0086  C HLTWTM,70000,1024
0087        &IDB6/2HHL,2HTW,2HTM,2H,7,2H00,2H00,2H,1,2H02,2H4 /,
0088  C SDSTRDRT
0089        &IPFG/2HSD,2HST,2HRD,2HRT/,
0090  C HLTWTM,77454,5
0091        &IDB7/2HHL,2HTW,2HTM,2H,7,2H74,2H54,2H,5/,
0092  C RDWRT: FILE (NAMR):
0093        &MES12/2HRD,2HWR,2HT:,2H F,2HIL,2HE ,2H(N,2HAM,2HR),2H: ,
0094        &2H /,
0095  C RDWRT: ERROR, SPECIFIED NON-DISC FILE.
0096        &MES13/2HRD,2HWR,2HT:,2H E,2HRR,2HOR,2H, ,2HSP,
0097        &2HEC,2HIF,2HIE,2HD ,2HNO,2HN-,2HDI,2HSC,2H F,2HIL,2HE./,
0098  C RDWRT: ERROR, FILE TYPE IS INCORRECT.
0099        &MES14/2HRD,2HWR,2HT:,2H  ,2HER,2HRO,2HR,,2H F,2HIL,2HE ,
0100        &2HTY,2HPE,2H I,2HS ,2HIN,2HCO,2HRR,2HEC,2HT./,
0101  C RDWRT: ******:******:******:******:******
0102        &MES15/2HRD,2HWR,2HT:,2H  ,2H  ,2H  ,2H  ,2H: ,2H  ,
```

Figure 12-3. Program RDWRT, Mass Storage Program (Continued)

```
0103        &2H   ,2H   ,2H:-,2H   ,2H   ,2H   ,2H: ,2H   ,2H   ,2H   ,2H: ,2H   ,
0104        &2H   ,2H   /,
0105  C RDWRT: INPUT HEADER RECORD:
0106        &MES16/2HRD,2HWR,2HT:,2H I,2HNP,2HUT,2H H,2HEA,
0107        &2HDE,2HR ,2HRE,2HCO,2HRD,2H: ,2H /,
0108  C RDWRT: FMP ERROR:
0109        &MES17/2HRD,2HWR,2HT:,2H F,2HMP,2H E,2HRR,2HOR,
0110        &2H   ,2H   ,2H   ,2H   /,
0111  C RDWRT: FILE TYPE DOESN'T MATCH THE COMMAND YOU'VE GIVEN.
0112        &MES18/2HRD,2HWR,2HT:,2H F,2HIL,2HE ,2HTY,2HPE,2H D,
0113        &2HOE,2HSN,2H'T,2H M,2HAT,2HCH,2H T,2HHE,2H C,2HOM,2HMA,
0114        &2HND,2H Y,2HOU,2H'V,2HE ,2H G,2HIV,2HEN,2H. /,
0115  C RDWRT: REPETITIVE SWITCH SHOULD BE OFF.
0116        &MES19/2H   ,2H   ,2H   ,2H R,2HEP,2HET,2HIT,2HIV,2HE ,2HSW,
0117        &2HIT,2HCH,2H S,2HHO,2HUL,2HD ,2HBE,2H O,2HFF,2H. /
0118  C
0119  C
0120         IF(INPRM(ID).EQ.2HYE) GO TO 48
0121         CALL EXEC(2,ILU,MESS2,14)
0122         CALL EXEC(2,ILU,MESS3,23)
0123         PAUSE 1
0124         CALL EXEC(2,ILU,MESS4,11)
0125         REG=REIO(1,ILU+400B,MBUF,20)
0126         CALL PARSE(MBUF,IB*2,IPBUF)
0127         IDLU=IPBUF(2)
0128  C LOCK THE HPIB LU TO THIS PROGRAM
0129     48 CALL EXEC(2,ILU,MESS0,28)
0130         CALL LURQ(1,IDLU,1)
0131     49 CALL EXEC(2,ILU,MESS1,30)
0132  C  SEND PROMPT TO USER TERMINAL
0133         CALL EXEC(2,ILU,MESS7,1)
0134         REG=REIO(1,ILU+400B,MBUF,20)
0135         IFS=MBUF
0136  C  PUT 3582A IN REMOTE
0137         CALL EXEC(3,1600B+IDLU,0)
0138         DO 18 I2=1,4
0139  C  WHAT NEEDS TO BE DONE?
0140         IF(IFS.EQ.IPFG(I2))GO TO 1000
0141     18 CONTINUE
0142         IF(IFS.EQ.2H??) GO TO 600
0143         IF(IFS.EQ.2HEN) GO TO 500
0144         CALL EXEC(2,ILU,MESS8,5)
0145         GO TO 49
0146  C GET FILE NAME
0147   1000 CALL EXEC(2,ILU,MES12,11)
0148         REG=REIO(1,ILU+400B,MBUF,20)
0149         ISTRC=1
0150  C CONVERT COLONS
0151         IF(NAMR(IPBUF,MBUF,IB*2,ISTRC).LT.0) GO TO 1000
0152         IF(IAND(IPBUF(4),3).EQ.3) GO TO 15
0153         CALL EXEC(2,ILU,MES13,19)
0154         GO TO 1000
0155  C DETERMINE WHAT THE DEFAULT FILE SIZE SHOULD BE.
0156     15 IF(ISIZ.EQ.0.AND.IFS.EQ.2HST) ISIZ=9
0157         IF(ISIZ.EQ.0.AND.IFS.EQ.2HSD) ISIZ=5
0158         ITYP=2000
0159         IERR=0
```

Figure 12-3. Program RDWRT, Mass Storage Program (Continued)

```
0160  C IF RESTORE DATA OR TIME, GO OPEN THE FILE
0161        IF(IFS.EQ.2HRD.OR.IFS.EQ.2HRT) GO TO 300
0162  C OTHERWISE CREATE THE FILE ONLY
0163  C FILE CREATION SECTION
0164        IF(CREAT(IDCB,IERR,NAME,ISIZ,ITYP,ISEC,ICR).GE.0) GO TO 400
0165        IF(IERR.NE.-2)GO TO 900
0166  C OPEN FILE SECTION
0167  300   IOPT=0
0168        IF(OPEN(IDCB,IERR,NAME,IOPT,ISEC,ICR).LT.0)GO TO 900
0169  C MAKE SURE FILE TYPE MATCHES (CHECK DATA CONTROL BLOCK)
0170        IF(IDCB(3).EQ.2000)GO TO 400
0171  C THE FILE TYPE MUST BE 2000 TO BE USED WITH THIS PROGRAM
0172        CALL EXEC(2,ILU,MES14,19)
0173        GO TO 60
0174  C PRINT OUT THE COMPLETE FILE NAMR
0175    400 ITYPE=IDCB(3)
0176        ICR=IAND(IDCB,77B)
0177        MES15(5)=NAME(1)
0178        MES15(6)=NAME(2)
0179        MES15(7)=NAME(3)
0180        MES15(9)=2H
0181        MES15(10)=2H
0182        MES15(11)=ISEC
0183        IF(IAND((IPBUF(4)/4),3).NE.3)CALL CNUMD(ISEC,MES15(9))
0184        CALL CNUMD(ICR,MES15(13))
0185        CALL CNUMD(ITYP,MES15(17))
0186        CALL CNUMD(ISIZ,MES15(21))
0187        CALL EXEC(2,ILU,MES15,23)
0188  C SAVE DISPLAY BUFFER SECTION
0189        IF(IFS.NE.2HSD) GO TO 1500
0190  C  GET DISPLAY STATUS FROM THE 3582A
0191        CALL EXEC(2,IDLU,IDB1,-13)
0192        REG=REIO(1,IDLU+100B,I,5)
0193  C  GET THE DISPLAY BUFFER FROM THE 3582A
0194        CALL EXEC(2,IDLU,IDB2,-13)
0195  C FIXED LENGTH BINARY READ FROM 3582A MEMORY (512=4*128 WORDS)
0196        IL=512
0197        REG=REIO(1,IDLU+100B,IBUF,IL)
0198        IF(IB.LT.IL)CALL EXEC(2,ILU,MESS9,11)
0199        GO TO 59
0200  C SAVE TIME BUFFER (1024=8 BLOCKS*128 WORDS) SECTION
0201   1500 IF(IFS.NE.2HST) GO TO 2000
0202  C INSTRUCT 3582A TO RETURN 5 STATUS WORDS
0203        CALL EXEC(2,IDLU,IDB1,-13)
0204        REG=REIO(1,IDLU+100B,I,5)
0205  C INSTRUCT THE 3582A TO RETURN 1024 WORDS FROM TIME BUFFER MEMORY
0206        CALL EXEC(2,IDLU,IDB5,-17)
0207        IL=1024
0208        REG=REIO(1,IDLU+100B,IBUF,IL)
0209        IF(IB.LT.IL)CALL EXEC(2,ILU,MESS9,11)
0210  C  SET UP THE FILE HEADER
0211     59 CALL EXEC(2,ILU,MES16,15)
0212        REG=REIO(1,ILU+400B,IMBUF,33)
0213  C PUT LENGTH OF HEADER RECORD BEFORE HEADER
0214        MBUF=IB
0215  C SAVE RDWRT COMMAND AND TWO BLANK CHARACTERS
0216        MBUF(2)=IFS
```

Figure 12-3. Program RDWRT, Mass Storage Program (Continued)

```
0217          MBUF(3)=2H
0218    C PUT 5 WORD MEMORY STATUS RIGHT AFTER HEADER RECORD
0219          DO 19 IJ=1,5
0220    19    IMBUF(IB+IJ)=I(IJ)
0221          IF(WRITF(IDCB,IERR,MBUF,IHDL+8).LT.0) GO TO 900
0222    C WRITE 3582A MEMORY RECORD TO DISC FILE
0223          IF(WRITF(IDCB,IERR,IBUF,IL).LT.0) GO TO 900
0224          GO TO 60
0225    C GET HEADER AND 3582A STATUS FROM FILE
0226     2000 IF(READF(IDCB,IERR,MBUF,128,LEN).LT.0) GO TO 900
0227    C 3582A MEMORY STATUS
0228          DO 29 IJ=1,5
0229       29 I(IJ)=IMBUF(IHDL+IJ)
0230    C INSTRUCT USER TO TURN OF THE REPETITIVE SWITCH
0231          CALL EXEC(2,ILU,MES19,20)
0232          IF(ICMD.EQ.2HST)CALL SENSI(I(3))
0233    C PRINT OUT FILE HEADER FOR THE USER AND ASK IF RIGHT ONE
0234          IMBUF(IHDL+1)=2H?                                          X_
0235          CALL EXEC(2,ILU,IMBUF,IHDL+1)
0236          REG=REIO(1,ILU+400B,IANS,1)
0237          IF(IANS.NE.2HYE) GO TO 60
0238    C CHECK TO SEE IF COMMAND IS COUNTERPART OF ONE IN THE FILE
0239          IF(IFS.EQ.2HRD)IFS2=2HSD
0240          IF(IFS.EQ.2HRT)IFS2=2HST
0241          IF(IFS2.EQ.ICMD) GO TO 2010
0242          CALL EXEC(2,ILU,MES18,29)
0243          GO TO 60
0244     2010 IL=512
0245          IF(IFS.EQ.2HRT) IL=1024
0246    C READ IN THE TIME OR DISPLAY BUFFER FROM THE FILE
0247          IF(READF(IDCB,IERR,IBUF,IL,LEN).LT.0) GO TO 900
0248          IF(IFS.EQ.2HRT)GO TO 2500
0249    C  RESTORE THE DISPLAY BUFFER TO THE 3582A
0250          CALL EXEC(2,IDLU,IDB3,6)
0251          CALL EXEC(2,IDLU+100B,I(2),1)
0252          CALL EXEC(2,IDLU,IDB4,8)
0253          GO TO 69
0254    C RESTORE THE TIME BUFFER TO THE 3582A
0255    2500  CALL EXEC(2,IDLU,IDB7,7)
0256          CALL EXEC(2,IDLU+100B,I,5)
0257          CALL EXEC(2,IDLU,IDB6,9)
0258    C FIXED LENGTH BINARY WRITE
0259       69 CALL EXEC(2,IDLU+100B,IBUF,LEN)
0260    C CLOSE THE FILE
0261       60 CALL CLOSE(IDCB,IERR)
0262          GO TO 49
0263    C
0264    C EXPLAIN THE PROMPTING SEQUENCE
0265    C
0266    600   CALL EXEC(2,ILU,MESS5,10)
0267          CALL EXEC(2,ILU,MESS6,8)
0268          CALL EXEC(2,ILU,MES10,15)
0269          CALL EXEC(2,ILU,MES11,13)
0270          GO TO 49
0271     900  MES17(9)=2H -
0272          IERR=IERR*(-1)
0273          CALL CNUMD(IERR,MES17(10))
```

Figure 12-3. Program RDWRT, Mass Storage Program (Continued)

```
0274          CALL EXEC(2,ILU,MES17,12)
0275          CALL CLOSE(IDCB,IERR)
0276    500   END
0277          INTEGER FUNCTION INPRM(ID),11-29-78 (GWG) RUN PRM FOR HP-IB
0278          INTEGER         ISTRNG(40),OSTRNG(10),STRT
0279          COMMON          ILU,ILST,IDLU
0280    C
0281    C 'INPRM' GETS:
0282    C
0283    C   A. THE INPUT LOGICAL UNIT (INTERACTIVE TERMINAL).
0284    C   B. THE LIST LOGICAL UNIT FROM PARAMETER ONE (IT
0285    C       SETS THE LIST LU EQUAL TO THE INPUT LU IF THE
0286    C       LIST LU IS 0).
0287    C   C. UP TO THREE DEVICE LUS (INPRM CHECKS TO SEE
0288          INPRM=2HNO
0289          ILU=LOGLU(ID)
0290          CALL GETST(ISTRNG,-80,RTNCLN)
0291          STRT=1
0292          DO 600 I=1,2
0293          IF(NAMR(OSTRNG,ISTRNG,RTNCLN,STRT))700,100
0294      100 ITYP=IAND(OSTRNG(4),3B)
0295          IF(I.EQ.1)GO TO 200
0296          IF(ITYP.NE.1)RETURN
0297          IDLU=OSTRNG
0298          GO TO 600
0299      200 ILST=OSTRNG
0300          IF(ITYP.EQ.0)ILST=ILU
0301      600 CONTINUE
0302      700 IF(IDLU.GT.0)INPRM=2HYE
0303          RETURN
0304          END
0305          SUBROUTINE SENSI(ISTAT),02-08-79 (GWG) PRINT SENSITIVITY
0306          COMMON ILU,ILST,IDLU
0307          ISTAT1=IAND(ISTAT,17B)
0308          IF(ISTAT1.EQ.01B)ASSIGN 10 TO IFM
0309          IF(ISTAT1.EQ.10B)ASSIGN 20 TO IFM
0310          IF(ISTAT1.EQ.00B)ASSIGN 30 TO IFM
0311          IF(ISTAT1.EQ.14B)ASSIGN 40 TO IFM
0312          IF(ISTAT1.EQ.04B)ASSIGN 50 TO IFM
0313          IF(ISTAT1.EQ.16B)ASSIGN 60 TO IFM
0314          IF(ISTAT1.EQ.06B)ASSIGN 70 TO IFM
0315          IF(ISTAT1.EQ.17B)ASSIGN 80 TO IFM
0316          IF(ISTAT1.EQ.07B)ASSIGN 90 TO IFM
0317          IF(ISTAT1.EQ.13B)ASSIGN 100 TO IFM
0318          WRITE(ILU,110)
0319    110   FORMAT("    1. SELECT INPUT MODE A."/,
0320         &       "    2. SET INPUT SENSITIVITY TO")
0321          WRITE(ILU,IFM)
0322      10  FORMAT(" 3mV/-50dBv.")
0323      20  FORMAT(" 10mV/-40dBv.")
0324      30  FORMAT(" 30mV/-30dBv.")
0325      40  FORMAT(" .1V/-20dBv.")
0326      50  FORMAT(" .3V/-10dBv.")
0327      60  FORMAT(" 1V/0dBv.")
0328      70  FORMAT(" 3V/10dBv.")
0329      80  FORMAT(" 10V/20dBv.")
0330      90  FORMAT(" 30V/30dBv.")
```

Figure 12-3. Program RDWRT, Mass Storage Program (Continued)

```
0331    100  FORMAT(" CALIBRATE.")
0332         WRITE(ILU,120)
0333    120  FORMAT("    3. IN 'LOCAL', CONTINUALLY PUSH THE 'ARM' BUTTON",
0334        &/,     "       UNTIL A VALID WAVEFORM APPEARS ON THE DISPLAY.",
0335        &//,    "            NOTE: '..OVERLOAD..' MUST NOT",/,
0336        &       "                  BE VISIBLE ON THE DISPLAY.",//,
0337        &       "    4. ONCE THE TIME WAVEFORM HAS BEEN RESTORED",/,
0338        &       "       TO THE 3582A BELOW, PUSHING THE 'LOCAL'",/,
0339        &       "       BUTTON WILL CAUSE THE TRANSFORM TO APPEAR",/
0340        &       "       ON THE DISPLAY."/)
0341         WRITE(ILU,130)
0342    130  FORMAT("FILE HEADER ")
0343         RETURN
0344         END
0345         END$
```

Figure 12-3. Program RDWRT, Mass Storage Program (Continued)

```
SD --  SAVE THE DISPLAY BUFFER IN A DISC FILE
ST --  SAVE THE TIME BUFFER IN A DISC FILE
RD --  RESTORE THE DISPLAY BUFFER TO THE 3582A FROM A DISC FILE
RT --  RESTORE THE TIME BUFFER TO THE 3582A FROM A DISC FILE
```

Figure 12-4. RDWRT Commands

The program RDWRT also contains information about HP 1000 system subroutines and how they can be used in measurement situations as well as I/O information about the 3582A (see figure 12-5). The program shows examples which,

1. access 3582A memory directly (display memory in lines 194 through 197, time memory in lines 206 through 208),

2. analyze binary data received from the 3582A (subroutine "SENSI" starting in line 305) and,

3. which write binary data to 3582A memory (display memory in lines 249 through 252 and line 259, time memory in lines 255 through 257 and line 259).

HP 1000 "EXEC" requests were used to output messages to the user terminal instead of incurring the added memory overhead required for the FORTRAN formatter. (The formatter is used in the subroutine "SENSI" but can be excluded by converting these "WRITE" statements to EXEC calls also.)

The methods employed by RDWRT involve the operations shown in Table 12-2. There are two operation types used repeatedly in the program:

SD or ST Save 3582A memory in a disc file.

RD or RT Restore disc file to 3582A memory.

The 3582A time and display memories are transferred using binary EXEC requests in the HP 1000 (line 208, figure 12-3). These I/O requests allow the computer to ignore data which may otherwise be interpreted as an end-of-record (EOR). This way, 3582A memory can be transmitted directly to the HP 1000 at high speed in large buffers, with no binary to ASCII conversion in the process.

The 3582A program messages used for the memory transfers are shown in Table 12-3. (See "Binary Memory I/O" and "Process Control" then refer to figure 12-3, lines 191, 194, 203, and 206.)

Line No.	Subroutine	Comments
Line 120	INPRM	See Application Note 401-1 (part no. 5953-2800).
Line 130	LURQ	Locks the 3582A LU to the user program (documented in RTE Programmers Reference Manual for RTE-IV, part no. 92067-90001).
Line 151	NAMR	Universal parse routine for File Manager file "Namrs" (documented in the Session Monitor Reference Manual, part no. 09570-93021).
Line 164	CREAT	Creates a File Manager file (documented in the Batch Spool Monitor Manual, part no. 92060-90013).
Line 168	OPEN	Opens a File Manager file (see above reference).
Line 184	CNUMD	Converts binary number to ASCII (see LURQ above).
Line 221	WRITF	Writes to a File Manager file (see CREAT above).
Line 275	CLOSE	Closes a File Manager file (see CREAT above).

Figure 12-5. Subroutines Used in "RDWRT"

Operation	Program Function	Lines
SD and ST	Prompts the user for the name of the file in which data is to be saved.	147
SD and ST	Prompts the user for the file header record.	211
SD and ST	Obtains the complete front panel status information of the 3582A and saves it in the disc file.	191-192 (SD) 203-204 (ST)
SD and ST	Opens a type = 2000 for valid data file.	
RD and RT	Reads the file command used for the save (SD or ST) and verifies that it is the proper counterpart. (ST corresponds to RT or SD corresponds to RD.)	238-242
RD and RT	Reads the file header, then prompts the user for verification.	233-237
RD and RT	Restores the front panel status at the time of the save.	249-252
RT	Restores the front panel status and prompts the user so that he may restore the sensitivity control status before the time-waveform is restored. This way the user may return the instrument to local after the restore and perform front panel operations. (See subroutine "SESNI' line 305.)	232

Table 12-2. Procedures Used in "RDWRT"

Table 12-3. Binary Transfer Messages

Group	Command	Description
Listing Commands	LAD	List frequency adjust value NNNNN.N CRLF
	LMK	List marker amplitude and frequency ±N.NNNE±NN, NNNNN CRLF
	LSP	List span (Hz) NNNNN CRLF
	LAS	List Ch A sensitivity } ±N.NNE±NN CRLF
	LBS	List Ch B sensitivity } ±N.NNE±NN CRLF
	LXS	List transfer function sensitivity } ±N.NNE±NN CRLF
	LDS	List display (128, 256, or 512 points in corresponding units) each point ±N.NNE±NN separated by commas; CRLF
	LAN	List alphanumerics (128 ASCII characters, CRLF; representing the four 32 character lines)
Binary Memory I/O	LFM,M,N	List from memory
	WTM,M,N	Write to memory M = Start Address (Octal) N = Number of words to be transferred (decimal) Input is in 2N 8-bit bytes Most significant byte first
Writing Display Alpha-numerics	WTA 1–4, 32 ASCII Characters	Inputs a 32 character string to alpha line 1 to 4 (top to bottom) of display. Use blanks where needed to complete 32 character count.
Processor Control	HLT	Unconditional halt at next HP–IB branch point
	RUN	Unconditional run
Status Word	LSTØ LST1	List status word (Ø Resets Bits After Reading) One 8-Bit Byte Bit / Value / Meaning 0 / 1 / Diagnostic on screen. Indicates current switch setting is invalid. Set and cleared by 3582. 1 / 2 / Arm light is on. Set and cleared by 3582 to agree with arm light on front panel. 2* / 4 / A overload. Set by 3582 when: 1)Time record is moved to FFT area or time record is complete 2)and hardware overload has occurred 3)and A or BOTH INPUT MODE. 3* / 8 / B overload. Same as A.

Table 12-3. Binary Transfer Messages (Continued)

Group	Command	Description	
		4* 16	Time record complete. Set when 1024 new time points have been taken since last record complete.
		5* 32	Single sweep spectrum complete. Set when time complete data has been FFT'D and displayed. Use LST1 to check this flag! It depends on internal flags which are cleared by LSTØ.
		6* 64	Average complete.
		7* 128	X–Y plot complete.
Preset	PRS	Preset command Causes instrument to go into the following control state: (25 kHz, 1 channel)	
		Switch	Setting (when applicable)
		Coupling	AC (Channels A & B)
		Input Mode	Channel A
		Sensitivity	30 V (Channels A & B)
		Level	Free Run
		Repetitive	On
		Arm	Off
		Trigger Slope	—
		Marker	Off
		Marker Relative	Off
		Marker ÷ $\sqrt{BW}$	Off
		Mode	0–25 kHz Baseband
		Span	25 kHz
		Amplitude	A (B&XFR-OFF)
		Scale	10 dB/Div
		Phase	None
		Time	None
		Coherence	Off
		Amplitude Ref Lev	Normal
		Passband	Flat Top
		Average	Off
		Average Number	4
		Average Shift	Off
		Trace 1 Store	Off
		Trace 1 Recall	Off
		Trace 2 Store	Off
		Trace 2 Recall	Off

Note the precedures used in RDWRT. Many times, when excessive I/O is being done in a multiprogramming system, it's a wise investment to lock the device LU for the duration of the program. The subroutine "LURQ" (line 130) accomplishes this task for RDWRT. The LU is automatically unlocked by the system when RDWRT finishes. See the comments at the beginning of the program (figure 12-3) for the file format, header, etc.

Service Requests

In the 3582A, SRQ's occur only as a result of syntax errors caused by improper HP-IB commands. The SRQ is cleared by a device clear (DCL) or as the result of a serial poll.

Status may be obtained from the 3582A by sending the command "LST0" or "LST1" and then performing a binary read request to input a status byte.

Figure 12-6 shows an example HP 1000 SRQ program which can be set up to run automatically when the 3582A generates an SRQ.

```
0001  FTN4,L
0002        PROGRAM A3582(3),02-07-79 (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 3582A INTERRUPTS.
0012  C
0013  C RMPAR IS CALLED N TIMES.
0014  C
0015  C
0016        INTEGER IPM(5),IPRG(4),ISTT(2)
0017        COMMON  ILU,ILST,IDLU
0018        DATA    NO/2HNO/
0019        DATA    IPRG/5,2HA3,2H58,2H2 /,LOOP/0/
0020  C
0021        IF(INPRM(ID).EQ.NO)  GO TO 999
0022        WRITE(ILU,100)IDLU
0023    100 FORMAT(" 3582A: SRQ PROGRAM SETUP",
0024       &" IN PROGRESS FOR FOR LU "I2"."/)
0025        CALL SRQ(IDLU,17)
0026        CALL SRQ(IDLU,16,IPRG)
0027        IF(IERR(NN).LT.0) GO TO 20
0028     10 CALL EXEC(6,0,1)
0029        CALL RMPAR(IPM)
0030        WRITE(ILU,120)
0031    120 FORMAT("A3582: 3582A SYNTAX ERROR. 3582A CLEARED."/)
0032  C     WRITE(IDLU,220)
0033  C 220 FORMAT("LST0")
0034  C     CALL EXEC(1,IDLU+100B,ISTAT,1)
0035  C     WRITE(ILU,150)ISTAT
0036  C 150 FORMAT("3582A STATUS: "K6)
0037  C     IF(IAND(ISTAT,1).EQ.1)WRITE(IDLU,200)
0038  C 200 FORMAT("DIAGNOSTIC ON SCREEN. CLEARED.")
0039  C     IF(IAND(IATAT,2).EQ.2)WRITE(IDLU,205)
0040  C 205 FORMAT("ARM LIGHT IS ON. SET AND CLEARED.")
```

Figure 12-6. 3582A SRQ Program

```
0041  C      IF(IAND(ISTAT,4).EQ.4)WRITE(IDLU,210)
0042  C 210  FORMAT("A OVERLOAD.")
0043  C      IF(IAND(ISTAT,8).EQ.8)WRITE(IDLU,230)
0044  C 230  FORMAT("B OVERLOAD.")
0045  C      IF(IAND(ISTAT,16).EQ.16)WRITE(IDLU,240)
0046  C 240  FORMAT("TIME RECORD COMPLETE.")
0047  C      IF(IAND(ISTAT,64).EQ.64)WRITE(IDLU,250)
0048  C 250  FORMAT("AVERAGE COMPLETE.")
0049  C      IF(IAND(ISTAT,128).EQ.128)WRITE(IDLU,260)
0050  C 260  FORMAT("X-Y PLOT COMPLETE.")
0051         GO TO 10
0052    999  WRITE(ILU,130)
0053    130  FORMAT(" :RU,A3582,ILST,IDLU"/)
0054         STOP
0055    20   END
0056  C
0057  C
0058         FUNCTION IERR(N),
0059        &07-26-78 (GWG) HANDLE BUS ERRORS
0060         COMMON ILU,ILST,IDLU
0061         I=IBERR(IDLU)
0062         IERR=0
0063         IF(I.EQ.0)GO TO 10
0064         IERR=-I
0065         WRITE(ILU,30)I,IDLU
0066  30     FORMAT(" 3437A: BUS ERROR "I2" ON LU ",
0067        &I2," (HP-IB USERS GUIDE).")
0068  10     RETURN
0069         END
0070  C
0071  C
0072  C
0073         INTEGER FUNCTION INPRM(ID),11-29-78 (GWG) RUN PRM FOR HP-IB
0074         INTEGER         ISTRNG(40),OSTRNG(10),STRT
0075         COMMON          ILU,ILST,IDLU
0076  C
0077  C 'INPRM' GETS:
0078  C
0079  C    A. THE INPUT LOGICAL UNIT (INTERACTIVE TERMINAL).
0080  C    B. THE LIST LOGICAL UNIT FROM PARAMETER ONE (IT
0081  C       SETS THE LIST LU EQUAL TO THE INPUT LU IF THE
0082  C       LIST LU IS 0).
0083  C    C. THE DEVICE LOGICAL UNIT(INPRM CHECKS TO SEE
0084  C       IF IDLU IS NON-ZERO. IF NOT INPRM IS SET TO
0085  C       '2HNO').
0086  C
0087         INPRM=2HNO
0088         ILU=LOGLU(ID)
0089         CALL GETST(ISTRNG,-80,RTNCLN)
0090         STRT=1
0091         DO 600 I=1,2
0092         IF(NAMR(OSTRNG,ISTRNG,RTNCLN,STRT))700,100
0093    100  ITYP=IAND(OSTRNG(4),3B)
0094         IF(I.EQ.1)GO TO 200
0095         IF(ITYP.NE.1) RETURN
```

Figure 12-6. 3582A SRQ Program (Continued)

```
0096          IDLU=OSTRNG
0097          GO TO 600
0098      200 ILST=OSTRNG
0099          IF(ITYP.EQ.0) ILST=ILU
0100      600 CONTINUE
0101      700 IF(IDLU.GT.0)INPRM=2HYE
0102          RETURN
0103          END
0104          END$
```

Figure 12-6. 3582A SRQ Program (Continued)

The program in figure 12-6 also interrogates the 3582A for status each time and prints a 3582A evaluation message on the user's terminal.

The first time, "A3582" is scheduled from the user's terminal which initializes SRQ program scheduling for LU "IDLU" supplied in the run parameters. Line 26,

```
CALL SRQ(IDLU,16,IPRG)
```

sets up the new correspondence for "A3582". The program then terminates in a special way in line 28,

```
CALL EXEC(6,0,1)
```

The next time it is scheduled (when the 3582A generates an interrupt), it will begin from the last line of suspension +1 (line 29).

Performance

The "real-time" measurement speed of the 3582A is discussed in an application note called "Understanding the 3582A Spectrum Analyzer".[3]

Technically, 3582A performance describes the bandwidth where the time record collection process exceeds the actual transform and display time. The "real-time" spans are the ones which take the longest to measure. On the 1 Hz span, the measurement is in "real-time", but it takes 250 seconds. On the 25 kHz span, the measurement is not in "real-time," but it only takes about 400 milliseconds. The actual measurement time depends on several factors including the data being analyzed.

Table 12-4 gives some typical times. These can be expected to vary as much as 20 ms depending on the data being analyzed. Note that for maximum analysis speed in HP-IB type environments, the display should not be activated until necessary.

	Typical Swept Analyzer		3582A	
	Bandwidth	Time	Bandwidth	Time
100 Hz SPAN	1 Hz	200 SEC	0.4 Hz	≈3 SEC
500 Hz SPAN	3 Hz	100 SEC	2 Hz	≈9 SEC
1000 Hz SPAN	3 Hz	200 SEC	4 Hz	≈6 SEC

Table 12-4. 3582A Performance Times

The maximum transfer speed for binary data (speed is limited by the 3582A) is approximately 5 kilobytes per second once the request has been initiated in the HP 1000 (that is, from 1 to 2 milliseconds after the request has been made).

[3]*Part number 5952-8773.*

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