8350B
SWEEP
OSCILLATOR

1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CA. 95404

MANUAL PART NO. 08350-90034
Microfiche Part No. 08350-40035

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SECTION III
OPERATING INFORMATION

3-1. INTRODUCTION

3-2. This subsection contains a index of keys and functions which refer to the figured functional blocks at the end of this subsection. Included in this section are descriptions of all front panel controls connectors and indicators, operator's checks, operating instructions, and operator's maintenance.

3-3. SAFETY

3-4. Before applying power, refer to SAFETY CONSIDERATIONS in Section I of this manual.

3-5. The information, cautions, and warnings in this manual must be followed to ensure safe operation and to keep the insturment safe.

WARNING

Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers and devices connected to it should be connected to a protective earth grounded socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in personal injury.

Only fuses with the required rated current and specified type should be used. Do not use repaired fuses or short circuited fuseholder. To do so could cause a shock or fire hazard.

CAUTION

Before the instrument is switched on, it must be set to the voltage of the power source, or damage to the instrument may result.

3-6. OPERATING CHARACTERISTICS

3-7. Table 3-1 briefly summarizes the major operating characteristics of the Sweep Oscillator. The table is not intended to be an in-depth listing of all operations and ranges. For more information on Sweep Oscillator capabilities, refer to Specifications Table 1-1, and Supplemental Information Table 1-2.

3-8. Panel Features

3-9. Figure 3-1 Front Panel features provides a reference to a functional block figure number which provides a complete description of each control within the function block.

3-10. Rear Panel features are described in Figure 3-2.

3-11. OPERATOR'S CHECKS

3-12. The local operator's check (Figure 3-3) allows the operator to make a quick check of the main instrument functions prior to use. This check assumes that an RF Plug-in is installed in the Sweep Oscillator and that a 10 dB attenuator, oscilloscope, and appropriate crystal detector are available. If these items are not available the preliminary self test may still be performed.

3-13. The remote operator's check (Figure 3-4) allows the operator to make a quick check to the main remote functions prior to use. This test is shown in program statements for HPL and BASIC and a general flow chart.

3-14. OPERATING INSTRUCTIONS

3-15. Located underneath the Sweep Oscillator is a pullout information card which contains information on general operating instructions, some remote programming information, and some Plug-in usage information.

3-15A. SOFTWARE REVISION NUMBER

3-15B. The current mainframe software revision may be displayed by pressing **[SHIFT 49]**. The revision number will appear in the FREQUENCY/TIME display. The current software revision for any installed 83500 series Plug-in may be displayed by pressing **[SHIFT 99]**. The revision number will appear in the Plug-in POWER display.

3-16. For a complete reference of each function refer to the function group index (Table 3-2).

3-17. LOCAL OPERATION

3-18. The operation of the 8350B Sweep scillator in the Local mode is described in the Local Operation handbook and by functional block figures indexed in the table of contents and Table 3-2.

FRONT PANEL FEATURES

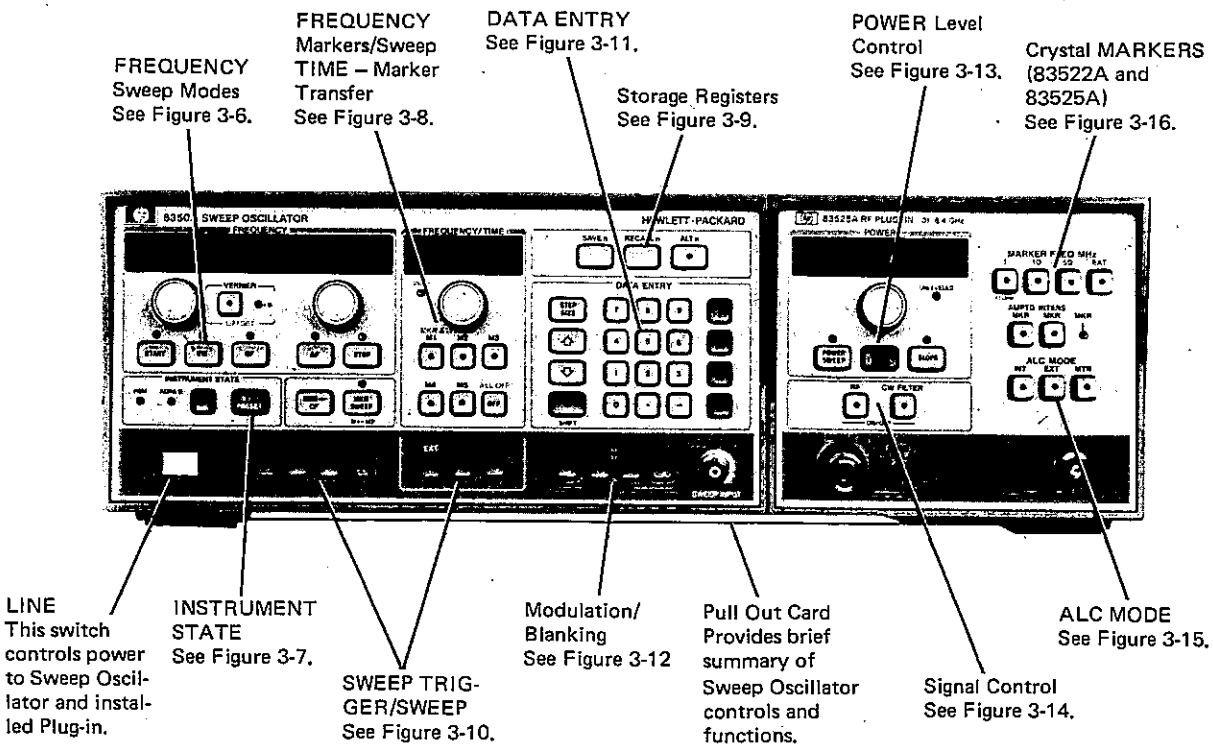
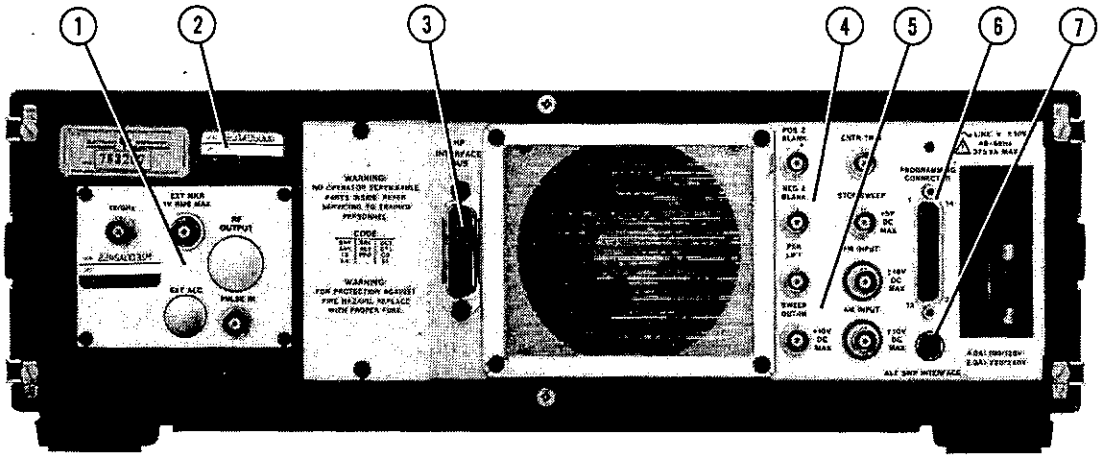


Figure 3-1. Front Panel Features

REAR PANEL FEATURES



Plug-in connectors (as apply)

1 1V/GHz Frequency Reference output connector provides approximately 1V (DC) per GHz of sweep signal output.

EXT MKR (1V RMS MAX) (on 83522A and 83525A only) input connector allows use of external markers when plug-in front panel EXT MARKER FREQ button is engaged.

PULSE INPUT connector provides input connector for external pulse or squarewave modulation.

EXT ALC and RF OUTPUT. These connectors replace the corresponding front panel connectors in Option 004 plug-ins.

2 SERIAL PLATE and Option label.

3 HP INTERFACE BUS input/output connector allows interface with other HP-IB instrument or controllers.

4 POS Z BLANK output connector provides positive (+5V) retrace and bandswitch blanking and negative intensity Marker Z-axis Modulation signals for external display.

CNTR TRIG. Counter trigger output connector when used with STOP SWEEP with appropriate frequency counter (SWP INTFC B) to stop the forward sweep long enough to take a frequency count.

NEG Z BLANK output connector provides retrace (−5V) and bandswitch blanking Z-axis modulation signals for external displays.

5 PEN LIFT output connector provides TTL output to the remote penlift coil of an X-Y recorder.

SWEEP OUT/IN connector parallels front panel SWEEP OUT/IN connector. Provides and accepts sweep signal.

FM INPUT connector passes signal thru to plug-in for frequency modulation or phase-lock error signal inputs.

6 PROGRAMMING CONNECTOR provides digital control of external display functions and sweeper control.

Pin	Description	in/out	Logic
1	———		
2	Marker Pulses	output	TTL –
3	Pen Lift Request	input	TTL –
4	Sweep Alternate	output	TTL –
5	Stop Fwd Swp Req.	input	TTL –
6	+5 volts (100 ma Max)	output	TTL –
7	RF Blanking	output	TTL –
8	RF Blank Request	input	TTL –
9	Ext Trig Input	input	TTL +
10	Pen Lift	output	TTL
11	Recorder Mute	output	TTL –
12	———		
13	———		
14	Blanking Pulse	output	TTL –
15	Marker Request	input	TTL –
16	Retrace	output	TTL –
17	Alternate Swp En	output	TTL –
18	Stop Swp Request	input	TTL –
19	Digital Ground	in/out	
20	Blk Pulse Request	input	TTL –
21	Counter trigger	output	TTL –
22	Step Up Advance	input	TTL –
23	Inverse Penlift	output	TTL –
24	8410 Ext Trigger	output	TTL +
25	———		

7 ALT SWP INTERFACE connector may be connected to the 8755C ALT SWP INTERFACE connector via cable HP Part No. 8120-3174 to provide Alternate Sweep Function.

Figure 3-2. Rear Panel Features

Table 3-1. Sweep Oscillator Operating Characteristics

FREQUENCY RANGE	Set automatically when plug-in installed
SWEEP MODES	START-STOP CENTER FREQUENCY-ΔF Marker→Center frequency Marker Sweep CW Frequency
MARKERS	5 settable frequency markers amplitude and intensity
SWEEP TIME	Range .01—100 seconds
POWER	Control power level with 83500 Series Plug-ins

Table 3-2. Functional Block Index (1 of 2)

Table 3-2. Functional Block Index (2 of 2)

Function	Function Block Index	Page
Instrument Preset	Instrument State	25
Intensity Crystal Markers	Crystal Markers	43
Intensity Markers 8350B	Frequency Markers	26
Internal ALC	ALC Mode	41
Internal Sweep Trigger	Sweep/Sweep Trigger	33
Learn String	HP-IB Only Functions	45
Level Power	Power Control	38
Line Sweep Trigger	Sweep/Sweep Trigger	32
Local Key	Instrument State	24
Manual Sweep	Sweep/Sweep Trigger	32
M1 to M5	Frequency Markers	26
Markers Crystal	Crystal Markers	43
Marker Delta	Frequency Markers	26
Marker Sweep	Frequency Markers	26
Marker→Center Frequency	Frequency Markers	26
Memory Lock	Storage Registers	30
Memory Unlock	Storage Registers	30
Meter ALC	ALC Mode	41
Millisecond	Data Entry	34
MHz	Data Entry	34
Network Analyzer Trigger	HP-IB Only Functions	45
Offset	Frequency Sweep Mode	21
Output Active Parameter	HP-IB Only Functions	45
Power Level	Power Control	39
Power Sweep	Power Control	39
Recall n	Storage Registers	31
RF	Power Control	38
Save n	Storage Registers	30
Shift	Data Entry	35
Single Sweep Trigger	Sweep/Sweep Trigger	32
Slope	Power Control	38
Slope Cal	Power Control	38
Square Wave Modulation	Blanking/Modulation	37
Start Sweep	Frequency Sweep Mode	21
Step Size	Data Entry	34
Stop Sweep	Frequency Sweep Mode	21
Time Sweep	Frequency Markers	26
Up ▲ Step key	Data Entry	34
Vernier	Frequency Sweep Mode	21

LOCAL OPERATOR'S CHECKS

DESCRIPTION

The Preliminary check provides assurance that most of the internal functions of the Sweep Oscillator are working. The main check provides a general check of the overall functions of the Sweep Oscillator.

PRELIMINARY CHECK

(Self test) Each time the Sweep Oscillator is turned on or INSTR PRESET button is engaged the instrument performs a series of self tests taking about one second to complete. When the self test is complete the instrument will perform one of the following functions: If the self test was initiated by turning the power on the instrument will be in the same functional configuration that it was in before it was turned off. If the self test was initiated by an INSTRUMENT PRESET the instrument will be in the preset mode if a Plug-in is installed or the left-most frequency display will have an E001 error code indicating no Plug-in is installed. If error code E016 is observed refer to paragraph 3-103. If another error code is noted the Sweep Oscillator requires service. Refer to paragraph 3-107. Plug-in related error information (E050 to E099) is in the Plug-in manual.

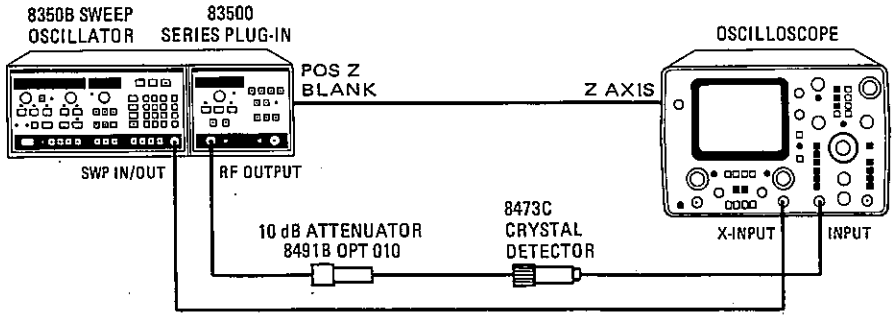
1. Set LINE switch to ON. Press **[INSTR PRESET]**. Observe display in START/STOP mode with display frequency equaling Plug-in range or E001 if no Plug-in is installed.

MAIN CHECK

Equipment:

RF Plug-in	HP 83500 series or HP 86200 series with adapter HP 11869A (18 GHz or less)
Oscilloscope	HP 1220A or HP 1740A
Crystal Detector	HP 8473C or a crystal detector that will cover frequency range of interest.
Attenuator 10 dB	8491B Option 010
Cables BNC to BNC (3)	10503A (123 cm)

Setup:



Connect the equipment listed above as shown in the above diagram. Select External Sweep on oscilloscope.

Figure 3-3. Local Operator's Check (1 of 2)

LOCAL OPERATOR'S CHECKS (Cont'd)

CAUTION

BEFORE CONNECTING LINE POWER, ensure that all devices connected to this instrument are connected to the protective (earth) ground.

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that the line power plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.)

NOTE

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that the power transformer primary is matched to the available line voltage, the correct fuse is installed, and the safety precautions are taken. See Power Requirements, Line Voltage Selection, Power Cables, and associated warnings and cautions in Section II.

Procedure:

1. Set LINE switch to ON position. Press **[INSTR PRESET]**. Observe that LEDs above START and STOP buttons are on with the frequency range of installed Plug-in displayed above them. Oscilloscope trace should show detected RF signal output below zero—volt reference with no discontinuities in swept trace across band.

2. Press **[CW]** button. Observe LED above CW on and trace is reduced to dot at center of CRT with display at center of Plug-in frequency range.

3. Press **[CF]** button. Observe LED above CF and ΔF buttons on, that displayed center frequency is at center of Plug-in frequency range and ΔF display is equal to frequency span.

4. Press **[M1]** button. Observe button LED blinking and check for an intensity dot at approximately the center of the trace.

5. Press SWEEP **[TIME]** button; then press DATA ENTRY [▲] button a few times and observe sweep getting slower. Press DATA ENTRY [▼] button a few times and observe sweep getting faster.

6. Press DATA ENTRY **[.] [1] [GHz/s]** and observe FREQUENCY/TIME display is 0.100 sec.

Figure 3-3. Local Operator's Check (2 of 2)

REMOTE OPERATOR'S CHECK

Flowchart	HPL Statements[1]	BASIC Statements[2]	Visual Indicators
START			
--REMOTE			
Send REN command to ensure instrument is in remote enable state.	`rem 719`	`REMOTE 719`	Remote LED on
--DATA			
Program sweep oscillator to Instrument Preset.	`wrt 719,"IP"`	`OUTPUT 719;"IP"`	Instrument START/STOP condition preset sweep

Print Start and Stop frequencies.	`wrt 719,"OPFA"`
	`red 719,A`
	`wrt 719,"OPFB"`
	`red 719,B`
	`prt "START FREQ",A`
	`prt"STOP FREQ",B`
		`OUTPUT 719;"OPFA"`
		`ENTER 719,A`
		`OUTPUT 719;"OPFB"`
		`ENTER 719;B`
		`PRINT"START FREQ";A`
		`PRINT"STOP FREQ";B`
			Printout equals plug-in frequency range

Switch to CW. Print CW.	`wrt 719,"CWOPCW"`
	`red 719,C`
	`prt "CW",C`
		`OUTPUT 719;"CWOPCW"`
		`ENTER 719;C`
		`PRINT"CW";C`
			CW LED on printout CW frequency

Switch to CF ΔF. Change sweep time to 10 seconds.	`wrt, "CFST10SC,"`	`OUTPUT 719;"CFST10SC"`	CF and ΔF, TIME LEDS on, 10 second sweeptime
--LOCAL			
Switch to local.	`lcl 719`	`LOCAL 719`	Remote lamp out

1 Typical Statements for the HP 9825 Series Desktop Computer.
2 Typical Statements for the HP 9835, 9845, and 85 Series Desktop Computers.

Figure 3-4. Remote Operator's Check

3-19. REMOTE OPERATION: HEWLETT-PACKARD INTERFACE BUS

3-20. The 8350B Sweep Oscillator can be operated remotely via the Hewlett-Packard Interface Bus (HP-IB). Bus compatibility, programming capability, and data formats are described in the following paragraphs. For complete information on specific program code syntax, functions, limits, etc., please see Functional Block Index Table 3-2.

3-21. All front panel functions except for the LINE switch are programmable through the HP-IB. Also provided are special HP-IB only functions to aid the programmer. Complete descriptions of all HP-IB programmable functions are contained within the functional blocks.

3-22. To verify that the Sweep Oscillator's HP-IB interface is functional, a quick check is provided in Figure 3-4 Operators' Checks. This tests that the 8350B can respond and send to the controller the fundamental HP-IB bus messages. The following information gives a general description of the HP-IB and defines the terms, concepts, and messages used in an HP-IB system.

3-23. For more information about the HP-IB, refer to any of the following documents:

IEEE Interface Standard 488-1975

ANSI Interface Standard MC1.1

"Improving Measurements in Engineering and Manufacturing" (HP Part No. 5952-0058)

"Condensed Description of the Hewlett-Packard Interface Bus" (HP Part No. 59401-90030)

3-24. General HP-IB Description

3-25. The HP-IB is a parallel bus of 16 active signal lines grouped into three sets according to function, to interconnect up to 15 instruments. Figure 3-5 is a diagram of the interface connections and bus structure. Table 3-3 defines the function of each signal line.

Table 3-3. The Bus Signals

Name	Nmemonic	Description
Data Input/Output	DIO1-8	The eight data lines for the byte of data.
Data Valid	DAV	Indicates the data lines have a valid byte of data.
Not Ready for Data	NRFD	Indicates that the listening devices are not ready to accept further data.
Not Data Accepted	NDAC	Indicates that the listening devices have not completely accepted the present byte of data.
Attention	ATN	Enables a device to interpret data on the bus as a controller command (command mode) or data transfer (data mode).
Interface Clear	IFC	Initializes the HP-IB system to an idle state (no activity on the bus).
Service Request	SRQ	Alerts the controller to a need for communication.
Remote Enable	REN	Places instruments under remote program control
End Or Identify	EOI	Indicates last data transmission during a data transfer sequence; used with ATN to poll devices for their status.

3-26. Eight signal lines form the first set and are termed "data" lines. The data lines carry coded messages which reperesent addresses, program data, measurements, and status bytes. The same data lines are used for input and output messages in bit-parallel, byte-serial form. Normally, a seven-bit ASCII code represents each piece (byte) of data, leaving the eighth bit available for parity checking.

3-27. Data transfer is controlled by means of an interlocked "handshake" technique which permits data transfer (asynchronously) at the rate of the slowest device participating in that particular conversation. The three data byte transfer control lines which implement the handshake (DAV, NRFD, NDAC) form the second set of lines.

3-28 The remaining five general interface management lines form the third set and are used in such ways as activating all the connected devices at once, clearing the interface, allowing a device to request service, etc.

3-29. Definition of HP-IB Terms and Concepts

3-30. The following list defines the terms and concepts that describe HP-IB system operations.

Byte: A unit of information consisting of 8 binary digits (bits).

Device: Any unit that is compatible with the IEEE Standard 488-1975.

Device Dependent: An action a device performs in response to information sent on the HP-IB. The action is characteristic of an individual devices' design and may vary from device to device.

Addressing: The set of characters sent by a controller to specify which device will send information on the bus and which device(s) will receive that information. A device may also have its address fixed so that it may receive information (listen only) or send information (talk only).

Polling: The process by which a controller can identify a device that needs interaction with it. The controller may poll devices for their operational condition one at a time, which is termed a serial poll, or as groups of devices simultaneously, which is termed a parallel poll.

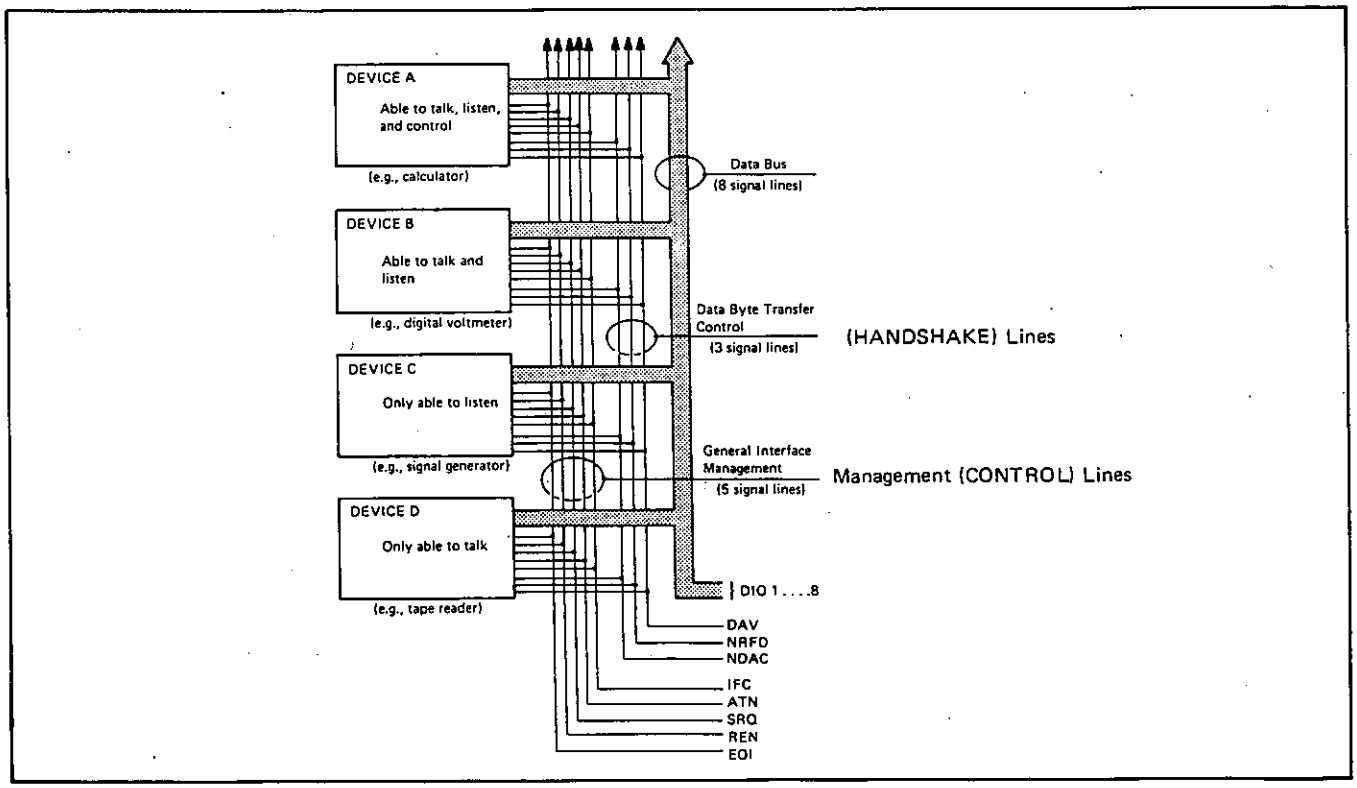


Figure 3-5. Interface Connections and Bus Structure

3-31. Basic Device Communication Capability

3-32. Devices which communicate along the interface bus fall into three basic categories.

Talkers: Devices which send information on the bus when they have been addressed.

Listeners: Devices which receive information sent on the bus when they have been addressed.

Controllers: Devices that can specify the talker and listener(s) for an information transfer. The controller can be an active controller or a system controller. The active controller is defined as the current controlling device on the bus. The system controller can take control of the bus even if it is not the active controller. Each system can have only one system controller, even if several controllers have system control capability.

3-33. HP-IB System Messages

3-34. The transfer of information via the HP-IB occurs from one device to one or more devices, thus consider the information to be a message. There are twelve types of messages on the HP-IB. The following describes each of the HP-IB System Messages.

- **The Data Message:** The actual information which is sent from the talker to one or more listeners on the HP-IB. The information or data can be in a numeric or a string of characters.
- **The Trigger Message:** This causes the listening device(s) to perform a device-dependent action when addressed.
- **The Clear Message:** This causes either the listening device(s) or all of the devices on the bus to return to a predefined device-dependent state.
- **The Remote Message:** This causes the listening device(s) to switch from local front panel control to remote program control when addressed to listen. This message remains in effect so that devices subsequently addressed to listen will go into remote operation.
- **The Local Message:** This clears the remote message from listening device(s) and returns the device(s) to local front panel control.
- **The Local Lockout Message:** This prevents the user of a device from manually inhibiting remote program control.
- **The Clear Lockout/Set Local Message:** This causes all devices on the bus to be removed from local lockout and revert to local. This message also clears the remote message for all devices on the bus.
- **The Request Service Message:** A device can send this message at any time to signify that the device needs some type of interaction with a controller. The message is cleared by sending the device's Status Byte message if the device no longer needs service.
- **The Status Byte Message:** A byte that represents the status of a single device on the bus. Within this byte, the seventh most significant bit (bit 6 of bits 0 through 7) indicates whether the device has sent a Require Service message. The remaining bits indicate the present operational conditions defined by the device. This byte is sent from a talking device in response to a serial poll operation performed by a controller.
- **The Status Bit Message:** A byte that represents the operational conditions of a group of devices on the bus. Each device responds on a particular bit of the byte thus identifying a device-dependent condition. This bit is typically sent by devices in resonse to a parallel poll operation by a controller.

  This message can also be used by a controller to specify the particular bit and logic level that a device will respond with when a parallel poll operation is performed. Thus more than one device can respond on the same bit.
- **The Pass Control Message:** This transfers the bus management responsibilities from the active controller to another controller.
- **The Abort Message:** The system controller sends this message to unconditionally assume control of the bus. This message terminates all bus communications but does not implement the Clear message.

A summary of the twelve bus messages, their related commands and mnemonics are provided in Table 3-4.

Table 3-4. The Twelve Bus Messages (1 of 2)

HP-IB Message	Appli-cable	8350 Response	Related Comments	Interface Function	Message Type	Sample Statements	
						HPL (9825)	BASIC (9835,9845,85)
Data	Yes	Input data controls all front panel functions (except the Line switch) plus special HP-IB only functions. Output data includes information as to present instrument state, values of selected functions, and the instrument status.		T6 L4 AH1 SH1	Input Data	wrt 719,"..."	OUTPUT 719;"..."
					Output Data	red 719,A;...	ENTER 719;A,...
Trigger	Yes	Responds by triggering a sweep if and only if in the single sweep trigger mode.	GET	DT1	System Trigger	trg 7	TRIGGER 7
					Device Trigger	trg 719	TRIGGER 719
Clear	Yes	Clears the instrument status byte and the extended status byte.	DCL SDC	DC1	System Clear	clr 7	RESET 7
					Device Clear	clr 719	CLEAR 719
Remote	Yes	Removes the 8350 from local front panel control to remote HP-IB control. All functions remain the same as in local and the keyboard is non-responsive except the LOCAL key.	REN	RL1	System Remote	rem 7	REMOTE 7
					Device Remote	rem 719	REMOTE 719
Local	Yes	Removes the 8350 from remote HP-IB control to local front panel control. All functions remain the same as in the remote state.	GTL	RL1	System Local	lcl 7	LOCAL 7
					Device Local	lcl 719	LOCAL 719
Local Lockout	Yes	Functions the same as the remote message except that the entire front panel is disabled including the LOCAL key.	LLO	RL1		llo 7	LOCAL LOCKOUT 7
Clear Lockout/ Set Local	Yes	Removes the 8350 from local lockout and remote HP-IB control to local front panel control. All functions remain the same as in the remote state.	$\overline{\text{REN}}$	RL1		lcl 7	LOCAL 7
Require Service	Yes	The 8350 can set the HP-IB SRQ (Service Request) line if one of the following instrument conditions exists and has been enabled by the Request Mask value. Testable conditions include: parameter value altered, syntax error, end of sweep, power failure, and RF unleveled.	SRQ	SR1		rds(719)→A, if bit (6,A) =1; gto "SRQ"	STATUS 719; A IF BIT (A,6)=1 THEN Srq

Table 3-4. The Twelve Bus Messages (2 of 2)

HP-IB Message	Appli-cable	8350A Response	Related Comments	Interface Function	Message Type	Sample Statements	
						HPL (9825)	BASIC (9835,9845,85)
Status Byte	Yes	Responds to a Serial Poll with one 8-bit byte with the seventh most significant bit (bit 6 of bits 0 through 7) set if the 8350A is Requesting Service. Bit 2 indicates a status change has occurred that can be detected only by analyzing the extended status byte which is accessible with the Output Status function only.	SPE SPD	T6		rds(719)→A	STATUS 719; A or A=S POLL (719)
Status Bit	No	The 8350A does not respond to a Paralell Poll.	PPØ				
Pass Control	No	The 8350A does not have the ability to take or pass control of the HP-IB.	CØ				
Abort	Yes	Responds by terminating all Listener or Talker functions.	IFC	T6 L4		cli 7	ABORT TO 7

3-35. HP-IB Addressing

3-36. Certain messages require that a specific talker and listener be designated. Each instrument on the bus has its own distinctive listen and/or talk address which distinguishes it from other devices. Devices can be listen only, talk only, and both talker and listener.

3-37. Addressing usually takes the form of "universal unlisten command, device talk address, device(s) listen address(es)". The universal unlisten command removes all listeners from the bus, thereby allowing only the listener(s) designated by the device(s) listen address(es) to receive information. The information is sent by the talker designated by the talk address. The system controller may designate itself as either talker or listener.

3-38. Table 3-5 lists all the possible talk and listen addresses on the bus. The device address is typically set via five binary bits which are the same for both listen and talk addresses, with the sixth and seventh bits used to determine when the address is listen (bits are 0,1) or talk (bits are 1,0). Some controllers distinguish between listen and talk automatically, requiring only the 5-bit code equivalent to designate a device.

3-39. 8350B HP-IB MESSAGE RESPONSES

3-40. The 8350B responds to the twelve bus messages as shown in Table 3-4.

3-41. 8350B HP-IB Compatibility.

3-42. Table 3-6 lists the 8350B Sweep Oscillators' HP-IB capability, which is compatible with IEEE Standard 488-1975.

Table 3-5. Possible HP-IP Addresses

ASCII Listen Address	Characters Talk Address	Address Code (Binary) 5 4 3 2 1	Equivalent Decimal Value
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

Table 3-6. 8350B Interface Functions

Code	Function
SH1	Source handshake capability
AH1	Acceptor handshake capability
T6	Basic talker; Serial Poll; Unaddress to talk if addressed to listen
L4	Basic listener; Unaddressed to listen if addressed to talk
SR1	Service Request capability
RL1	Remote; Local capability
PP0	No Parallel Poll capability
DC1	Device clear capability
DT1	Device trigger capability
C0	No controller capability
E1	Open collector bus drivers

3-43. Compatible Universal and Addressed HP-IB Commands.

3-44. The 8350B will respond to the following universal and addressed commands, which are sent in the command modes (ATN true).

Mnemonic	Command	ASCII Code
Universal:		
DCL	Device Clear	DC4
LLO	Local Lockout	DC1
MLA	My Listen Address	(selectable)
MTA	My Talk Address	(selectable)
SPD	Serial Poll Disable	EM
SPE	Serial Poll Enable	CAN
UNL	Unlisten	?
UNT	Untalk	—
Addressed:		
GET	Group Execute Trigger	BS
GTL	Go to Local	SOH
SDC	Selected Device Clear	EOT

3-45. Remote Mode.

3-46. Remote Capability. The 8350B communicates on the bus in both remote and local modes. In remote, its front panel controls are disabled except the LINE switch and LOCAL key. The 8350B can be addressed to listen or talk. When addressed to listen, the 8350B will automatically stop talking and respond to the following bus messages: Data, Trigger, Clear, Remote, Local, Local Lockout, Clear Lockout/ Set Local, and Abort. When addressed to talk, the 8350B will automatically stop listening and send one of the following messages: Data, Require Service, or Status Byte.

3-47. Displays. The REM light is on when the 8350B is in the remote mode. The ADRS'D light is on when the 8350B is currently addressed to talk or listen. All other displays function the same as in local front panel control.

3-48. Local-to-Remote Change. The 8350B switches to remote upon receipt of the two part Remote message. The two parts of the Remote message are:

Remote Enable (REN)
Addressed to Listen (MLA)

3-49. The Sweep Oscillator's output signal and all control settings remain unchanged with the local-to-remote transition.

3-50. Local Mode.

3-51. Local Capability. In local, the 8350B can send a Require Service message, send a Status Byte, and respond to the Remote message.

NOTE

The 8350B can respond to all HP-IB messages except the Data Message while in local. However, most of these messages would not normally be used in the local mode.

3-52. Remote-to-Local Change. The 8350B returns to local control upon receipt of the Local or Clear Lockout/Set Local message. It can also be set to local by pressing the front panel LOCAL key (assuming that local lockout is not in effect). The Sweep Oscillator's output signal and all control settings remain unchanged with the remote-to-local transition.

3-53. Local Lockout. When a data transmission is interrupted, which can happen by returning the 8350B to local with the front panel LOCAL key, the data could be lost. This would leave the 8350B in an unknown state. To prevent this, a local lockout is recommended to disable the LOCAL key. Local lockout remains in effect until the 8350B is returned to the local state by either turning the LINE switch off/on or by programming the Local Message.

3-54. 8350B Address Assignment Information.

3-55. The 8350B has a primary address only that is determined by an internal storage register. The register is initialized at the factory by utilizing the address bits A5 through A1 from switches located on the 8350B A8 HP-IB Assembly. Note that these switches are factory preset to decimal 19 (Listen address of "3", Talk address of "S"). The 8350B HP-IB address can be dynamically changed from the front panel in local mode by executing the "Set HP-IB Address" function (Shift Local).

Refer to Section 2, Chapter 2-15, "HP-IB Address selection" for further information.

The present 8350B HP-IB address can be found by pressing the **[SHIFT]** followed by the **[LCL]** key.

3-56. The decimal equivalent of the talk/listen address will be displayed in the FREQUENCY/ TIME display. Refer to Table 3-5 for interpretation of the equivalent decimal value into separate talk and listen address characters. To change the address refer to Figure 3-7 "Instrument State" for further information.

3-57. Receiving The Data Message

3-58. The 8350B accepts program codes that contain information for programming all of the front panel and special HP-IB only functions (except the LINE switch). The 8350B will respond to the Data message when in remote and addressed to listen.

3-59. Input Syntax. The 8350B responds to program codes in a Data message in the order in which they are received. Each function is programmed with a string of ASCII coded characters that follow one of the following sequences:

[Function Code] [Numeric Value]
[Units terminator] [EOS]
[Function Code] [Numeric Value] [EOS]
[Function Code] [EOS]

3-60. Function Codes. Function codes are typically 2 to 4 character mnemonics. For functions that have a numeric value associated with it, passing the function code only will enable and activate the function for further data entry.

3-61. Numeric Value. These are either a single decimal digit, a set of 14 characters or less representing a number, or a string of binary bytes. If the numeric value is a single digit (0 through 9), it represents a storage register. A string of 14 characters maximum can be expressed in exponential, decimal, or integer form. Acceptible numeric formats are referenced in further sections by the following format syntax:

Exponential	±d***d.d***E±dd
Decimal	±d***d.d***d
Integer	±d***d
Single Digit	d
Double Digit	dd
Binary String	b***b
Binary Byte	b

Where the character 'd' indicates a leading or trailing zero, a space, or numeric digit (0 through 9), the characters '***' indicate a variable number of the previous characters. The character 'b' indicates an 8 bit binary byte. Numeric values that are not binary in nature are scaled by the appropriate units terminator.

3-62. Units Terminator. These are 2 character codes that terminate and scale the associated numeric value. Frequency values can be entered in GHz, MHz, kHz, or Hz. Sweep time values can be entered in Seconds or milliseconds. Power values can be entered in dBm or dB. If a units terminator is not passed, the 8350B assumes the numeric value is in the fundamental units of Hz or Seconds.

3-63. End Of String Message (EOS). This can be the ASCII character Line Feed (LF, decimal 10), the bus END command (EOI and ATN true), or another function code string.

NOTE

The HP-IB program code syntax typically mirrors that of the local front panel keystroke sequence.

3-64. Valid Characters. The alpha program codes can be either upper or lower case since the 8350B can accept either type. Spaces, unnecessary signs (+,−), leading zeroes, and carriage returns (CR) are ignored.

3-65. Program Codes. See Table 3-7 for the summary of input programming codes that are acceptible via the Data message.

3-66. Sending The Data Message.

3-67. The 8350B can send Data messages when in remote and addressed to talk. The available output modes are:

Learn String
Micro Learn String
Mode String
Interrogate Function
Active Function
Status

3-68. Each function is activated by the 8350B receiving a Data message with the appropriate function code (refer to Table 3-7). The Learn String, Micro Learn String, Mode String, and Status functions send a Data message consisting of a string of 8-bit binary bytes terminated using the bus END command (EOI and ATN true) with the last byte. The Interrogate and Active functions send a Data message consisting of a 14 character ASCII string representing the numeric value and terminated with a Carriage Return (CR)/Line Feed (LF).

Table 3-7. HP-IB Program Codes

Code	Description	Code	Description
AKm	Amplitude Marker On/Off	M4	Marker #4
ALmn	Alternate Sweep On/Off	M5	Marker #5
A1	Internal Leveling	SHM0	All Markers Off
A2	External Crystal Leveling	SHMO	All Markers Off
A3	External Power Meter Leveling	SHM1	Marker Delta
BK	Backspace	SHM2	Counter Interface Enable
CAm	Amplitude Crystal Marker On/Off (83522/83525 Only)	SHM3	Counter Interface Disable
		SHSP	Permanent Marker Sweep
CF	Center Frequency	NT	Network Analyzer Trigger (8410B)
CIm	Intensity Crystal Marker On/Off (83522/83525 Only)	OA	Output Active Parameter
		OH	Output Harmonic Number
CS	Clear Status Bytes	OI	Output Software Revision Number
CW	CW Frequency	OL	Output Learn String
SHCF	Coarse CW Resolution	OM	Output Mode String
SHDF	Fine CW Resolution	OP	Output Interrogated Parameter
SHCW	Swept CW	OS	Output Status Bytes
C1	1 MHz Crystal Marker Frequency (83522/83525 Only)	OX	Output Micro Learn String
		PL	Power Level
C2	10 MHz Crystal Marker Frequency (83522/83525 Only)	PSm	Power Sweep On/Off
		RCn	Recall Register
C3	50 MHz Crystal Marker Frequency (83522/83525 Only)	RE	Extended Status Byte Mask
		RFm	RF Power On/Off
C4	External Crystal Marker Frequency (83522/83525 Only)	RM	Request Status Byte Mask
		RPm	RF Blanking On/Off
DB	dB	RS	Reset Sweep
DF	Delta F Frequency Span	R2	Second Extended Status Byte Mask
DM	dBm	SC	Seconds
DN	Step Down/Decrement	SF	Frequency Step Size
DPm	Display Blanking On/Off	SG	Single Sweep
DUm	Display Update On/Off	SH	Shift Function
E	Exponent Power Of 10	SLm	Slope On/Off
FA	Start Frequency	SM	Manual Sweep
FB	Stop Frequency	SP	Power Step Size
FIm	CW Filter In/Out	SS	Step Size
F1	−20 MHz/V FM	SHSS	Default Step Size
F2	−6 MHz/V FM	ST	Sweep Time (Continuous Sweep)
GZ	GHz	SVn	Save Register
HZ	Hz	SHSV	Enable Save
IL	Input Learn String	SHRC	Disable Save
IP	Instrument Preset	SX	External Sweep
IX	Input Micro Learn String	S1	Sweep Time (Continuous Sweep)
KZ	KHz	TS	Take Sweep
MC	Marker To Center Frequency	T1	Internal Sweep Trigger
MDm	Square Wave Amplitude Modulation On/Off	T2	Line Sweep Trigger
		T3	External Sweep Trigger
MO	Marker Off	T4	Single Sweep
MPm	Marker 1-2 Sweep On/Off	UP	Step Up/Increment
MS	Milliseconds	VR	CW Vernier
MZ	MHz	SHVR	Offset
M0	Marker Off	SHFA	Frequency Display Multiplier
M1	Marker #1	SHFB	Frequency Display Offset
M2	Marker #2	0-9+−	Acceptable Numeric Data
M3	Marker #3		

NOTES

1. **Program codes of the form "XXm" use "m" to turn the function On or Off (1 or 0). For the storage register functions the "n" is 1 through 9.**
2. **The 8350B ignores spaces, plus signs, negative signs (except when valid) and any unexpected characters. Program codes can be upper or lower case alpha characters.**

3-69. Binary Syntax. [b***b] [EOI]

3-70. Numeric Syntax. [±d.dddddE±dd] [CR] [LF]

3-71. The character 'b' indicates an 8-bit binary byte and 'd' indicate a decimal digit (0 through 9). The characters '***' indicate a variable number of the previous characters. Note that the binary output format may include bytes that could be misinterpreted as the ASCII codes for Carriage Return or Line Feed commands. Therefore, avoid using a Carriage Return or Line Feed to terminate a binary string or byte. To terminate a binary string or byte use the bus END command (EOI and ATN true), or another function code string. EOI and ATN operate independently of the HP-IB Data lines and therefore cannot be confused with ASCII coding.

3-72. Receiving The Trigger Message.

3-73. The 8350B responds to the Group Execute Trigger (GET) command to the HP-IB bus select code and a Selective Device Trigger to the 8350B HP-IB address. The effect of the GET command is to trigger the sweep if presently in the External Sweep Trigger mode only, otherwise no action is taken. The response is as if a Data message consisting of the Single Sweep Trigger (T4) program code were transmitted.

3-74. Receiving The Clear Message.

3-75. The 8350B responds to both Device Clear (DCL) and Selective Device Clear (SDC) by resetting all HP-IB handshake lines to the inactive state. The effect is to remove the 8350B from any Talker or Listener control functions. The 8350B responds by clearing the Status Byte and the Extended Status Byte.

3-76. Receiving The Remote Message.

3-77. The Remote message causes the 8350B to switch to remote mode. It has two parts: 1) remote enable and 2) address-to-listen. The Sweep Oscillator's output and all other controls do not change with the local-to-remote transition.

3-78. The REM light turns on only when the 8350B is in remote mode and after receiving its first Data Message. The ADRS'D light turns on when the 8350B is addressed to talk or listen.

3-79. Receiving The Local Message.

3-80. The 8350B returns to front panel control when it receives the Local message. Its output and all other controls do not change with the remote-to-local transition.

3-81. When the 8350B goes to local mode, the front panel REM indicator turns off. However, the ADRS'D indicator would still illuminate if the 8350B were addressed.

3-82. The local message is the means by which the controller sends the Go To Local (GTL) bus command. The front panel LOCAL key can also return the 8350B to local mode. However, pressing the LOCAL key might interrupt a Data message to the 8350B and this would leave the 8350B in a state unkown to the controller. This situation could be avoided by sending the Local Lockout message which disables the LOCAL key.

3-83. Receiving The Local Lockout Message.

3-84. After receiving the Local Lockout message, the 8350B front panel LOCAL key is disabled in addition to all the other front panel keys. With local lockout in effect, the 8350B can be returned to local only by the controller or by turning the 8350B front panel LINE switch off/on.

3-85. Receiving The Clear Lockout/Set Local Message.

3-86. The 8350B responds to the Clear Lockout/Set Local message in the same way as to the Local message. Hence it returns to local front panel control. The 8350B need not be addressed to listen to receive this message.

3-87. Sending The Request Service Message.

3-88. The 8350B sends a Request Service message (RQS) whenever one of the following conditions exist and if it has been preprogrammed to send the message by the Request Mask (RM) function:

Error in syntax
Parameter value modified to default value
Front panel entry complete
Hardware failure
End of sweep

3-89. The 8350B can send a Require Service message in either the local or remote mode. Further information pertaining to the instrument state can be obtained by conducting a Serial Poll or by executing the Output Status function, both of which access Status Byte information. The RQS state and the bus SRQ line are cleared only by executing a Serial Poll.

3-90. Sending The Status Byte Message.

3-91. After receiving a Serial Poll Enable command (SPE) and when addressed to talk, the 8350B responds by sending its Status Byte message as indicated in Table 3-8. Two additional status bytes are available but must be accessed via the Output Status function. When the seventh most significant bit (bit 6, Request Service) of the Status Byte is true (one), an SRQ has occurred. See Service Request for the conditions causing a Service Request. Bit 2 indicates whether a change has occurred in the Extended Status Byte. If Bit 2 is true, then the additional status bytes should be accessed via the Output Status function to determine the cause of the status change. All other bits indicate the present status of the noted function. The bits are true (one) if and only if the associated function/condition is true. To select an SRQ for a particular set of circumstances, the Status Byte can be masked with the Request Mask function. The mask for each byte is determined by summing the decimal values of each selected function/condition that is desired. The default Request Mask value is '00000000' or decimal 0. Also, SRQ generation due to conditions indicated in the first and second status bytes can be masked by using the RE and R2 functions. The default mask values are binary 11111111, or decimal 255. See Table 3-8 for decimal values of each Status Byte and Extended Status byte bits.

Table 3-8. Status Byte Information

STATUS BYTE (#1)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
FUNCTION	N/A	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	N/A	SRQ on Change in Extended Status Byte	N/A	SRQ on Front Panel Key Pressed
EXTENDED STATUS BYTE (#2)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
FUNCTION	Airflow Failure	*RF Unleveled	Power Failure/on	N/A	N/A	N/A	N/A	Self Test Failed
SECOND EXTENDED STATUS BYTE (#3)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
FUNCTION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	SRQ on Numeric Parameter Altered to Default Value

***Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.**

3-92. Sending The Status Bit Message.

3-93. The 8350B does not respond to the Parallel Poll Enable (PPE) bus command and thus cannot send a Status Bit message.

3-94. Receiving The Pass Control Message.

3-95. The 8350B does not have the ability to take or pass control thus it cannot respond to the Pass Control message.

3-96. Receiving The Abort Message.

3-97. The 8350B responds to the Abort message (IFC true) by stopping all Talker or Listener functions.

3-98. OPERATOR'S MAINTENANCE

3-99. Operator's maintenance consists of replacing defective fuses, cleaning the air filter, and cleaning the Plug-in interface connectors. These items are discused in the following paragraphs.

3-100. Fuses

3-101. There are twelve fuses in the 8350B. Only the ac line fuse located at the back of the instrument may be replaced by the Operator. The value for the ac fuse is printed on the rear panel of the instrument below the power module. The value and HP part number for the ac fuse may be found in Sections II (Installation) and IV (Replaceable Parts).

WARNING

For continued protection against fire hazard, replace only with 250V fuses of the same current rating and type (normal blow).

3-102. To replace the ac fuse the Line switch should be switched off then the ac line cord removed from the power source and instrument. With the line cord removed, access may be gained to the fuse compartment. The fuse may be removed by pulling the lever inside the fuse compartment. The internal fuses should only be replaced by a qualified service technician.

WARNING

It is important that the following maintenance procedures be executed to retain the safety features which have been designed into the instrument.

3-103. Air Filter

3-104. The cooling fan located on the rear panel has a metal filter attached which will require periodic cleaning. Due to the variety of environmental conditions the interval between cleanings cannot be estimated. Error signal E016 indicates reduced air flow through an increase in temperature in the cooling system. When this error is noted on display a clogged filter may be the reason. To clean the filter refer to Section VIII of the manual.

3-105. Plug-in Interconnect

3-106. If Plug-ins are changed frequently and/or the interconnectors are dirty the 8350B Plug-in interconnect connector may require cleaning to avoid voltage losses (tune voltage).

3-107. Service Tag Information

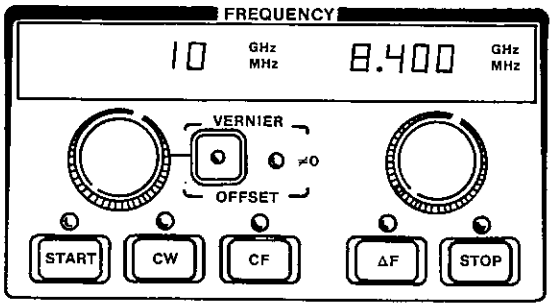
3-108. If the Sweep Oscillator requires service and the operators maintenance is not sufficient the instrument may be sent as per Section II to your local HP service organization. Before sending the instrument back, fill out and attach one of the blue service tags. If a sweep oscillator error code is noticed when a failure occurs, note that error code in the failure symptoms/special control settings section of the tag.

FREQUENCY SWEEP MODE

DESCRIPTION

This function block contains the keys to select one of the three desired modes (**START/STOP, CW, CF/ΔF**) or a modification of the mode (**VERNIER, OFFSET, COARSE or FINE CW control knob resolution, DISPLAY MULTIPLIER, DISPLAY OFFSET**). The two displays provide a visual display of the frequency/ies in the mode selected. The rotary control knobs provide a variable control to change the frequency of the function selected.

PANEL LAYOUT



FUNCTIONS/INDICATORS

START: Enables START/STOP mode and allows selection of the lower the frequency limit of sweep.

STOP: Enables START/STOP mode and allows selection of the upper frequency limit of sweep.

CW: Enables single frequency (CW) mode and allows selection of the frequency.

Coarse CW Control Knob Resolution: Provides coarse resolution control knob adjustments for CW frequency value settings.

Fine CW Control Knob Resolution: Provides Fine resolution control knob adjustments for CW Frequency value settings.

Swept CW: Enables CW mode with full SWEEP OUTPUT voltage (0-10 volts).

CF: Enables center frequency/delta frequency mode and allows selection of the center frequency.

ΔF: Enables center frequency/delta frequency mode and allows selection of the total frequency span/width.

VERNIER: Provides high resolution adjustments to values of the effective sweep center and CW frequencies. Range is ±0.05 percent of Plug-in frequency band. Light indicates non-zero VERNIER value.

Figure 3-6. Frequency Sweep Mode (1 of 4)

FREQUENCY SWEEP MODE (Cont'd)

OFFSET: Offset RF frequency by entered value. START/STOP, CF/ΔF, and CW displays do not indicate the change. Light indicates non-zero OFFSET value.

=/0: This lamp indicates when a non-zero frequency vernier or offset value is in effect. To zero the vernier or offset enter 0 MHz.

Display Multiplier: Enables LED Display mode and allows the Frequency LED displays to show the Final RF output when a frequency multiplier is used. The Frequency/Time display (not pictured above) contains the selected multiplication Factor. Allowable multiplication factors are 1 to 99 (integers only).

Display Offset: Enables LED Display mode and allows the Frequency LED displays to show the Final RF output when a frequency up-converter is used. The Frequency/Time display (not pictured above) contains the selected offset value. Allowable offset values are 0 to 999 GHz.

LIMITATIONS/CONCERNS

1. The range of frequencies input to mainframe is determined by the Plug-in (values to ±2% out of range are accepted).
2. The order in which START/STOP or CFΔF are entered is not important.
3. START frequency must be lower than STOP frequency. Entering a Start frequency greater than the Stop frequency causes the Stop frequency to equal the Start frequency. If the START frequency is greater than the STOP, then START equals the new STOP frequency.
4. Lights except as noted indicate active values/function.
5. Frequency values entered do not change when mode is changed.
6. Sweep Out provides a 0 to 10 volt ramp for all sweeps with 0 volts corresponding to the effective start frequency and 10 volts to the stop frequency. In CW mode the voltage out multiplied by 10 is equal to the percentage of band (except Swept CW). Example: With a 1 volt sweep output, CW frequency is equal to 10% of band.
7. Vernier value can "roll over" if knob or step causes the vernier value to exceed the maximum value then the CW/CF value is changed and the vernier value reset to 0 MHz (or appropriate value).
8. All LED display multiplier values and LED display offset values default to 1 and 0 respectively after an Instrument Preset.

Figure 3-6. Frequency Sweep Mode (2 of 4)

FREQUENCY SWEEP MODE (Cont'd)

LOCAL FUNCTION PROCEDURES:

Mode	Modifier	Activate	Program Code				Range and Resolution
			On/Off	Knob	Step	Keyboard	
START/STOP	Start Frequency	[START]		X	X	X	Same as ΔF See Section I Table 1-1
	Stop Frequency	[STOP]		X	X	X	
CONTINUOUS WAVE	Continuous Wave	[CW]		X	X	X	.00038% of band
	Coarse CW Control Knob Resolution	[SHIFT][CF]	X				.0015% of band
	Fine CW Control Knob Resolution	[SHIFT] [ΔF]	X				.00038% of band
	CW Vernier	[VERNIER]		X	X	X	
SWEPT CW	Swept CW	[SHIFT][CW]		X	X	X	
CF/ΔF	Center Frequency	[CF]		X	X	X	See Section I Table 1-1
	Delta Frequency	[ΔF]		X	X	X	
ANY MODE	(RF) Offset	[SHIFT] [VERNIER]		X	X	X	.00038% of band
	Display Multiplier	[SHIFT][START]				X[1]	
	Display Offset	[SHIFT][STOP]				X[1]	

[1]Entered only after pressing GHz, MHz, or dBm keys

Figure 3-6. Frequency Sweep Mode (3 of 4)

FREQUENCY SWEEP MODE (Cont'd)

REMOTE FUNCTION PROCEDURES:

Mode	Function	Program Code				
		Suffix	Scale	Resolution	Suffix	Scale
START/STOP	Start	FA	Plug-in	Same as ΔF	GZ MZ KZ HZ	GHz MHz kHz Hz
	Stop	FB				
CW	CW	CW	Plug-in	.00038% of Band		
	Swept CW	SH CW				
CF/ΔF	Center Frequency	CF	Plug-in	See Sec. I Table 1-1		
	Delta Frequency					
OFFSET	Frequency Offset	SH VR		.00038% of Band		
VERNIER	Frequency Vernier	VR	±0.05% of Band			
FRONT PANEL DISPLAY	Display Multiplier	SH FA				
	Display Offset	SH FB				

[1]Depends on plug-in used: 1 KHz if <2 GHz in 93525 or 93522.

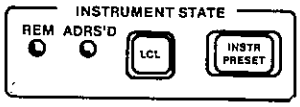
Figure 3-6. Frequency Sweep Mode (4 of 4)

INSTRUMENT STATE

DESCRIPTION

This function block contains two LEDs one that indicates whether the Sweep Oscillator is in the remote mode, and another indictates when it is addressed to talk or listen. The local key when not in local lockout will switch the Sweep Oscillator from remote to local (front panel) control. The Instrument Preset key when engaged will first run the Sweep Oscillator self test then set the controls to the preset condition.

PANEL LAYOUT



FUNCTIONS/INDICATORS

LCL: Returns Sweep Oscillator control to front panel from remote operation unless a Local Lockout has been executed. The 8350B retains the same control settings when switched from remote to local.

Select HP-IB Address: Provides a way to see and change the current HP-IP address code (00 to 30). The code is displayed in the FREQUENCY/TIME display.

INSTR PRESET: The following two steps take place when instrument preset is engaged or the sweep oscillator is switched on. Plug-in related error E050 to E099 information is found in the Plug-in manual.

1. A Self Test of the entire instrument is begun that takes approximately 1½ seconds to complete. If an error is found the test stops and an error code is displayed. Section VIII has a list of error codes and failures.

2. After Instrument Preset initiated Self-tests are completed the sweep oscillator presets the controls as follows:

   SWEEP MODE: START STOP, over the full frequency range of the Plug-in
   SWEEP TIME: fastest allowable for Plug-in
   Markers/Modulation: off, Marker frequency values reset
   Vernier/ Offset: 0 MHz
   SAVE/RECALL: all registers remain unchanged from their values prior to Instrument Preset.

   When using 83500 series Plug-ins:

   POWER LEVEL: maximum leveled value
   RF: ON
   ALC MODE: INT
   Plug-in MARKERS: off (50MHz lamp on)
   REMOTE: Sets Sweep Oscillator into remote HP-IB operation.

Figure 3-7. Instrument State (1 of 2)

INSTRUMENT STATE (Cont'd)

LIMITATIONS/CONCERNS

1. Local key will not function if a Local Lockout has been implemented.
2. Allowable HP-IB addresses are from 00 thru 30. However the value 21 is typically reserved for the controller and should be avoided.
3. The HP-IB address will remain unchanged even if power is turned off.
4. If an instrument problem occurs, Section 8 of the manual contains some operator initiated self-tests. The results of these tests should be recorded on one of the blue tags located at the beginning of this section. This may help to isolate the problem and enable service to reduce turn around time.

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms				Range
		On/Off	Knob	Step	Keyboard	
Local Key	[LCL]	X				
Select HP-IB Address	[SHIFT LCL]				X[1]	Integers from 0 to 30
Instrument Preset	[INSTR PRESET]	X				
Remote	Not Available					

[1]Address entered only after pressing the GHz, MHz, or dBm keys.

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code
		Prefix
Local	Use HP-IB Command	
Select HP-IB Address	Not Available	
Instrument Preset	Instrument Preset	IP
Remote	Use HP-IB Command	

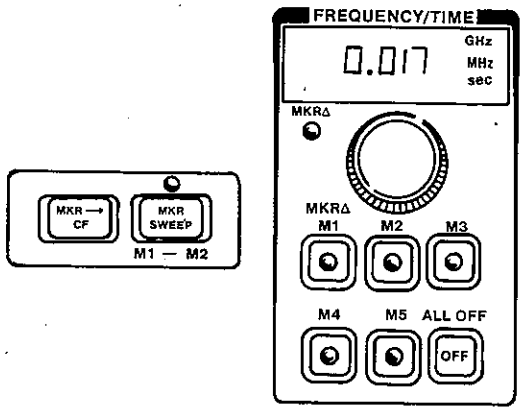
Figure 3-7. Instrument State (2 of 2)

FREQUENCY MARKERS/SWEEP TIME/MARKER TRANSFER

DESCRIPTION

The frequency marker functions consist of up to five independent and contiuously variable frequency markers. The marker Δ function displays the difference frequency between any two markers. MKR}CF sets the effective sweep center frequency (CF) equal to the active marker frequency. MARKER SWEEP initiates/exits sweep between Marker 1 and Marker 2. After exit, sweep returns to original sweep limits except in (SHIFT) MARKER SWEEP mode where marker values become the permanent START/STOP values. The FREQUENCY/TIME display will display active marker frequency, and marker frequency, Sweep Time, or frequency in manual sweep mode.

PANEL LAYOUT



FUNCTIONS/INDICATORS

Markers 1 to 5: Each marker (M1 through M5) can be enabled and a frequency value defined. The last marker engaged is the active marker and it is the one modifiable by the control knob, step keys, keyboard, or remote control. Lamp off indicates marker off, lamp on, indicates marker on and lamp flickering indicates marker is active.

Active Marker Off: Turns off the active frequency marker and saves the previous value. The value is recalled when the marker is turned on later.

All Markers Off: Turns off all frequency markers saving the values of each to be recalled later when the markers are turned on.

Marker Delta: Selects the MKR Δ mode where the FREQUENCY/TIME display indicates the frequency difference between the active frequency marker and the previously active frequency marker. The active marker is still active and modifiable via the FREQUENCY/TIME control knob, step keys, keyboard, or remotely via HP-IB. If in intensity marker mode the display trace is intensified between the two selected frequency markers.

Marker to Center Frequency: This function takes the value of the presently active frequency marker and reassigns it to the CW frequency, Center Frequency, or effective center frequency of the Start/Stop sweep. The frequency marker value is unchanged, the previous center frequency value is lost.

Figure 3-8. Frequency Markers/Sweep Time/Marker Transfer (1 of 4)

FREQUENCY MARKERS/SWEEP TIME/MARKER TRANSFER (Cont'd)

Marker Sweep: This function temporarily uses the values of Markers 1 and 2 and reassigns them to the Start and Stop frequencies respectively. The previous values of the Start and Stop frequencies are saved and reassigned when exiting Marker Sweep mode. If Marker 1 is greater than Marker 2 (or M2 less than M1) the lower frequency is used for the Start frequency, and the higher value for the Stop frequency. Note that the values of Markers 1 and 2 and hence the temporary Start and Stop frequency values can be modified in marker sweep mode by using either the start or the stop controls or M1 or M2 controls. The new values of M1 and M2 are retained upon exiting Marker Sweep mode.

Marker 1 to Start, Marker 2 to Stop: This functions the same as marker sweep except that the Start and Stop frequencies are permanently reassigned and not restorable to their previous values.

COUNTER INTERFACE enable: This function allows counting of the sweep frequency at the Start, Stop, or selected marker frequency with a suitable counter.

LIMITATIONS/CONCERNS

1. All frequency markers are initialized to the value of the center frequency of the frequency range of the Plug-in only after Instrument Preset.

2. Frequency markers if active and the present value is out of the present sweep frequency range, will be reassigned the value of the present effective center frequency when the FREQUENCY/TIME knob is first turned.

3. If no markers are presently active when entering MKR Δ, Markers 1 and 2 are assumed the active and previously active markers respectively.

4. If marker 1 frequency is higher than marker 2 frequency then these values are interchanged in marker sweep mode.

5. Start and Stop values are modified to correspond to the new center frequency and old sweep width in MKR}CF. Likewise the Δ frequency span and start/stop may be modified so that the new frequency sweep is within the frequency range of the Plug-in.

6. If no marker is presently active the previously active marker is assumed. After Instrument Preset Marker 1 is assumed to be the active marker.

7. If Marker 1 and/or Marker 2 are not on when MRK SWEEP is engaged, they are turned on and their previous values used.

8. If sweep width is out of range when MKR→CF is engaged it will automatically scale down the frequency to be within Plug-in frequency range.

9. The Plug-in and markers have the capability of 2 percent frequency overrange, if this occurs a flickering of the GHz or MHz annunciator will occur.

Figure 3-8. Frequency Markers/Sweep Time/Marker Transfer (2 of 4)

FREQUENCY MARKERS/SWEEP TIME/MARKER TRANSFER (Cont'd)

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms				Range and Resolution
		On/Off	Knob	Step	Keyboard[1]	
Markers	[M1] to [M5]		X	X	X	Resolution: 0.4% of Selected Sweep Width
Marker Δ	[SHIFT][M1]		X	X	X	
Marker to Center Frequency	[MKR→CF]		X	X	X	Range See plug-in
Marker Sweep	[MKR SWEEP]	X	X	X	X	
Permanent Marker Sweep	[SHIFT][MKR SWEEP]		X	X	X	
Turn Off Active Marker	[OFF]	X				
Turn Off All Markers	[SHIFT][OFF]	X				
Counter Interface Enable	[function] [SHIFT][M2]	X				
Counter Interface Disable	[SHIFT][M3]	X				

[1]Values must end with terminator (GHz or MHz).

Figure 3-8. Frequency Markers/Sweep Time/Marker Transfer (3 of 4)

FREQUENCY MARKERS/SWEEP TIME/MARKER TRANSFER (Cont'd)

REMOTE FUNCTION PROCEDURE:

Function	Description	Program Code				
		Prefix	Range	Resolution	Suffix	Scale
Markers	Select and Position Markers	M1 to M5	Plug-in	0.4% of Selected Sweep Width	GZ MZ KZ HZ	GHz MHz kHz Hz
MARKER Δ	Displays Difference Frequency	SH M1				
MKR → CF	Active Marker to Center Frequency	MC				
MARKER SWEEP	Sweep ON M1 and M2 OFF	MP1 MP0				
MARKER SWEEP	Permanent Marker Sweep	SH MP				
OFF	Active Marker Off	M1 to M5			MO*	
ALL OFF	All Markers Off	SH			MO*	
Counter Interface Enable	Counting End Points or Marker On Swept Frequency	FA, FB, or M1 to M5 SH M2				
Counter Interface Disable	Disables Swept Counting	SH M3				

*The suffix M followed by either a letter O or number zero is allowable.

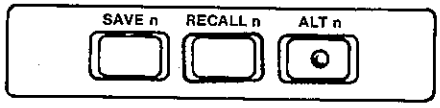
Figure 3-8. Frequency Markers/Sweep Time/Marker Transfer (4 of 4)

STORAGE REGISTERS

DESCRIPTION

The Saven function allows all the control settings to be stored in one of the nine internal registers. The Recalln function will implement the previously stored settings. Alternate n function alternates between current state and register selected on successive sweeps.

PANEL LAYOUT



FUNCTIONS/INDICATORS

SAVE: Enables current settings (modes, frequencies etc.) to be stored in a register. Nine registers (1—9) are available for storage.

RECALL: Recalls the operational parameters stored in one of the nine registers. When enabled the registers may be incremented with the [▲] buttons or decremented with the [▼] button. Registers not previously stored will contain the instrument preset settings.

SAVE REGISTER LOCK: All Save Registers may be write-protected (locked) by pressing **[SHIFT] [SAVEn]**. This command makes it impossible to change the contents of any register until it is unlocked by pressing **[SHIFT] [RECALLn]**. Since the 8350B memory is non-volatile the contents of the Save Registers and the locked/unlocked status are retained even with Line power off. If a SAVEn command is attempted after the SAVE LOCK is engaged an Error 30 (E030) will be displayed.

Alternate: Alternates between current state and selected stored register on successive sweeps. If used with appropriate HP 8755C or HP 8756A, current state response is on channel 1 and selected state response is on channel 2.

LIMITATIONS/CONCERNS

1. Unused registers have instrument preset values stored until new values are stored.
2. The instrument retains stored settings even with AC power off.
3. Remote Step Up Advance (Programming Connector) or Auto Step allows cycling of RECALL storage registers only.

Figure 3-9. Storage Registers (1 of 2)

STORAGE REGISTERS (Cont'd)

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms				Range
		On/Off	Knob	Step	Keyboard	
Store Settings	[SAVEn]				X	Integers 1 to 9
Recall Settings	[RECALLn]			X[1]	X	Integers 1 to 9
Memory Lock	[SHIFT] [SAVEn]				X	
Memory Unlock	[SHIFT] [RECALLn]				X	
Alternate Sweep Settings	[ALTn]			X[1]	X	Integers 1 to 9
Alternate Sweep Off	[ALTn]	X			X	

[1]Step keys activated only after a number has been entered.

REMOTE FUNCTION PROCEDURE:

Function	Description	Program Code	
		Prefix	Range
SAVE	Store Current Settings	SV	Register 1 to 9
RECALL	Resets Stored Settings	RC	Register 1 to 9
LOCK	Memory Lock	SH SV	
UNLOCK	Memory Unlock	SH RC	
ALTERNATE	Successive Sweep Selected and Current	AL1	Register 1 to 9
	Alternate Off	AL0	

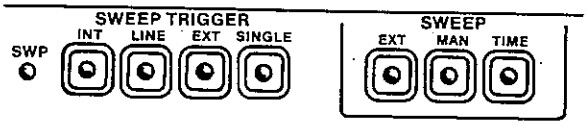
Figure 3-9. Storage Registers (2 of 2)

SWEEP/SWEEP TRIGGER

DESCRIPTION

This function block contains seven keys for control of sweep source and time. This block also has a SWP LED to indicate sweep in progress. The SWEEP keys enable selection of EXTERNAL, MANUAL or TIME sweep controls. The SWEEP TRIGGER keys enable selection of INTernal, LINE, EXTernal and SINGLE sources of sweep triggering. Lights on keys indicate active function.

PANEL LAYOUT



FUNCTIONS/INDICATORS

SWEEP EXTERNAL: Enables sweep input via front or rear panel SWP INPUT BNC (SWP INPUT 0 to 10 volts) to externally tune Plug-in oscillator. Frequency/Time display is blanked when in External Sweep.

SWEEP MANUAL: Enables manual control of sweep voltage via frequency inputs. Manual frequency is displayed on FREQUENCY/TIME display.

SWEEP TIME: Enables internally timed sweep. The triggering for TIME may be one of the following trigger Sources. Sweep Time is displayed on FREQUENCY/TIME display.

INT: Enables internal sweep triggering (free run, auto).

LINE: Enables triggering by power line frequency.

SWEEP TRIGGER EXT: Enables external triggering of sweep via rear panel auxiliary connector pin 9. A two volt trigger (20.0 volts max) must be supplied to auxiliary connector.

SINGLE: Selects and/or triggers single sweep mode. The initial engagement of SINGLE also terminates any inprocess sweep immediately.

LIMITATIONS/CONCERNS

1. SWEEP TRIGGER controls work only in TIME sweep mode.
2. Using the step keys with sweep time forces specific values in a 1,2,5 sequence such as 10ms, 20ms, 50ms, 100ms, etc. No other step size values can be set for sweep time.
3. Single sweep when initially engaged switches to single sweep mode and terminates current sweep. If presently in single sweep, engaging single sweep triggers a new sweep. Holding the key down will result in continuous single sweeps.

Figure 3-10. Sweep/Sweep Trigger (1 of 2)

SWEEP/SWEEP TRIGGER (Cont'd)

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms				Range and Resolution
		On/Off[3]	Knob	Step	Keyboard[1]	
SWEEP TYPE External	[EXT]	X				
Manual	[MAN]		X	X	X	Range: Present Sweep Width Resolution: 0.1% of present sweep
Time	[TIME]		X	X[2]	X	
SWEEP TRIGGER Internal	[INT]	X				
Line	[LINE]	X				
External Volts (2 to 5 Volts Input)	[EXT]	X				
Single Activates	[SINGLE]					

[1]Values must end with terminator (GHz, MHz, S, or mS).
[2]The step size may not be set for time.
[3]Each mode (except TIME) disables other modes.
[4]The limit for broad band sweeps is higher than 0.01 second.

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code			
		Prefix	Range	Suffix	Scale
Sweep Type	External	SX			
	Manual	SM	Frequency	GZ MZ KZ HZ	GHz MHz kHz Hz
	Time	ST	0.01—100 second	SC MS	seconds msec
Sweep Trigger	Internal	T1			
	Line	T2			
	External	T3			
	Single	T4			

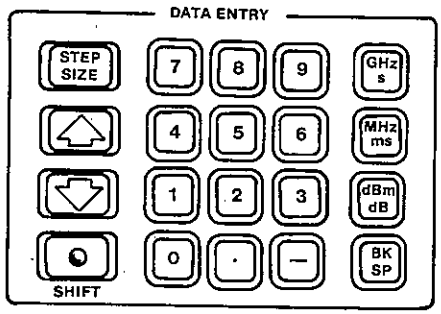
Figure 3-10. Sweep/Sweep Trigger (2 of 2)

DATA ENTRY—STEP KEYS/KEYBOARD

DESCRIPTION

This function block contains the step key function, numeric entry keyboard and terminators which allow modification of many of the values of functions. This function block has a backspace key which works like an erase or rubout of the last entry. Also in this function block is a shift key (blue) which enables shift key functions.

PANEL LAYOUT



FUNCTIONS/INDICATORS

STEP SIZE: This function allows the setting of the frequency or power level step size.

▲(step up): This function increments the presently active frequncy or power parameter value by a pre-selected step size.

▼ (step down): This function decrements the presently active frequency or power parameter value by a pre-selected step size.

0-9, −, . : Numeric digits, sign, and decimal point useable to input data for active function.

BACK SPACE: This function performs a character back space, or rubout, to erase the last digit entered on the present numeric entry. Backspace will only work when entering a number and the units terminator has not been entered. Backspace will function as long as the key is depressed.

GHz/s: Units terminator for Gigahertz frequency data or seconds time data.

MHz: Units terminator for Megahertz frequency data or millisecond time data.

dBm: Units terminator for dbm or dB power data.

SHIFT (blue key): This function enables the "shift" functions that are labeled in blue on the front panel. The SHIFT function can be performed locally or by HP-IB control. Shift related commands not shown on the Front Panel are explained on the Information Card located under the 8350B.

CONCERNS/LIMITATIONS

1. Step size not settable for sweep time. It is a 1,2,5 data progression like 10 msec, 20 msec, 50 msec, 100msec, etc.
2. There is no visable data display for step size values.
3. Step size entry is differentiated via units terminator (i.e., frequency or power step).

Figure 3-11. Data Entry-Step Keys/Keyboard (1 of 2)

DATA ENTRY—STEP KEYS/KEYBOARD (Cont'd)

4. All numeric entries are not input/entered until the appropriate units terminator is entered (GHz/seconds, MHz/milliseconds, or dBm/dB).
5. Auto step via depressing and holding an up or down key.
6. Negative numeric data must be entered with negative sign first.
7. Blank and unnecessary negative signs are ignored by the sweep oscillator (i.e., 0.5 seconds, the zero is ignored, or −10 seconds, the negative sign is ignored).
8. Some shift functions are not labeled on the front panel. Refer to the Functional Descriptions for each function Block for more information (Section III, Figures 3-6 to 3-16).
9. Shift key indicator stays on until a correct shift function key stroke is entered.
10. Holding a number key or backspace key down will cause it to be continuously entered/rubbed out.
11. On Instrument Preset step size parameters revert to default values.

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms				Range
		On/Off	Knob	Step	Keyboard	
STEP SIZE Frequency	(Frequency Parameter) [STEP SIZE]		X	X	X	Range: See plug-in frequency limits.
STEP SIZE Power	(Power Parameter) [STEP SIZE]		X	X	X	Range: See plug-in power limits.
Reset to default STEP SIZE	[SHIFT][STEP SIZE]	X				

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code				
		Prefix	Range	Resolution	Suffix	Scale
STEP SIZE	Frequency Step Size	SF	See Plug-in Frequency Limits		GZ MZ KZ HZ	GHz MHz kHz Hz
	Power Step Size	SP	See Plug-in	See Plug-in	DM	
STEP INCREMENT	Step Up (▲)	UP				
STEP DECREMENT	Step Down (▼)	DN				
BACK SPACE	Back Space	BK				
Default STEP SIZE	Reset to default STEP SIZE	SH SS				

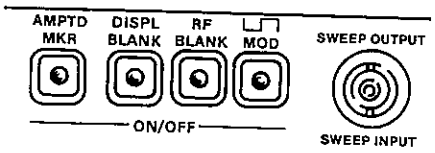
Figure 3-11. Data Entry-Step Keys/Keyboard (2 of 2)

MODULATION/BLANKING

DESCRIPTION

This function block controls the frequency marker display mode, RF power and external CRT control. Mainframe frequency markers can be RF amplitude dips or CRT intensity dots (via Z-axis control). The RF power can be turned off during the retrace sweep. The CRT display retrace sweep can be blanked. The internal squarewave amplitude modulation can be enabled. The squarewave frequency is 27.8 KHz standard for proper operation with the HP 8755 Frequency Response Test Set or internally selectable (see Section V) to 1 KHz for proper operation with the HP 415 SWR Meter and other instruments. The sweep input/output connector is also in this block.

PANEL LAYOUT



FUNCTIONS/INDICATORS

AMPLITUDE MARKER: This function when engaged (light on) sets the mainframe frequency markers into RF amplitude dips instead of Z-axis controlled CRT intensity dots.

DISPLAY BLANKING: This function when engaged (light on) blanks the retrace sweep on CRT displays via Z-axis control.

RF BLANKING: This function when engaged (light on) blanks (turns off) the RF power during the retrace sweep.

⎍ SQUAREWAVE MODULATION: This function when engaged (light on) enables the internal amplitude modulation squarewave. The stndard squarewave frequency is 27.8 KHz, internally selectable to 1 KHz.

SWEEP OUTPUT/INPUT: When Sweep Oscillator is in manual or time sweep mode this connector provides a linear ramp voltage from 0 to 10 volts that is synchronous with RF sweep. In external sweep mode connector is input for a sweep ramp from 0 to 10 volts.

LIMITATIONS/CONCERNS:

1. Changing frequency of modulation (1 or 27.8 KHz) requires moving of a jumper (see Adjustment section) and recalibration of the 27.8/1KHZ circuit.

2. Plug-in frequency markers are controlled from Plug-in for CRT intensity dots or RF amplitude dips.

Figure 3-12. Modulation/Blanking (1 of 2)

MODULATION/BLANKING (Cont'd)

3. Internal squarewave modulation and a External AM signal can be used simultaneously.

4. CRT Z-axis control is provided with both positive and negative polarity control for blanking (via rear panel POS Z-BLANK or NEG Z-BLANK). Mainframe frequency markers, when used in the CRT intensity dot mode are useable with positive polarity Z-axis control only.

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms			
		On/Off	Knob	Step	Keyboard
Amplitude Markers	[AMPTD MKR]	X			
Display Blanking	[DSPL BLANK]	X			
RF Blanking	[RF BLANK]	X			
Squarewave Modulation	[⊔⊓ MOD]	X			

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code
		Prefix
Amplitude Markers	Amplitude Marker On Amplitude Marker Off	AK1 AK0
Blanking	Display Blanking On Display Blanking Off	DP1 DP0
	RF Blanking On RF Blanking Off	RP1 RP0
Modulation	⊔⊓ Modulation On ⊔⊓ Modulation Off	MD1 MD0

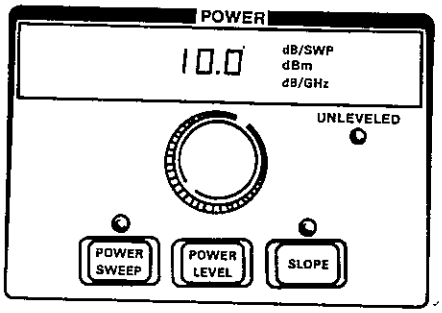
Figure 3-12. Modulation/Blanking (2 of 2)

POWER CONTROL

DESCRIPTION

This function block contains all functions relating to the RF output power level. The desired power level can be set. To compensate for a linear loss through a device (like a cable) on the output of the Plug-in, a slope compensation can be set to level the output. To provide a ramp of output power, a power sweep width can be set and a Power Sweep function enabled. Power Sweep starts the RF output power at the Power Level setting then ramps up the specific Power Sweep width.

PANEL LAYOUT



FUNCTIONS/INDICATORS

POWER LEVEL: This function, when enabled (light on), allows setting of the output power level for all ALC modes. Calibrated power level during internal leveling only.

POWER SWEEP: This function, when enabled (light on), allows the RF power output to sweep over a selected power range. The original power level becomes the lower limit of the power sweep. The lower limit plus the selected Power Sweep range determines the upper limit.

Example

1. Set RF Plug-in power level to 0 dBm.
2. Press **[POWER SWEEP] [5] [dB]**.
3. The RF Plug-in will now sweep from 0 dBm to +5 dBm (5dB/Sweep).

SLOPE: This function, when enabled (light on), allows setting of the frequency slope compensation in dB/GHz. It allows compensation for high loss devices to achieve a flat, leveled output power at the output of a device/cable by increasing the output power at higher freqencies.

UNLEVELED Light: Light is on when all or portion of sweep is unleveled.

POWER Display: Provides digital display of power mode to a tenth of a dB and Slope to 0.01 dB. The units for power level are dBm, for power sweep dB/SWP,and for slope it is dB/GHz.

Figure 3-13. Power Control (83500 series Plug-ins) (1 of 2)

POWER CONTROL (Cont'd)

LIMITATIONS/CONCERNS

1. See Plug-in manual for Power Level calibrated range. ALC dynamic range is typically 15 dB. Power Level range depends on Plug-in installed and its options, if any.
2. The total combined Slope and Power Sweep range is limited by the dynamic range of the RF Plug-in ALC loop.
3. Power Sweep will not cause the attenuator to step across a Step Attenuator boundary.
4. Power Sweep and Slope values may not be negative.

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms				Range and Resolution
		On/Off	Knob	Step	Keyboard[1]	
Power Level	[POWER LEVEL]		X	X	X	Range: See plug-in
Power Sweep	[POWER SWEEP]		X	X	X	Resolution: See plug-in
Slope	[SLOPE]		X	X	X	

[1] Values must end with terminator (dBm or dB).

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code				
		Prefix	Range	Resolution	Suffix	Scale
Power	Level	PL	10-15 dB	See plug-in	DB DM	dB dBm
Power	Sweep On	PS1	25.5 dB			
	Sweep Off	PS0				
	Slope On	SL1	5 dB/GHz			
	Slope Off	SL0				

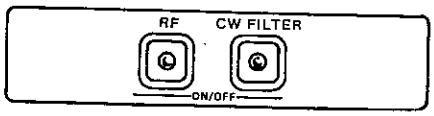
Figure 3-13. Power Control (83500 series Plug-ins) (2 of 2)

SIGNAL CONTROL

DESCRIPTION

This function block controls the signal purity and switches the signal RF off or on. The CW Filter, when enabled, reduces the oscillator tuning voltage noise and hence Residual FM. Filter is inactive in sweep modes.

PANEL LAYOUT



FUNCTIONS/INDICATORS

RF ON/OFF: This function switches RF power on (light on) or off (≥30dB attenuation).

CW FILTER ON/OFF: This function enables (light on) or disables the oscillator tune voltage filter when in CW or Manual sweep modes only.

LIMITATIONS/CONCERNS

1. CW filter cannot be enabled during sweeps.

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms			
		On/Off	Knob	Step	Keyboard
RF Power	[RF]	X			
CW Filter	[CW FILTER]	X			

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code Prefix
RF	Power On Power Off	RF1 RF0
CW Filter	Filter On Filter Off	FI1 FI0

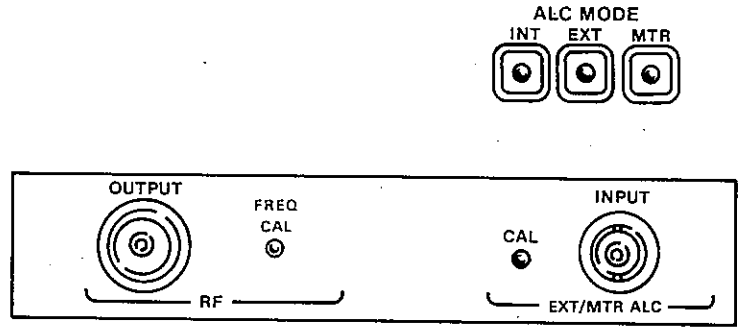
Figure 3-14. Signal Control (83500 series plug-ins)

ALC MODE

DESCRIPTION

This functional block controls all Automatic Leveling Control (ALC) functions of the output power. Several modes of ALC can be selected, these are Internal, External via a Crystal/ Detector, or external via a Power Meter.

PANEL LAYOUT



FUNCTIONS/INDICATORS

INTERNAL ALC: This selects the internal crystal detector/coupler for leveling the output power at the front panel output connector.

EXTERNAL ALC: This selects the external crystal detector for leveling with the detector output applied to the front panel External ALC BNC input connector.

METER ALC: This selects the external power meter for leveling with the power meter output applied to the front panel External ALC input connector.

EXT/MTR/ALC INPUT: Input connector for External crystal detector and power meter outputs.

ALC CAL: Used to adjust external leveling gain when using EXTERNAL leveling. Clockwise rotation increases gain.

FREQUENCY CAL: Adjustment that allows calibrating the RF Plug-in frequency using the crystal markers, frequency marker indicator, and CW or Start Frequency value.

LIMITATIONS/CONCERNS

1. Only crystal detectors of negative polarity (−10 to −200 millivolts) can be used.
2. Only power meter outputs of 0 to 1 volt can be used. The HP 431 and 432 series are compatible, the HP 435 and 436 are not.

Figure 3-15. ALC Mode (1 of 2)

ALC MODE (Cont'd)

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms			
		On/Off[1]	Knob	Step	Keyboard
Internal Leveling	[INT]	X			
External Leveling	[EXT]	X			
Power Meter Leveling	[MTR]	X			

[1]Each mode disables all other appropriate modes.

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code
		Prefix[1]
ALC Leveling	INTERNAL	A1
	External Crystal	A2
	External Power Meter	A3

[1]Mode disables all other possible modes.

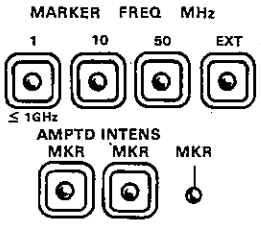
Figure 3-15. ALC Mode (83500 series plug-ins) (2 of 2)

CRYSTAL MARKER FREQUENCY

DESCRIPTION

This functional block controls the crystal frequency markers and the way they are displayed (amplitude or intensity mode). The MARKER FREQ MHz keys (upper row) allows the selection of a marker every 1MHz (available to 1GHz or below), 10 MHz, or 50 MHz. The EXT function allows an external frequency to be input into the rear panel External Marker input. The AMPTD/INTENS keys (bottom row) allows the selection of an Amplitude or Intensity marker mode. The crystal frequency markers (amplitude or intensity) may be displayed independent of the mainframe frequency markers.

PANEL LAYOUT



FUNCTIONS/INDICATORS

1 MHz CRYSTAL: Selects (light on) a crystal frequency comb of markers at harmonics of 1 MHz.

10 MHz CRYSTAL: Selects (light on) a crystal frequency comb of markers at harmonics of 10 MHz.

50 MHz CRYSTAL: Selects (light on) a crystal frequency comb of markers at harmonics of 50 MHz.

EXTERNAL FREQUENCY: Selects frequency markers at the RF frequencies that are input to the rear panel External Marker input. Allowable RF power range at input is −10 dBm minimum to +10 dBm maximum.

INTENSITY MARKER: Sets the marker display mode to CRT intensity dots via Z-axis control.

AMPLITUDE MARKER: Sets the marker display mode to RF amplitude dips.

FREQUENCY MARKER INDICATOR: Lamp lights when RF output frequency is coincident with the selected crystal marker frequency.

EXTERNAL MARKER INPUT: Rear panel input for external frequency marker. Maximum drive range −10 to +10 dBm.

Figure 3-16. Crystal Marker Frequency (83500 series plug-ins) (1 of 2)

CRYSTAL MARKER FREQUENCY (Cont'd)

LIMITATIONS/CONCERNS

1. Plug-in markers display modes are independent of the 8350B mainframe markers. Hence any combination of intensity or amplitude markers will work.
2. Intensity markers obtainable using the 8350B positive polarity Z-axis output only.
3. Maximum drive level of External Marker Input is +10 dBm.
4. Plug-in markers can be intensity and amplitude variety simultaneously.
5. Refer to appropriate RF Plug-in manual for other crystal marker limitations.

LOCAL FUNCTION PROCEDURE:

Function	Activate	Data Forms			
		On/Off	Knob	Step	Keyboard
1 MHz Marker	[1]	X			
10 MHz Marker	[10]	X			
50 MHz Marker	[50]	X			
External	[EXT]	X			
Amplitude Markers	[AMPTD MKR]	X			
Intensity Markers	[INTENS MKR]	X			

REMOTE FUNCTION PROCEDURE:

Mode	Function	Program Code
		Prefix
Crystal Marker Frequency	1 MHz[1]	C1
	10 MHz[1]	C2
	50 MHz[1]	C3
	External Input[1]	C4
Crystal Marker	Amplitude MKR On Amplitude MKR Off	CA1 CA0
	Intensity MKR On Intensity MKR Off	CI1 CI0

[1]Mode disables the previous mode.

Figure 3-16. Crystal Marker Frequency (83500 series plug-ins) (2 of 2)

HP-IB ONLY FUNCTIONS

DESCRIPTION

This section describes functions which are only accessible via the HP-IB. These functions allow the HP-IB user to learn about the present instrument state, setup the instrument state, and enable some special functions to improve HP-IB operation.

FUNCTIONS

INPUT/OUTPUT LEARN STRING: A string of 90 bytes of binary data that completely describes the present instrument state (does not include the storage registers) of the 8350B and 83500 Series Plug-in. This information is packed and encoded for minimal storage requirements thereby making data analysis difficult. If data analysis is necessary, use the Output Mode String and Output Interrogated Parameter functions instead. When output from the 8350B and stored in an ASCII character data string, the Learn String can later be input to the 8350B to restore that instrument state. The length of the Learn String is fixed, independent of the functions selected and the Plug-in used.

The Output Learn String function learns the present sweeper settings only. To learn the storage register settings, sequentially recall each storage register and then learn the present sweeper settings. Likewise, to restore the storage registers, input the learn string for the appropriate storage register then save the present sweeper settings in the proper register.

INPUT/OUTPUT MICRO LEARN STRING: A string of 8 bytes of binary data that completely describes the present CW Frequency, Vernier, Sweep Output voltage, and Power Level of the 8350B and 83500 Series Plug-in. This information is packed and encoded for minimal storage requirements thereby making data analysis difficult. When output from the 8350B and stored in an ASCII character data string, the Micro Learn String can later be input to the 8350B to restore the instrument state for rapid CW frequency programming. The length of the Micro Learn String is fixed, independent of the functions selected and the Plug-in used.

In this mode the 8350B numeric displays are blanked and the Micro Learn String bytes are used to pre-load the appropriate internal DAC's. For proper operation the 8350B must be in the CW mode and the Plug-in CW Filter capacitor should be off. Since the Micro Learn String overrides the present values of the 8350B when it is input, do not program any functions while in this mode. If a function is programmed one of two things may occur: 1) the 8350B may exit the Input Micro Learn String mode with the previous sweeper settings restored, or 2) the 8350B may interpret the program codes as another Micro Learn String and cause the instrument to enter a non-predicatable state. The only function that is valid for execution while the Micro Learn String is in effect is the Network Analyzer Trigger function.

To output the Micro Learn String: 1) program the desired CW frequency, 2) program the "OX" code, then 3) read the 8 byte string.

Figure 3-17. HP-IB Only Functions (1 of 9)

HP-IB ONLY FUNCTIONS (Cont'd)

To input the Micro Learn String: program the "IX" code and the 8 byte string. When the user desires to exit the Input Micro Learn String mode and return to the normal mode of operation, the user must exit properly. When in the Input Micro Learn String mode the 8350B accepts the input program code/bytes in a special binary entry mode. The mode is exited by programming the 8350B with a function code that does not start with a number (0—9) or the letters A through F since these are interpreted as possible Micro Learn String data characters. It is suggested that the user exit this mode by using the "M0" (the 'o' can be the letter 'o' or the number zero, either will work) code as the mode terminator and then restore the numeric displays via the "CW", "ST", and "PL" function codes.

OUTPUT MODE STRING: A string of 8 bytes of binary data that describes all of the presently active functions of the 8350B and 83500 Series Plug-in. This information is not packed thus allowing simple data analysis. The information passed indicates only which functions are presently active functions with no numeric values included. By determining the decimal value of each byte the user can determine which function is active. To determine the actual numeric value of some functions use the Output Interrogated Parameter function. The length of the Mode String is fixed, independent of the functions selected and the Plug-in used.

OUTPUT INTERROGATED PARAMETER: The 8350B outputs the present numeric value of the instructed parameter that is to be interrogated. Any parameter that has a numeric value associated with it such as Start Frequency, Sweep Time, etc., can be interrogated. The units of the output data are Hz, dBm, dB, or sec., implied with the function selected.

OUTPUT ACTIVE PARAMETER: The 8350B outputs the numeric value of the parameter that is presently active, i.e., enabled for value modification from the step keys or data entry. The units of the output data are Hz, dBm, dB, or sec., implied with the function selected.

OUTPUT STATUS: The 8350B outputs 3 sequential bytes, 8 bits wide, that indicate the present instrument status. The first status byte is equivalent to the Status Byte of the Serial Poll (the Status Byte Message). The second and third status bytes are the Extended Status Bytes which provide additional information. See the Status Byte Information table for a description of each Status Byte. Status Byte values are cleared upon execution of a Serial Poll (the Status Byte Message), Device Clear (the Clear Message), CS (Clear Status), and/or Instrument Preset function command. The CS (Clear Status) command also clears the Extended status bytes.

SERVICE REQUEST MASK: This determines which bits within the 8350B Status Byte (byte #1) can cause the 8350B to send a Request Service (RQS) Message to the HP-IB controller. The Status Byte Mask is a one 8-bit byte value where with each bit position corresponds to the same bit position as in the 8350B Status Byte. If a bit in the Status Mask byte is set (logical '1') then this condition is enabled for RQS generation. If the bit value is cleared (logical '0') then the bit is ignored. The Status Byte Mask value ranges from decimal 0 to 255 where the decimal value can be determined by summing the decimal values of each Status Byte bit to be enabled (the user must always select the RQS bit); the first and second extended status bytes can be masked the same way as the status byte. The default at power on is a Status Mask Byte of '00000000' or decimal 0 and Extended Status Byte Mask value of '11111111' or decimal 255. The Request Masks are reset to the default value at power on only and are not affected by an Instrument Preset.

Figure 3-17. HP-IB Only Functions (2 of 9)

HP-IB ONLY FUNCTIONS (Cont'd)

Status Byte Information Table

STATUS BYTE (#1)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	N/A	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	N/A	SRQ on Change in Extended Status Byte	N/A	SRQ on Front Panel Key Pressed
EXTENDED STATUS BYTE (#2)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	Airflow Failure	*RF Unleveled	Power Failure/on	N/A	N/A	N/A	N/A	Self Test, Failed
SECOND EXTENDED STATUS BYTE (#3)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	SRQ on Numeric Parameter Altered to Default Value

*Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.

OUTPUT HARMONIC NUMBER: The 8350B outputs the ratio of the RF OUTPUT frequency to the AUX. OUTPUT frequency. The output in the heterodyne band condition is zero.

OUTPUT SOFTWARE REVISION NUMBER: The 8350B outputs the revision level of the mainframe and Plug-in software in the following manner: 08350B REV X, Y where X is the mainframe software revision level and Y is the Plug-in software revision level. Example: "08350B REV 1,5".

NETWORK ANALYZER TRIGGER (8410B): This causes an external trigger pulse to be generated for the HP 8410B Microwave Network Analyzer to re-phase lock on the present RF signal. This is used to insure proper HP-IB operation in stepped CW frequency sweeps to guarantee that the 8410B is phase-locked at the proper RF frequency after CW settling.

Figure 3-17. HP-IB Only Functions (3 of 9)

HP-IB ONLY FUNCTIONS (Cont'd)

RESET SWEEP: This aborts the present single sweep that is in progress and resets the sweep so that it can be triggered again. This function is enabled only if the 8350B is in the Single Sweep Trigger mode and has the same effect as programming a single sweep trigger ("T4").

TAKE SWEEP: This triggers a single sweep. This function is enabled only if the 8350B is in the Single Sweep Trigger mode and has the same effect as programming a single sweep trigger ("T4").

DISPLAY UPDATE ON/OFF: This selects whether or not the 8350B updates its numeric displays upon further programming of any parameter with a numeric value. The function reduces the amount of time involved in programming the 8350B numerically related parameters (ie. CW Frequency) and aids in producing faster stepped CW frequency sweeps. The default at power on and Instrument Preset is the Display Update On state. When in the Display Update Off state, the 8350B numeric displays will be blanked.

FM SENSITIVITY (83500 Series Plug-ins Only): This selects the External FM Input sensitivity of −20 MHz per volt or −6 MHz per volt. This function is normally selected with an internal Plug-in switch but can be overridden via the HP-IB. Note that the FM sensitivity is reset to the switch position after turning power on or if an Instrument Preset is executed. Thus the user should select the desired sensitivity after performing either of these actions.

LIMITATIONS/CONCERNS

1. When using the Micro Learn String (both Input and Output), the 8350B must be in the CW mode and the Plug-in CW Filter capacitor should be off.
2. You must exit the Input Micro Learn String mode with the "M0" code only. The numeric displays will still be blanked until the appropriate functions are re-activated.
3. All Learn String and Micro Learn String characters must be retained and re-input to the 8350B. If the 8350B does not receive the expected number of characters it will undergo an Instrument Preset.
4. The valid functions for the Output Interrogated Parameter are: FA, CW, CF, DF, FB, VR, SHVR, M1, M2, M3, M4, M5, SHM1, SF, SM, ST, PL, PS, SL, and SP.
5. The Request Mask byte value is reset only when another value is programmed is unaffected by Instrument Preset.
6. The Plug-in FM Sensitivity range is reset after an Instrument Preset to the value selected by the internal switch.

Figure 3-17. HP-IB Only Functions (4 of 9)

HP-IB ONLY FUNCTIONS (Cont'd)

7. The Output Learn String, Output Micro Learn String, Output Mode String, and Output Status functions send a Data message consisting of a string of 8-bit binary bytes terminated using the bus END command (EOI and ATN true) with the last byte. The Output Interrogated Parameter and Output Active functions send a Data message consisting of a 14 character ASCII string representing the numeric value in exponential form terminated with a Carriage Return/Line Feed (CR/LF).

   Binary Syntax: [b***b] [EOI]

   Numeric Syntax: [+d.dddddE+dd] [CR] [LF]

   Where the character 'b' indicates an 8-bit binary byte and 'd' indicates a decimal digit (0 through 9). Note that the binary output format could have bytes that may be misinterpreted as Carriage Returns and/or Line Feeds so the user should use the bus END command LEOI and ATN true).

REMOTE FUNCTION PROCEDURE:

Mode	Function	Input		8350B Output Response To Input	Notes
		Prefix	Data		
Display Update On/Off	DISPLAY UPDATE ON	DU1			
	DISPLAY UPDATE OFF	DU0			
FM Sensitivity	–20 MHz/V	F1			
	–6 MHz/V	F2			
Learn String	OUTPUT LEARN STRING	OL		90 bytes [EOI]	
	INPUT LEARN STRING	IL	90 bytes		
Micro Learn String	OUTPUT MICRO LEARN STRING	OX		8 bytes [EOI]	
	INPUT MICRO LEARN STRING	IX	8 bytes		

Figure 3-17. HP-IB Only Functions (5 of 9)

HP-IB ONLY FUNCTIONS (Cont'd)

REMOTE FUNCTION PROCEDURE (Cont'd):

Mode	Function	Input		8350B Output Response To Input	Notes
		Prefix	Data		
Mode String	OUTPUT MODE STRING	OM		8 bytes [EOI]	
Output Interrogated Parameter	OUTPUT PARAMETER	OP	(Function Prefix)	± d.dddddE ± dd [CR/LF]	Valid Functions: FA, CW, CF, DF, FB, M1, M2, M3, M4, M5, VR, SHVR, SHM1, SS, ST, SM, PL, PS, SL, SP, SHFA, SHFB
	OUTPUT HARMONIC NUMBER	OH		dd [CR/LF]	
	OUTPUT SOFTWARE REVISION NUMBER (OUTPUT IDENTITY)	OI		08350B REV d, d [CR/LF]	
Output Active Parameter	OUTPUT ACTIVE	OA		± d.dddddE ± dd [CR/LF]	
Status Bytes	OUTPUT STATUS	OS		3 bytes [EOI]	
	CLEAR STATUS	CS		Clears all 3 Status Bytes	
Request Status Bytes	REQUEST STATUS BYTE MASK	RM	1 byte		
	REQUEST EXTENDED STATUS BYTE MASK	RE	1 byte		
	REQUEST SECOND EXTENDED STATUS BYTE MASK	R2	1 byte		
Reset Sweep	RESET SWEEP	RS			
Take Sweep	TAKE SWEEP	TS			
Trigger	NETWORK ANALYZER TRIGGER (8410B)	NT			

Figure 3-17. HP-IB Only Functions (6 of 9)

8350B MODE STRING DEFINITION

NOTE: In all bit number references mentioned below, bit 0 is the least significant bit and bit 7 is the most significant bit.

In bytes 1 and 2 the numeric value of the entire byte indicates function.

BYTE 1

Numeric Byte Value	Front Panel Key Codes
0-9	0-9
10	.
11	-
12	Backspace
13	Step Up
14	Step Down
15	Marker to CF
16	Permanent Marker Sweep
17	Instrument Preset
18	Single Sweep
19-64	(Reserved for future use)
65-254	Not Assigned
255	Any other key

BYTE 2

Numeric Byte Value	Active Function Code
1	Save
2	Recall
3	Alt
7	Power Level
8	Sweep Time
10	CW
11	CF
12	DF
13	Start
14	Stop
15	Marker 1
16	Marker 2
17	Marker 3
18	Marker 4
19	Marker 5
23	HP-IB Address
26	Manual frequency
27	Freq. Offset
28	Freq. Multiplier
29	RF Slope
32	Number of steps
35	ALC
36	Attenuator
43	Sweep Time Limit
60	Vernier
61	RF Offset
62	Step Size (freq. or power)
63	Hex Entry Address
64	Hex Entry Data
65	Key Test
66-255	Unassigned

Figure 3-17. HP-IB Only Functions (7 of 9)

BYTE 3

Byte 3 is separated into 3 functional parts. Bits 0, 1, and 2 contain a number that represents the Active Marker. Bits 3, 4, and 5 contain a binary number that represents the last Active Marker. Bits 6 and 7 are not used.

Bits	Definition
0-2	Active Marker (Binary number corresponds to marker number)
3-5	Last Active Marker (Binary number corresponds to marker number)
6, 7	Not used

BYTE 4

Each of the 8 bits that make up byte 4 independently represents the status of the frequency Markers and Marker Modes. A logic one in any bit indicates active function.

Bit	Definition
0	Marker Sweep
1	Marker 1
2	2
3	3
4	4
5	5
6	Counted Markers
7	Marker Delta Mode

BYTE 5

Byte 5 is separated into 3 functional parts. Bits 0 and 1 contain a binary number that indicates the Sweep Trigger mode. Bits 2, 3, and 4 contain a binary number that indicates the Sweep Source. Bits 5, 6, and 7 contain a binary number that indicates Sweep Mode.

Bits	Definition
0-1	Sweep Trigger 0 Internal Free Run 1 Line 2 External
2-4	Sweep Source 0 Continuous Analog Sweep ("Time") 1 Single Analog Sweep 2 Manual 3 External Sweep Input 4 Continuous Step Sweep 5 Single Step Sweep
5-7	Sweep Mode 0 Start/Stop 1 CF/DF 2 Swept CW 3 CW

Figure 3-17. HP-IB Only Functions (8 of 9)

BYTE 6

Each of the bits that make up byte 6 independently represents the status of the function listed. A logic one in any bit represents active function.

Bit	Definition
0	Amplitude Markers
1	Display Blanking
2	RF Blanking
3	Sqr. Wave Mod.
4	Entry and RPG
5	Save Lock
6	Alt. Sweep Mode
7	Keyboard Shifted

BYTE 7

Bits 0 and 1 of byte 7 contain a binary number that indicates ALC Leveling Mode. Bits 2, 3, 4, and 5 independently represent the status of the functions listed (a logic one in any one of these bits indicates active function). Bits 6 and 7 are not used.

Bit(s)	Definition/Function
0-1	ALC Leveling Mode 0 Internal 1 External 2 Power Meter
2	CW Filter
3	RF Power Sweep
4	RF Power Slope
5	RF Power Output
6, 7	Not used

BYTE 8

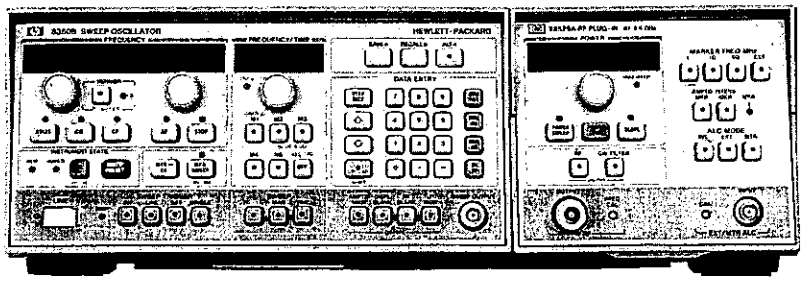
Each of the bits in byte 8 independently represents the status of the functions listed. A logic one in any bit indicates active function.

Bit	Definition
0	Xtal Amplitude Markers
1	Xtal Intensity Markers
2	Phase Lock
3	Pulse Modulation
4	Frequency Modulation
5	Amplitude Modulation
6	YTM Peaking
7	Penlift at Bandcross

Figure 3-17. HP-IB Only Functions (9 of 9)

LOCAL OPERATION

8350B SWEEP OSCILLATOR



HEWLETT PACKARD

8350B
SWEEP OSCILLATOR

1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CA. 95404

MANUAL PART NO. 08350-90034
Microfiche Part No. 08350-40035

Printed: JANUARY 1983

LOCAL OPERATION

INTRODUCTION

This Local Operation handbook provides information on the local use (non HP-IB) of the 8350B Sweep Oscillator with 83500 series Plug-ins. Throughout this handbook are blocks of example procedures on implementing some of the information. The front panel controls are divided into function groups. These groups and other information topics are arranged in the following sequence:

- GETTING STARTED – Brief example of control usage.
- INSTRUMENT PRESET – Error codes and preset conditions.
- DATA ENTRY – Numeric, step, units, and shift keys.
- FREQUENCY – Mode selection, vernier and offset.
- FREQUENCY/TIME – Markers and sweep control.
- SAVEn/RECALLn/ALTn – Storage Registers, Step Up Advance.
- DISPLAY FUNCTION – Blanking, Modulation, and Sweep Out/In.
- 83500 SERIES PLUG-INS – Power, signal, and crystal markers.
- USE WITH SPECIFIC MEASUREMENT EQUIPMENT:
  HP 8756A Scalar Network Analyzer
  HP 8755S Frequency Response Test Set
  HP 8410B Network Analyzer
  HP 7010B and other X-Y Recorders
  HP 5343A Frequency Counter
- APPENDIX 1 – Rear panel connector information.
- APPENDIX 2 – Use of 86200 series Plug-Ins with 11869A Adapter.
- APPENDIX 3 – Summary of Sweep Oscillator front panel controls with fold-out front panel drawing.

GETTING STARTED

NOTE

If a 86200 series RF Plug-in and 11869A Adapter are used, the Plug-in coding on the adapter must be set properly to get the correct frequency display.

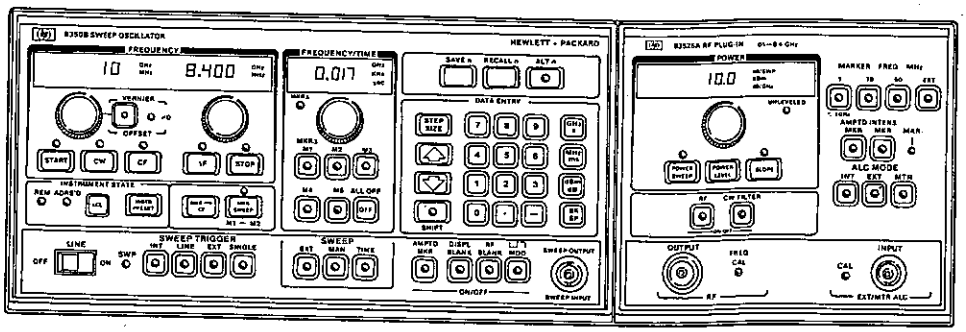
When the 8350B INSTR PRESET key is pressed the front panel of the 8350B is set to the following pre-determined state: The RF output is swept over the full frequency range of the Plug-in at the maximum specified leveled output power, minimum sweep time for the RF Plug-in installed, and the internal square wave amplitude modulation is off.

Example:

8350B with 83525A 0.01-8.4 GHz Plug-in

To change from the INSTR PRESET state to 4.2 to 6.2 GHz sweep (in START/STOP mode), 0.20 second sweep time, +4.5 dBm output power, 27.8 KHz square wave modulation on RF output:

1. Press the **[START]** key and then rotate the START control clockwise to increase the start frequency until the display above the START key reads 4.200 GHz
2. Rotate the STOP control counterclockwise to decrease the STOP frequency to 6.500 GHz.
3. Press the **[TIME]** key, then turn the FREQUENCY/TIME control clockwise to increase the sweep time to 0.2 second (displayed on the FREQUENCY/TIME display).
4. Press [⊔⊓ **MOD**] key to activate the internal 27.8 KHz square wave modulation. The lamp in the center of the key will be on.
5. Press the **[POWER LEVEL]** key, then turn the Plug-in POWER control until the display reads +4.5 dBm.



INSTRUMENT PRESET

This condition occurs when the INSTR PRESET key is pressed.

Turning the 8350B on or performing an INSTR PRESET causes an internal self test to occur. Only after the INSTR PRESET command will the instrument be set to the preset condition. If certain internal errors or failures are detected during the self test or during normal operation they will be indicated via error codes in the form "Ennn" (where n=0, . . . ,9) read from the left FREQUENCY display. For a complete description of the error code listing see the Operating and Service Manual Section 8. The error codes are:

E001	Plug-in interface failure. Check Plug-in.
E002	Sweep voltage DAC/Marker voltage DAC failure
E003	Tuning voltage DAC/Marker voltage DAC failure

Figure 1. Instrument Preset Key (1 of 2)

E004	Power supply failure
E005	Instrument interface bus failure
E006	Front panel bus failure
E007	ROM failure
E008	ROM failure
E009	ROM failure
E010	ROM failure
E011	RAM failure
E012	RAM failure
E013	RAM failure
E014	RAM failure
E015	Microprocessor failure
E016	Insufficient cooling. Check air filter and fan.
E030	A SAVEn Command has been attempted when the SAVE-Lock is engaged.
E050 to E099	Plug-in failure. Refer to appropriate Plug-in manual for troubleshooting information.

If, after INSTR PRESET, the self test completes without errors the instrument presets to:

SWEEP MODE: START/STOP, over full frequency range of Plug-in

SWEEP TIME: fastest allowable for Plug-in

MARKERS: reset/off

MODULATION: off

SWEEP TRIGGER/SWEEP: INT-TIME

VERNIER/OFFSET: 0 MHz

DISPLAY BLANKING: on

SAVE/RECALL: All SAVE registers remain unchanged.

All Other Functions: off

When using 83500 series Plug-ins:

POWER LEVEL: maximum specified leveled value

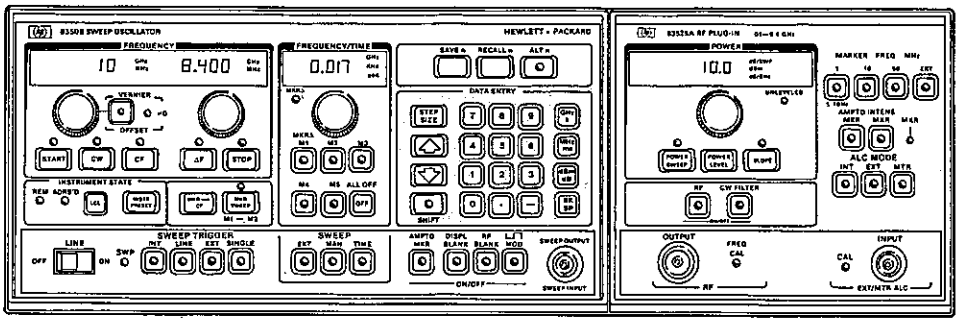
RF: on (Selectable by RF Plug-in configuration switch.)

ALC MODE: INT

CRYSTAL MARKERS: off (83522A, 83525A/B only)

All Other Functions: off

Figure 1. Instrument Preset Key (2 of 2)



DATA ENTRY

The DATA ENTRY section shown above, contains the numeric keyboard, terminators (i.e., GHz, seconds, dBm), step size/up/down, backspace and shift keys. This section allows a specific value to be entered for any Frequency, Time, or power parameter. The entry will modify the active function (last function selected) and must be terminated with the appropriate GHz/seconds, MHz/milliseconds, or dBm/dB Key. The step up [▲] and step DOWN [▼] keys allow the active function to be incremented or decremented. Step size for frequency and Power may be changed to any desired value.

Number/unit keys

These keys are used to enter values of frequency, time or power. Holding a number key down causes it to repeat.

Example:

To enter a START frequency of 1.870 GHz:

Press **[START] [1] [.] [8] [7] [GHz/s]**

or

[START] [1] [8] [7] [0] [MHz/ms]

to enter the equivalent frequency in MHz.

Backspace Key BK SP. Prior to pressing a units key the value entered from the keyboard may be changed via the BK SP key without effecting the current instrument state. The backspace key allows the user to alter digits already entered. Holding down the Backspace key causes it to repeat.

Step UP and Step DOWN keys

These keys increment or decrement the active function (including memory registers) by the STEP SIZE or preset amount. By holding either key down the 8350B will continue to step

Figure 2. Data Entry (1 of 2)

therefore eliminating the need for the user to repeatedly press the step keys. The STEP UP function may be engaged via the remote STEP UP ADVANCE on the rear panel AUX PROGRAMMING connector. The STEP UP ADVANCE is incremented by supplying contact closure to ground or logical 0 to pin 22.

STEP SIZE

Entering a frequency or power increment to be used with the UP or DOWN key. The STEP SIZE key is pressed before the quantity is entered. A frequency step that is entered is common for START, STOP, CF, CW, MARKER and MANUAL SWEEP functions. A power step is used for varying POWER LEVEL. Default values are assigned at instrument preset for step sizes until new values are entered. Note that a step size for SWEEP TIME cannot be entered and always increments in a 1, 2, 5 sequence. The step keys affect the last active function. The entered Step Size is not displayed.

Example:

To set a 250 MHz step size:

Press **[STEP SIZE] [2] [5] [0] [MHz/ms]**

After this, each time the UP or DN key is pressed the active frequency parameter will change by 250 MHz.

SHIFT key (BLUE)

This key is used to activate the functions coded in blue on the front panel and other special SHIFT functions are also explained on the pull out information card. The lamp in the center of this key is on when the key is active.

Example:

To activate all 5 frequency markers: Press **[M1] [M2] [M3] [M4] [M5]**

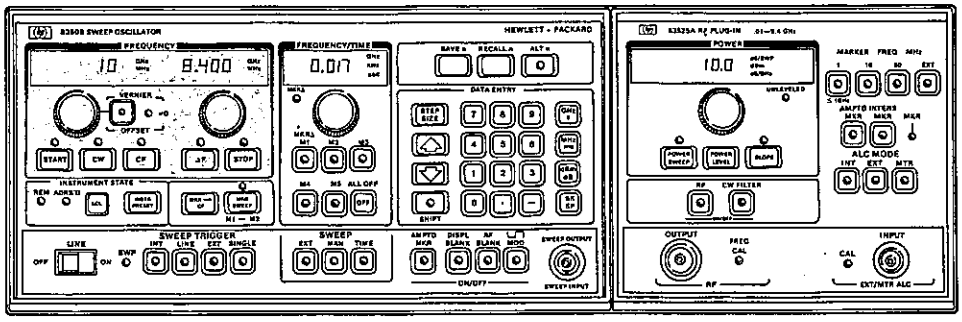
To turn off all 5 frequency markers at once:
Press **[SHIFT] [OFF]**; this activates the (markers) ALL OFF command.

The SHIFT key is also used to set the HP-IB address. Press **[SHIFT] [LCL]**; the FREQUENCY/TIME display will indicate the present HP-IB address number. The address may be changed to any value between 0 and 30 by using the keyboard to enter a number and the GHz, MHz or dBm key as a terminator (It does not make any difference which of the terminator keys is pressed). The 8350B is factory preset for an HP-IB address of 19.

NOTE

Address number 21 is normally reserved for calculator addressing and HP-IB interface functions and should not be used.

Figure 2. Data Entry (2 of 2)



FREQUENCY

The gray area, shown above, controls the sweep modes and frequency limits.

START/STOP

When either the START or STOP key is pressed the sweep oscillator is put in the START/STOP mode swept RF output begins at the START frequency and ends at the STOP frequency. The START frequency must be less than or equal to the STOP frequency. The left FREQUENCY display shows the value of the start frequency. While the right FREQUENCY display shows the value of the stop frequency. Frequencies may be changed in three ways.

- Frequency control knob – Provides continuous adjustment. Clockwise rotation increases frequency.
- Keyboard data entry – Specific frequency values may be entered for the active frequency mode by Pressing the desired values and units.
- Step Control Key – THE ACTIVE FREQUENCY FUNCTION can be incremented or decremented by pressing the appropriate STEP key. The value of the STEP SIZE can be set to any desired value (see STEP SIZE for setting procedure).

CF/ΔF

The CF/ΔF mode allows the swept output frequency range to be read as a center frequency and a frequency sweep width. The output frequency is swept from CF−ΔF/2 (start frequency) to CF+ΔF/2 (stop frequency). When changing between CF/ΔF and START/STOP modes only the method of display changes. The swept RF output remains the same.

When either CF or ΔF is activated the left display shows the center frequency (CF), the right display shows the delta frequency (ΔF). Both the CF and ΔF can be changed via the appropriate control knob, number/units keyboard or step keys.

CW

When the CW function is activated the 8350B outputs a constant frequency. The value of the CW frequency is displayed on the left FREQUENCY display. The CW frequency is always the same as the center frequency (CF) of the CW/ΔF swept range. The CW frequency value can be changed using the control knob, data entry keyboard or step keys. In CW mode, the SWEEP OUT voltage is equal to a percentage of the full band. Pressing **[SHIFT] [CW]** enters a "swept" CW mode with the SWEEP OUT being a 0 to 10 volt ramp that results in the display trace being a flat horizontal line. This is often useful when reading values (e.g., dB of attenuation) from a CRT screen when at a CW frequency.

Figure 3. Frequency Controls (1 of 2)

CW Fine/Coarse Control Knob Resolution

CW control knob resolution is coarse when CW mode is activated after an INSTRUMENT PRESET. To change from coarse control knob resolution, 0.0015% of band/16,384 points, to fine resolution, 0.00038% of band/262,144 points, press **[SHIFT]** [ΔF]. To return to coarse control knob resolution press **[SHIFT]** [CF].

FREQUENCY VERNIER

The effective center frequency of any mode (CW or swept) may be adjusted with high resolution up to ±0.05% of the frequency band being used with the vernier. Pressing the VERNIER key activates the function and sets the left FREQUENCY display to read the vernier value in MHz.

1. "≠0" light is on whenever a frequency vernier or frequency offset is present in any mode. After setting vernier, to return to the previous mode, press the appropriate key (e.g., START, CF, etc.) and the display will return to reading the appropriate frequencies and the "≠ 0" lamp will be lit.
2. Frequency vernier can be set by the control knob, Data Entry keyboard, or step keys.
3. The displayed vernier adjustment can be up to ±0.05% of the frequency band being swept. When in a sub-band of a multiband Plug-in (for example, the 0.01-2 GHz band of the 83525A .01-8.4 GHz Plug-in) the adjustment range will be ±0.05% of the sub-band. This feature allows for better frequency resolution than would otherwise be possible with the vernier when using a multiband Plug-in.
4. The vernier adds its value to the appropriate frequency parameter and then resets the vernier to zero when the adjustment exceeds ±0.05% for continuous adjustment.
5. ZEROING VERNIER. To set the vernier to zero, press **[VERNIER] [0] [MHZ/ms]** and the"≠0" lamp will turn off.

FREQUENCY OFFSET

The frequency offset feature allows the CW frequency and/or the effective center frequency of the swept range to be shifted by any amount up to the full range of the Plug-in.

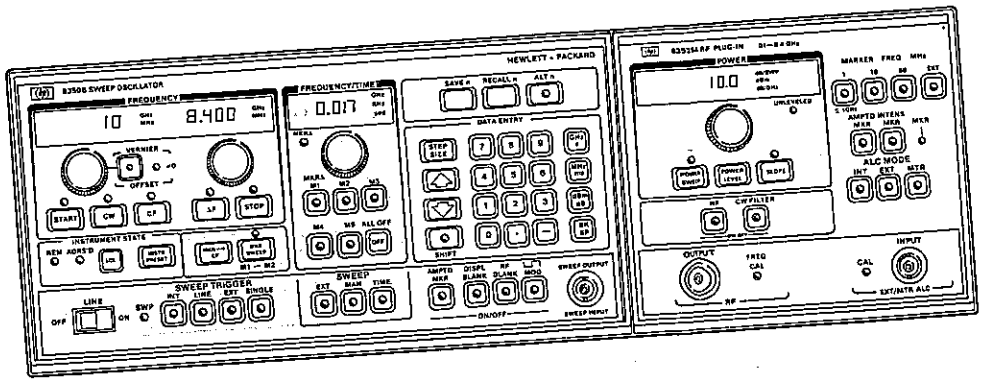
1. To enter an offset press **[SHIFT] [VERNIER]** and enter the offset by either the left FREQUENCY control or data keyboard. The amount of offset (in GHz or MHz) will be shown in the left FREQUENCY display and the "≠ 0" lamp will be lit.
2. To exit the displayed offset mode press the appropriate mode key (i.e., START, CW, etc.). The sweep limits displayed will appear to be unchanged, however the "≠ 0" lamp will be on indicating the offset is present and the actual RF output frequency will be shifted.
3. To display or adjust the frequency offset press **[SHIFT] [VERNIER]**. To zero the offset press **[SHIFT] [VERNIER] [0] [MHz]**.

OVERRANGE

The 8350B will permit frequency sweeps beyond the specified range of the Plug-in by ±2.0% of the Plug-in bandwidth. However, Plug-in performance in the overrange condition is unspecified.

As a warning of the frequency overrange condition the GHz or MHz annunicator will flicker in the appropriate function display.

Figure 3. Frequency Controls (2 of 2)



FREQUENCY/TIME

The FREQUENCY/TIME portion of the front panel shown above enables the control of the SWEEP TRIGGER modes, the SWEEP modes and the frequency markers.

SWEEP

The 8350B SWEEP Mode select keys provide three ways to control the frequency sweep; TIME, MANUAL, and EXTERNAL sweep, described below.

TIME. When the TIME key is pressed the output is swept at the user-specified or default rate. If the time key is lit but the display reads GHz/MHz or is blank, press the TIME key again and the display will read seconds. The mainframe can allow sweep times from 100 seconds to 0.01 second although the minimum sweep time is dependent on the Plug-in being used and the bandwidth being swept.

When display reads seconds, sweep time can be adjusted with the control knob or number/units keyboard. The step keys can be used to adjust the sweep time in a 1-2-5 sequence.

MANUAL SWEEP(MAN). FREQUENCY/TIME display will read GHz/MHz. By using the FREQUENCY/TIME control, step keys or number/units keyboard, it is possible to manually sweep the frequency range with the display indicating the present output frequency.

EXTERNAL SWEEP(EXT). The 8350B can be swept via an external voltage. Apply 0 to 10 volts into the sweep output/input (use BNC connector on front or rear panel) with 0V input corresponding to the lower frequency limit of the sweep range and 10V corresponding to the upper limit. DC sweep input voltages will cause CW frequency outputs. Markers and blanking outputs are disabled when in external sweep mode.

SWEEP TRIGGER

Controls when the sweep will begin in the timed sweep mode. The sweep light, SWP, is lit when the sweep is occurring.

INT. Sweep triggered internally, free running.

LINE. Sweep triggered by power line frequency.

Figure 4. Frequency/Time Controls (1 of 3)

EXT. The sweep can be triggered externally by applying a positive going signal from 0 to 2 volts minimum, +20volts maximum. The trigger signal must be wider than 0.5 microsecond at less than a 1 MHz repetition rate.

SINGLE. This key selects single sweep mode and aborts present sweep when first pressed. Subsequent keying will trigger or abort single sweeps at current sweep time.

MARKERS

Any or all of the five markers (M1 through M5) may be enabled by pressing the marker key corresponding to the marker desired. When a marker is activated it is set to its last active frequency unless INSTRUMENT PRESET has been activated in which case the marker will be set to center of the present sweep. A marker can be in one of three states:

- ACTIVE – Lamp in center of key flashing.
- ON – Lamp on.
- OFF – Lamp off.

The five mainframe markers are available in two forms, Intensity and Amplitude.

Intensity markers are active any time a marker is selected. These markers are available at the Positive Z-axis output (rear panel BNC) and appears as intensified dots on a display.

Amplitude markers are only on when the AMPTD MKR key has been pressed. Amplitude marker circuitry is internal to the 8350B mainframe and RF Plug-ins and causes dips in the RF output power at the selected marker frequencies.

Only one marker at a time, the "active" marker, can have its value altered. Pressing any marker key makes that marker "active".

- When a marker is active the keyboard, FREQUENCY/TIME control knob, step keys, or DATA ENTRY Keyboard can be used to modify its value. The value of the active marker in GHz/MHz is displayed.
- By pressing OFF, the active marker only will be turned off. If multiple markers are on, the remaining lamps will remain lit although the display will go blank.
- A marker may be initially activated or returned to active state by pressing the corresponding marker key.
- All markers may be turned off simultaneously by pressing **[SHIFT] [OFF]**.

Example:

To activate Marker "3":
Press **[M3]**. (Note M3 lamp flashing other lamps off.)

To activate Marker "5":
Press:**[M5]**. (Note M5 lamp flashing, M3 lamp on and other lamps off.)

Figure 4. Frequency/Time Controls (2 of 3)

MKR (Marker) SWEEP. In this mode the RF output is swept between markers M1 and M2. The lamp over the key will be on. Marker 1 must be less than or equal to Marker 2 in frequency (if M1 is greater than M2 the values of M1 and M2 are permanently interchanged). By varying the active marker (1 or 2) or by turning the START/STOP controls the sweep limits can be altered. When both M1 and M2 are not on, the sweep occurs between the most recent values of M1 and M2. To exit this mode press **[MKR SWEEP]** and the lamp over the key will go out. Pressing **[SHIFT] [MKR SWEEP]** causes the values of M1 and M2 to become the START/STOP frequency values permanently.

MARKER-TO-CENTER FREQUENCY (MKR→CF). When this key is pressed the frequency of the active marker becomes the center frequency of the swept output. The frequency span remains unchanged if it is within the frequency limits of the Plug-in. If the original frequency span exceeds the Plug-in limits frequency span will be reduced to retain symmetry.

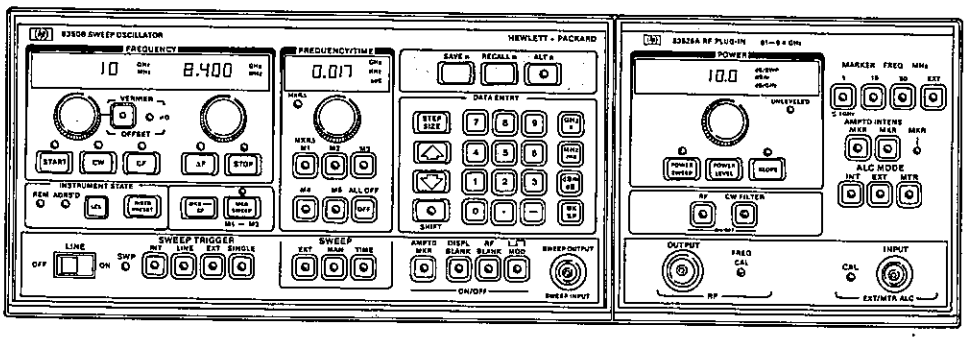
MKR Δ. This function allows the frequency difference between any markers to be displayed and the trace between them intensified (if intensity markers are selected).

1. Press **[SHIFT] [M1]** the display shows the frequency difference between the currently active marker and the one that was previously active.
2. The FREQUENCY/TIME control, DATA ENTRY keyboard, or step keys can change the active marker value.
3. To exit MKR Δ mode press **[OFF]**.

Example:

1. Press **[M4]** and set frequency via DATA ENTRY or Control Knob to 2 GHz.
2. Press **[M2]** and set frequency via DATA ENTRY or Control Knob to 2.4 GHz.
3. Press **[SHIFT] [MKR Δ]** (Note Frequency/Time display reads difference between marker 4 and marker 2, 400 MHz).

Figure 4. Frequency/Time Controls (3 of 3)



SAVEn/RECALLn/ALTn

SAVEn/RECALLn

The 8350B is equipped with memory registers which allow up to nine complete front panel settings (frequency range, markers, power level, etc.) to be stored and later recalled. Instrument settings are stored in memory locations 1 through 9 by pressing **[SAVEn]** and 1, . . ., or 9. To recall a stored instrument setting press **[RECALLn]** and 1, . . ., or 9. The STEP keys may be used to step through the stored registers. The instrument settings stored in memory may be recalled remotely in sequence by using the Step Up Advance on pin 22 of the Auxiliary Program connector on the rear panel of the 8350B. A contact closure to ground or logic 0 is used to implement this function.

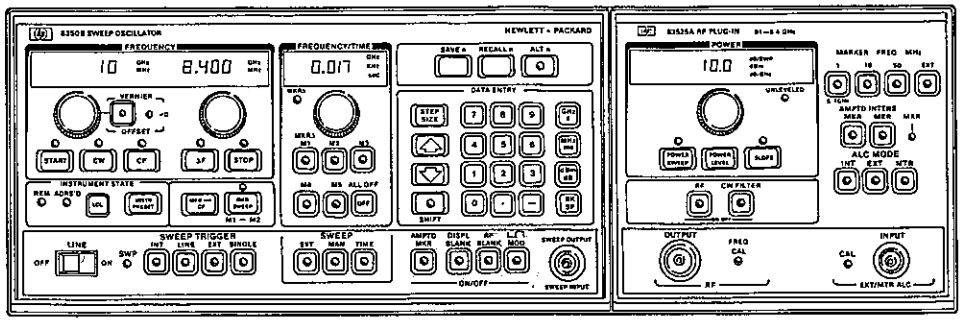
SAVE REGISTER LOCK:

All Save Registers may be write-protected (locked) by pressing **[SHIFT] [SAVEn]**. This command makes it impossible to change the contents of any register until it is unlocked by pressing **[SHIFT] [RECALLn]**. Since the 8350B memory is non-volatile the contents of the Save Registers and the locked/unlocked status are retained even with Line power off. If a SAVEn command is attempted after SAVE LOCK is engaged an Error 30 (E030) is displayed.

ALTn

ALTn causes the 8350B to alternate between the current instrument state and the setting stored in memory location n (where n=1, . . . ,9) on sucessive sweeps. When the 8350B is in this mode the lamp will be on and the SAVE and RECALL keys disabled. To exit from the ALTn mode press the key again, the lamp will turn off and the SAVE/RECALL keys will become operational. When using the 8350B with an HP Swept Amplitude Analyzer, channel 1 displays the current instrument state and channel 2 displays the stored setting (provided the 8350B ALT SWP INTERFACE cable is connected to the analyzer).

Figure 5. Save n, Recall n, and ALT n Keys



DISPLAY FUNCTIONS FOR ANALYZER INTERFACE

AMPT MKR, DSPL BLANK, RF BLANK. (Function in effect when lamp in center of key is lit)

DSPL BLANK ON/OFF. Blanks the display during the retrace via the POS Z BLANK or NEG Z BLANK outputs.

RF BLANK ON/OFF. Blanks (turns off) the RF power during the retrace.

MOD ON/OFF. Activates the internal 27.8 KHz square wave amplitude modulation of the RF output. This feature makes the 8350B directly compatible with the HP 8756 and the HP 8755 Scalar Network Analyzers. The 8350B may be modified via an internal jumper to provide 1000 Hz square wave amplitude modulation for instruments like the HP 415E SWR Meter (refer to the Operating and Service Manual Section 5).

SWP (Sweep) OUTPUT/SWP (Sweep) INPUT (BNC connection).

SWP (Sweep) OUTPUT. Supplies a 0 to 10 Volt signal when 8350B is in MAN or TIME sweep mode. 0V output is at the start frequency of sweep, 10V output is at the stop frequency of sweep. In CW mode the output is a dc voltage proportional to the percent of the band. This can be used to drive the X-axis on a CRT or X-Y recorder.

SWP (Sweep) INPUT. Used when in EXT sweep mode. Supplying a dc voltage will tune the RF where 0 volts tunes to the lower frequency of the set sweep and 10 volts tunes to the upper frequency. The input can be a ramp for a swept output or DC for a CW frequency.The display and RF blanking must be off when externally sweeping.

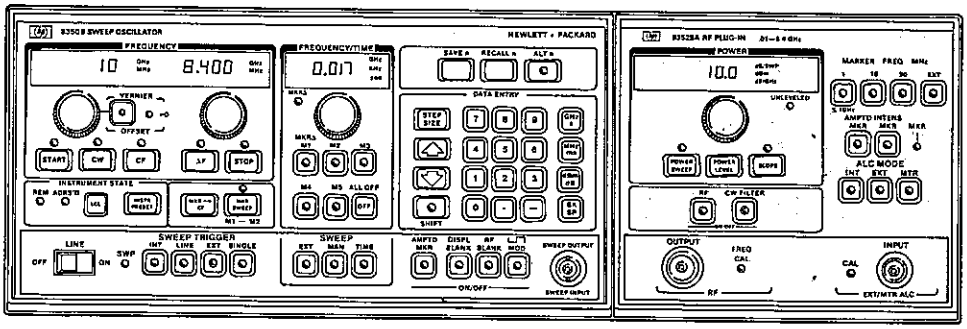
DISPLAY FUNCTIONS FOR FREQUENCY MULTIPLIER OR UP-CONVERTER INTERFACE

Two SHIFT functions located in the Frequency section of the front panel allow the actual RF output frequencies to be displayed when a frequency multiplier or frequency up-converter is used.

DISPLAY MULTIPLIER. This function is activated by pressing **[SHIFT] [START] [n] [GHz]**. The possible values for "n" range from 0 to +99 allowing the appropriate integer multiplier to be entered. This integer (n) multiplier (typically 2 or 3) does not affect the RF output of the 8350B but simply allows the Frequency LED displays to automatically show the final RF output when a frequency multiplier is used.

DISPLAY OFFSET. This function is activated by pressing **[SHIFT] [STOP] [n] [GHz]**. The possible values for "n" range from 0 to +999 GHz enabling an appropriate Frequency LED display offset to be entered. This display offset does not affect the 8350B RF output but only allows the Frequency LED displays to automatically show the final RF output when a frequency up-converter is used.

Figure 6. Display Function Keys



83500 SERIES PLUG-IN

Power Control

POWER LEVEL. When the POWER LEVEL key is pressed, the Plug-in display indicates the RF output power. The output power may be varied using the POWER control knob, keyboard or step keys. Note that the internal leveling must be on and the unleveled light out for calibrated output power. See Plug-in manual for Plug-in calibrated range. ALC dynamic range depends on Plug-in installed and its options, if any.

SLOPE. Compensates for high frequency power losses in external RF cables by increasing power at higher frequencies. This compensation provides a flat RF signal output at the end of a cable or test set. Press **[SLOPE]** and the display will indicate dB/GHz of compensation desired. Use the POWER control knob, keyboard or step keys to enter the amount of slope. Press **[SLOPE]** again to remove all compensation.

POWER SWEEP. This function enables the output power to be swept up. The maximum calibrated power sweep range depends on Plug-in installed. Note that when using Plug-ins withe Option 002 Step Attenuator, the power cannot be swept across the internal attenuator switch points. The procedure for performing a power sweep is:

1. After selecting the output frequency (sweep range or "swept" CW mode) use the POWER LEVEL key to set the starting value for the power sweep.

2. Press the **[POWER SWEEP]** key, the display will now read the dB/SWEEP. By using the POWER control knob, keyboard or step keys set the desired sweep range. The original power setting becomes the lower limit of the Power Sweep. The lower limit plus the entered sweep value is the upper sweep limit. Press the **[POWER SWEEP]** key again to turn the power sweep off.

Figure 7. Plug-in Controls (1 of 2)

Signal Control

RF ON/OFF. Turns the RF power on and off.

CW FILTER ON/OFF. When on, this filters the internal oscillator's tuning voltage to provide a more stable CW output. During swept operation this filter is always disabled.

ALC (Automatic Level Control) Mode: INT, EXT, MTR

INT. Provides internal leveling of output power at the output connector. The 83500 series Plug-in must be on INT leveling for calibrated output power.

EXT. This setting is used when leveling with an external crystal/diode detector. The front panel EXT ALC input accepts negative voltages in the −25 to −250 millivolt range (typically).

MTR. Used when leveling output power with an HP 432A/B/C Power Meter.

CAL. Adjusts the ALC gain so the display can be calibrated by an external power meter or detector.

CRYSTAL MARKERS (83522A, 83525A/B Plug-ins only)

50, 10, and 1 MHz crystal frequency marker combs are available. The 50 and 10 MHz are available in band 0 while the 1 MHz markers are available under 1 GHz.

AMPTD/INTENS. The markers can be set to be amplitude dips (on the RF output) and/or intensified spots (on the Z-axis of the CRT) or both. They are independent of the mainframe markers.

EXT (External Marker). An external frequency marker can be input through the rear panel of the Plug-in. The marker appears when the RF output frequency equals the marker frequency. The external marker input power should be between −10 dBm and −10 dBm.

MKR Lamp. When the 8350B is in CW or manual/external sweep mode the MKR Lamp will light when the CW frequency is at a marker frequency. Useful when an accurate CW frequency reference is desired and to calibrate Plug-ins.

RF OUTPUT CONNECTOR

Type N female. The 83570A 18 to 26.5 GHz Plug-in is equipped with a WR-42 waveguide output connector.

Figure 7. Plug-in Controls (2 of 2)

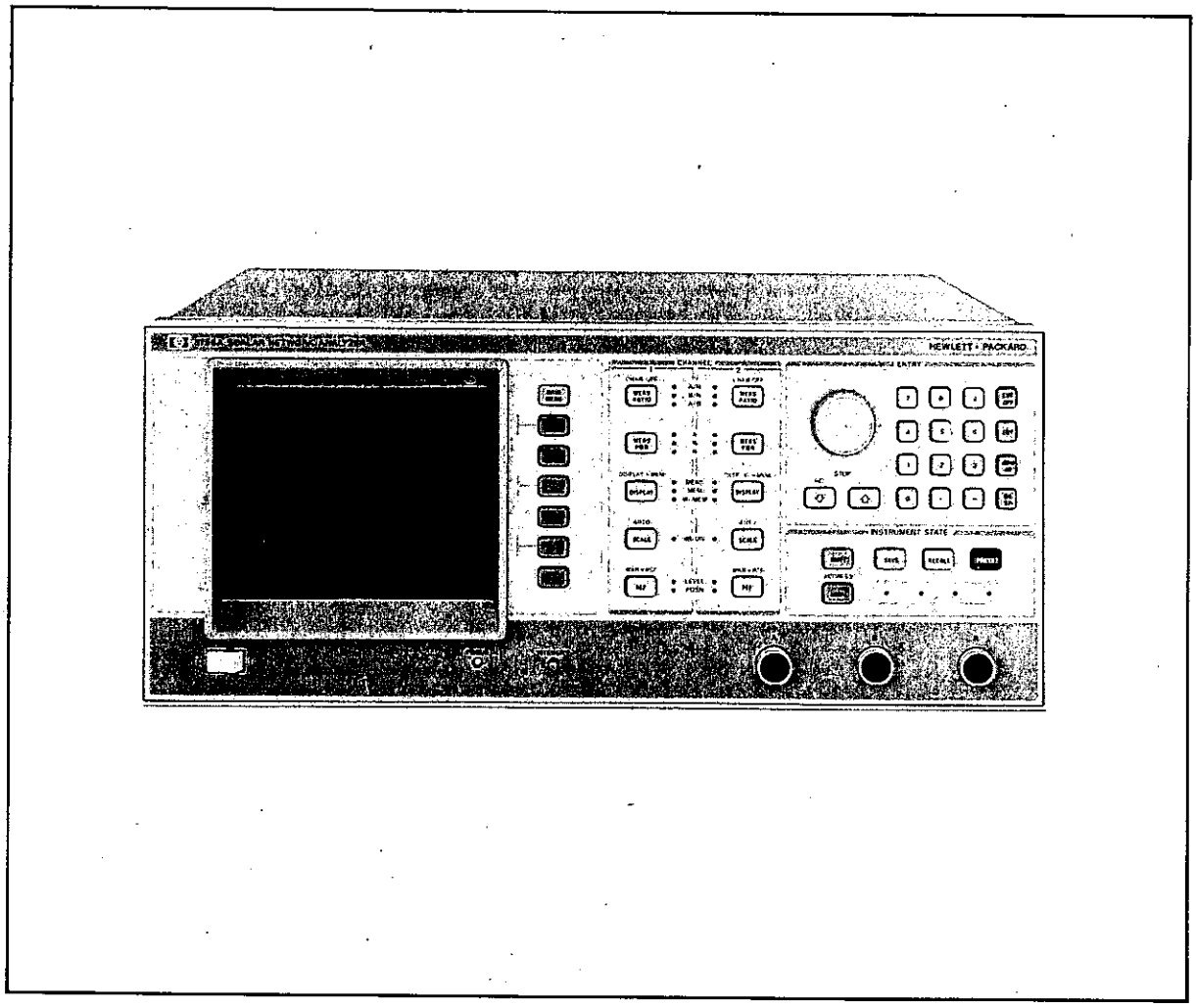


Figure 8. 8756A Scalar Network Analyzer

INTERFACING THE 8350B WITH SPECIFIC MEASUREMENT EQUIPMENT

8756A SCALAR NETWORK ANALYZER

The 8756A is used for scalar transmission and reflection measurements, with 60 dB of dynamic range for ratio measurements, and absolute power measurement from −50 dBm to +10 dBm.

The 8350B has the following features designed for use with the 8756A Scalar Network Analyzer.

RF Square-wave Modulation. By engaging the ⊔⊓ MOD key an internally generated squarewave modulation of the RF output is available thus eliminating the need for external modulating equipment. A jumper internal to the 8350B enables the square wave modulation frequency to be changed to 1 KHz (see section 5 of the Operating and Service manual for details).

Alternate Sweep Function. The ALTn function of the 8350B allows two different frequency and power settings to be swept on successive sweeps. The front panel setting and the setting stored in a memory register location n (n=1, . . . ,9) can be selected for alternate sweeps. See Figure 9 for a sweep display of the ALTn function when used with a bandpass response at different resolutions and offsets.

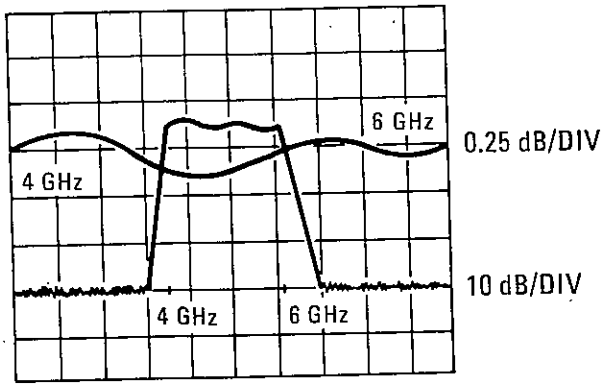


Figure 9. Alternate Sweep Function Display

Some other features enhancing the convenience and versatility of the 8756A are:

Marker Δ. The MKR Δ function reduces the trace intensity between the Active and the previously Active Markers.

Power Sweep. The RF output power may be ramped up when the sweeper is in the swept or "swept" CW mode by using the POWER SWEEP function. See Figure 10 for a gain compression display using power sweep.

Save and Recall. This function allows the storage and recall of nine complete instrument settings.

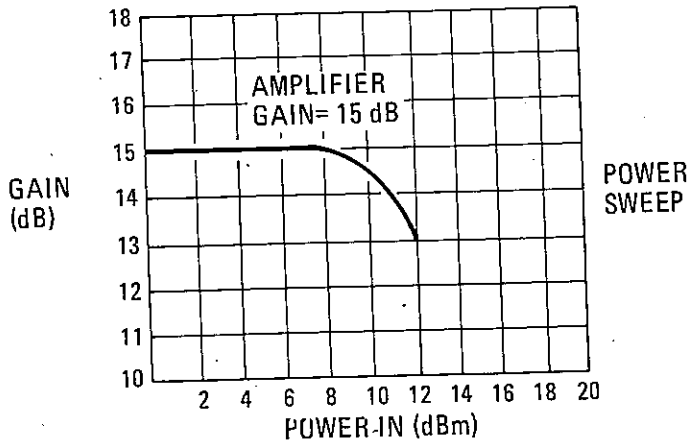


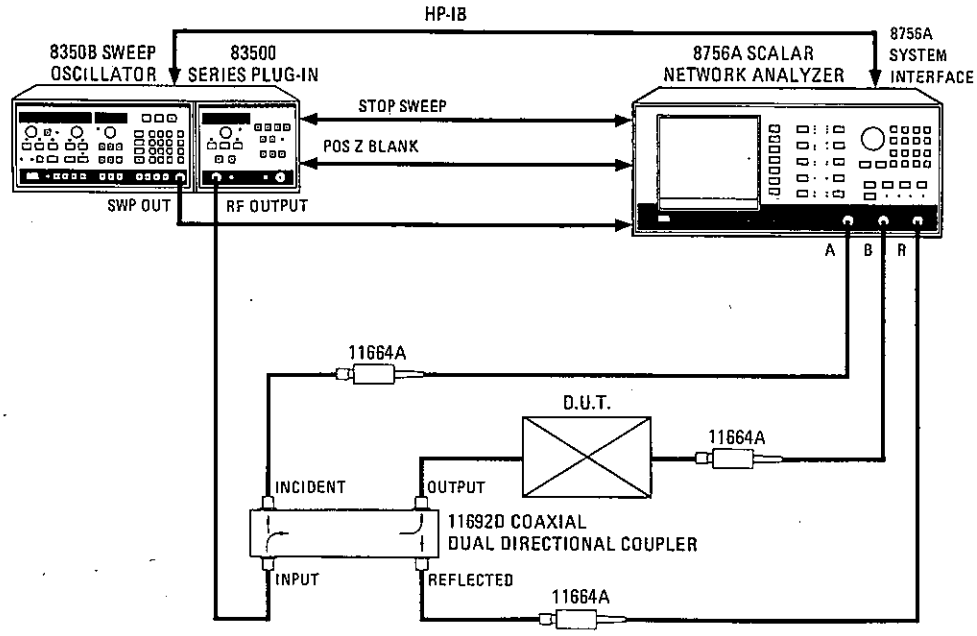
Figure 10. Gain Compression Display

Figure 11 outlines the general procedure used in making a scalar transmission and reflection measurement. The 11692D Dual-Directional Coupler is used in the example but if an 11666A Reflectometer Bridge, a 85020A/B, or a 85021 A/B Directional Bridge is available, it may be used instead of the Coupler and two detectors.

For more information and additional features of the 8756A with the 8350B, refer to the Operating Section of the 8756A Operating and Service Manual.

Example:

1. Connect the equipment as shown in the diagram below. Initially, the 8350B should be set by pressing **[PRESET]** on the 8756A. The sweep time will be set to 150 ms, the 8350B internal square wave modulation and the 8350B INSTR PRESET will be activated.



Notes on connections:

- Either the front or rear panel SWEEP OUT/IN may be used.
- When in ALTn mode both channels 1 and 2 (on 8756A) must be on and receiving inputs.

2. Turn off channel 1 on the 8756A by pressing **[SHIFT] [MEAS RATIO]**. Set the 8350B controls as desired. On channel 2 set the function, dB/DIV and Offset desired for viewing the current sweep setting.

3. Set the 8350B controls as desired then store the current 8350B sweep setting in any available memory location. Then turn off channel 2 of the 8756A by pressing the **[SHIFT] [MEAS RATIO]** pushbuttons.

4. On Channel 1 of the 8756A, set the function, dB/DIV and Offset as desired. Set 8350B controls as desired.

5. Turn on channel 2. Press **[ALTn] [n]** and the 8350B will alternate between the two settings on successive sweeps.

Channel 1 now displays the response due to the current front panel setting while channel 2 displays the response to the setting stored in memory location n. The front panel controls of the 8350B are enabled and the current sweep setting may be altered if necessary.

Figure 11. Typical Test Setup Using 8756A

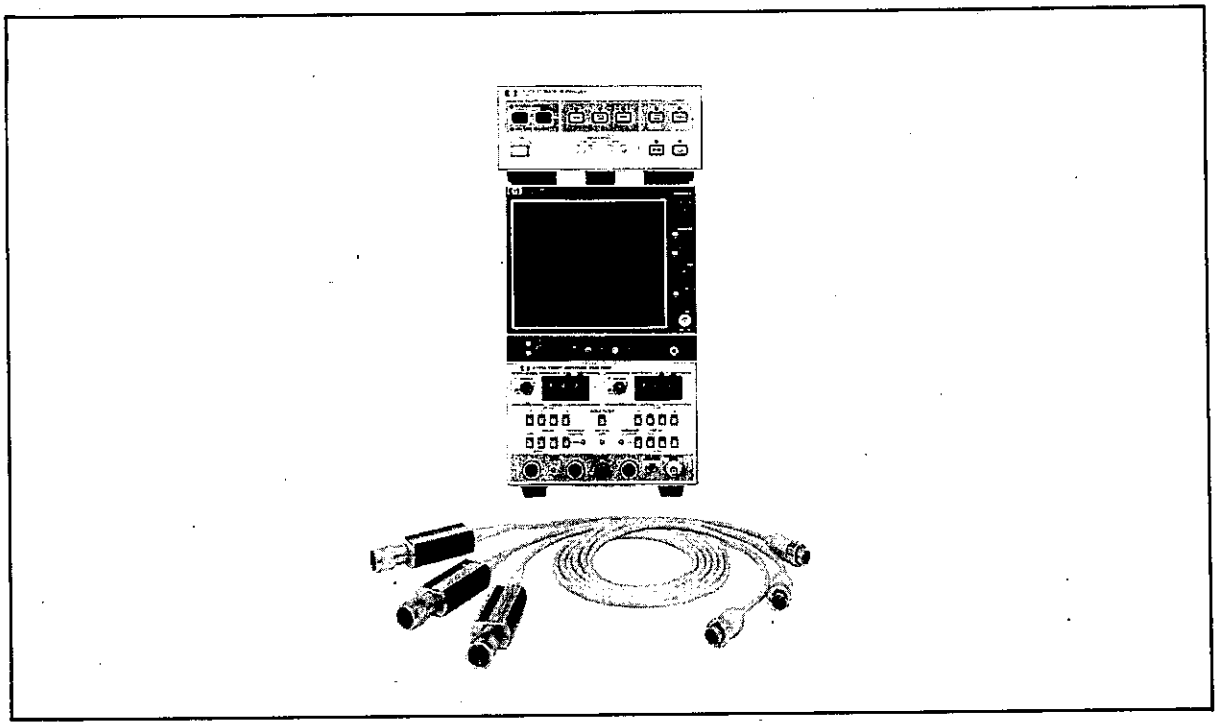


Figure 12. Frequency Response Test Set

8755S FREQUENCY RESPONSE TEST SET

The 8755S consist of:

- 8755C Swept Amplitude Analyzer
- 182T Oscilloscope
- 11664A Detectors (3 each)
- 8750A Storage-Normalizer

The 8755S is used for scalar transmission and reflection measurements requiring up to 60 dB of dynamic range and for absolute power measurement from −50 dBm to +10 dBm.

The 8350B has the following features designed specifically for use with the 8755S Frequency Response Test Set:

RF Square-wave Modulation. By engaging the ⊔⊓MOD key an internally generated squarewave modulation of the RF output is available thus eliminating the need for external modulating equipment. A jumper internal to the 8350B enables the square wave modulation frequency to be changed to 1 KHz (see section 5 of the Operating and Service manual for details).

Alternate Sweep Function. The ALTn function of the 8350B allows two different frequency and power settings to be swept on successive sweeps. The front panel setting and the setting stored in a memory register location n (n=1, . . . ,9) can be selected for alternate sweeps. The Alternate Sweep Function will not work properly with the 8755A or 8755B. See Figure 13 for a sweep display of the ALTn function when used with a bandpass response at different resolutions and offsets.

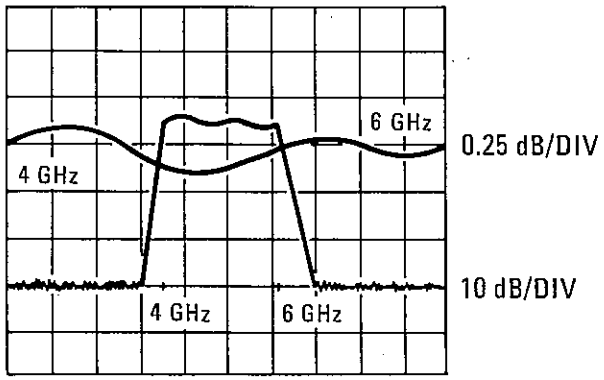


Figure 13. Alternate Sweep Function Display

Some other features enhancing the convenience and versatility of the 8755S are:

Marker Δ. The MKR Δ function increases trace intensity between the Active and the previously Active markers. The 8750A Storage-Normalizer will need to be in BYPASS mode to view Z-axis modulation on the oscilloscope.

Power Sweep. The RF output power may be ramped up when the sweeper is in the swept or "swept" CW mode by using the POWER SWEEP function. See Figure 14 for a gain compression display using power sweep.

Save and Recall. This function allows the storage and recall of nine complete instrument settings.

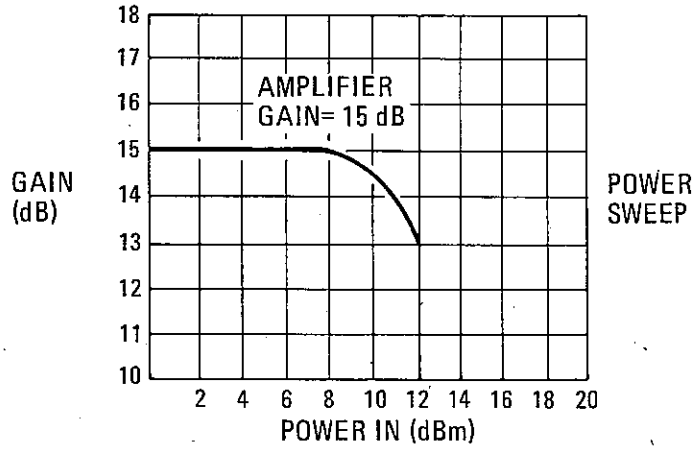


Figure 14. Gain Compression Display

Figure 15 outlines the general procedure used in making a scalar transmission and reflection measurement. The 11692D Dual-Directional Coupler is used in the example but if an 11666A Reflectometer Bridge is available it may be used instead of the Coupler and two detectors (8755S Option 002).

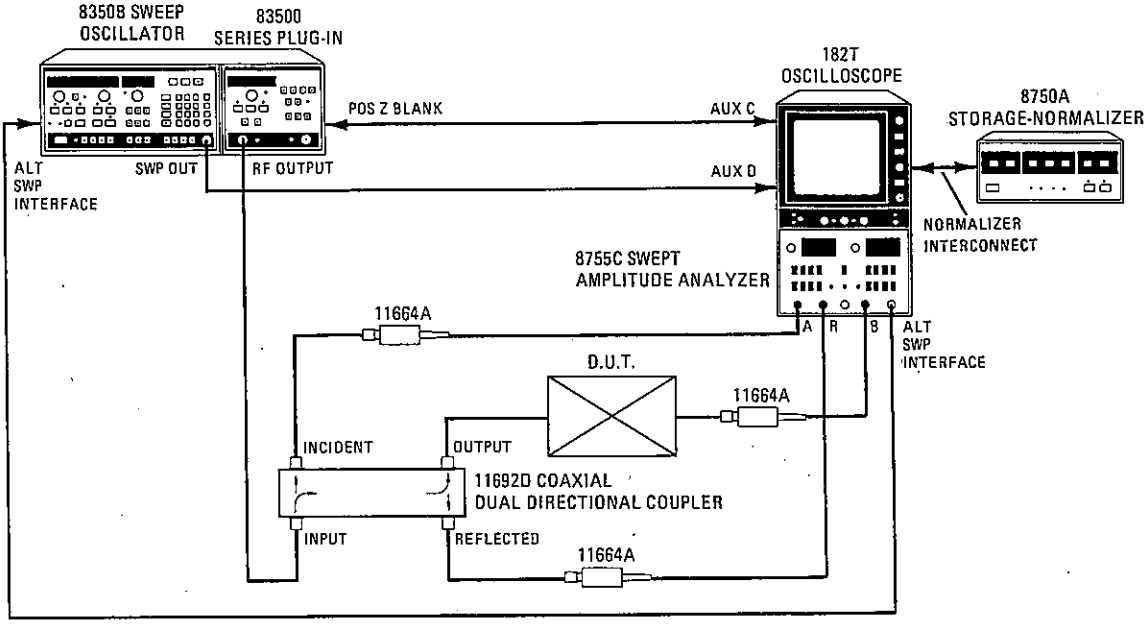
To keep the following procedure brief the 8750A will not be used (switched to BYPASS) in the procedure. The following anomalies exist when using the 8750A with the 8350B Sweep Oscillator:

- The 8350B DISPL BLANK must be engaged to ensure triggering 8750A updating.
- Intensity markers are changed to amplitude markers. In MKR Δ mode they appear as a level shift over the MKR Δ range.

- If an 8755 channel is switched off the trace goes to the reference line (bottom of CRT).

Example:

1. Connect the equipment as shown in the diagram below. Initially, the 8350B should be set by pressing **[INSTR PRESET] [⊔⊓ MOD]** (Set to 27.8 KHz) which will set the front panel instrument state and activate the internal square wave modulation.



Notes on connections:

- Either the front or rear panel SWEEP OUT/IN may be used.
- When in ALTn mode both channels 1 and 2 (on 8755C) must be on and receiving inputs.

2. Turn off channel 1 on the 8755C by releasing the display pushbutton. Set the 8350B controls as desired and set [⊔⊓MOD] on. On channel 2 set the function, dB/DIV and Offset desired for viewing the current sweep setting.
3. Set the 8350B controls as desired then store the current 8350B sweep setting in any available memory location. Then turn off channel 2 by releasing its display pushbuttons.
4. Turn on Channel 1 of the 8755C and set the function, dB/DIV and Offset as desired. Set 8350B controls as desired.
5. Turn on Channel 2. Press **[ALTn] [n]** and the 8350B will alternate between the two settings on successive sweeps.

Channel 1 now displays the response due to the current front panel setting while channel 2 displays the response to the setting stored in memory location n. The front panel controls of the 8350B are enabled and the current sweep setting may be altered if necessary.

Figure 15. Typical Test Setup Using 8755S

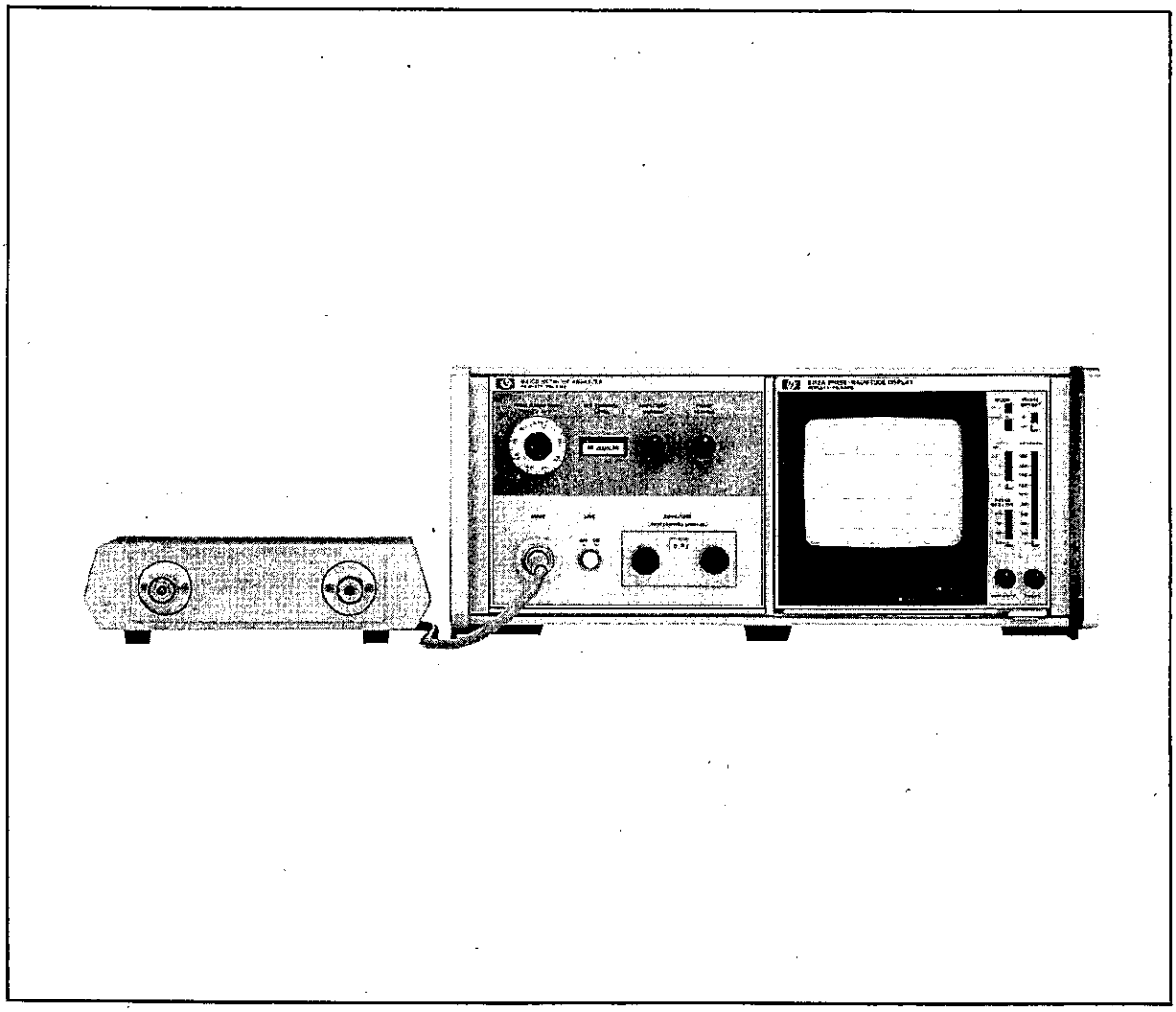


Figure 16. Frequency Response Test Set

8410B NETWORK ANALYZER

The 8350B is compatible with the 8410B Network Analyzer systems and accessories. The Source Control Cable (HP P/N 08410-60146) synchronizes the two instruments to provide continuous multi-octave coaxial magnitude and phase measurement capability from 110 MHz to 18 GHz with 65 dB dynamic range. The frequency markers can be displayed in polar format as intensity dots (Z-axis). Frequency markers derived from crystal oscillators allow frequency measurements to be made with an accuracy of five parts per million.

Waveguide measurements between 18 and 26.5 GHz can be made with the K8747A Reflection/Transmission Test Unit which is designed for use with the 8410B. This test system utilizes two 8350B Sweep Oscillators and 83570A 18 to 26.5 GHz RF Plug-ins. One sweeper is used as a local oscillator while the second is used to sweep the desired frequency range.

See Figure 17 for an example measurement set up using the 8410B with a single 8350B and 83500 series Plug-in.

The 8410B FREQ RANGE should be set to AUTO. In addition, the sweep time on the 8350B should be slow enough and/or sweep range narrow enough to insure phase locking over entire sweep range.

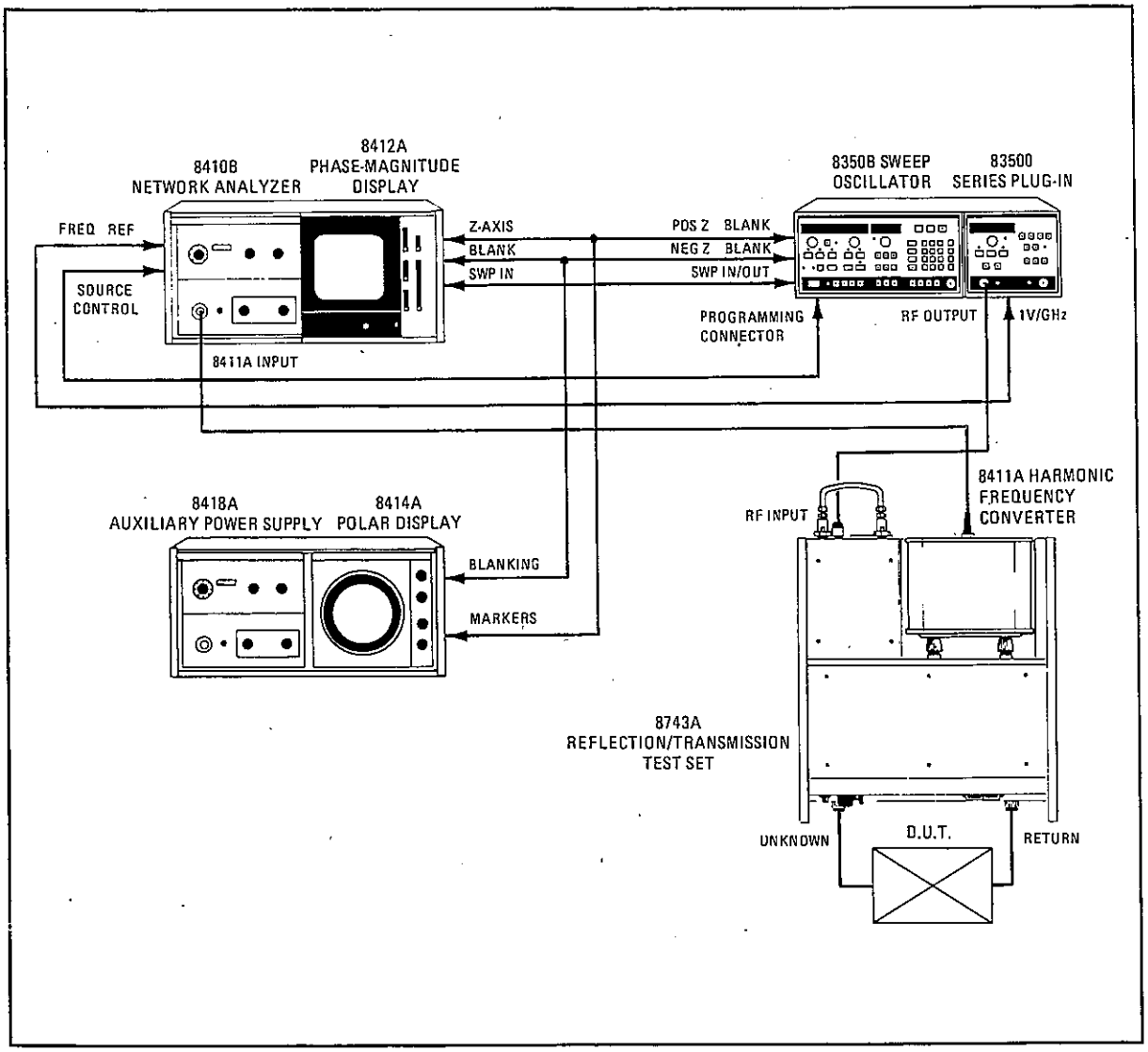


Figure 17. 8350B Connections to 8410

Notes on connections:

- FREQ REF output of the 83500 or 86200 series Plug-ins provides a 1-volt-per-GHz output so that the 8410B may synchronize with the sweep.
- The 8410B display units (8412A, 8414A) require that the NEG Z BLANK from the 8350B be used as the blanking signal.
- POS Z BLANK (from the 8350B) line contain the Z-axis markers. This line connects to the MARKERS input on the 8414A Polar Display and to the Z AXIS input on the 8412A Phase-Magnitude Display.
- SWEEP OUT/IN outputs a 0 to +10 volt signal in proportion to the swept or CW frequency output. 0V corresponds to the lower frequency sweep limit; +10V to the upper. Swept RF output causes a ramp voltage out; CW output causes a dc voltage out.This connection is necessary only when using 8412A Phase-Magnitude Display.
- 8350B/8410B SOURCE CONTROL CABLE. Provides "handshake" lines for synchronization between 8350B and 8410B (HP Part No. 08410-60146).

X-Y RECORDERS

The 8350B is equipped with outputs for controlling X-Y analog recorders.

Some of the HP X-Y recorders that may be used with the 8350B are:

7010B/7015B
7035B
7004B/7034A
7044/7045/7046/7047

The available/required signals for proper operation with an X-Y recorder are:

X INPUT – Typically SWEEP IN/OUT. Supplied by BNC connector on front or rear panel.

Y INPUT – Y axis voltage. On 8755S Frequency Response Test Set this would be AUX A for channel 1 or AUX B for channel 2. For 8410B systems, the 8412A display provides amplitude and phase outputs.

PEN LIFT – Signal line for controlling remote pen up/down. Pen up is open contact or +5 volts. Pen down (current sink) is contact closure to ground or 0 volt. Supplied by BNC connector on rear panel or pin 10 on 8350B Auxiliary Program Connector.

RECORDER (SERVO) MUTE – 7044/7045/7047 only. Control line that mutes the power to the recorder servos for 100 ms at bandswitch (when using multi-band Plug-ins) or designated points. Pin 11 on the 8350B Auxiliary Program Connector.

PEN LIFT REQUEST – Allows a pen lift to be initiated by remote control independent of the present pen lift status. Pin 3 on the 8350B Auxiliary Program Connector.

INVERSE PEN LIFT – Inverse function of Pen Lift, pin 23 on 8350B Auxiliary Program Connector.

The pen lift control line is assigned to a pin on the Remote Control connector of the X-Y recorder. For a complete pin assignment listing refer to the Operating Manual for the particular X-Y recorder being used.

Pen lift pin location on X-Y recorders:

Recorder	Pen Lift Pin No.
7010B/7015B	3
7035B	18
7004B/7034A	18
7044A/45A/47A	1
7046A	34

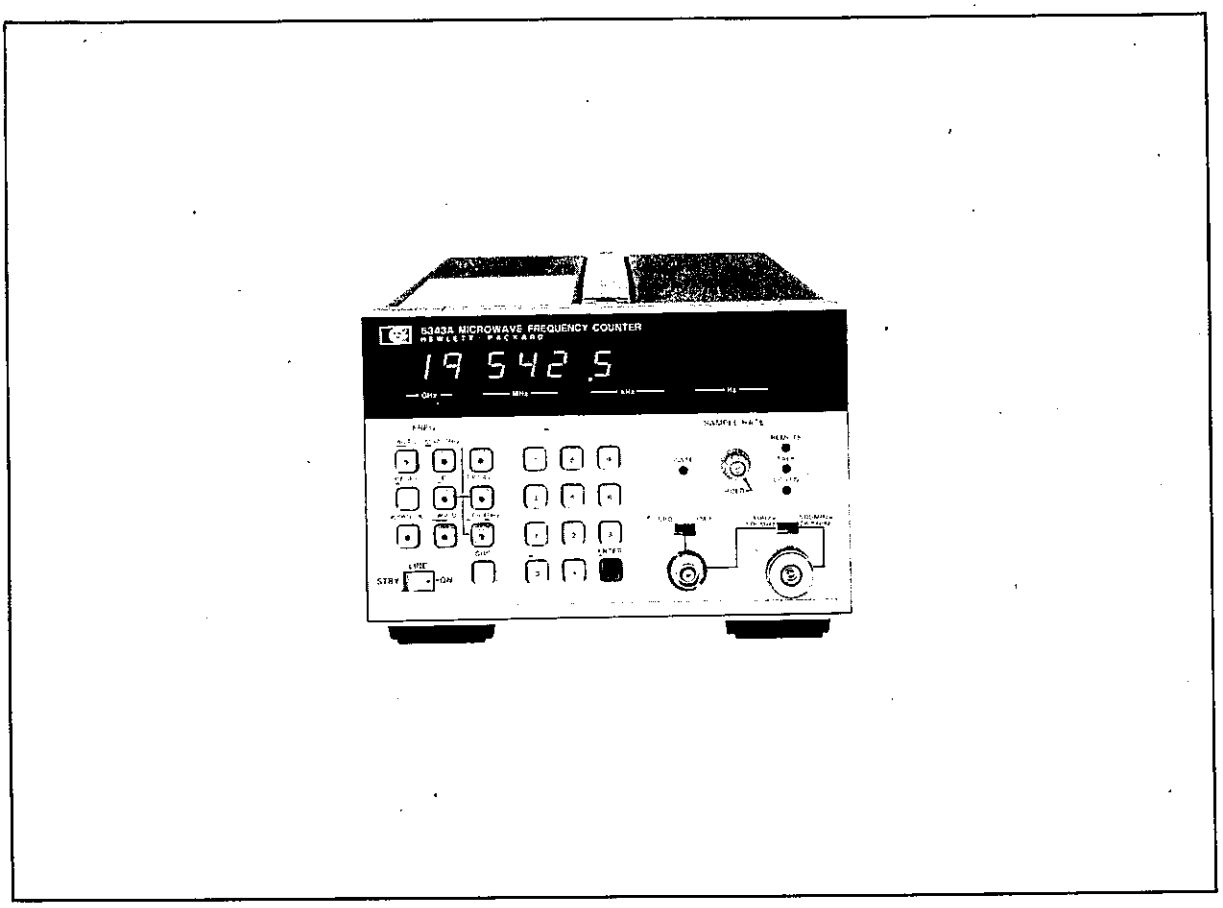


Figure 18. 5343A Microwave Frequency Counter

5343A FREQUENCY COUNTER

The 5343A Microwave Frequency Counter can be used with the 8350B to measure frequencies in swept mode in addition to normal CW frequency measurements.

During swept operation the 5343A will stop the 8350B sweep and count a selected frequency parameter such as the START frequency, STOP frequency or any frequency markers in the sweep range. To accomplish this, the 8350B and 5343A communicate via two signal lines (Counter Trigger, Stop Sweep on the 8350B and Sweep Interface A and B on the 5343A) that enable the 8350B to externally trigger the 5343A and then allow the 5343A to stop the sweep long enough to gate and count the selected frequency parameter.

See Figure 19 for the test set up.

Measuring CW frequencies

When measuring CW frequencies the CNTR TRIG and STOP SWEEP connections are not necessary. The 5343A should be in the AUTO mode and the internal square wave modulation on the 8350B must be off.

Auxiliary Output

The auxiliary output of an RF Plug-in (if available) may be used with the 5343A. When using the auxiliary output of a multi-band Plug-in such as the 83592A (0.01-20 GHz) the frequency multiplier feature of the 5343A may be used so that the proper RF frequency is displayed.

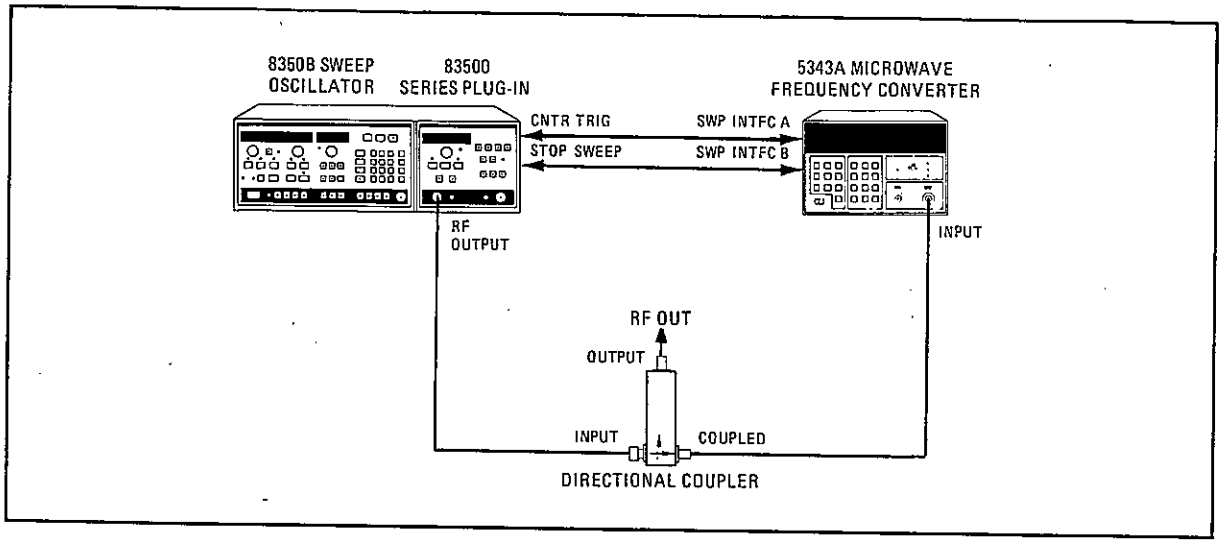


Figure 19. 5343A Test Setup

Notes on connections:

- A power splitter or directional coupler may be used as long as the input to the 5343A does not exceed +7 dBm or go below the minimum sensitivity.
- CNTR TRIG (Counter Trigger): Output for controlling the HP 5343A Microwave Frequency Counter. This allows a frequency count of the selected marker, START or STOP frequency of the present sweep. Connects to the SWP INTFC A (sweep interface, on the rear panel of the 5343A) to externally trigger the counter.
- STOP SWEEP: Input for stopping the progress of the forward sweep. When connected to the SWP INTFC B (sweep interface, on the rear panel of the 5343A) the 5343A stops the sweep long enough for the counter to gate and measure the selected frequency marker, START or STOP frequency. If the internal modulation on the 8350B is on, it is momentarily disabled so that the counter may measure the frequency.

To measure a START, STOP, or marker frequency during a sweep:

5343A: Set to AUTO, SWP M and set desired frequency resolution. Set the rear panel ACQ TIME switch to MED.

8350B: Select the frequency parameter to be measured by pressing the appropriate key, START, STOP, or any marker Mn (where n=1, ...,5) and then press **[SHIFT] [M2]**

If the sweep setting is changed or it is desired to exit this mode, disable the 5343A by pressing **[SHIFT] [M3]** on the 8350B front panel.

Example:

To measure the START frequency.

1. Connect equipment as shown in Figure 19. Set the 5343A to AUTO, SWP M and set desired frequency resolution.
2. Press the 8350B **[INSTR PRESET] [START] [SHIFT] [M2]** keys. The 5343A will temporarily stop the sweep, measure the frequency and display it at the desired resolution.

NOTE

Improve Frequency Accuracy and Stability With HP 5344A Source Synchronizer.

The 8350B can be used with the HP 5343A Microwave Frequency Counter and the HP 5344A Source Synchronizer to achieve 1 KHz frequency accuracy with 1Hz frequency resolution in a CW mode. Analog swept frequency accuracy can also be improved by the wideband Lock-and-Roll techniques and narrowband (40 MHz) phase-lock sweep capabilities controlled by the 5344A Source Synchronizer. Added stability is possible by phase-locking the 8350B RF output to the 10 MHz time-base crystal of the 5343A Counter. For more information see a HP 5344S Source Synchronizer data sheet or Operating and Service Manual.

APPENDIX 1
REAR PANEL CONNECTIONS.

For a diagram of the rear panel see Figure 20.

POS Z BLANK. Positive Z axis blanking signal. Supplies a rectangular pulse of approximately +5V into 2500 ohms during the retrace and bandswitch points of the RF output. Also supplies a −4V (−8 volts for active marker) pulse when the RF is coincident with a marker frequency if intensity markers are selected.

NEG Z BLANK. Negative Z-axis blanking signal. Supplies a negative rectangular pulse (−5V into 2500 ohms) during the retrace and bandswitch points of the RF output.

PEN LIFT. Output to control the pen lift function of an X-Y recorder. Maximum pen-up level is +40V and maximum pen-down sink current is 150 mA (at +0.7V).

SWEEP OUT/IN. Wired in parallel with sweep out/in BNC connector on front panel. See Display Functions Control group for a description.

CNTR TRIG. Counter Trigger (HP 5343A Frequency Counter only). Output for controlling the external trigger input of the HP 5343A frequency counter.

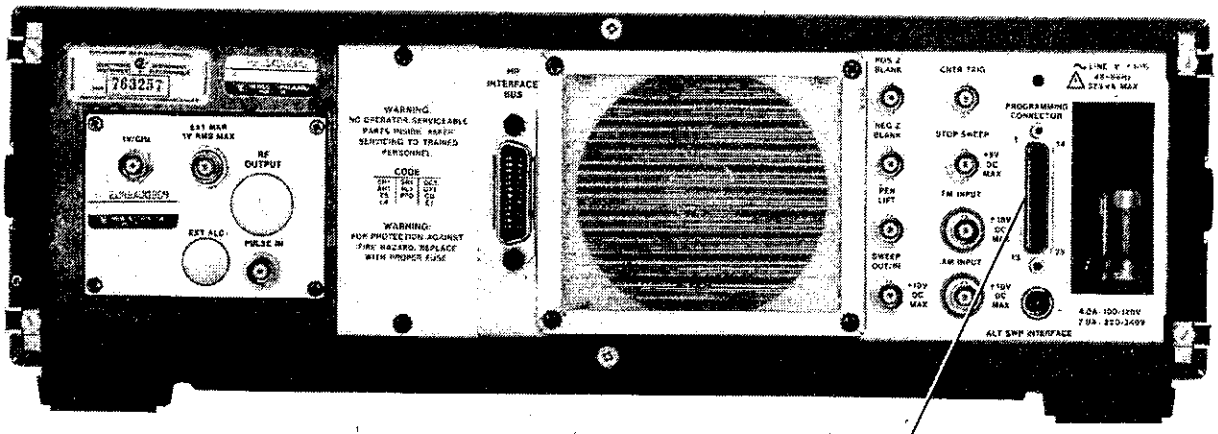
STOP SWEEP. Input for stopping the progress of a forward sweep. When input is 0 to 0.8 volt, sweep is stopped − RF output is a constant CW frequency. Sweep continues when input voltage returns to greater than 2 volts or open circuit. Usable with the HP 5343A Frequency Counter and CNTR TRIG to select and measure frequency points along the sweep.

FM INPUT. Input for frequency modulation or phase lock error signal for the Plug-in. This input is passed through to the Plug-in and processed by the Plug-in only. See Plug-in specifications for frequency deviation and sensitivity.

AM INPUT. Input for external amplitude modulation of the Plug-in. This input is passed through to the Plug-in. See Plug-in specifications for amplitude input range.

ALT SWP INTERFACE. Connects via cable HP Part No. 8120-3174 to 8755C to provide Alternate Sweep function.

PROGRAMMING CONNECTOR. See Figure 20 for pin designation.



PROGRAMMING CONNECTOR

Pin No.	Description		Pin No.	Description	
1			15 –	Marker Pulse Request	(I)
2 –	Marker Pulse	(O)			
3 –	Pen Lift Request	(I)	16 –	Retrace	(O)
4 –	Sweep Alternate	(O)	17 –	Alternate Sweep Enable	(O)
5 –	Stop Fwd. Sweep Request	(I)	18 –	Stop Sweep Request	(I)
6	+5 Volt (100 ma MAX)	(O)			
7 –	RF Blanking	(O)	19	Digital Ground	(I/O)
8 –	RF Blank Request	(I)	20 –	Blanking Pulse Request	(I)
9 –	Ext. Trigger Input	(I)	21 –	Counter Trigger	(O)
10 +	Pen Lift	(O)	22 –	Step Up	(I)
11 –	Recorder Mute	(O)	22 –	Advance	
12	—	(O)	23 –	Inverse Pen Lift	(O)
13	—		24 +	8410 Ext. Trigger	(O)
14 –	Blanking	(O)	25	—	

– Negative Logic (True is logical "Ø")
\+ Positive Logic

(I) Input
(O) Output

Figure 20. Rear Panel Connections

APPENDIX 2:

86200 SERIES PLUG-INS WITH 11869A ADAPTER

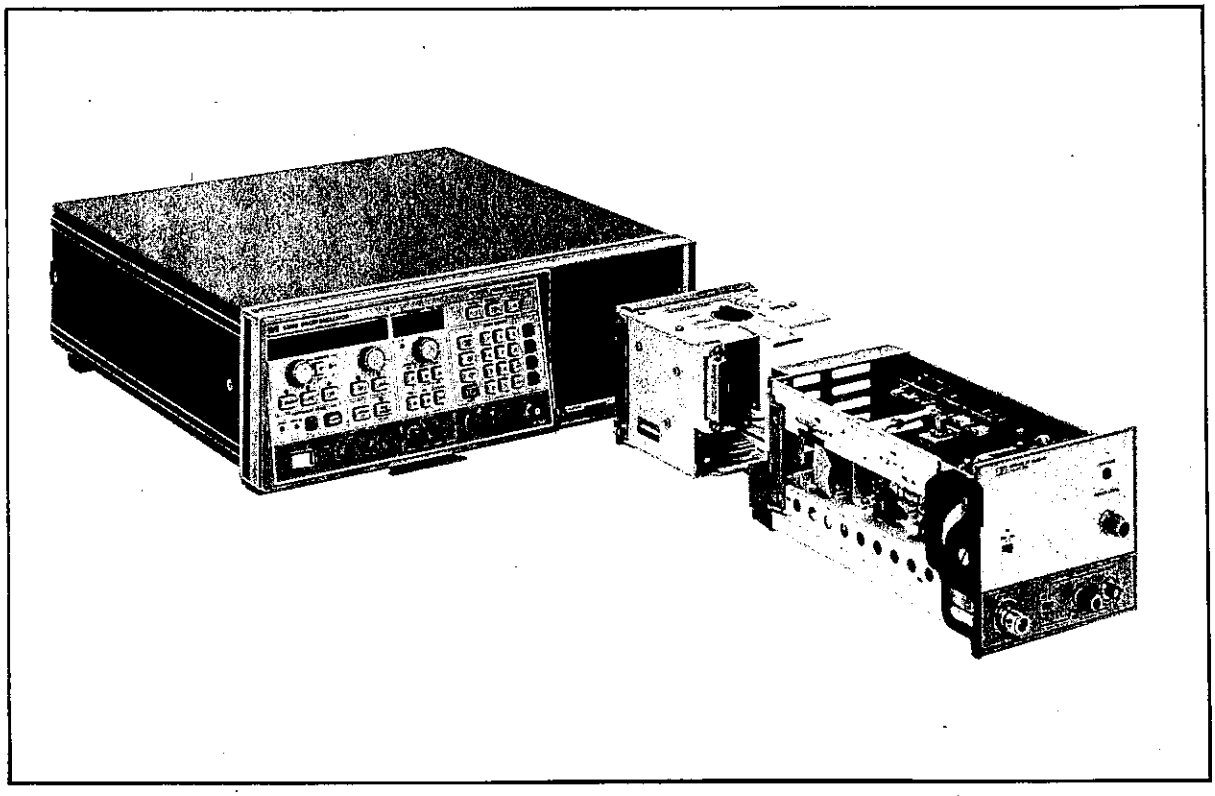


FIGURE 21. Connecting 11869A Adapter to 86200 series Plug-in

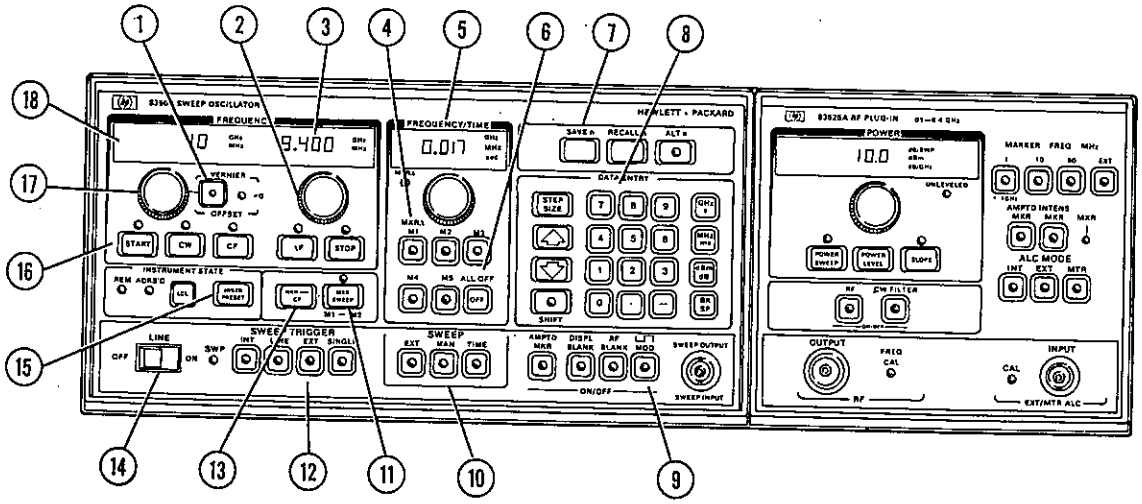
Although designed for the 8620 Sweep Oscillator, the 86200 series RF Plug-ins can be used in the 8350B Sweep Oscillator with the addition of the 11869A Adapter.

The 11869A Adapter provides the electrical and mechanical interface between the 8350B and an 86200 series Plug-in. A switch on the 11869A allows the user to select the appropriate interface code (from the code listing on the adapter) so that an 86200 series Plug-in can be used in the 8350B mainframe.

All of the standard performance and control of the 8350B is available when using an 86200 Plug-in with the 11869A Adapter. However, Plug-in functions (e.g. output power, RF on/off, Plug-in markers) will not be programmable and will not respond to keyboard and step keys. On the rear panel of the 11869A Adapter are several hole plugs that allow connection to be made to the back panel of the Plug-in. 11869A Option 004 provides two semi-rigid cables to allow connection of 86200 series rear panel output to 11869A rear panel output.

Special Plug-ins: **(Plug-ins with Option HXX)**

When using 86200 series Plug-ins that have been factory modified for a non-standard frequency range, a PROM obtained from the factory must be used in the 11869A Adapter. The PROM is inserted in the 16-pin socket on the PC board of the adapter and is needed for proper interfacing and controlling of a non-standard plug-in.



APPENDIX 3
FRONT PANEL CONTROLS SUMMARY

1. **Vernier/Offset.** Vernier function offsets sweep ranges, CW or CF frequencies. ≠0 lamp lit when non-zero offset or vernier present.

2. **Right Frequency Control.** Adjusts ΔF or STOP frequency.

3. **Right Frequency Display.** Displays STOP or ΔF frequency in GHz or MHz.

4. **MKR-Δ.** Allows user to display frequency difference between any two markers and intensifies the appropriate portion of the display.

5. **Frequency/Time Display.** Display Marker or manual sweep frequency in GHz or MHz. Sweep Time in seconds and HP-IB address.

6. **Markers.** Controls the five independent, mainframe supplied frequency markers.

7. **Save n/Recall n/Alt n.** Can save and recall up to nine different settings.

8. **Data Entry Keyboard.** Can enter exact values or step sizes for most sweep parameters via the keyboard.

9. **Output Controls.** Can control marker display mode, RF and display blanking and internal square wave modulation (of the RF output).

10. **Sweep Mode.** Selects External, Manual, or Timed sweep mode.

11. **MARKER SWEEP.** Causes Marker 1 frequency to temporarily become start of sweep, Marker 2 frequency to become stop of sweep.

12. **Sweep Trigger.** Determines how sweep will trigger.

13. **MKR→CF.** Causes center frequency of sweep to be shifted to the frequency of the currently active marker.

14. **Line switch.** Turns on/off 8350B mainframe and plug-in.

15. **Instrument Preset.** Selects a pre-determined instrument state.

16. **START/CF/CW/ΔF/STOP Sweep mode keys.** Selects mode of output and display.

17. **Left frequency Control.** Adjusts START, CW, CF, VERNIER or OFFSET.

18. **Left Frequency Display.** Displays START, CW, CF, VERNIER or OFFSET frequency in GHz or MHz, depending on mode selected, plus self test error codes.

Figure 18. Front Panel Controls

PROGRAMMING NOTES
INTRODUCTION

The following 8350A Programming Notes are fully compatible with the 8350B Sweep Oscillator, however, they do not exercise all of the 8350B's operating features.

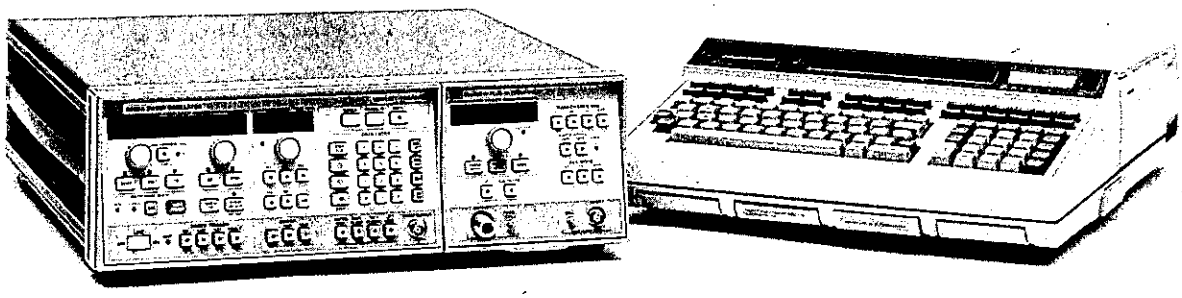
DESIGNED FOR HP-IB SYSTEMS

Programming Note

8350A/9825-1
Supersedes: None

AUGUST 1980

Introductory Operating Guide for the HP 8350A Sweep Oscillator with the HP 9825 Desktop Computer



INTRODUCTION

This programming note is a guide to the remote operation of the HP 8350A Sweep Oscillator and appropriate HP 83500 Series Plug-in using the HP 9825 Desktop Computers. Included in this guide are the system connections for remote operation and several example programs with descriptions of each step.

The 8350A is fully compatible with the Hewlett-Packard Interface Bus (HP-IB). When used with a controller such as the 9825, complete control of the sweep mode, frequency limits, frequency markers, power level, and all other front panel controls can be achieved.

REFERENCE INFORMATION

For further information on the HP Interface Bus, the following references should prove helpful:

1. Condensed Description of the Hewlett-Packard Interface Bus (HP Part Number 59401-90030).
2. HP-IB Programming Hints for Selected Instruments/9825 (HP Part Number 59300-90005).

Complete reference information on the 8350A can be found in the 8350A Sweep Oscillator Operating and Service Manual (HP Part Number 08350-90001). For information on operating the 9825B the following references are available:

1. 9825B/T Operating, Programming and Control Manual (HP Part Number 09825-90200).
2. 9825B/T I/O Programming Manual (HP Part No. 09825-90210).

If using the 9825A:

1. 9825A/S Operating and Programming Manual (HP Part No. 09825-90000).
2. 9825A/S General I/O Programming Manual (HP Part No. 09825-90024).
3. 9825A/S Extended I/O Programming Manual (HP Part No. 09825-90025).

HEWLETT PACKARD

EQUIPMENT REQUIRED

To perform all the example programs described in this programming note, you will need the following equipment and accessories:

1. HP 8350A Sweep Oscillator with any HP 83500 Series Plug-in. Note that an HP 86200 Series Plug-in with the HP 11869A Adapter can be used but all references to power level and power control are not applicable and some functions do not have their full capability.
2. HP 9825B/T Desktop Computer (all ROM's are internal)

   or

   HP 9825A/S Desktop Computer with:

   a. HP 98210A String-Advanced Programming ROM
   b. HP 98213A or 98214A or 98216A General I/O-Extended I/O ROM
3. HP 98034A HP-IB Interface Card/Cable.

NOTE

The following equipment is not required for the programs to function but rather for a visual display of the 8350A functions.

4. HP 8755S Frequency Response Test Set with:
   a. HP 8755C Swept Amplitude Analyzer
   b. HP 180TR or 182T Display Unit
   c. HP 11664A or 11664B Detector
   d. Two 120 cm BNC cables (HP 11170C variety)

   or any appropriate oscilloscope with Detector (Crystal/Schottky), Attenuator and BNC cabling.
5. Any test device over the frequency range of the 83500 Series Plug-in.

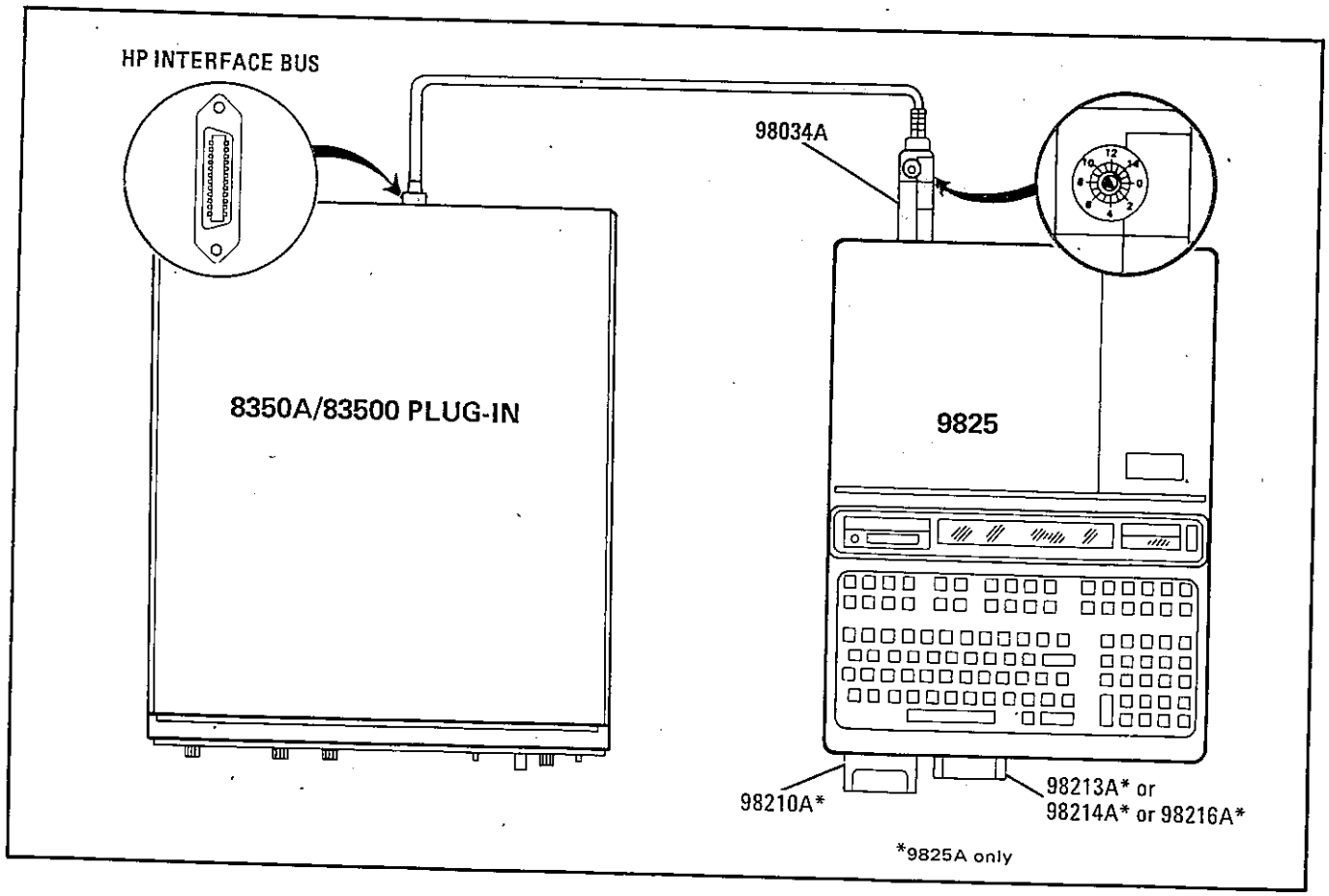


Figure 1. System Connection

SET-UP

Figure 1 shows the system connection and switch settings for the 98034A Interface and the 9825 Desktop Computer. The following procedure completes the setup:

1. Turn off the power to the 9825.
2. For the 9825 Desktop Computer verify that the ROMS's are installed. If using a 9825A, then check the front panel slots. If using the 9825B these ROM's are internal and and may have been disabled by an internal switch.
3. Install the 98034A Interface Card into one of the rear panel slots of the 9825.
4. Verify that the rotary switch on top of the 98034A is set to "7". If not then set it to "7" since this is the select code for the interface card for all programs found within this guide.
5. Connect the 24-pin HP-IB connector of the 98034A to the rear panel HP-IB connector of the 8350A. This connector is tapered to insure proper connection.

CAUTION

Do not attempt to connect black metric threaded screws on one connector with silver English threaded nuts on another connector, or vice-versa, as damage may result. A metric conversion kit which will convert one cable and one or two instruments to metric hardware is available by ordering HP Part No. 5060-0138.

6. All programs within this guide expect the 8350A HP-IB address to be decimal 19. The 8350A HP-IB address switches are located inside the instrument and are factory preset to decimal 19. The present HP-IB address can be found by executing the front panel 'Set HP-IB Address' function by:

   Press SHIFT LCL

   The FREQUENCY/TIME display will indicate the present decimal address. If the number displayed is not 19 then reset it by:

   Press 1 9 GHz

   This HP-IB address will remain in effect until the instrument is powered off when the internal address switches are read at power on (unless 8350A Option 001 Non-volatile Memory is used). Since Example 4 requires the 8350A to be powered off and then on, the internal address switches should be reset to 19 if necessary.

CHECK-OUT

Turn on the 9825 and the 8350A. The 9825 should have a "lazy T" (⊢) in the LED display and the 8350A should undergo an internal self test. The 8350A turn-on self test consists of the red LED numeric displays being blanked and all yellow indicator LED's on, then the 8350A sweep controls are set to the instrument preset state: Start/Stop Sweep over the entire plug-in frequency range, fastest sweep time for plug-in used (typically 10 milliseconds), and maximum leveled output power for the plug-in. If the 8350A fails the power-up self test an error message will be displayed in the far left LED display. Check section 8 of the 8350A Operating and Service Manual for error message decoding.

To verify that the HP-IB connections and interface are functional perform the following on the 9825:

1. Press RESET
2. Type 'rem 719'
3. Press EXECUTE

Verify that the REMote light on the 8350A is lit. If this fails, verify that the 98034A select code switch is set to "7", the 8350A address switches are set to "19", and the interface cable is properly connected.

If the 9825 display indicates an error message, it is possible that the above remote message was typed in incorrectly or the ROM's are not properly installed. If the 9825 accepts the remote statement and the "lazy T" appears in the display but the 8350A REMote light does not turn on, you could have a defective 98034A or 8350A. Perform the operational checks as outlined in the respective Operating and Service Manuals to find the defective device.

PROGRAMMING EXAMPLES

The following sample programs show the various ways of controlling the 8350A. In remote control situations the 8350A Sweep Oscillator can interact with the system HP-IB controller in two basic ways:

1. "Listen Mode": The 8350A listens to the control commands as to modifying the present instrument state. This effectively commands the 8350A

to do a specific event much like setting a front panel function.

2. "Talk Mode": The 8350A informs the controller of the present instrument state with a numeric value or a string of characters. This effectively allows the user to interrogate or learn any 8350A function.

Each programming example is structured using the following format:

1. A general description of the functions exercised.
2. A program listing.
3. An explanation of each program line.
4. Detailed instructions for operating the program.

A complete summary of all the 8350A HP-IB program codes is provided at the end of this note.

EXAMPLE PROGRAM 1: Remote, Local, Local Lockout, and Instrument Preset

Before programming the 8350A for different sweep functions, the user should be aware of the extent of remote control that can be used. The Remote Enable ('rem') command sets the 8350A into remote control from the local (manual) mode. In remote the 8350A will perform only as its functions are programmed. However if the LCL button is pressed, the 8350A will return to the remote state to local control. To prevent this from occurring the Local Lockout (llo) command disables all front panel controls, specifically the "Local" key. The Go To Local (lcl) command will return the 8350A to front panel control thereby removing it from the remote and local lockout modes. Note that the above remote and local commands are different from the general HP-IB bus local and remote commands (lcl 7 and rem 7). Finally, in remote control it is periodically desirable to reset the 8350A to a predefined state, this is achievable with the Instrument Preset function.

PROGRAM 1

```
0: rem 719;dsp "Remote";stp
1: rem 719;llo 7;dsp "Local Lockout";stp
2: lcl 719;dsp "Local";stp
3: wrt 719,"IP";stp
*21323
```

PROGRAM 1 EXPLANATION

Line 0: Sets 8350A to remote, the 9825 displays "Remote", then stops program execution.

Line 1: Sets 8350A to remote and local lockout, the 9825 displays "Local Lockout", then stops program execution.

Line 2: Sets 8350A to local, the 9825 displays "Local", then stops program execution.

Line 3: Sets 8350A to remote and performs an Instrument Preset, then stops program execution.

To verify and investigate the different remote modes perform the following:

1. Press [RESET] [ERASE] [A] [EXECUTE] on the 9825. This erases the program memory.
2. Press [INSTR PRESET] on the 8350A.
3. Type in the above program.
4. Press [RUN] on the 9825.
5. With the 9825 displaying "Remote", verify that the 8350A REMote light is lit. From the front panel, attempt to change the start frequency and verify that this is impossible. Verify that the Instrument Preset key and all other keys except LCL are disabled. Now press the [LCL] key and verify that the 8350A REMote light is off and that you can modify any of the sweep functions.
6. Press [CONTINUE] on the 9825. With the 9825 displaying "Local Lockout" verify that the 8350A REMote light is again lit. Again attempt to change the start frequency and perform an instrument preset. Verify that this is impossible. Now press the [LCL] key and verify that still no action is taken.
7. Press [CONTINUE] on the 9825. With the 9825 displaying "Local" verify that the 8350A REMote light is off. Also verify that all sweep functions can now be modified via the front panel controls.
8. Press [CONTINUE] on the 9825. Verify that the 8350A has undergone an Instrument Preset and the REMote light is on. The Write ('wrt 719') statement does two things, one it performs a 'rem 719', and second it passes data to the 8350A.

Note that the 8350A LCL key produces the same result as programming 'lcl 719' or 'lcl 7'. Be careful as the latter command places all instruments on the HP-IB in local state as opposed to the 8350A alone.

EXAMPLE PROGRAM 2: Programming Functions

To program any function on the 8350A the controller must pass specific program codes and data to the sweeper. The statement that allows this is the Write (wrt) statement. The alphanumeric data string of the write statement can be a concatenation of character strings and/or variables. The data can be specific codes, free field formatted data, or reference a specific format (fmt) statement. For example, to program the CW Frequency (CW), one program code sequence is "CW", followed by the frequency in GHz, then "GZ". If the frequency is to be 7.555 GHz, then the string "CW7.555GZ" will suffice. However if the frequency were to change then a variable 'F' could indicate the frequency in GHz and the program string could be "CW",F,"GZ". Using a format statement also allows a specific number of digits to be passed, thereby avoiding any unexpected round off errors.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency 7.555 GHz. If using a plug-in that does not cover this frequency range then the value in line 1 should be changed to an appropriate value.

PROGRAM 2

```
0: wrt 719,"IP";fxd 2
1: wrt 719,"CW7.555GZ";dsp
   "CW = 7.555 GHz";stp
2: ent "CW (in GHz) = ?";F
3: prt "CW = ",F," GHz"
4: wrt 719;"CW",F,"GZ";sto -2
5: fmt 1,"CW",f6.3,"GZ"
6: wrt 719.1,F;sto -4
*19247
```

PROGRAM 2 EXPLANATION

Line 0: Puts the 8350A into a predefined state via instrument preset, then fixes data to 2 decimal places.

Line 1: Puts the 8350A in CW mode and programs a CW frequency of 7.555 GHz, the 9825 displays "CW = 7.555 GHz", then stops program execution.

Line 2: The 9825 displays "CW (in GHz) = ?". The user is prompted to input a new CW frequency value which is stored in the variable 'F'.

Line 3: Print on the internal strip printer the programmed CW frequency.

Line 4: Program the CW frequency using the default data format, then go to line 2.

Line 5: Format statement #1 is set up for programming the CW frequency with a 1 MHz resolution.

Line 6: Program the CW frequency via format statement #1, then go back to line 2.

The equipment setup is the same as the previous example. Reset the 9825, erase the 9825 memory, then type in the above program. Then perform the following:

1. Press RUN on the 9825. The 9825 displays "CW = 7.555 GHz". The 8350A changes from the instrument preset state of Start/Stop sweep to a CW frequency of 7.555GHz.
2. Press CONTINUE on the 9825. The 9825 now displays "CW (in GHz) = ?". Type in a new CW frequency (value in GHz), then press CONTINUE
3. The 8350A will be programmed to the new CW frequency with the new value printed on the internal strip printer. The program jumps back to step 2. above.

When inputting the CW frequency try several values, each with a different number of digits after the decimal point. Notice that the 8350A displays the frequency to 3 decimal places (1 MHz frequency resolution). Values with better than 1 MHz frequency resolution are rounded to the nearest MHz by the 8350A. However when the 9825 is reset all numeric output data defaults to the 'fxd 2' or fixed 2 decimal places format. Thus the 9825 rounds the desired frequency to the nearest 10 MHz. To change this free-field format to more decimal places change the fixed format statement in line 0 to 'fxd 5' then re-run the program. Another approach is to utilize the format statement to set the desired number of decimal places. To use the format statement in the program perform the following on the 9825:

Press STOP FETCH 4 EXECUTE
then DELETE LINE

This should delete line 4 from program #2 and allow the use of lines 5 and 6 instead. Run the modified program again and use the same steps for operation as before. Now if the value inputted has a frequency resolution greater than 1 MHz the 9825 does the rounding instead of the 8350A. This is the preferred

programming approach. Change the format statement for 10 MHz frequency resolution and verify the results from the 8350A frequency display.

Since a device select code address can be a variable via the Device ('dev') statement, verify that this can be used in the modified or original program #2 by doing the following:

1. Insert before Line 0 a new line using the 'dev' command by:

   Press STOP FETCH 0 EXECUTE
   Type 'dev "SWP",719'
   Press INSERT LINE

2. Modify the write statement(s) by fetching the necessary lines, then change the
   'wrt 719' to 'wrt "SWP" ' and
   'wrt 719.1' to 'wrt "SWP.1" '.

3. Re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 3: Setting Up A Typical Sweep

Typically the sweeper is programmed for the proper sweep frequency range, sweep time, power level, and marker frequencies for a test measurement. This program sets up the sweeper for a general purpose situation using several dedicated format statements. Note that not all parameters need to be reprogrammed every time.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency range of at least 3 to 7 GHz. If using a plug-in with a different frequency range, change the values in lines 5, 8, and 9, to the appropriate values. If using an 86200 Series Plug-in, then do not enter Line 6.

PROGRAM 3

```
0: fmt 1,"FA",f6.3,"GZFB",f6.3,"GZ"
1: fmt 2,"ST",f5.0,"MS"
2: fmt 3,"M",f1.0,f6.3,"GZ"
3: fmt 4,"PL",f6.2,"DM"
4: wrt 719,"IPMD1"
5: wrt 719.1,3,7
6: wrt 719.4,10
7: wrt 719.2,50
8: wrt 719.3,1,4
9: wrt 719.3,2,6;stp
*20341
```

PROGRAM 3 EXPLANATION

Line 0: Format statement for setting the Start and Stop Sweep frequencies in GHz.

Line 1: Format statement for setting the Sweep Time in milliseconds.

Line 2: Format statement for setting a Frequency Marker by marker number and frequency in GHz.

Line 3: Format statement for setting the Output Power Level in dBm.

Line 4: Preset the sweeper to a known state via instrument preset and enable the internal 27.8 kHz Square Wave Amplitude Modulation.

Line 5: Set a Start/Stop Sweep of 3.0 to 7.0 GHz.

Line 6: Set the Sweep Time to 50 msec.

Line 7: Set the Output Power Level to +10 dBm.

Line 8: Set Marker #1 to 4 GHz.

Line 9: Set Marker #2 to 6 GHz, then stops program execution.

Set up the equipment as shown in figure 2 by adding the 8755C, the 180TR or 182T, the 11664, and a test device like a 4 to 6 GHz Bandpass Filter. It is important that the two rear panel connections from the 8350A to the 8755C/182T are made for a proper CRT display. For the example measurement set the following front panel controls:

On the 8755C:
- Channel 1:
  - Display ..... OFF (press all the display push buttons so that they are out)
- Channel 2:
  - Display ..... B
  - dB/DIV ..... 10 dB
  - Reference Level ..... −10 dB
  - Reference Level Vernier ..... OFF

On the 182T or 180TR:
- Magnifier X1
- Display ..... INT

After connecting the equipment: reset the 9825, erase the 9825 memory, then type in the above program. Then run the program. The 8350A will initially undergo an instrument preset which will set the proper power leveling mode and sweep blanking signals. Since the 8755C requires the RF signal to be modulated at a 27.8 kHz rate, the internal amplitude modulation is enabled. If using a 4 to 6 GHz Bandpass Filter as the test device, the CRT display should reflect the filter transmission

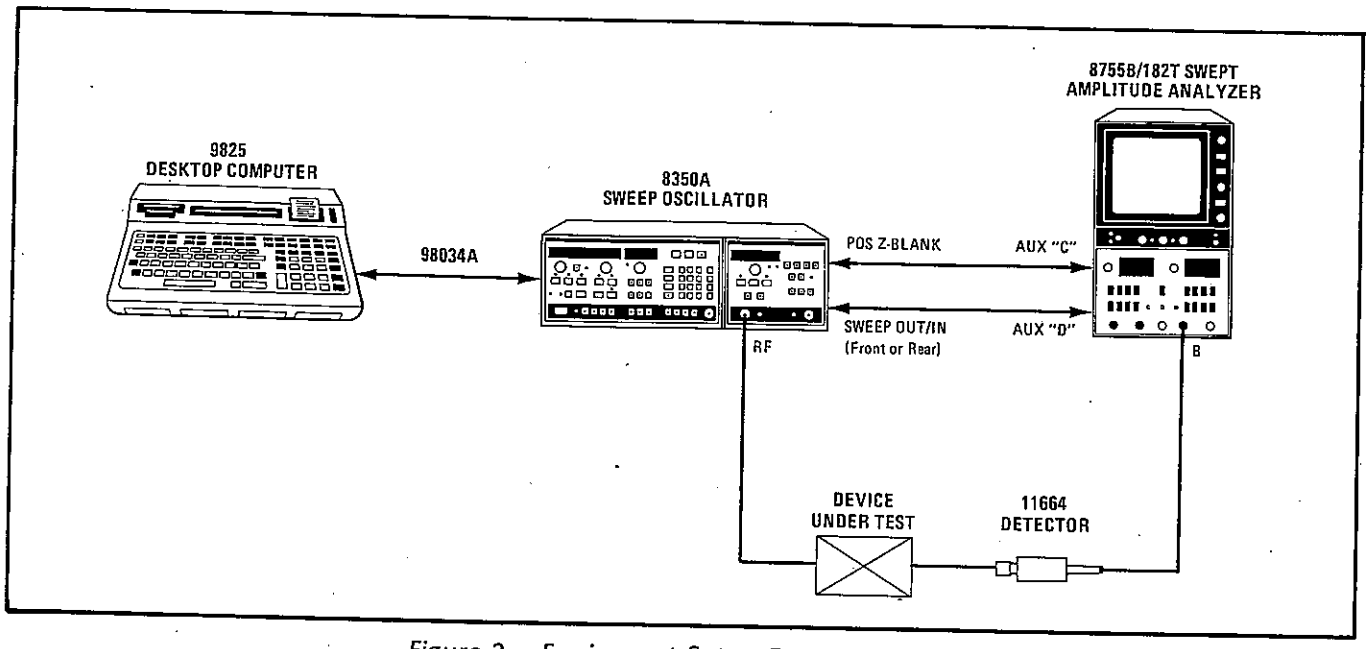


Figure 2. Equipment Setup For Program 3

response over the 3 to 7 GHz range. Two frequency markers of the Z-Axis Intensity dot variety are set to 4 and 6 GHz, hopefully within the passband or near the 3 dB points. The setup can be modified by changing the values in lines 5, 6, 7, 8, and/or 9, then rerun the program.

EXAMPLE PROGRAM 4: Learning An Instrument State

Being able to save a specific instrument state is helpful when it is needed several times in a test or measurement procedure. The user could save the instrument state by manually logging the important sweep parameters such as frequency range, power level, ALC modes, etc., then re-inputting them at the appropriate time. A somewhat simpler approach is to save the instrument state in one of the 8350A internal storage registers, then recall it when needed.

However, this is not a permanent solution unless the 8350A Non-volatile Memory option (Option 001) is used. A more permanent solution is to use the Output Learn String function of the 8350A so that the 9825 can learn then store a data string that describes the present instrument state on a tape cartridge or in its' internal memory. Once an instrument state is stored or learned, the 8350A can then be restored to that state using the Input Learn String function. The power of these instrument Learn/Teach functions are demonstrated by the following program usng the 9825 fast data transfer function.

PROGRAM 4

```
 0: dim A$[116]
 1: buf "Learn",A$,3
 2: wrt 719,"IPMD1";ICL 719;stp
 3: wrt 719,"OL"
 4: tfr 719,"Learn",90
 5: if rds("Learn")=-1;sto +0
 6: A$[1,90]→A$
 7: stp
 8: wrt 719,"IL"&A$
 9: stp
*23021
```

PROGRAM 4 EXPLANATION:

Line 0: Set the length of the A$ string to 116 characters.

Line 1: Set up an I/O buffer named "Learn" that uses the string A$ for data storage. The buffer type selected is a byte data, fast read/write buffer.

Line 2: Set the 8350A to a predefined state via instrument preset and enable the square wave modulation. Return the 8350A to local control, then stops program execution.

Line 3: Program the 8350A to output the Learn String.

Line 4: Transfer the Learn String information into the 9825 data buffer specifying to transfer only 90 characters.

Line 5: Check the status of the buffer to determine if the transfer is complete. If it is not, then keep checking the buffer status.

Line 6: Extract the Learn String information from the buffer by removing the buffer pointers and re-save only the Learn String in A$.

Line 7: Stops program execution.

Line 8: Program the 8350A to accept a new Learn String, then send the new Learn String to the 8350A.

Line 9: Stops program execution.

Set up the equipment as in example 3 using the CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 9825, erase the 9825 memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state, then press CONTINUE on the 9825.
2. Turn the 8350A line power off. Wait five seconds then turn the 8350A power back on. Press INSTR PRESET on the 8350A.
3. Press CONTINUE on the 9825. Verify on the CRT display and/or the 8350A that the original instrument state has been restored.

EXAMPLE PROGRAM 5: Interrogating The Present Value Of A Function

While the 8350A Learn String enables the user to completely save a string of characters that define the present instrument state, the information is densely packed and encoded to save memory space. If the user wishes to determine the actual value of a specific parameter, say the Start Frequency, it would require a tedious process to extract a numeric value from several characters within the Learn String. An easier approach is to use the Output Interrogated Parameter function of the 8350A. With this function the 9825 instructs the 8350A to output the present numeric value of a specified function. Any function that has a numeric value associated with it (except Step Size) can be interrogated. Note that if the parameter is not presently active, the 8350A uses a computed value or its previous value. The following program demonstrates the capability of the interrogate function.

PROGRAM 5

```
  0: wrt 719,"IPMD1";lcl 719;stp
  1: wrt 719,"OPFA";red 719;A
  2: prt "Start Freq = ";A/1e6
  3: wrt 719,"OPFB";red 719;B
  4: prt "Stop Freq = ";B/1e6
  5: wrt 719,"OPST";red 719;T
  6: prt "Sweep Time = ";1000T
  7: stp
end +17982
```

PROGRAM 5 EXPLANATION

Line 0: Set the 8350A to a predefined instrument state via instrument preset and enable the square wave modulation. Return the 8350A to local control, then stop program execution.

Line 1: Program the 8350A to output the present value of the Start Frequency. Read the value into the 9825 and store it in the variable 'A'.

Line 2: Print on the internal strip printer the present value of the Start Frequency in MHz.

Line 3: Program the 8350A to output the present value of the Stop Frequency. Read the value into the 9825 and store it in the variable 'B'.

Line 4: Print on the internal strip printer the present value of the Stop Frequency in MHz.

Line 5: Program the 8350A to output the present value of the Sweep Time. Read the value into the 9825 and store it in the variable 'T'.

Line 6: Print on the internal strip printer the present value of the Sweep Time in milliseconds.

Line 7: Stops program execution.

Set up the equipment as in example 3 using the analyzer's CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 9825, erase the 9825 memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state using the Start Frequency, Stop Freuency, and Sweep Time controls.
2. Press CONTINUE on the 9825.
3. The present values of the Start Frequency, Stop Frequency, and Sweep Time are sequentially interrogated and then printed on the internal strip printer of the 9825.

EXAMPLE PROGRAM 6: A Stepped CW Sweep

Present automatic measurement systems typically make measurements at a sequence of CW test frequencies instead of analog sweeping the frequency range of interest. If swept, the measurement data taking machine would need to sample the RF signal at a very fast rate to maintain accurate frequency information, too. This is typically not accomplished. Stepped CW sweeps can be accomplished in several ways with the 8350A:

1. Program sequential CW test frequencies.
2. Program the frequency sweep range then enable the manual sweep mode. Perform a stepped manual sweep by repetitively programming the step up/increment function.
3. Program the CW frequency to the start frequency, the Step Size to an appropriate value, then repetitively program the step up/increment function.

Considering the speed of programming the above approaches, the third is the most efficient time wise. This program illustrates a stepped sweep using this approach.

PROGRAM 6

```
 0: wrt 719,"IPMD1"
 1: ent "Start Freq (GHz) = ?",A
 2: ent "Stop Freq (GHz) = ?",B
 3: ent "Step Size (GHz) = ?",C
 4: (B-A)/C→D
 5: wrt 719,"CWSS "&C&"GZ"
 6: wrt 719,"CW "&A&"GZ"
 7: for I=1 to D
 8: wrt 719,"UP";wait 20
 9: next I;gto -3
*21490
```

PROGRAM 6 EXPLANATION

Line 0: Set the 8350A to a predefined instrument state and enable the square wave modulation.

Line 1: The 9825 displays "Start Freq (GHz) = ?", input prompts for start frequency of the sweep. Store it in the variable 'A'.

Line 2: The 9825 displays "Stop Freq (GHz) = ?", input prompts for the stop frequency of the sweep. Store it in 'B'.

Line 3: The 9825 displays "Step Size (GHz) = ?", input prompts for the step size of the sweep. Store it in 'C'.

Line 4: Determine the number of frequency steps in sweep, store in 'D'.

Line 5: Set the CW Step Size.

Line 6: Set the CW frequency to the start frequency value.

Line 7: Iterate the CW step 'D' times.

Line 8: Program the Step Increment/Up function, then wait 20 msec for settling.

Line 9: Continue step iteration, then go to line 6.

The equipment setup is the same as in the previous example. Reset the 9825, erase the 9825 memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. Then perform the following:

1. The 9825 will display "Start Freq (GHz) = ?". Answer this prompt by inputting the desired Start frequency (value in GHz) of the sweep, then press CONTINUE
2. The 9825 will display "Stop Freq (GHz) = ?". Answer this prompt with the desired Stop frequency (in GHz) of the sweep, then press CONTINUE
3. The 9825 will display "Step Size (GHz) = ?". Answer this prompt with the desired Step size (in GHz) of the sweep, then press CONTINUE
4. The 8350 CW frequency will be programmed to the Start frequency of the sweep selected. Then the CW frequency is repetitively incremented by the step size value. The sweep is then restarted after reaching the stop frequency.

To stop the program press STOP or RESET.

Part of the time involved in changing CW frequencies is updating the numeric LED display. This time can be reduced by blanking the numeric display via the Display Update On/Off function. This can be implemented by modifying line 0 to: wrt 719, "IPMD1DU0". Re-run the modified program.

EXAMPLE PROGRAM 7: Using Service Requests, Status Bytes, and Request Mask

Certain error conditions of the 8350A can be detected by the 9825 so that corrective action can be taken. Examples of some detectable error conditions are RF power unleveled, numeric data entry out of range, and line power failure. If an error condition exists, the user can instruct the 8350A to request service from the 9825 by initiating a Service Request (SRQ). The 9825 can detect whether an SRQ has taken place on the bus by analyzing bit 7 (see note) of the Status Byte of the 98034A HP-IB Interface. Two modes are available for analyzing the 98034A Status Byte: 1) periodically read the Status Byte, or 2) enable bit 7 to interrupt the program when it is set. In either case, once it is determined that the 8350A has requested service, the specific error condition(s) can then be determined by reading and analyzing the Status Bytes of the 8350A. The 8350A has two Status Bytes, each consisting of 8 bits with each bit indicating the present status of a particular function or condition. See Table 1 for a complete description of the conditions associated with each Status Byte bit. The user can analyze these Status Bytes for every SRQ, or more simply, instruct the 8350A to issue an SRQ only if a specific set of error conditions exists. The set of conditions is determined by a numeric value passed by the Request Mask function. This numeric value is generated by summing the decimal values of each Status Byte bit to be checked. This program demonstrates the capability of the SRQ and Status Bytes to detect an error condition.

NOTE

This assumes that the status bits are numbered 0 thru 7 with the least-significant bit being number 0. Other references may assume that the bits are numbered 1 thru 8 with the least-significant bit being number 1.

If using an 86200 Series Plug-in, the Status Bytes can provide only limited information. Table 1 indicates which Status Byte function/bits are usable.

Table 1. 8350A Status Byte Descriptions

STATUS BYTE (#1)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	Front Panel SRQ REQUEST	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	*SRQ on RF Settled	SRQ on Change in Extended Status Byte	SRQ on Front Panel Entry Complete	SRQ on Numeric Parameter Altered to Default Value

EXTENDED STATUS BYTE (#2)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	N/A	*RF Unleveled	Power Failure	*RF Unlocked	*External Freq. Ref. Selected	*Oven Cold	*Over Modulation	Self Test Failed

*Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.

PROGRAM 7

```
0: cli 7;clr 719;wrt 719;"IPMD1"
1: oni 7,"SRQ"
2: eir 7,128
3: ent "CW Freq (GHz) = ?",F
4: wrt 719,"CW",F,"GZ"
5: wait 100
6: sto -3
7: "SRQ":rds(719)→A
8: if bit(6,A)=0;sto +4
9: if bit(0,A)=1;prt "Value Altered"
10: if bit(5,A)=1;prt "Syntax Error"
11: clr 719
12: eir 7,128;iret
*32644
```

PROGRAM 7 EXPLANATION

Line 0: Clear the status of the HP-IB and the 8350A. Preset the 8350A to a predefined instrument state and enable the square wave modulation.

Line 1: Indicate that if an interrupt from the 98034A HP-IB Interface is received that program execution will branch to the interrupt service routine located at the line labelled "SRQ".

Line 2: Enable the controller to accept an interrupt from the 98034A if bit 7 (decimal value 128) is set.

Line 3: The 9825 displays "CW Freq (GHz) = ?", input prompts for the desired CW frequency value in GHz. Store it in the variable 'F'.

Line 4: Set the CW frequency as determined by 'F'.

Line 5: Wait 100 milliseconds to allow the 8350A to interrupt.

Line 6: Go to line 3.

Line 7: Location of the interrupt service routine. Read the Status Byte of the 8350A and store it in 'A'.

Line 8: Check bit 6 of the 8350A Status Byte to see if it generated the SRQ, go to line 12 if not.

Line 9: Check bit 0 of the 8350A Status Byte for a Parameter Value Altered error indication. Print on the internal strip printer "Value Altered" if one exists.

Line 10: Check bit 5 of the 8350A Status Byte for a Syntax error. Print on the internal strip printer "Syntax Error" if one exists.

Line 11: Clear the 8350A status to enable another SRQ.

Line 12: Re-specify and re-enable interrupts from bit 7 of the 98034A, return from the interrupt service routine to the main program.

The equipment setup is the same as the previous example. Reset the 9825 memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. The 9825 then displays "CW Freq (GHz) = ?". Answer this prompt by inputting the desired CW frequency in GHz, then press CONTINUE. Verify that the 8350A CW frequency has been properly programmed. Try several values that are out of range of the plug-in's frequency limits and verify that an error message was printed on the strip printer. The program repeats the above input prompt. To stop the program press STOP or RESET.

---

† NOTE

For Program 7 to function properly, change line 0 to: 0: cli7; clr 719; wrt 719, "IPMD1RM" & char (97). This change enables status bit 5 (SRQ on Syntax Error) and bit 0 (SRQ on Numeric Parameter Altered to Default Value).

HP-IB PROGRAM CODES

CODE	DESCRIPTION
AKm	Amplitude Marker On/Off
ALmn	Alternate Sweep On/Off
A1	Internal Leveling
A2	External Crystal Leveling
A3	External Power Meter Leveling
BK	Backspace
CAm	Amplitude Crystal Marker On/Off (83522/83525 Only)
CF	Center Frequency
CIm	Intensity Crystal Marker On/Off (83522/83525 Only)
CW	CW Frequency
C1	1 MHz Crystal Marker Frequency (83522/83525 Only)
C2	10 MHz Crystal Marker Frequency (83522/83525 Only)
C3	50 MHz Crystal Marker Frequency (83522/83525 Only)
C4	External Crystal Marker Frequency (83522/83525 Only)
DF	Delta F Frequency Span
DM	dBm
DN	Step Down/Decrement
DPm	Display Blanking On/Off
DUm	Display Update On/Off
E	Exponent Power Of 10
FA	Start Frequency
FB	Stop Frequency
FIm	CW Filter In/Out
GZ	GHz
HZ	Hz
IL	Input Learn String
IP	Instrument Preset
IX	Input Micro Learn String
KZ	KHz
MC	Marker To Center Frequency
MDm	Square Wave Amplitude Modulation On/Off
MO	Marker Off
MPm	Marker 1-2 Sweep On/Off
MS	Milliseconds
MZ	MHz
M0	Marker Off
M1	Marker #1
M2	Marker #2
M3	Marker #3
M4	Marker #4
M5	Marker #5
NT	Network Analyzer Trigger (8410B)
OA	Output Active Parameter
OL	Output Learn String
OM	Output Mode String
OP	Output Interrogated Parameter
OS	Output Status Bytes
OX	Output Micro Learn String
PL	Power Level
PSm	Power Sweep On/Off
RCn	Recall Register
RFm	RF Power On/Off
RM	Service Request Mask
RS	Reset Sweep
SC	Seconds
SH	Shift Function
SLm	Slope On/Off
SM	Manual Sweep
SS	Step Size
ST	Sweep Time
SVn	Save Register
SX	External Sweep
TS	Take Sweep
T1	Internal Sweep Trigger
T2	Line Sweep Trigger
T3	External Sweep Trigger
T4	Single Sweep
UP	Step Up/Increment
VR	CW Vernier
	0—9 + — Acceptable Numeric Data

NOTES

1. **Program codes of the form "XXm" use "m" to turn the function On or Off (1 or 0). For the storage register functions the "n" is 1 through 9.**
2. **The 8350A ignores spaces, plus signs, negative signs (except for vernier, offset, and power values), and any unexpected characters. Program codes can be upper or lower case alpha characters.**

For more information, call your local HP Sales Office or nearest Regional Office: **Eastern** (201) 265-5000; **Midwestern** (312) 255-9800; **Southern** (404) 955-1500; **Western** (213) 970-7500; **Canadian** (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland. **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Suginami-ku, Tokyo 168.

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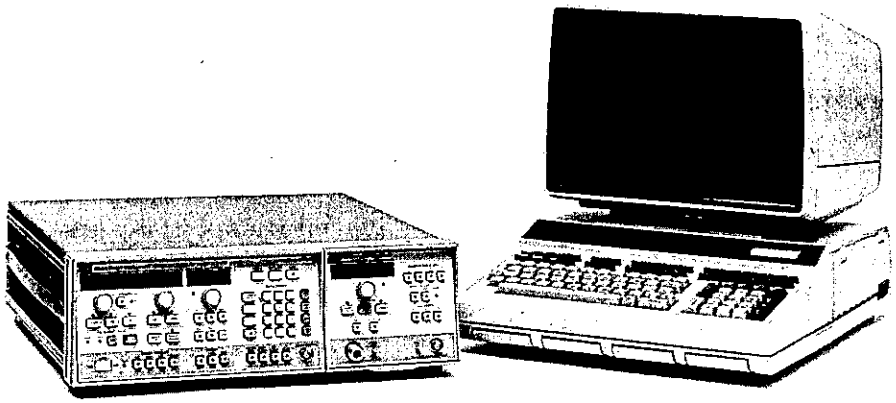
DESIGNED FOR HP-IB SYSTEMS

Programming Note

8350A/9835A-1
Supersedes: None

OCTOBER 1980

Introductory Operating Guide for the HP 8350A Sweep Oscillator with the HP 9835A Desktop Computer



INTRODUCTION

This programming note is a guide to the remote operation of the HP 8350A Sweep Oscillator and appropriate HP 83500 Series Plug-in using the HP 9835A Desktop Computer. Included in this guide are the system connections for remote operation and several example programs with descriptions of each step.

The 8350A is fully compatibile with the Hewlett-Packard Interface Bus (HP-IB). When used with a controller such as the 9835A, complete control of the sweep mode, frequency limits, frequency markers, power level, and all other front panel controls can be achieved.

REFERENCE INFORMATION

For further information on the HP Interface Bus, the following reference should prove helpful:

- Condensed Description of the Hewlett-Packard Interface Bus (HP Literature No. 59401-90030).

Complete reference information on the 8350A can be found in the 8350A Sweep Oscillator Operating and Service Manual (HP Part No. 08350-90001). For information on operating the 9835A the following references are available:

- 9835A Operating and Programming Manual (HP Part No. 09835-90000).
- 9835A I/O ROM Programming Manual (HP Part No. 09835-90060).

EQUIPMENT REQUIRED

To perform all the example programs described in this programming note, you will need the following equipment and accessories:

1. HP 8350A Sweep Oscillator with any HP 83500 Series Plug-in. Note that an HP 86200 Series Plug-in with the HP 11869A Adapter can be used but all references to power level and power control are not applicable.
2. HP 9835A Desktop Computer with:
   a. HP 98332A I/O ROM (actually 4 ROM's)
   b. HP 98034A Revised HP-IB Interface Card/ Cable

HEWLETT PACKARD

NOTE

The following equipment is not required for the programs to function but rather for a visual display of the 8350A functions.

3. HP 8755S Frequency Response Test Set with:
   a. HP 8755C Swept Amplitude Analyzer
   b. HP 180TR or 182T Display Unit
   c. HP 11664A or 11664B Detector
   d. Two 120 cm. (4 ft.) cables (HP 11170C type).

   or any appropriate Oscilloscope with Crystal/ Schottky Detector, Attenuator, and BNC Cabling.

4. Any test device over the frequency range of the 83500 Series Plug-in.

SET-UP

Figure 1 shows the system connection and switch settings for the 98034A Interface and the 9835A Desktop Computer. The following procedure completes the setup:

1. Turn off the power to the 9835A.
2. Verify that the ROM's are installed in the 9835A. If not, then install the ROM's in an unused ROM drawer then insert the drawer in one of the front panel slots of the 9835A.
3. Install the 98034A Interface Card into one of the rear panel slots of the 9835A.
4. Verify that the rotary switch on top of the 98034A is set to "7". If not then set it to "7" since this is the select code for the interface card for all programs found within this guide.
5. Connect the 24-pin HP-IB connector of the 98034A to the rear panel HP-IB connector of the 8350A. This connector is tapered to insure proper connection.

CAUTION

Do not attempt to mate black metric threaded screws on one connector with silver English threaded nuts on another connector, or vice-versa, as damage may result. A metric conversion kit which will convert one cable and one or two instruments to metric hardware is available by ordering HP Part No. 5060-0138.

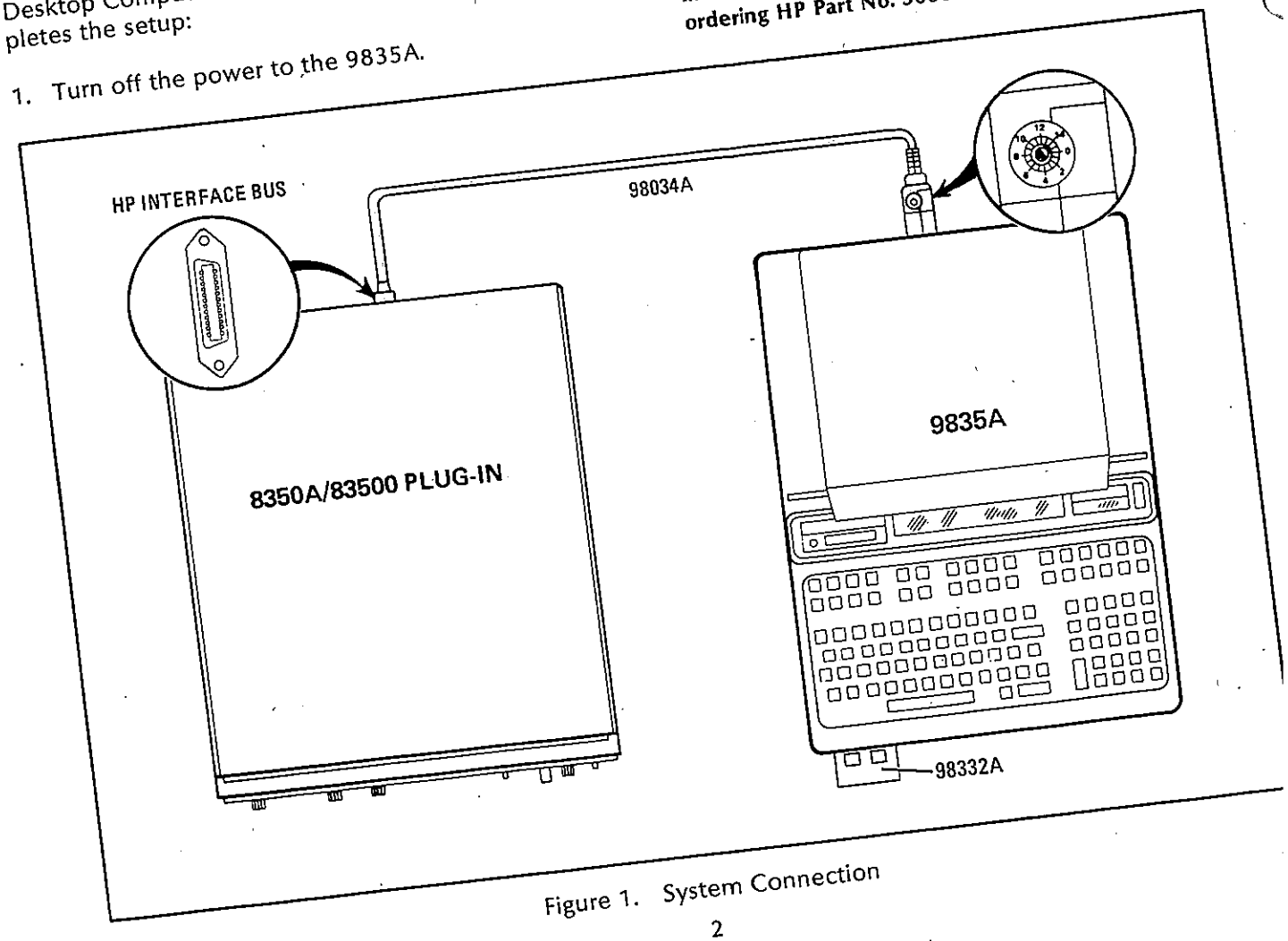


Figure 1. System Connection

6. All programs within this guide expect the 8350A HP-IB address to be decimal 19. The 8350A HP-IB address switches are located inside the instrument and are factory preset to decimal 19. To execute a front panel 'Set HP-IB Address' which will display the present HP-IB address:

   Press SHIFT LCL

   The FREQUENCY/TIME display will indicate the present decimal address. To reset the number if 19 is not displayed:

   Press 1 9 GHz

   This HP-IB address will remain in effect until the instrument is powered off since the internal address switches are read at power on (unless 8350A Option 001 Non-volatile Memory is used). Since Example 4 requires the 8350A to be powered off then on, the internal address switches should be reset to 19 if necessary.

CHECK-OUT

Turn on the 9835A and the 8350A. The 9835A should undergo an internal memory test then display "9835A READY FOR USE" on the CRT display. The 8350A should also undergo a turn-on self test consisting of the red LED numeric displays being blanked and all yellow indicator LED's on, then the 8350A sweep controls are set to the instrument preset state: Start/Stop Sweep over the entire plug-in frequency range, fastest sweep time for plug-in used (typically 10 milliseconds), and maximum leveled output power for the plug-in. If the 8350A fails the power-up self test an error message will be displayed in the far left LED display. Check section 8 of the 8350A Operating and Service Manual for error message decoding and diagnostics.

To verify that the HP-IB connections and interface are functional perform the following on the 9835A:

1. Press CONTROL STOP (or RESET)
2. Type 'REMOTE 719'
3. Press EXECUTE

Verify that the REM light on the 8350A is lit. If this fails, verify that the 98034A select code switch is set to "7", the 8350A address switches are set to "19", and the interface cable is properly connected.

If the 9835A display indicates an error message, it is possible that the above remote message was typed in incorrectly or the ROM's are not properly installed. If the 9835A accepts the remote statement and the display is clear but the 8350A REM light does not turn on, you could have a defective 98034A or 8350A. Perform the operational checks as outlined in the respective Operating and Service Manuals to find the defective device.

PROGRAMMING EXAMPLES

The following sample programs show the various ways of controlling the 8350A. In remote control situations the 8350A Sweep Oscillator can interact with the system HP-IB controller in two basic ways:

1. "Listen Mode": The 8350A listens to the control commands as to modifying the present instrument state. This effectively commands the 8350A to do a specific event much like setting a front panel function.

2. "Talk Mode": The 8350A informs the controller of the present instrument state with a numeric value or a string of characters. This effectively allows the user to interrogate or learn any 8350A function.

Each programming example is structured using the following format:

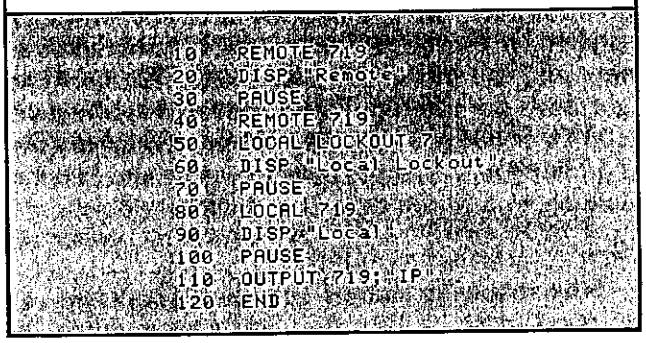
1. A general description of the functions exercised.
2. The program listing.
3. An explanation of each program line.
4. Detailed instructions for operating the program.

EXAMPLE PROGRAM 1: Remote, Local, Local Lockout, and Instrument Preset

Before programming the 8350A for different sweep functions, the user should be aware of the extent of remote control that can be used. The Remote Enable ('REMOTE') command sets the 8350A into remote control from the local (manual) mode. In remote the 8350A will perform only as its functions are programmed. However if the LCL button is pressed, the 8350A will return from the remote state to local control. To prevent this from occurring the Local Lockout ('LOCAL LOCKOUT') command disables all front panel controls, specifically the "Local" key. The Go To Local ('LOCAL') command will return the 8350A to front panel control thereby removing it from the remote and local lockout modes. Note that the above remote and local commands are different from the general HP-IB bus

local and remote commands ('LOCAL 7' and 'REMOTE 7'). Finally, in remote control it is periodically desirable to reset the 8350A to a predefined state, this is achievable with the Instrument Preset function.

PROGRAM 1



PROGRAM 1 EXPLANATION:

Line 10: Sets 8350A to remote.

Line 20: The 9835A displays "Remote".

Line 30: Temporarily stops program execution.

Line 40: Sets 8350A to remote.

Line 50: Sets local lockout mode.

Line 60: The 9835A displays "Local Lockout".

Line 70: Temporarily stops program execution.

Line 80: Sets 8350A to local.

Line 90: The 9835A displays "Local".

Line 100: Temporarily stops program execution.

Line 110: Sets 8350A to remote and performs an Instrument Preset.

Line 120: Stops program execution.

To verify and investigate the different remote modes do the following:

1. Press CONTROL, STOP, SCRATCH, A, EXECUTE on the 9835A. This scratches the program memory.
2. Press INSTR PRESET on the 8350A.
3. Type in the above program.
4. Press RUN on the 9835A.
5. With the 9835A displaying "Remote", verify that the 8350A REM light is lit. From the front panel, verify that the start frequency cannot be changed. Verify that the INSTR PRESET key and all other keys except LCL are disabled. Now press the LCL key and verify that the 8350A REM light is off and that you can modify any of the sweep functions.
6. Press CONTINUE on the 9835A. With the 9835A displaying "Local Lockout" verify that the 8350A REM light is again lit. Again attempt to change the start frequency and perform an instrument preset. Verify that this is impossible. Now press the LCL key and verify that still no action is taken.
7. Press CONTINUE on the 9835A. With the 9835A displaying "Local" verify that the 8350A REM light is off. Also verify that all sweep functions can now be modified via the front panel controls.
8. Press CONTINUE on the 9835A. Verify that the 8350A has undergone an Instrument Preset and the REM light is on. The Output ('OUTPUT 719') statement does two things, one it performs a 'REMOTE 719', and second it passes data to the 8350A.

Note that the 8350A LCL key produces the same result as programming 'LOCAL 719' or 'LOCAL 7'. Be careful as the latter command places all instruments on the HP-IB in local state as opposed to the 8350A alone.

EXAMPLE PROGRAM 2: Programming Functions

To program any function on the 8350A the controller must pass specific program codes and data to the sweeper. The statement that allows this is the Output ('OUTPUT') statement. The alphanumeric data string of the output statement can be a concatenation of character strings and/or variables. The data can be specific codes, free field formatted data, or reference a specific image ('IMAGE') statement. For example, to program the CW Frequency (CW), one program code sequence is "CW", the frequency in GHz, "GZ". If the frequency is to be 7.555 GHz, then the string "CW7.555GZ" will suffice. However if the frequency were to change then a variable 'F' could indicate the frequency in GHz and the program string could be "CW",F,"GZ". Using an image statement also allows a specific number of digits to be passed, thereby avoiding any unexpected round off errors.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency 7.555 GHz. If using a plug-in that does not cover this frequency range then the value in lines 30 and 40 should be changed to an appropriate value.

PROGRAM 2

```
10   OUTPUT 719;"IP"
20   FIXED 2
30   OUTPUT 719;"CW7.555GZ"
40   DISP "CW = 7.555 GHz"
50   PAUSE
60   INPUT "CW (in GHz) = ?",F
70   PRINT "CW = ";F;" GHz"
80   OUTPUT 719;"CW";F;"GZ"
90   GOTO 60
100  IMAGE "CW",DD.DDD,"GZ"
110  OUTPUT 719 USING 100;F
120  GOTO 60
```

PROGRAM 2 EXPLANATION:

Line 10: Puts the 8350A into a predefined state via instrument preset.

Line 20: Fixes numeric data output to 2 decimal places.

Line 30: Puts the 8350A in CW mode and programs a CW frequency of 7.555 GHz.

Line 40: The 9835A displays "CW = 7.555 GHz".

Line 50: Temporarily stops program execution.

Line 60: The 9835A displays "CW (in GHz) = ?". The user is prompted to input a new CW frequency value which is stored in the variable 'F'.

Line 70: Print on the CRT display the programmed CW frequency.

Line 80: Program the CW frequency using the default data format.

Line 90: Go to line 60.

Line 100: Image statement is set up for programming the CW frequency with a 1 MHz resolution.

Line 110: Program the CW frequency via image statement in line 100.

Line 112: Go to line 60.

The equipment setup is the same as the previous example. Reset the 9835A, scratch the 9835A memory, then type in the above program. Then do the following:

1. Run the program. The 9835A displays "CW = 7.555 GHz". The 8350A changes from the instrument preset state of Start/Stop sweep to a CW frequency of 7.555 GHz.
2. Press CONTINUE on the 9835A. The 9835A now displays "CW (in GHz) = ?". Type in a new CW frequency (value in GHz), then press CONTINUE.
3. The 8350A will be programmed to the new CW frequency with the new value printed on the CRT display. The program jumps back to step (2) above.

When inputting the CW frequency try several values, each with a different number of digits after the decimal point. Notice that the 8350A displays the frequency to 3 decimal places (1 MHz frequency resolution). Values with better than 1 MHz frequency resolution are rounded to the nearest MHz by the 8350A. However when the 9835A is reset all numeric output data defaults to the 'FIXED 2' or fixed 2 decimal places format. Thus the 9835A rounds the desired frequency to the nearest 10 MHz. To change this free-field format to more decimal places modify the fixed format statement in line 20 to 'FIXED 5' then re-run the program. Another approach is to utilize the image statement to set the desired number of decimal places. To use the image statement in the program, do the following on the 9835A:

Press STOP
Type 'DEL 80, 90'
Press EXECUTE.

This should delete lines 80 and 90 from program #2 and allow the use of lines 100, 110, and 120 instead. Run the modified program again and use the same steps for operation as before. Now if the value inputted has a frequency resolution greater than 1 MHz the 9835A does the rounding instead of the 8350A. This is the preferred programming approach. Change the image statement for 10 MHz frequency resolution and verify the results from the 8350A frequency display.

Since a device select code address can be a variable, verify that this can be used in the modified or original program #2 by doing the following:

1. Insert before Line 10 a new line with the variable 'Swp' by:

   Press STOP
   Type '5 Swp=719'
   Press STORE.

2. Modify the output statement(s) by editing the necessary lines and changing the 'OUTPUT 719' to 'OUTPUT Swp' and 'OUTPUT 719 USING 100' to 'OUTPUT Swp USING 100'.

3. Re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 3: Setting Up A Typical Sweep

Typically the sweeper is programmed for the proper sweep frequency range, sweep time, power level, and marker frequencies for a test measurement. This program sets up the sweeper for a general purpose situation using several dedicated image statements. Note that not all parameters need to be reprogrammed every time.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency range of at least 3 to 7 GHz. If using a plug-in with a different frequency range, change the values in lines 60, 90, and 100, to the appropriate values. If using an 86200 Series Plug-in then do not enter line 70.

PROGRAM 3

```
10   IMAGE "FA",DD.DDD,"GZFB",DD.DDD,"GZ"
20   IMAGE "ST",DDDDD,"MS"
30   IMAGE "M",D,DD.DDD,"GZ"
40   IMAGE "PL",DDD.D,"DM"
50   OUTPUT 719;"IPMD1"
60   OUTPUT 719 USING 10;3,7
70   OUTPUT 719 USING 40;10
80   OUTPUT 719 USING 20;50
90   OUTPUT 719 USING 30;1,4
100  OUTPUT 719 USING 30;2,6
110  END
```

PROGRAM 3 EXPLANATION:

Line 10: Image statement for setting the Start and Stop Sweep frequencies in GHz.

Line 20: Image statement for setting the Sweep Time in milliseconds.

Line 30: Image statement for setting a Frequency Marker by marker number and frequency in GHz.

Line 40: Image statement for setting the Output Power Level in dBm.

Line 50: Preset the sweeper to a known state via instrument preset and enable the internal 27.8 kHz Square Wave Amplitude Modulation.

Line 60: Set a Start/Stop Sweep of 3.0 to 7.0 GHz.

Line 70: Set the Output Power Level to +10 dBm.

Line 80: Set the Sweep Time to 50 milliseconds.

Line 90: Set Marker#1 to 4 GHz.

Line 100: Set Marker#2 to 6 GHz.

Line 110: Stop program execution.

Set up the equipment as shown in Figure 2 by adding the 8755C, the 180TR or 182T, the 11664, and a test device like a 4 to 6 GHz Bandpass Filter. It is important that the two rear panel connections from the 8350A to the 8755C/182T are made for a proper CRT display. For the example measurement set the following front panel controls:

On the 8755C:

Channel 1:

Display ..... OFF (press all the display push buttons so that they are all out)

Channel 2:

Display ..... B
dB/DIV ..... 10 dB
Reference Level ..... −10 dB
Reference Level Vernier ..... OFF

On the 182T or 180TR:

Magnifier X1
Display ..... INT

After connecting the equipment: reset the 9835A, scratch the 9835A memory, then type in the above program. Then run the program. The 8350A will initially undergo an instrument preset which will set the proper power leveling mode and sweep blanking signals. Since the 8755C requires the RF signal to be modulated at a 27.8 kHz rate, the internal amplitude modulation is enabled. If using a 4 to 6 GHz Bandpass Filter as the test device, the CRT display should reflect the filter transmission response over the 3 to 7 GHz range. Two frequency markers of the Z-Axis Intensity dot variety are set to 4 and 6 GHz hopefully within the passband or near the 3 dB points. The setup can be modified by changing the values in lines 60, 70, 80, 90, and/or 100, then re-run the program.

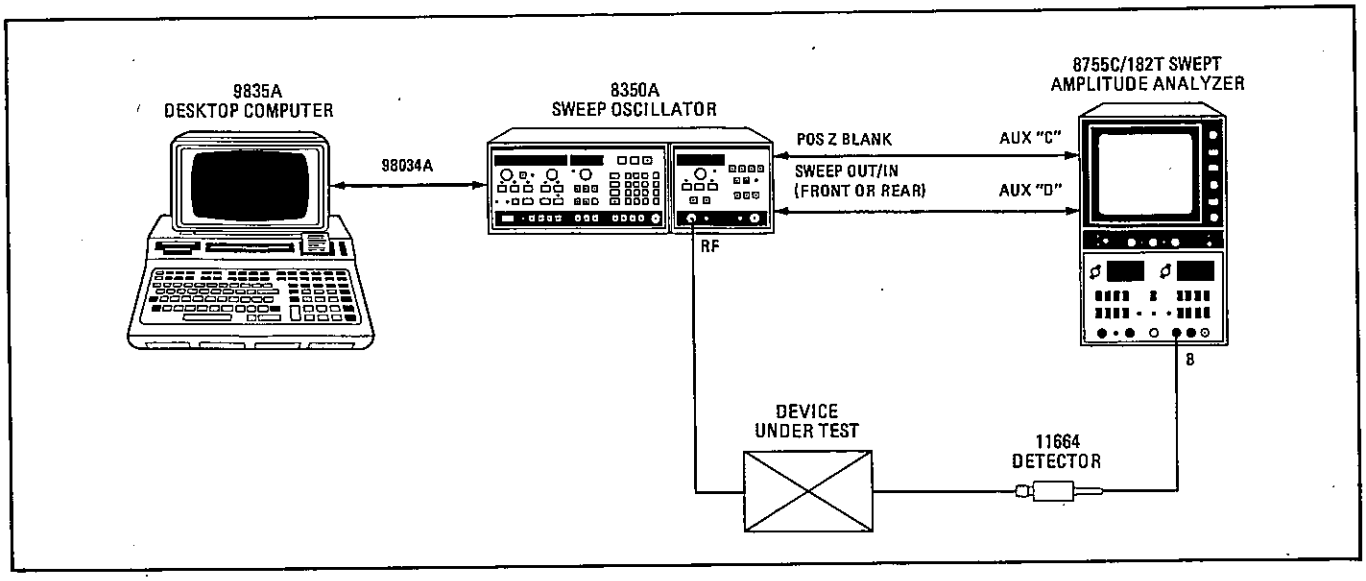


Figure 2. Equipment Setup For Program 3

EXAMPLE PROGRAM 4: Learning An Instrument State

Being able to save a specific instrument state is helpful when it is needed several times in a test or measurement procedure. The user could save the instrument state by manually logging the important sweep parameters such as frequency range, power level, ALC modes, etc., then re-inputting them at the appropriate time. A somewhat simpler approach is to save the instrument state in one of the 8350A internal storage registers, then recall it when needed. However, this is not a permanent solution unless the 8350A Non-volatile Memory option (Option 001) is used. A more permanent solution is to use the Output Learn String function of the 8350A so that the 9835A can learn then store a data string that describes the present instrument state on a tape cartridge or in its' internal memory. Once an instrument state is stored or learned, the 8350A can then be restored to that state using the Input Learn String function. The power of these instrument Learn/Teach functions are demonstrated by the following program using the 9835A fast data transfer function.

PROGRAM 4

```
10   OPTION BASE 1
20   DIM A$[100]
30   OUTPUT 719;"IPMD1"
40   LOCAL 719
50   PAUSE
60   OUTPUT 719;"OL"
70   ENTER 719 BFHS 90 USING "#,90A";A$
80   PAUSE
90   OUTPUT 719;"IL"&A$
100  END
```

PROGRAM 4 EXPLANATION:

Line 10: Define the first element in any array to be at index number 1.

Line 20: Set the length of the A$ string to 100 characters.

Line 30: Set the 8350A to a predefined state via instrument preset and enable the square wave modulation.

Line 40: Return the 8350A to local control.

Line 50: Temporarily stops program execution.

Line 60: Program the 8350A to output the Learn String.

Line 70: Read the Learn String into the 9835A using a byte fast handshake transfer of 90 string characters ignoring the line feed as the string terminator. Store the 90 character Learn String in A$.

Line 80: Temporarily stops program execution.

Line 90: Program the 8350A to accept a Learn String, then send the new Learn String to the 8350A.

Line 100: Stop program execution.

Setup the equipment as in example 3 using the CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 9835A, scratch the 9835A memory, then

type in the above program. Run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state, then press CONTINUE on the 9835A.
2. Turn the 8350A line power off. Wait five seconds then turn the 8350A power back on. Press INSTR PRESET on the 8350A.
3. Press CONTINUE on the 9835A. Verify on the CRT display and/or the 8350A that the original instrument state has been restored.

EXAMPLE PROGRAM 5: Interrogating The Present Value Of A Function

While the 8350A Learn String enables the user to completely save a string of characters that define the present instrument state, the information is densely packed and encoded to save memory space. If the user wishes to determine the actual value of a specific parameter, say the Start Frequency, it would require a tedious process to extract a numeric value from several characters within the Learn String. An easier approach is to use the Output Interrogated Parameter function of the 8350A. With this function the 9835A instructs the 8350A to output the present numeric value of a specified function. Any function that has a numeric value associated with it can be interrogated. Note that if the parameter is not presently active, the 8350A uses a computed value or its previous value. The following program demonstrates the capability of the interrogate function.

PROGRAM 5

```
 10  OUTPUT 719;"IPMD1"
 20  LOCAL 719
 30  PAUSE
 40  OUTPUT 719;"OPFA"
 50  ENTER 719;A
 60  PRINT "Start Freq = ";A/1E6;" MHz"
 70  OUTPUT 719;"OPFB"
 80  ENTER 719;B
 90  PRINT "Stop Freq  = ";B/1E6;" MHz"
100  OUTPUT 719;"OPST"
110  ENTER 719;T
120  PRINT "Sweep Time = ";1000*T;" msec"
130  END
```

PROGRAM 5 EXPLANATION:

Line 10: Set the 8350A to a predefined instrument state via instrument preset and enable the square wave modulation.

Line 20: Return the 8350A to local control.

Line 30: Temporarily stops program execution.

Line 40: Program the 8350A to output the present value of the Start Frequency.

Line 50: Read the value into the 9835A and store it in the variable 'A'.

Line 60: Print on the CRT display the present value of the Start Frequency in MHz.

Line 70: Program the 8350A to output the present value of the Stop Frequency.

Line 80: Read the value into the 9835A and store it in the variable 'B'.

Line 90: Print on the CRT display the present value of the Stop Frequency in MHz.

Line 100: Program the 8350A to output the present value of the Sweep Time.

Line 110: Read the value into the 9835A and store it in the variable 'T'.

Line 120: Print on the CRT display the present value of the Sweep Time in milliseconds.

Line 130: Stops program execution.

Setup the equipment as in example 3 using the analyzers' CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 9835A, scratch the 9835A memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state using the Start Frequency, Stop Frequency, and Sweep Time controls.
2. Press CONTINUE on the 9835A.
3. The present values of the Start Frequency, Stop Frequency, and Sweep Time are sequentially interrogated and then printed on the CRT of the 9835A.

EXAMPLE PROGRAM 6: A Stepped CW Sweep

Present automatic measurement systems typically make measurements at a sequence of CW test frequencies instead of analog sweeping the frequency range of interest. If swept, the measurement data taking machine would need to sample the RF signal at a very fast rate to maintain accurate frequency information, too. This is typically not accomplished. Stepped CW sweeps can be accomplished in several ways with the 8350A:

1. Program sequential CW test frequencies.

2. Program the frequency sweep range then enable the manual sweep mode. Perform a stepped manual sweep by repetitively programming the step up/increment function.

3. Program the CW frequency to the start frequency, the Step Size to an appropriate value, then repetitively program the step up/increment function.

Considering the speed of programming the above approaches, the third is the most efficient. This program illustrates a stepped sweep using this approach.

PROGRAM 6

```
10  OUTPUT 719;"IPMD1FI0"
20  INPUT "Start Freq (GHz) = ?",A
30  INPUT "Stop Freq (GHz) = ?",B
40  INPUT "Step Size (GHz) = ?",C
50  D=(B-A)/C
60  OUTPUT 719;"CWSS";C;"GZ"
70  OUTPUT 719;"CW";A;"GZ"
80  FOR I=1 TO D
90  OUTPUT 719;"UP"
100 WAIT 20
110 NEXT I
120 GOTO 70
```

PROGRAM 6 EXPLANATION:

Line 10: Set the 8350A to the predefined instrument state, enable the square wave modulation, and disable CW Filter.

Line 20: The 9835A displays "Start Freq (GHz) = ?", input prompts for Start frequency of the sweep. Store it in the variable 'A'.

Line 30: The 9835A displays "Stop Freq (GHz) = ?", input prompts for the stop frequency of the sweep. Store it in 'B'.

Line 40: The 9835A displays "Step Size (GHz) = ?", input prompts for the step size of the sweep. Store it in 'C'.

Line 50: Determine the number of frequency steps in sweep, store in 'D'.

Line 60: Set the CW Step Size.

Line 70: Set the CW frequency to the start frequency value.

Line 80: Iterate the CW step 'D' times.

Line 90: Program the Step Increment/Up function.

Line 100: Wait 20 milliseconds for settling.

Line 110: Continue step iteration.

Line 120: Go to line 70.

The equipment setup is the same as in the previous example. Reset the 9835A, scratch the 9835A memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. Then perform the following:

1. The 9835A will display "Start Freq (GHz) = ?". Answer this prompt by inputting the desired Start frequency (value in GHz) of the sweep, then press CONTINUE.

2. The 9835A will display "Stop Freq (GHz) = ?". Answer this prompt with the desired Stop frequency (in GHz) of the sweep, then press CONTINUE.

3. The 9835A will display "Step Size (GHz) = ?". Answer this prompt with the desired Step size (in GHz) of the sweep, then press CONTINUE.

4. The 8350A CW frequency will be programmed to the Start frequency of the sweep selected. Then the CW frequency is repetitively incremented by the step size value. The sweep is then restarted after reaching the stop frequency.

To stop the program press STOP.

Since part of the time involved in changing CW frequencies is in updating the numeric LED display if this could be defeated the CW frequency time can be optimized. Note that one drawback is that the numeric display will not indicate the present frequency. The 8350A provides a Display Update On/Off function and it can be implemented by modifying line 10 to be:

OUTPUT 719;"IPMD1FI0DU0"

Then re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 7: Using Service Requests, Status Bytes, and Request Mask

Certain error conditions of the 8350A can be detected by the 9835A so that corrective action can be taken: Examples of some detectable error conditions are RF power unleveled, numeric data entry out of range, and line power failure. If an error condition exists, the user can instruct the 8350A to request service from the 9835A by initiating a Service Request (SRQ). The 9835A can detect whether an SRQ has taken place on the bus by analyzing bit 7 (see note below) of the Status Byte of the 98034A HP-IB Interface. Two modes are available for analyzing the 98034A Status Byte: (1) periodically read the Status Byte, or (2) enable bit 7 to interrupt the program when it is set. In either case, once it is determined that the 8350A has requested service, the specific error condition(s) can then be determined by reading and analyzing the Status Bytes of the 8350A. The 8350A has two Status Bytes, each consisting of 8 bits with each bit indicating the present status of a particular function or condition. See Table 1 for a complete description of the conditions associated with each Status Byte bit. The user can analyze these Status Bytes for every SRQ, or more simply, instruct the 8350A to issue an SRQ only if a specific set of error conditions exists. The set of conditions is determined by a numeric value passed by the Request Mask function. This numeric value is generated by summing the decimal values of each Status Byte bit to be checked. This program demonstrates the capability of the SRQ and Status Bytes to detect an error condition.

PROGRAM 7

```
10   ABORTIO 7
20   CLEAR 719
30   OUTPUT 719;"IPMD1RM"&CHR$(97)
40   ON INT #7 GOSUB Srq
50   CONTROL MASK 7;128
60   CARD ENABLE 7
70   INPUT "CW Freq (GHz) = ?",F
80   OUTPUT 719;"CW";F;"GZ"
90   WAIT 100
100  GOTO 70
110 Srq: STATUS 719;A
120  IF BIT(A,6)<>1 THEN GOTO 160
130  IF BIT(A,0)=1 THEN PRINT
     "Parameter Altered" ELSE PRINT "Syntax Error"
140  IF BIT(A,5)=1 THEN PRINT "Syntax Error"
150  CLEAR 719
160  CONTROL MASK 7;128
170  CARD ENABLE 7
180  RETURN
```

NOTE

This assumes that the status bits are numbered 0 thru 7 with the least-significant bit being number 0. Other references may assume that the bits are numbered 1 thru 8 with the least-significant bit being number 1.

If using an 86200 Series Plug-in, the Status Bytes can provide only limited information. Table 1 indicates which Status Byte functions/bits are usable.

PROGRAM 7 EXPLANATION:

Line 10: Clear the status of the HP-IB.

Line 20: Clear the status of the 8350A.

Line 30: Preset the 8350A to a predefined instrument state and enable the square wave modulation, and set the Request Mask to enable Parameter Altered and Syntax Error SRQ's.

Line 40: Indicate that if an interrupt from the 98034A HP-IB Interface is received that program execution will branch to the interrupt service routine located at the line labelled 'Srq'.

Line 50: Specify an interrupt from the 98034A if bit 7 (decimal value 128) is set.

Line 60: Enable the controller to accept an interrupt from the 98034A.

Line 70: The 9835A displays "CW Freq (GHz) = ?", input prompts for the desired CW frequency value in GHz. Store it in the variable 'F'.

Line 80: Set the CW frequency as determined by 'F'.

Line 90: Wait 100 milliseconds to allow the 8350A to interrupt.

Line 100: Go to line 70.

Line 110: Location of the interrupt service routine. Read the Status Byte of the 8350A and store it in 'A'.

Line 120: Check bit 0 of the 8350A Status Byte for an Altered Parameter error. Print on the CRT display "Parameter Altered" if one exists.

Line 130: Check bit 5 of the 8350A Status Byte for a Syntax error. Print on the CRT display "Syntax Error" if one exists.

Line 140: Clear the 8350A Status Byte to enable another SRQ.

Line 150: Re-specify bit 7 of the 98034A to cause an interrupt.

Line 160: Re-enable interrupts from the 98034A.

Line 170: Return from the interrupt service routine to the main program.

The equipment setup is the same as the previous example. Reset the 9835A, scratch the 9835A memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. The 9835A then displays "CW Freq (GHz) =?". Answer this prompt by inputting the desired CW frequency in GHz, then press CONTINUE. Verify that the 8350A CW frequency has been properly programmed. Try several values that are out of range of the plug-in's frequency limits and verify that an error message was printed on the CRT display. The program repeats the above input prompt. To stop the program press STOP.

Table 1. 8350A Status Byte Descriptions

STATUS BYTE (#1)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
FUNCTION	N/A	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	N/A	SRQ on Change in Extended Status Byte	N/A	SRQ on Numeric Parameter Altered to Default Value

EXTENDED STATUS BYTE (#2)								
BIT #	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
DECIMAL VALUE	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
FUNCTION	Airflow Failure	*RF Unleveled	Power Failure/on	N/A	N/A	N/A	N/A	Self Test Failed

*Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.

HP-IB PROGRAMMING CODES

Code	Description
AKm	Amplitude Marker On/Off
ALmn	Alternate Sweep On/Off
A1	Internal Leveling
A2	External Crystal Leveling
A3	External Power Meter Leveling
BK	Backspace
CAm	Amplitude Crystal Marker On/Off (83522/83525 Only)
CF	Center Frequency
CIm	Intensity Crystal Marker On/Off (83522/83525 Only)
CW	CW Frequency
C1	1 MHz Crystal Marker Frequency (83522/83525 Only)
C2	10 MHz Crystal Marker Frequency (83522/83525 Only)
C3	50 MHz Crystal Marker Frequency (83522/83525 Only)
C4	External Crystal Marker Frequency (83522/83525 Only)
DF	Delta F Frequency Span
DM	dBm
DN	Step Down/Decrement
DPm	Display Blanking On/Off
DUm	Display Update On/Off
E	Exponent Power Of 10
FA	Start Frequency
FB	Stop Frequency
FIm	CW Filter In/Out
F1	−20 MHz/V FM
F2	−6 MHz/V FM
GZ	GHz
HZ	Hz
IL	Input Learn String
IP	Instrument Preset
IX	Input Micro Learn String
KZ	KHz
MC	Marker To Center Frequency
MDm	Square Wave Amplitude Modulation On/Off
MO	Marker Off
MPm	Marker 1-2 Sweep On/Off
MS	Milliseconds
MZ	MHz
M0	Marker Off
M1	Marker #1
M2	Marker #2
M3	Marker #3
M4	Marker #4
M5	Marker #5
NT	Network Analyzer Trigger (8410B)
OA	Output Active Parameter
OL	Output Learn String
OM	Output Mode String
OP	Output Interrogated Parameter
OS	Output Status bytes
OX	Output Micro Learn String
PL	Power Level
PSm	Power Sweep On/Off
RCn	Recall Register
RFm	RF Power On/Off
RM	Service Request Mask
RPm	RF Blanking On/Off
RS	Reset Sweep
SC	Seconds
SF	Frequency Step Size
SH	Shift Function
SLm	Slope On/Off
SM	Manual Sweep
SP	Power Step Size
SS	Step Size
ST	Sweep Time
SVn	Save Register
SX	external Sweep
TS	Take Sweep
T1	Internal Sweep Trigger
T2	Line Sweep Trigger
T3	External Sweep Trigger
T4	Single Sweep
UP	Step Up/Increment
VR	CW Vernier
0–9 + −	Acceptable Numeric Data

NOTES

1. **Program codes of the form "XXm" use "m" to turn the function On or Off (1 or 0). For the storage register functions the "n" is 1 through 9.**
2. **The 8350A ignores spaces, plus signs, negative signs (except when valid) and any unexpected characters. Program codes can be upper or lower case alpha characters.**

For more information, call your local HP Sales Office or nearest Regional Office: **Eastern** (201) 265-5000; **Midwestern** (312) 255-9800; **Southern** (404) 955-1500; **Western** (213) 970-7500; **Canadian** (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland. **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Suginami-ku, Tokyo 168.

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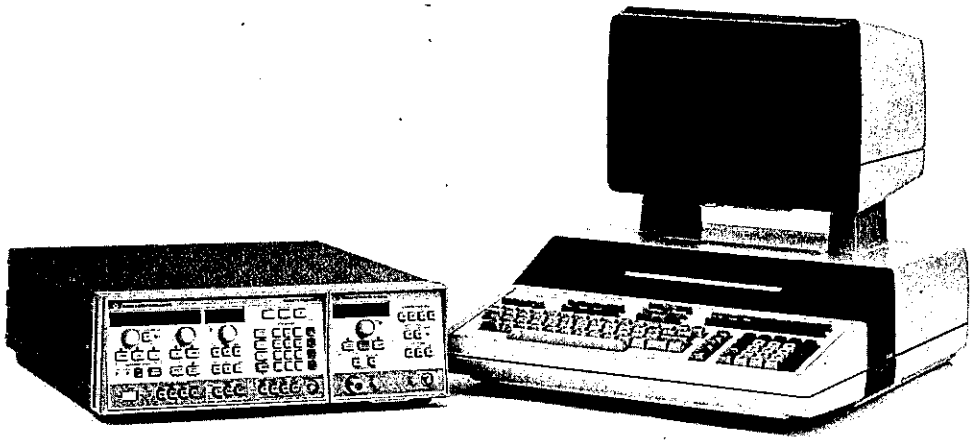
Programming Note

8350A/9845B-1
Supersedes: None

OCTOBER 1980

Introductory Operating Guide for the HP 8350A Sweep Oscillator with the HP 9845B Desktop Computer



INTRODUCTION

This programming note is a guide to the remote operation of the HP 8350A Sweep Oscillator and appropriate HP 83500 Series Plug-in using the HP 9845B Desktop Computer. Included in this guide are the system connections for remote operation and several example programs with descriptions of each step.

The 8350A is fully compatible with the Hewlett-Packard Interface Bus (HP-IB). When used with a controller such as the 9845B, complete control of the sweep mode, frequency limits, frequency markers, power level, and all other front panel controls can be achieved.

REFERENCE INFORMATION

For further information on the HP Interface Bus, the following reference should prove helpful:

- Condensed Description of the Hewlett-Packard Interface Bus (HP Literature No. 59401-90030).

Complete reference information on the 8350A can be found in the 8350A Sweep Oscillator Operating and Service Manual (HP Part No. 08350-90001). For information on operating the 9845B the following references are available:

- 9845B Operating and Programming Manual (HP Part No. 09845-91000).
- 9845B I/O ROM Programming Manual (HP Part No. 09845-91060).

EQUIPMENT REQUIRED

To perform all the example programs described in this programming note, you will need the following equipment and accessories:

1. HP 8350A Sweep Oscillator with any HP 83500 Series Plug-in. Note that an HP 86200 Series Plug-in with the HP 11869A Adapter can be used but all references to power level and power control are not applicable.

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2. HP 9845B Desktop Computer with:
   a. HP 98412A I/O ROM (actually 2 ROM's)
   b. HP 98034A Revised HP-IB Interface Card/ Cable

NOTE

The following equipment is not required for the programs to function but rather for a visual display of the 8350A functions.

3. HP 8755S Frequency Response Test Set with:
   a. HP 8755C Swept Amplitude Analyzer
   b. HP 180TR or 182T Display Unit
   c. HP 11664A or 11664B Detector
   d. Two 120 cm. (4 ft.) BNC cables (HP 11170C variety)

   or any appropriate Oscilloscope with Crystal/ Schottky Detector, Attenuator, and BNC Cabling.
4. Any test device over the frequency range of the 83500 Series Plug-in.

SET-UP

Figure 1 shows the system connection and switch settings for the 98034A Interface and the 9845B Desktop Computer. The following procedure completes the setup:

1. Turn off the power to the 9845B.
2. Verify that the ROM's are installed in the 9845B. If not, then install the ROM's in the appropriate side panel drawers of the 9845B.
3. Install the 98034A Interface Card into one of the rear panel slots of the 9845B.
4. Verify that the rotary switch on top of the 98034A is set to "7". If not then set it to "7" since this is the select code for the interface card for all programs found within this guide.
5. Connect the 24-pin HP-IB connector of the 98034A to the rear panel HP-IB connector of the 8350A. This connector is tapered to insure proper connection.

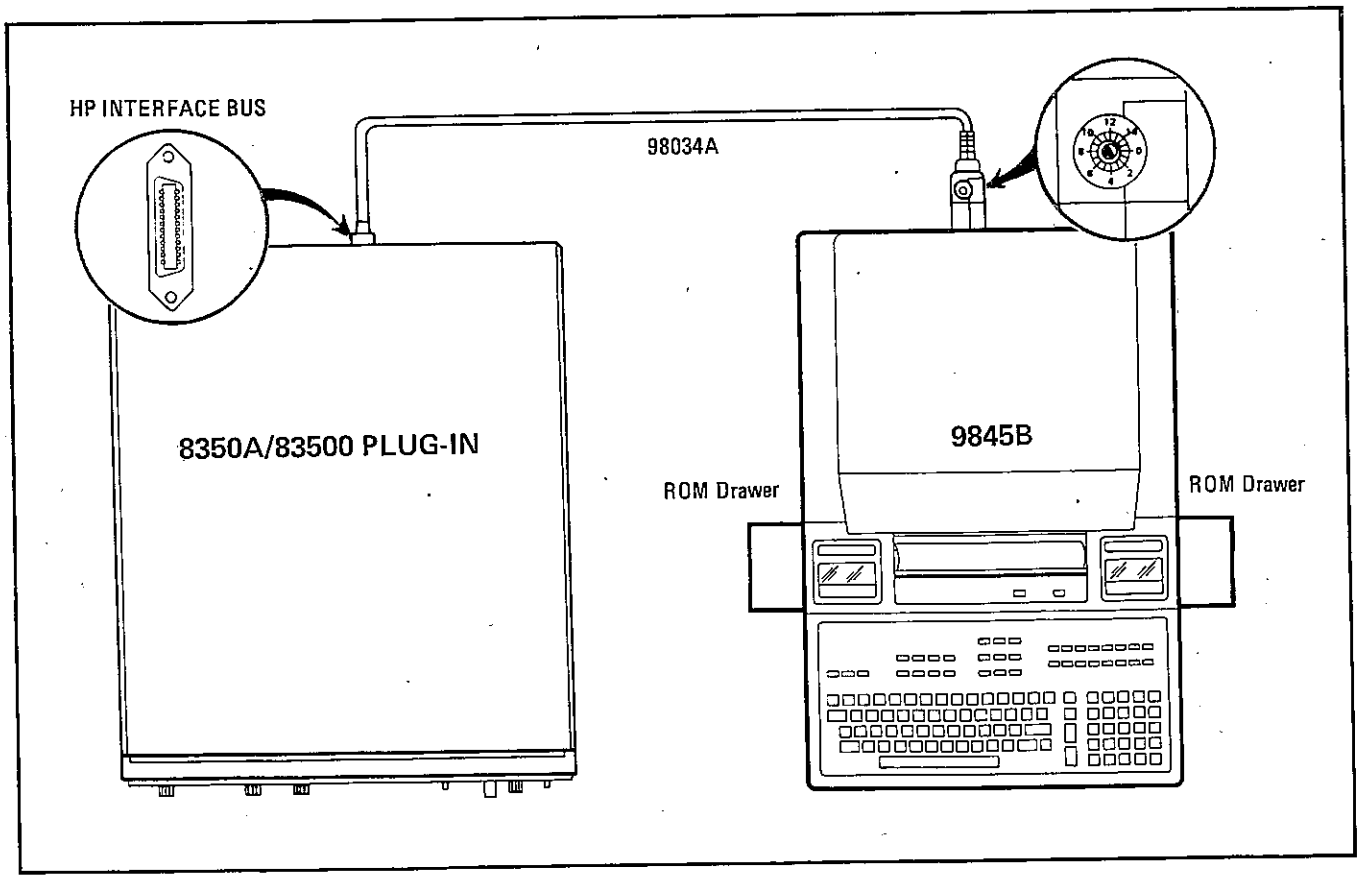

Figure 1. System Connection

CAUTION

Do not attempt to mate black metric threaded screws on one connector with silver English threaded nuts on another connector, or vice-versa, as damage may result. A metric conversion kit which will convert one cable and one or two instruments to metric hardware is available by ordering HP Part No. 5060-0138.

6. All programs within this guide expect the 8350A HP-IB address to be decimal 19. The 8350A HP-IB address switches are located inside the instrument and are factory preset to decimal 19. To execute a front panel 'Set HP-IB address' which will display the present HP-IB address:

   Press SHIFT LCL

   The FREQUENCY/TIME display will indicate the present decimal address. To reset the number if 19 is not displayed:

   Press 1 9 GHz

   This HP-IB address will remain in effect until the instrument is powered off since the internal address switches are read at power on (unless 8350A Option 001 Non-volatile Memory is used). Since Example 4 requires the 8350A to be powered off then on, the internal address switches should be reset to 19 if necessary.

CHECK-OUT

Turn on the 9845B and the 8350A. The 9845B should undergo an internal memory test then display "9845B READY FOR USE" on the CRT display. The 8350A should also undergo a turn-on self test consisting of the red LED numeric displays being blanked and all yellow indicator LED's on, then the 8350A sweep controls are set to the instrument preset state: Start/Stop Sweep over the entire plug-in frequency range, fastest sweep time for plug-in (typically 10 milliseconds), and maximum leveled output power for the plug-in. If the 8350A fails the power-up self test an error message will be displayed in the far left LED display. Check section 8 of the 8350A Operating and Service Manual for error message decoding and diagnostics.

To verify that the HP-IB connections and interface are functional perform the following on the 9845B:

1. Press CONTROL STOP (or RESET)
2. Type 'REMOTE 719'
3. Press EXECUTE

Verify that the REM light on the 8350A is lit. If this fails, verify that the 98034A select code switch is set to "7", the 8350A address switches are set to "19", and the interface cable is properly connected.

If the 9845B display indicates an error message, it is possible that the above remote message was typed in incorrectly or the ROM's are not properly installed. If the 9845B accepts the remote statement and the display is clear but the 8350A REM light does not turn on, you could have a defective 98034A or 8350A. Perform the operational checks as outlined in the respective Operating and Service Manuals to find the defective device.

PROGRAMMING EXAMPLES

The following sample programs show the various ways of controlling the 8350A. In remote control situations the 8350A Sweep Oscillator can interact with the system HP-IB controller in two basic ways:

1. "Listen Mode": Here the 8350A listens to the control commands as to modifying the present instrument state. This effectively commands the 8350A to do a specific event much like setting a front panel function.

2. "Talk Mode": Here the 8350A informs the controller of the present instrument state with a numeric value or a string of characters. This effectively allows the user to interrogate or learn any 8350A function.

Each programming example is structured using the following format:

1. A general description of the functions exercised
2. The program listing
3. An explanation of each program line
4. Detailed instructions for operating the program.

EXAMPLE PROGRAM 1: Remote, Local, Local Lockout, and Instrument Preset

Before programming the 8350A for different sweep functions, the user should be aware of the extent of remote control that can be used. The Remote Enable ('REMOTE') command sets the 8350A into

remote control from the local (manual) mode. In remote the 8350A will perform only as its functions are programmed. However if the LCL button is pressed, the 8350A will return from the remote state to local control. To prevent this from occurring the Local Lockout ('LOCAL LOCKOUT') command disables all front panel controls, specifically the "Local" key. The Go To Local ('LOCAL') command will return the 8350A to front panel control thereby removing it from the remote and local lockout modes. Note that the above remote and local commands are different from the general HP-IB bus local and remote commands ('LOCAL 7' and 'REMOTE 7'). Finally, in remote control it is periodically desirable to reset the 8350A to a predefined state, this is achievable with the Instrument Preset function.

PROGRAM 1

```
10   REMOTE 719
20   DISP "Remote"
30   PAUSE
40   REMOTE 719
50   LOCAL LOCKOUT 7
60   DISP "Local Lockout"
70   PAUSE
80   LOCAL 719
90   DISP "Local"
100  PAUSE
110  OUTPUT 719;"IP"
120  END
```

PROGRAM 1 EXPLANATION:

Line 10: Sets 8350A to remote.

Line 20: The 9845B displays "Remote".

Line 30: Temporarily stops program execution.

Line 40: Sets 8350A to remote.

Line 50: Sets local lockout mode.

Line 60: The 9845B displays "Local Lockout".

Line 70: Temporarily stops program execution.

Line 80: Sets 8350A to local.

Line 90: The 9845B displays "Local".

Line 100: Temporarily stops program execution.

Line 110: Sets 8350A to remote and performs an Instrument Preset.

Line 120: Stops program execution.

To verify and investigate the different remote modes do the following:

1. Press CONTROL STOP SCRATCH A EXECUTE on the 9845B. This scratches the program memory.
2. Press INSTR PRESET on the 8350A.
3. Type in the above program.
4. Press RUN on the 9845B.
5. With the 9845B displaying "Remote", verify that the 8350A REM light is lit. From the front panel, attempt to change the start frequency and verify that this is impossible. Verify that the Instrument Preset key and all other keys except LCL are disabled. Now press the LCL key and verify that the 8350A REM light is off and that you can modify any of the sweep functions.
6. Press CONT on the 9845B. With the 9845B displaying "Local Lockout" verify that the 8350A REM light is again lit. Again attempt to change the start frequency and perform an instrument preset. Verify that this is impossible. Now press the LCL key and verify that still no action is taken.
7. Press CONT on the 9845B. With the 9845B displaying "Local" verify that the 8350A REM light is off. Also verify that all sweep functions can now be modified via the front panel controls.
8. Press CONT on the 9845B. Verify that the 8350A has undergone an Instrument Preset and the REM light is on. The Output ('OUTPUT 719') statement does two things, one it performs a 'REMOTE 719', and second it passes data to the 8350A.

Note that the 8350A LCL key produces the same result as programming 'LOCAL 719' or 'LOCAL 7'. Be careful as the latter command places all instruments on the HP-IB in local state as opposed to the 8350A alone.

EXAMPLE PROGRAM 2: Programming Functions

To program any function on the 8350A the controller must pass specific program codes and data to the sweeper. The statement that allows this is the Output ('OUTPUT') statement. The alphanumeric data string of the output statement can be a concatenation of character strings and/or variables. The data can be specific codes, free field formatted data, or reference a specific image ('IMAGE') statement. For example, to program the CW Frequency (CW), one program code sequence is "CW",

followed by the frequency in GHz, then "GZ". If the frequency is to be 7.555 GHz, then the string "CW7.555GZ" will suffice. However if the frequency were to change then a variable 'F' could indicate the frequency in GHz and the program string could be "CW",F,"GZ". Using an image statement also allows a specific number of digits to be passed, thereby avoiding any unexpected round off errors.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency 7.555 GHz. If using a plug-in that does not cover this frequency range then the value in lines 30 and 40 should be changed to an appropriate value.

PROGRAM 2

```
10   OUTPUT 719;"IP"
20   FIXED 2
30   OUTPUT 719;"CW7.555GZ"
40   DISP "CW = 7.555 GHz"
50   PAUSE
60   INPUT "CW (in GHz) = ?",F
70   PRINT "CW = ";F;" GHz"
80   OUTPUT 719;"CW";F;"GZ"
90   GOTO 60
100  IMAGE "CW",DD.DDD,"GZ"
110  OUTPUT 719 USING 100;F
120  GOTO 60
```

PROGRAM 2 EXPLANATION:

Line 10: Puts the 8350A into a predefined state via instrument preset.

Line 20: Fixes numeric data output to 2 decimal places.

Line 30: Puts the 8350A in CW mode and programs a CW frequency of 7.555 GHz.

Line 40: The 9845B displays "CW = 7.555 GHz".

Line 50: Temporarily stops program execution.

Line 60: The 9845B displays "CW (in GHz) =?". The user is prompted to input a new CW frequency value which is stored in the variable 'F'.

Line 70: Print on the CRT display the programmed CW frequency.

Line 80: Program the CW frequency using the default data format.

Line 90: Go to line 60.

Line 100: Image statement is set up for programming the CW frequency with a 1 MHz resolution.

Line 110: Program the CW frequency via image statement in line 100.

Line 120: Go to line 60.

The equipment setup is the same as the previous example. Reset the 9845B, scratch the 9845B memory, then type in the above program. Then do the following:

1. Run the program. The 9845B displays "CW = 7.555 GHz". The 8350A changes from the instrument preset state of Start/Stop sweep to a CW frequency of 7.555 GHz.

2. Press CONT on the 9845B. The 9845B now displays "CW (in GHz) =?". Type in a new CW frequency (value in GHz), then press CONT.

3. The 8350A will be programmed to the new CW frequency with the new value printed on the CRT display. The program jumps back to step (2) above.

When inputting the CW frequency try several values, each with a different number of digits after the decimal point. Notice that the 8350A displays the frequency to 3 decimal places (1 MHz frequency resolution). Values with better than 1 MHz frequency resolution are rounded to the nearest MHz by the 8350A. However when the 9845B is reset all numeric output data defaults to the 'FIXED 2' or fixed 2 decimal places format. Thus the 9845B rounds the desired frequency to the nearest 10 MHz. To change this free-field format to more decimal places modify the fixed format statement in line 20 to 'FIXED 5' from the keyboard then re-run the program. Another approach is to utilize the image statement to set the desired number of decimal places. To use the image statement in the program, do the following on the 9845B:

Press STOP
Type 'DEL 80, 90'
Press EXECUTE

This should delete lines 80 and 90 from program #2 and allow the use of lines 100, 110, and 120 instead. Run the modified program again and use the same steps for operation as before. Now if the value

inputted has a frequency resolution greater than 1 MHz the 9845B does the rounding instead of the 8350A. This is the preferred programming approach. Change the image statement for 10 MHz frequency resolution and verify the results from the 8350A frequency display.

Since a device select code address can be a variable, verify that this can be used in the modified or original program #2 by doing the following:

1. Insert before Line 10 a new line with the variable 'Swp' by:

   Press STOP
   Type '5 Swp=719'
   Press STORE

2. Modify the output statement(s) by editing the necessary lines and changing the 'OUTPUT 719' to 'OUTPUT Swp' and 'OUTPUT 719 USING 100' to 'OUTPUT Swp USING 100'.

3. Re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 3: Setting Up A Typical Sweep

Typically the sweeper is programmed for the proper sweep frequency range, sweep time, power level, and marker frequencies for a test measurement. This program sets up the sweeper for a general purpose situation using several dedicated image statements. Note that not all parameters need to be reprogrammed every time.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency range of at least 3 to 7 GHz. If using a plug-in with a different frequency range, change the values in lines 60, 90, and 100, to the appropriate values. If using an 86200 Series Plug-in then do not enter line 70.

PROGRAM 3

```
10   IMAGE "FA",DD.DDD,"GZFB",DD.DDD,"GZ"
20   IMAGE "ST",DDDDD,"MS"
30   IMAGE "M",D,DD.DDD,"GZ"
40   IMAGE "PL",DDD.D,"DM"
50   OUTPUT 719;"IPMD1"
60   OUTPUT 719 USING 10;3,7
70   OUTPUT 719 USING 40;10
80   OUTPUT 719 USING 20;50
90   OUTPUT 719 USING 30;1,4
100  OUTPUT 719 USING 30;2,6
110  END
```

PROGRAM 3 EXPLANATION:

Line 10: Image statement for setting the Start and Stop Sweep frequencies in GHz.

Line 20: Image statement for setting the Sweep Time in milliseconds.

Line 30: Image statement for setting a Frequency Marker by marker number and frequency in GHz.

Line 40: Image statement for setting the Output Power Level in dBm.

Line 50: Preset the sweeper to a known state via instrument preset and enable the internal 27.8 kHz Square Wave Amplitude Modulation.

Line 60: Set a Start/Stop Sweep of 3.0 to 7.0 GHz.

Line 70: Set the Output Power Level to +10 dBm.

Line 80: Set the Sweep Time to 50 milliseconds.

Line 90: Set Marker#1 to 4 GHz.

Line 100: Set Marker#2 to 6 GHz.

Line 110: Stops program execution.

Set up the equipment as shown in Figure 2 by adding the 8755C, the 180TR or 182T, the 11664, and a test device like a 4 to 6 GHz Bandpass Filter. It is important that the two rear panel connections from the 8350A to the 8755C/182T are made for a proper CRT display. For the example measurement set the following front panel controls:

On the 8755C:

Channel 1:

Display ..... OFF (press all the display push buttons so that they are all out)

Channel 2:

Display ..... B
dB/DIV ..... 10 dB
Reference Level ..... −10 dB
Reference Level Vernier ..... OFF

On the 182T or 180TR:

Magnifier X1
Display ..... INT

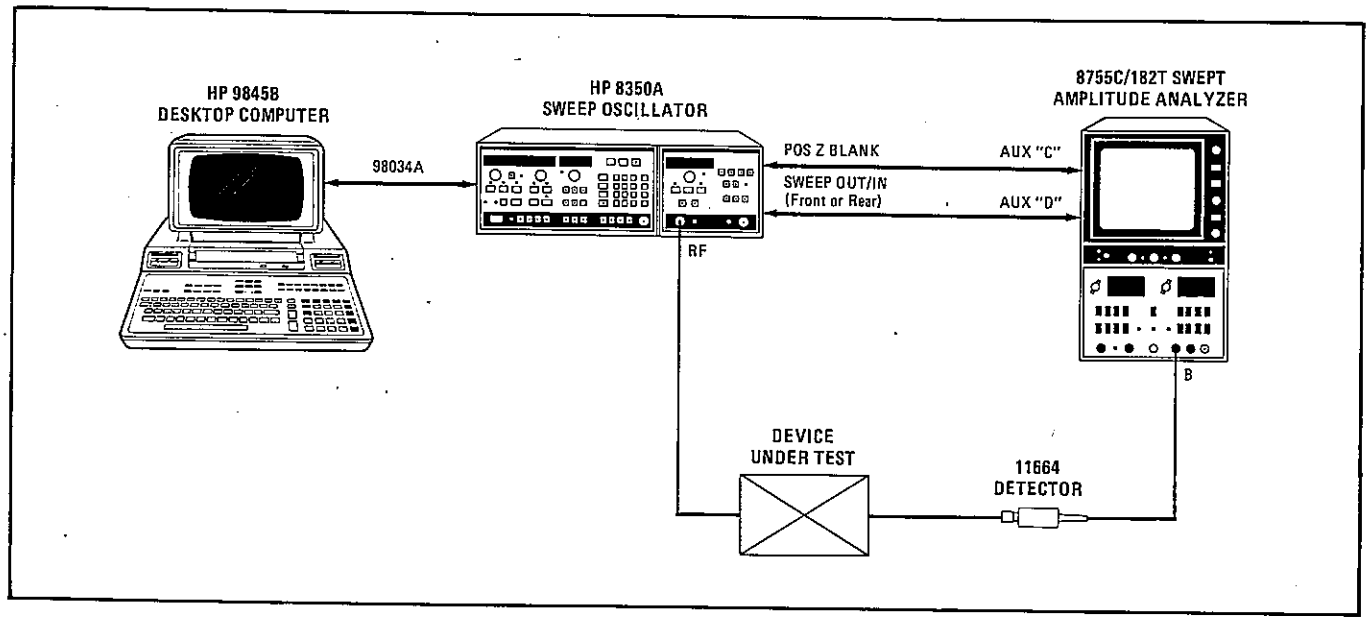

Figure 2. Equipment Setup For Program 3

After connecting the equipment: reset the 9845B, scratch the 9845B memory, then type in the above program. Then run the program. The 8350A will initially undergo an instrument preset which will set the proper power leveling mode and sweep blanking signals. Since the 8755C requires the RF signal to be modulated at a 27.8 kHz rate, the internal amplitude modulation is enabled. If using a 4 to 6 GHz Bandpass Filter as the test device, the CRT display should reflect the filter transmission response over the 3 to 7 GHz range. Two frequency markers of the Z-Axis Intensity dot variety are set to 4 and 6 GHz, hopefully within the passband or near the 3 dB points. The setup can be modified by changing the values in lines 60, 70, 80, 90, and/or 100, then re-run the program.

EXAMPLE PROGRAM 4: Learning An Instrument State

Being able to save a specific instrument state is helpful when it is needed several times in a test or measurement procedure. The user could save the instrument state by manually logging the important sweep parameters such as frequency range, power level, ALC modes, etc., then re-inputting them at the appropriate time. A somewhat simpler approach is to save the instrument state in one of the 8350A internal storage registers, then recall it when needed. However, this is not a permanent solution unless the 8350A Non-volatile Memory option (Option 001) is used. A more permanent solution is to use the Output Learn String function of the 8350A so that the 9845B can learn then store a data string that describes the present instrument state on a tape cartridge or in its' internal memory. Once an instrument state is stored or learned, the 8350A can then be restored to that state using the Input Learn String function. The power of these instrument Learn/Teach functions are demonstrated by the following program using the 9845B fast data transfer function.

PROGRAM 4

```
10   OPTION BASE 1
20   DIM A$[100]
30   OUTPUT 719;"IPMD1"
40   LOCAL 719
50   PAUSE
60   OUTPUT 719;"OL"
70   ENTER 719 BFHS 90 USING "#,90A";A$
80   PAUSE
90   OUTPUT 719;"IL"&A$
100  END
```

PROGRAM 4 EXPLANATION:

Line 10: Define the first element in any array to be at index number 1.

Line 20: Set the length of the A$ string to 100 characters.

Line 30: Set the 8350A to a predefined state via instrument preset and enable the square wave modulation.

Line 40: Return the 8350A to local control.

Line 50: Temporarily stops program execution.

Line 60: Program the 8350A to output the Learn String.

Line 70: Read the Learn String into the 9845B using a byte fast handshake transfer of 90 string characters ignoring the line feed as the string terminator. Store the 90 character Learn String in A$.

Line 80: Temporarily stops program execution.

Line 90: Program the 8350A to accept a Learn String, then send the new Learn String to the 8350A.

Line 100: Stops program execution.

Setup the equipment as in example 3 using the CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 9845B, scratch the 9845B memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state, then press CONT on the 9845B.
2. Turn the 8350A line power off. Wait five seconds then turn the 8350A power back on. Press INSTR PRESET on the 8350A.
3. Press CONT on the 9845B. Verify on the CRT display and/or the 8350A that the original instrument state has been restored.

EXAMPLE PROGRAM 5: Interrogating The Present Value Of A Function

While the 8350A Learn String enables the user to completely save a string of characters that define the present instrument state, the information is densely packed and encoded to save memory space. If the user wishes to determine the actual value of a specific parameter, say the Start Frequency, it would require a tedious process to extract a numeric value from several characters within the Learn String. An easier approach is to use the Output Interrogated Parameter function of the 8350A. With this function the 9845B instructs the 8350A to output the present numeric value of a specified function. Any function that has a numeric value associated with it can be interrogated. Note that if the parameter is not presently active, the 8350A uses a computed value or its previous value. The following program demonstrates the capability of the interrogate function.

PROGRAM 5

```
10   OUTPUT 719;"IPND1"
20   LOCAL 719
30   PAUSE
40   OUTPUT 719;"OPFA"
50   ENTER 719;A
60   PRINT "Start Freq = ";A/1E6;" MHz"
70   OUTPUT 719;"OPFB"
80   ENTER 719;B
90   PRINT "Stop Freq  = ";B/1E6;" MHz"
100  OUTPUT 719;"OPST"
110  ENTER 719;T
120  PRINT "Sweep Time = ";1000*T;" msec"
130  END
```

PROGRAM 5 EXPLANATION:

Line 10: Set the 8350A to a predefined instrument state via instrument preset and enable the square wave modulation.

Line 20: Return the 8350A to local control.

Line 30: Temporarily stops program execution.

Line 40: Program the 8350A to output the present value of the Start Frequency.

Line 50: Read the value into the 9845B and store it in the variable 'A'.

Line 60: Print on the CRT display the present value of the Start Frequency in MHz.

Line 70: Program the 8350A to output the present value of the Stop Frequency.

Line 80: Read the value into the 9845B and store it in the variable 'B'.

Line 90: Print on the CRT display the present value of the Stop Frequency in MHz.

Line 100: Program the 8350A to output the present value of the Sweep Time.

Line 110: Read the value into the 9845B and store it in the variable 'T'.

Line 120: Print on the CRT display the present value of the Sweep Time in milliseconds.

Line 130: Stops program execution.

Setup the equipment as in example 3 using the analyzers' CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 9845B, scratch the 9845B memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state using the Start Frequency, Stop Frequency, and Sweep Time controls.
2. Press CONT on the 9845B.
3. The present values of the Start Frequency, Stop Frequency, and Sweep Time are sequentially interrogated and then printed on the CRT of the 9845B.

EXAMPLE PROGRAM 6: A Stepped CW Sweep

Present automatic measurement systems typically make measurements at a sequence of CW test frequencies instead of analog sweeping the frequency range of interest. If swept, the measurement data taking machine would need to sample the RF signal at a very fast rate to maintain accurate frequency information, too. This is typically not accomplished. Stepped CW sweeps can be accomplished in several ways with the 8350A:

1. Program sequential CW test frequencies.
2. Program the frequency sweep range then enable the manual sweep mode. Perform a stepped manual sweep by repetitively programming the step up/increment function.
3. Program the CW frequency to the start frequency, the Step Size to an appropriate value, then repetitively program the step up/increment function.

Considering the speed of programming the above approaches, the third is the most efficient time wise. This program illustrates a stepped sweep using this approach.

PROGRAM 6

```
10   OUTPUT 719;"IPMD1FI0"
20   INPUT "Start Freq (GHz) = ?",A
30   INPUT "Stop Freq (GHz) = ?",B
40   INPUT "Step Size (GHz) = ?",C
50   D=(B-A)/C
60   OUTPUT 719;"CWSS";C;"GZ"
70   OUTPUT 719;"CW";A;"GZ"
80   FOR I=1 TO D
90   OUTPUT 719;"UP"
100  WAIT 20
110  NEXT I
120  GOTO 70
```

PROGRAM 6 EXPLANATION:

Line 10: Set the 8350A to a predefined instrument state, enable the square wave modulation, and disable CW Filter.

Line 20: The 9845B displays "Start Freq (GHz) = ?", input prompts for Start frequency of the sweep. Store it in the variable 'A'.

Line 30: The 9845B displays "Stop Freq (GHz) = ?", input prompts for the stop frequency of the sweep. Store it in 'B'.

Line 40: The 9845B displays "Step Size (GHz) = ?", input prompts for the step size of the sweep. Store it in 'C'.

Line 50: Determine the number of frequency steps in sweep, store in 'D'.

Line 60: Set the CW Step Size.

Line 70: Set the CW frequency to the start frequency value.

Line 80: Iterate the CW step 'D' times.

Line 90: Program the Step Increment/Up function.

Line 100: Wait 20 milliseconds for settling.

Line 110: Continue step iteration.

Line 120: Go to line 70.

The equipment setup is the same as in the previous example. Reset the 9845B, scratch the 9845B memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. Then perform the following:

1. The 9845B will display "Start Freq (GHz) = ?". Answer this prompt by inputting the desired Start frequency (value in GHz) of the sweep, then press CONT.
2. The 9845B will display "Stop Freq (GHz) = ?". Answer this prompt with the desired Stop frequency (in GHz) of the sweep, then press CONT.

3. The 9845B will display "Step Size (GHz) = ?". Answer this prompt with the desired Step size (in GHz) of the sweep, then press CONT.
4. The 8350A CW frequency will be programmed to the Start frequency of the sweep selected. Then the CW frequency is repetitively incremented by the step size value. The sweep is then restarted after reaching the stop frequency.

To stop the program press STOP.

Since part of the time involved in changing CW frequencies is in updating the numeric LED display if this could be defeated the CW frequency time can be optimized. Note that one drawback is that the numeric display will not indicate the present frequency. The 8350A provides a Display Update On/Off function and it can be implemented by modifying line 10 to be:

OUTPUT 719;"IPMD1FI0DU0"

Then re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 7: Using Service Requests, Status Bytes, and Request Mask

Certain error conditions of the 8350A can be detected by the 9845B so that corrective action can be taken. Examples of some detectable error conditions are RF power unleveled, numeric data entry out of range, and line power failure. If an error condition exists, the user can instruct the 8350A to request service from the 9845B by initiating a Service Request (SRQ). The 9845B can detect whether an SRQ has taken place on the bus by analyzing bit 7 (see note below) of the Status Byte of the 98034A HP-IB Interface. Two modes are available for analyzing the 98034A Status Byte: (1) periodically read the Status Byte, or (2) enable bit 7 to interrupt the program when it is set. In either case, once it is determined that the 8350A has requested service, the specific error condition(s) can then be determined by reading and analyzing the Status Bytes of the 8350A. The 8350A has two Status Bytes, each consisting of 8 bits with each bit indicating the present status of a particular function or condition. See Table 1 for a complete description of the conditions associated with each Status Byte bit. The user can analyze these Status Bytes for every SRQ, or more simply, instruct the 8350A to issue an SRQ only if a specific set of error conditions exists. The set of conditions is determined by a numeric value passed by the Request Mask function. This numeric value is generated by summing the decimal values of each Status Byte bit to be checked. This program demonstrates the capability of the SRQ and Status Bytes to detect an error condition.

NOTE

This assumes that the status bits are numbered 0 thru 7 with the least-significant bit being number 0. Other references may assume that the bits are numbered 1 thru 8 with the least-significant bit being number 1.

If using an 86200 Series Plug-in, the Status Bytes can provide only limited information. Table 1 indicates which Status Byte functions/bits are usable.

PROGRAM 7

```
10   ABORTIO 7
20   CLEAR 719
30   OUTPUT 719;"IPMD1RM"&CHR$(97)
40   ON INT #7 GOSUB Srq
50   CONTROL MASK 7;128
60   CARD ENABLE 7
70   INPUT "CW Freq (GHz) = ?",F
80   OUTPUT 719;"CW";F;"GZ"
90   WAIT 100
100  GOTO 70
110 Srq: STATUS 719;A
120  IF BIT(A,6)<>1 THEN GOTO 160
130  IF BIT(A,0)=1 THEN PRINT
     "Parameter Altered"
140  IF BIT(A,5)=1 THEN PRINT "Syntax Error"
150  CLEAR 719
160  CONTROL MASK 7;128
170  CARD ENABLE 7
180  RETURN
```

PROGRAM 7 EXPLANATION:

Line 10: Clear the status of the HP-IB.

Line 20: Clear the status of the 8350A.

Line 30: Preset the 8350A to a predefined instrument state enable the square wave modulation, and set the Request Mask to enable Parameter Altered and Syntax Error SRQ's.

Line 40: Indicate that if an interrupt from the 98034A HP-IB Interface is received that program execution will branch to the interrupt service routine located at the line labelled 'Srq'.

Line 50: Specify an interrupt from the 98034A if bit 7 (decimal value 128) is set.

Table 1. 8350A Status Byte Descriptions

STATUS BYTE (#1)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	N/A	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	N/A	SRQ on Change in Extended Status Byte	N/A	SRQ on Numeric Parameter Altered to Default Value

EXTENDED STATUS BYTE (#2)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	Airflow Failure	*RF Unleveled	Power Failure/on	N/A	N/A	N/A	N/A	Self Test Failed

*Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.

Line 60: Enable the controller to accept an interrupt from the 98034A.

Line 70: The 9845B displays "CW Freq (GHz) = ?", input prompts for the desired CW frequency value in GHz. Store it in the variable 'F'.

Line 80: Set the CW frequency as determined by 'F'.

Line 90: Wait 100 milliseconds to allow the 8350A to interrupt.

Line 100: Go to line 70.

Line 110: Location of the interrupt service routine. Read the Status Byte of the 8350A and store it in 'A'.

Line 120: Check bit 6 of the 8350A Status Byte to see if it generated the SRQ, go to line 160 if not.

Line 130: Check bit 0 of the 8350A Status Byte for an Altered Parameter error. Print on the CRT display "Parameter Altered" if one exists.

Line 140: Check bit 5 of the 8350A Status Byte for a Syntax error. Print on the CRT display "Syntax Error" if one exists.

Line 150: Clear the 8350A Status Byte to enable another SRQ.

Line 160: Re-specify bit 7 of the 98034A to cause an interrupt.

Line 170: Re-enable interrupts from the 98034A.

Line 180: Return from the interrupt service routine to the main program.

The equipment setup is the same as the previous example. Reset the 9845B, scratch the 9845B memory, then type in the above program. Run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. The 9845B then displays "CW Freq (GHz) =?". Answer this prompt by inputting the desired CW frequency in GHz, then press CONT. Verify that the 8350A CW frequency has been properly programmed. Try several values that are out of range of the plug-in's frequency limits and verify that an error message was printed on the CRT display. The program repeats the above input prompt. To stop the program press STOP.

HP-IB PROGRAM CODES

Code	Description
AKm	Amplitude Marker On/Off
ALmn	Alternate Sweep On/Off
A1	Internal Leveling
A2	External Crystal Leveling
A3	External Power Meter Leveling
BK	Backspace
CAm	Amplitude Crystal Marker On/Off (83522/83525 Only)
CF	Center Frequency
CIm	Intensity Crystal Marker On/Off (83522/83525 Only)
CW	CW Frequency
C1	1 MHz Crystal Marker Frequency (83522/83525 Only)
C2	10 MHz Crystal Marker Frequency (83522/83525 Only)
C3	50 MHz Crystal Marker Frequency (83522/83525 Only)
C4	External Crystal Marker Frequency (83522/83525 Only)
DF	Delta F Frequency Span
DM	dBm
DN	Step Down/Decrement
DPm	Display Blanking On/Off
DUm	Display Update On/Off
E	Exponent Power Of 10
FA	Start Frequency
FB	Stop Frequency
FIm	CW Filter In/Out
F1	−20 MHz/V FM
F2	−6 MHz/V FM
GZ	GHz
HZ	Hz
IL	Input Learn String
IP	Instrument Preset
IX	Input Micro Learn String
KZ	KHz
MC	Marker To Center Frequency
MDm	Square Wave Amplitude Modulation On/Off
MO	Marker Off
MPm	Marker 1-2 Sweep On/Off
MS	Milliseconds
MZ	MHz
M0	Marker Off
M1	Marker #1
M2	Marker #2
M3	Marker #3
M4	Marker #4
M5	Marker #5
NT	Network Analyzer Trigger (8410B)
OA	Output Active Parameter
OL	Output Learn String
OM	Output Mode String
OP	Output Interrogated Parameter
OS	Output Status Bytes
OX	Output Micro Learn String
PL	Power Level
PSm	Power Sweep On/Off
RCn	Recall Register
RFm	RF Power On/Off
RM	Service Request Mask
RPm	RF Blanking On/Off
RS	Reset Sweep
SC	Seconds
SF	Frequency Step Size
SH	Shift Function
SLm	Slope On/Off
SM	Manual Sweep
SP	Power Step Size
SS	Step Size
ST	Sweep Time
SVn	Save Register
SX	external Sweep
TS	Take Sweep
T1	Internal Sweep Trigger
T2	Line Sweep Trigger
T3	External Sweep Trigger
T4	Single Sweep
UP	Step Up/Increment
VR	CW Vernier
0–9 + −	Acceptable Numeric Data

NOTES

1. **Program codes of the form "XXm" use "m" to turn the function On or Off (1 or 0). For the storage register functions the "n" is 1 through 9.**
2. **The 8350A ignores spaces, plus signs, negative signs (except when valid) and any unexpected characters. Program codes can be upper or lower case alpha characters.**

For more information, call your local HP Sales Office or nearest Regional Office: **Eastern** (201) 265-5000; **Midwestern** (312) 255-9800; **Southern** (404) 955-1500; **Western** (213) 970-7500; **Canadian** (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland. **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Suginami-ku, Tokyo 168.

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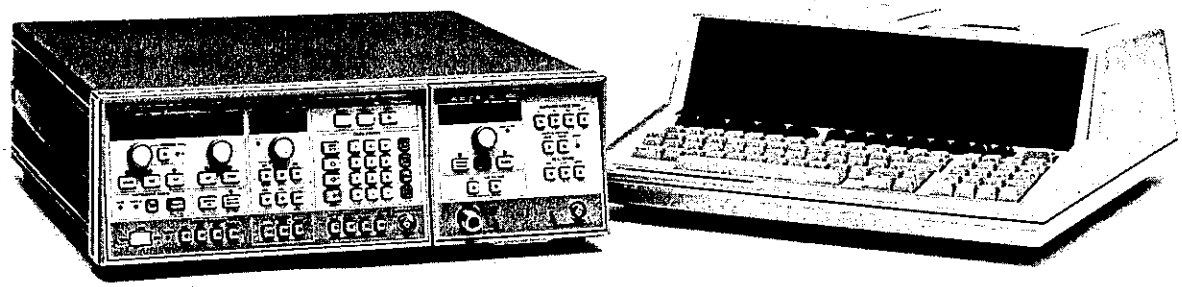
DESIGNED FOR HP-IB SYSTEMS

Programming Note

8350A/85-1
Supersedes: None

Introductory Operating Guide for the HP 8350A Sweep Oscillator with the HP 85A Personal Computer



INTRODUCTION

This programming note is a guide to the remote operation of the HP 8350A Sweep Oscillator and appropriate HP 83500 Series Plug-in using the HP 85A Personal Computer. Included in this guide are the system connections for remote operation and several example programs with descriptions of each step.

The 8350A is fully compatible with the Hewlett-Packard Interface Bus (HP-IB). When used with a controller such as the 85A, complete control of the sweep mode, frequency limits, frequency markers, power level, and all other front panel controls can be achieved.

REFERENCE INFORMATION

For further information on the HP Interface Bus, the following references should prove helpful:

- Condensed Description of the Hewlett-Packard Interface Bus (HP Literature No. 59401-90030).

Complete reference information on the 8350A can be found in the 8350A Sweep Oscillator Operating and Service Manual (HP Part No. 08350-90001). For information on operating the 85A the following references are available:

- 85A Owner's Manual and Programming Guide (HP Part No. 00085-90002).
- 85A I/O Programming Guide (HP Part No. 00085-90142).

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EQUIPMENT REQUIRED

To perform all the example programs as described in this programming note, you will need the following equipment and accessories:

1. HP 8350A Sweep Oscillator with any HP 83500 Series Plug-in. Note that an HP 86200 Series Plug-in with the HP 11869A Adapter can be used but all references to power level and power control are not applicable.

2. HP 85A Personal Computer with:

   a. HP Part No. 00085-15003 I/O ROM

   b. HP 82936A ROM Drawer

   c. HP 82937A HP-IB Interface Card/Cable

NOTE

The following equipment is not required for the programs to function but rather for a visual display of the 8350A functions.

3. HP 8755S Frequency Response Test Set with:

   a. HP 8755C Swept Amplitude Analyzer

   b. HP 180TR or 182T Display Unit

   c. HP 11664A or 11664B Detector

   d. Two 120 centimetre BNC cables (HP 11170C variety)

   or any appropriate Oscilloscope with Crystal/Schottky Detector, Attenuator, and BNC Cabling.

4. Any test device over the frequency range of the 83500 Series Plug-in.

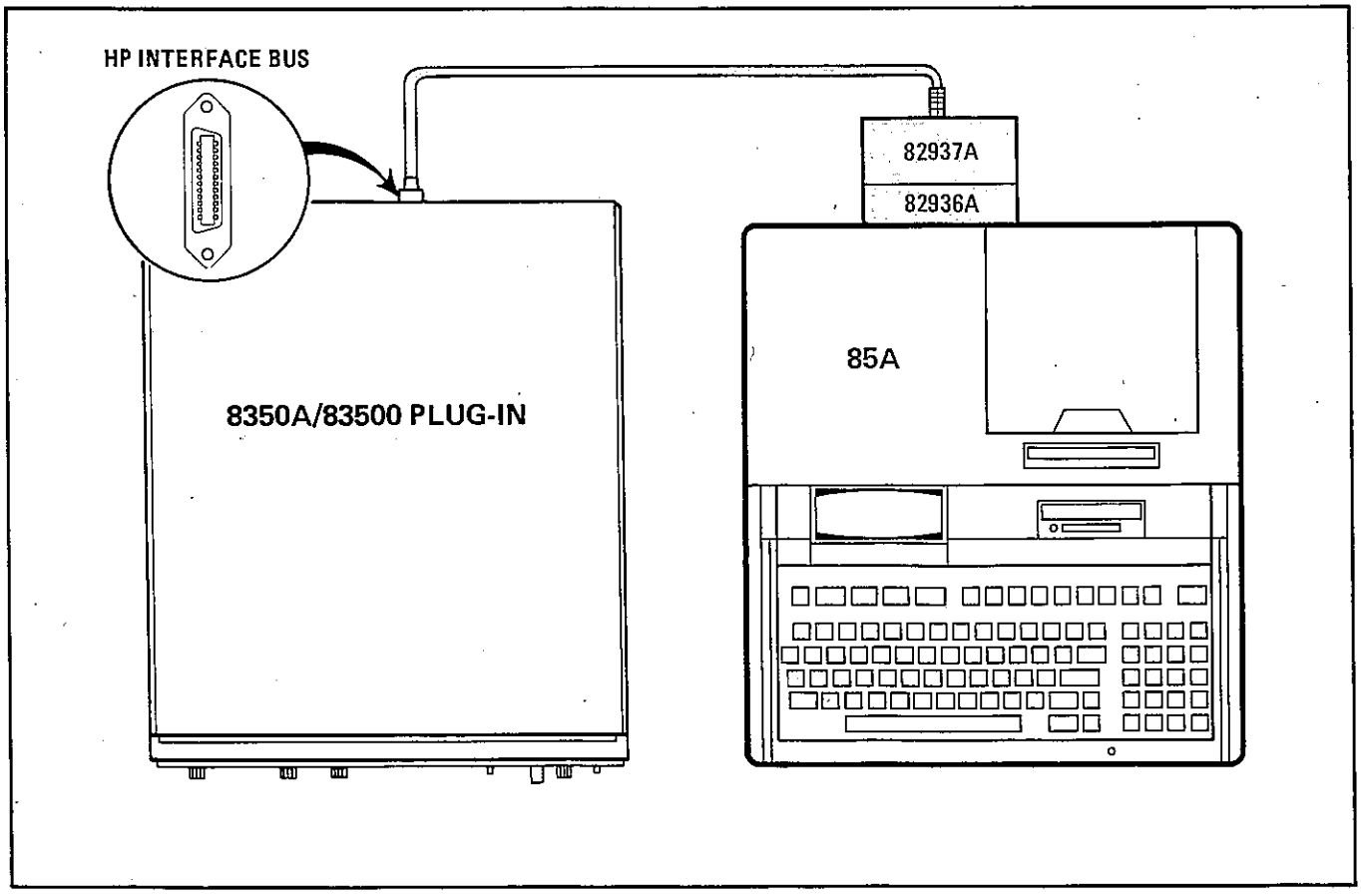

FIGURE 1: System Connection

SET-UP

Figure 1 shows the system connection and switch settings for the 82937A HP—IB Interface and the 85A Personal Computer. The following procedure completes the setup:

1. Turn off the power to the 85A.
2. Verify that the ROM is installed in the 85A. If not, then install the ROM in the 82936A ROM Drawer then insert the drawer in one of the rear panel slots of the 85A.
3. Install the 82937A HP—IB Interface Card into one of the rear panel slots of the 85A.
4. Connect the 24-pin HP-IB connector of the 82937A to the rear panel HP-IB connector of the 8350A. This connector is tapered to insure proper connection.

CAUTION

Do not attempt to mate black metric threaded screws on one connector with silver English threaded nuts on another connector, or vice-versa, as damage may result. A metric conversion kit which will convert one cable and one or two instruments to metric hardware is available by ordering HP Part No. 5060-0138.

5. All programs within this guide expect the 8350A HP-IB address to be decimal 19. The 8350A HP-IB address switches are located inside the instrument and are factory preset to decimal 19. To find the present HP-IB address use the front panel "Set HP-IB Address" by executing:

   Press SHIFT LCL

   The FREQUENCY/TIME display will indicate the present decimal address. To reset the number displayed if not 19:

   Press 1 9 GHz

   This HP-IB address will remain in effect until the instrument is powered off since the internal address switches are read at power on (unless 8350A Option 001 Non-volatile Memory is used). Since Example 4 requires the 8350A to be powered off and then on, the internal address switches should be reset to 19 if necessary.

CHECK-OUT

Turn on the 85A and the 8350A. The 85A should display the cursor ("—") in the upper left corner of the CRT display. The 8350A should undergo a turn-on self test consisting of the red LED numeric displays being blanked and all yellow indicator LED's on, then the 8350A sweep controls are set to the instrument preset state: Start/Stop Sweep over the entire plug-in frequency range, fastest sweep time for plug-in (typically 10 milliseconds), and maximum leveled output power for the plug-in. If the 8350A fails the power-on self test an error message will be displayed in the far left LED display. Check section 8 of the 8350A Operating and Service Manual for error message decoding and diagnostics.

To verify that the HP-IB connections and interface are functional perform the following on the 85A:

1. Press SHIFT RESET
2. Type 'REMOTE 719'
3. Press END LINE

Verify that the REMote light on the 8350A is lit. If this fails, verify that the 82937A select code switch is set to "7" (this switch is located inside the 82937A so refer to its Installation Manual), the 8350A address switches are set to "19", and the interface cable is properly connected.

If the 85A display indicates an error message, it is possible that the above remote message was typed in incorrectly or the ROM's are not properly installed. If the 85A accepts the remote statement and the display is clear but the 8350A REMote light does not turn on, you could have a defective 82937A or 8350A. Perform the operational checks as outlined in the respective Operating and Service Manuals to find the defective device.

PROGRAMMING EXAMPLES

The following sample programs show the various ways of controlling the 8350A. In remote control situations the 8350A Sweep Oscillator can interact with the system HP-IB controller in two basic ways:

1. "Listen Mode": The 8350A listens to the control commands as to modifying the present instrument state. This effectively commands the 8350A to do a specific event much like setting a front panel function.
2. "Talk Mode": The 8350A informs the controller of the present instrument state with a numeric value or a string of characters. This effectively allows the user to interrogate or learn any 8350A function.

Each programming example is structured using the following format:

1. A general description of the functions exercised.
2. The program listing.
3. An explanation of each program line.
4. Detailed instructions for operating the system.

EXAMPLE PROGRAM 1: Remote, Local, Local Lockout, and Instrument Preset

Before programming the 8350A for different sweep functions, the user should be aware of the extent of remote control that can be used. The Remote Enable ('REMOTE') command sets the 8350A into remote control from the local (manual) mode. In remote the 8350A will perform only as its functions are programmed. However if the LOCAL button is pressed, the 8350A will return from the remote state to local control. To prevent this from occurring the Local Lockout ('LOCAL LOCKOUT') command disables all front panel controls, specifically the "Local" key. The Go To Local ('LOCAL') command will return the 8350A to front panel control thereby removing it from the remote and local lockout modes. Note that the above remote and local commands are different from the general HP-IB bus local and remote commands ('LOCAL 7' and 'REMOTE 7'). Finally, in remote control it is periodically desirable to reset the 8350A to a predefined state, this is achievable with the Instrument Preset function.

PROGRAM 1

```
 10 REMOTE 719
 20 DISP "Remote"
 30 PAUSE
 40 REMOTE 719
 50 LOCAL LOCKOUT 7
 60 DISP "Local Lockout"
 70 PAUSE
 80 LOCAL 719
 90 DISP "Local"
100 PAUSE
110 OUTPUT 719 ;"IP"
120 END
```

PROGRAM 1 EXPLANATION:

Line 10: Sets 8350A to remote.
Line 20: The 85A displays "Remote'.
Line 30: Temporarily stops program execution.
Line 40: Sets 8350A to remote.
Line 50: Sets local lockout mode.
Line 60: The 85A displays "Local Lockout".
Line 70: Temporarily stops program execution.
Line 80: Sets 8350A to local.
Line 90: The 85A displays "Local".
Line 100: Temporarily stops program execution.
Line 110: Sets 8350A to remote and performs an Instrument Preset.
Line 120: Stops program execution.

To verify and investigate the different remote modes do the following:

1. Press CONTROL RESET SCRATCH ENDLINE on the 85A. This scratches the program memory.
2. Press INSTR PRESET on the 8350A.
3. Type in the above program.
4. Press SHIFT CLEAR RUN on the 85A.
5. With the 85A displaying "Remote", verify that the 8350A REMote light is lit. From the front panel, attempt to change the start frequency and verify that this is impossible. Verify that the Instrument Preset key and all other keys except LCL are disabled. Now press the LCL key and verify that the 8350A REMote light is off and that you can modify any of the sweep functions.
6. Press CONT on the 85A. With the 85A displaying "Local Lockout" verify that the 8350A REMote light is again lit. Again attempt to change the start frequency and perform an instrument preset. Verify that this is impossible. Now press the 8350A LCL key and verify that still no action is taken.
7. Press CONT on the 85A. With the 85A displaying "Local" verify that the 8350A REMote light is off. Also verify that all sweep functions now can be modified via the front panel controls.
8. Press CONT on the 85A. Verify that the 8350A has undergone an Instrument Preset and the REMote light is on. The Output ('OUTPUT 719') statement does two things, one it performs a 'REMOTE 719', and second it passes data to the 8350A.

Note that the 8350A LCL key produces the same result as programming 'LOCAL 719' or 'LOCAL 7'. Be careful as the latter command places all instruments on the HP-IB in local state as opposed to the 8350A alone.

EXAMPLE PROGRAM 2: Programming Functions

To program any function on the 8350A the controller must pass specific program codes and data to the sweeper. The statement that allows this is the Output ('OUTPUT') statement. The alphanumeric data string of the output statement can be a concatenation of character strings and/or variables. The data can be specific codes, free field formatted data, or reference a specific image ('IMAGE') statement. For example, to program the CW Frequency (CW), one program code sequence is "CW", followed by the frequency in GHz, then "GZ". If the frequency is to be 7.555 GHz, then the string "CW7.555GZ" will suffice. However if the frequency were to change then a variable 'F' could indicate the frequency in GHz and the program string could be "CW",F,"GZ". Using an image statement also allows a specific number of digits to be passed, thereby avoiding any unexpected round off errors.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency 7.555 GHz. If using a plug-in that does not cover this frequency then the value in lines 20 and 30 should be changed to an appropriate value.

PROGRAM 2

```
 10 OUTPUT 719;"IP"
 20 OUTPUT 719;"CW7.555GZ"
 30 DISP "CW=7.555 GHz"
 40 PAUSE
 50 DISP "CW=(in GHz)=";
 60 INPUT F
 70 PRINT "CW=";F;"GHz"
 80 OUTPUT 719;"CW";F;"GZ"
 90 GOTO 50
100 IMAGE "CW",DD.DDD,"GZ"
110 OUTPUT 719 USING 100;F
120 GOTO 50
```

PROGRAM 2 EXPLANATION:

Line 10: Puts the 8350A into a predefined state via instrument preset.
Line 20: Puts the 8350A in CW mode and programs a CW frequency of 7.555 GHz.
Line 30: The 85A displays "CW = 7.555 GHz".
Line 40: Temporarily stops program execution.
Line 50: The 85A displays "CW (in GHz) = ?".
Line 60: The user is prompted to input a new CW frequency value which is stored in the variable 'F'.
Line 70: Print on the CRT display the programmed CW frequency.
Line 80: Program the CW frequency using the default data format.
Line 90: Go to line 50.
Line 100: Image statement is set up for programming the CW frequency with a 1 MHz resolution.
Line 110: Program the CW frequency via image statement in line 100.
Line 120: Go to line 50.

The equipment setup is the same as the previous example. Reset the 85A, scratch the 85A memory, then type in the above program. Then perform the following:

1. Clear the 85A CRT display then run the program. The 85A displays "CW = 7.555 GHz". The 8350A changes from the instrument preset state of Start/Stop sweep to a CW frequency of 7.555 GHz.

2. Press CONT on the 85A. The 85A now displays "CW (in GHz) =?". Type in a new CW frequency (value in GHz), then press END LINE

3. The 8350A will be programmed to the new CW frequency with the new value printed on the internal printer. The program jumps back to step (2) above.

When inputting the CW frequency try several values, each with a different number of digits after the decimal point. Notice that the 8350A displays the frequency to 3 decimal places (1 MHz frequency resolution). Values with better than 1 MHz frequency resolution are rounded to the nearest MHz by the 8350A. However the 85A outputs data in a free-field format that outputs a number with all appropriate significant digits. Another approach is to utilize the image statement to set the desired number of decimal places. To use the image statement in the program, perform the following on the 85A:

Press PAUSE SHIFT CLEAR
Type 'DELETE 80, 90'
Press END LINE

This should delete lines 80 and 90 from program #2 and allow the use of lines 100, 110, and 120 instead. Run the modified program again and use the same steps for operation as before. Now if the value inputted has a frequency resolution greater than 1 MHz the 85A does the rounding instead of the 8350A. This is the preferred programming approach. Change the image statement for 10 MHz frequency

resolution and verify the results from the 8350A frequency display.

Since a device select code address can be a variable, verify that this can be used in the modified or original program #2 by doing the following:

1. Insert before line 10 a new line with the variable 'S' by:

   Press PAUSE SHIFT CLEAR
   Type '5 S=719'
   Press END LINE

2. Modify the output statement(s) by editing the necessary lines and changing the 'OUTPUT 719' to 'OUTPUT S' and 'OUTPUT 719 USING 100' to 'OUTPUT S USING 100'.

3. Re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 3: Setting Up A Typical Sweep

Typically the sweeper is programmed for the proper sweep frequency range, sweep time, power level, and marker frequencies for a test measurement. This program sets up the sweeper for a general purpose situation using several dedicated image statements. Note that not all parameters need to be reprogrammed every time.

NOTE

This program expects an 83500 Series Plug-in that covers the frequency range of at least 3 to 7 GHz. If using a plug-in with a different frequency range, change the values in lines 60, 90, and 100, to the appropriate values. If using an 86200 Series Plug-in then do not enter line 70.

PROGRAM 3

```
10 IMAGE "FA",DD.DDD,"GZFB",DD
   .DDD,"GZ"
20 IMAGE "ST",DDDDD,"MS"
30 IMAGE "M",D,DD.DDD,"GZ"
40 IMAGE "PL",DDD.DD,"DM"
50 OUTPUT 719;"IPMD1"
60 OUTPUT 719 USING 10 ; 3.7
70 OUTPUT 719 USING 40 ; 10
80 OUTPUT 719 USING 20 ; 50
90 OUTPUT 719 USING 30 ; 1.4
100 OUTPUT 719 USING 30 ; 2.6
110 END
```

PROGRAM 3 EXPLANATION:

Line 10: Image statement for setting the Start and Stop Sweep frequencies in GHz.
Line 20: Image statement for setting the Sweep Time in milliseconds.
Line 30: Image statement for setting a Frequency Marker by marker number and frequency in GHz.
Line 40: Image statement for setting the Output Power Level in dBm.
Line 50: Preset the sweeper to a known state via instrument preset and enable the internal 27.8 kHz Square Wave Amplitude Modulation.
Line 60: Set a Start/Stop Sweep of 3.0 to 7.0 GHz.
Line 70: Set the Output Power Level to +10 dBm.
Line 80: Set the Sweep Time to 50 milliseconds.
Line 90: Set Marker #1 to 4 GHz.
Line 100: Set Marker #2 to 6 GHz.
Line 110: Stop program execution.

Setup the equipment as shown in figure 2 by adding the 8755C, the 180TR or 182T, the 11664, and a test device like a 4 to 6 GHz Bandpass Filter. It is important that the two rear panel connections from the 8350A to the 8755C/182T are made for a proper CRT display. For the example measurement set the following front panel controls:

On the 8755C:
  Channel 1:
    Display ..... OFF (press all the display push buttons so that they are all out)
  Channel 2:
    Display ..... B
    dB/DIV ..... 10 dB
    Reference Level ..... −10 dB
    Reference Level Vernier ..... OFF
On the 182T or 180TR:
  Magnifier X1
  Display ..... INT

After connecting the equipment: reset the 85A, scratch the 85A memory, then type in the above program. Clear the 85A CRT display then run the program. The 8350A will initially undergo an instrument preset which will set the proper power leveling mode and sweep blanking signals. Since the 8755C requires the RF signal to be modulated at a 27.8 kHz rate, the internal amplitude modulation is

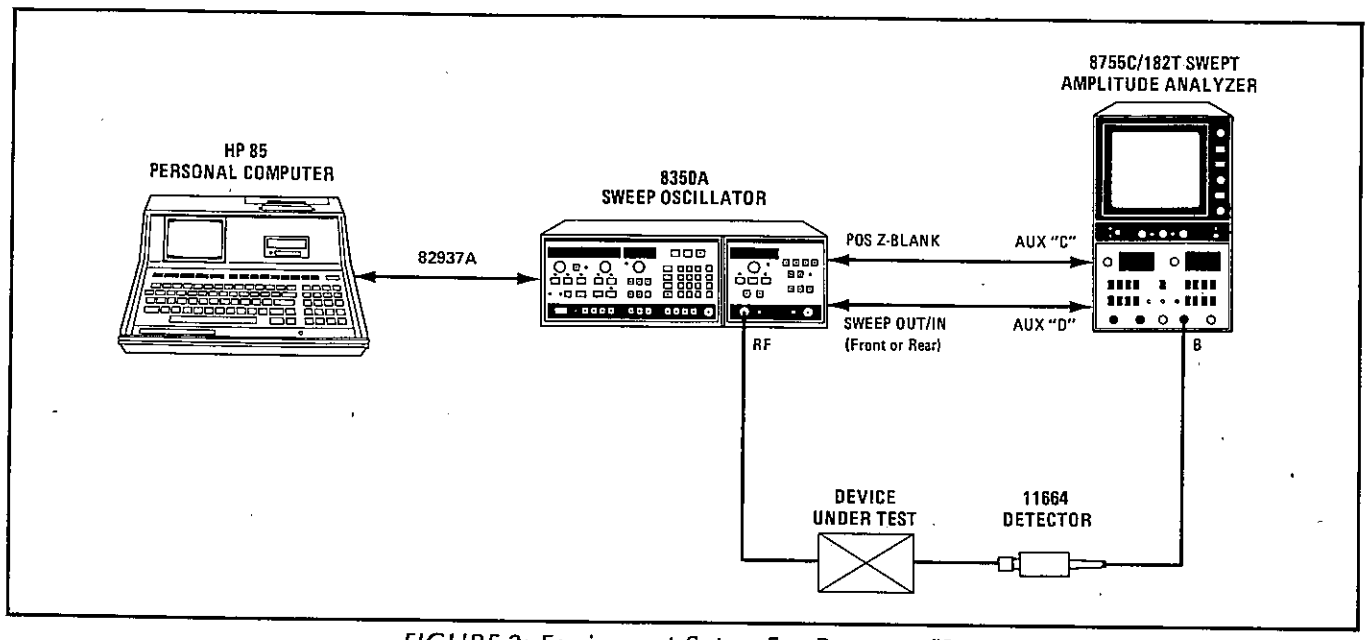

FIGURE 2: Equipment Setup For Program #3

enabled. If using a 4 to 6 GHz Bandpass Filter as the test device, the CRT display should reflect the filter transmission response over the 3 to 7 GHz range. Two frequency markers of the Z-Axis Intensity dot variety are set to 4 and 6 GHz, hopefully within the passband or near the 3 dB points. The setup can be modified by changing the values in lines 60, 70, 80, 90, and/or 100, then re-run the program.

EXAMPLE PROGRAM 4: Learning An Instrument State

Being able to save a specific instrument state is helpful when it is needed several times in a test or measurement procedure. The user could save the instrument state by manually logging the important sweep parameters such as frequency range, power level, ALC modes, etc., then re-inputting them at the appropriate time. A somewhat simpler approach is to save the instrument state in one of the 8350A internal storage registers, then recall it when needed. However, this is not a permanent solution unless the 8350A Non-volatile Memory option (Option 001) is used. A more permanent solution is to use the Output Learn String function of the 8350A so that the 85A can learn then store a data string that describes the present instrument state on a tape cartridge or in its' internal memory. Once an instrument state is stored or learned, the 8350A can then be restored to that state using the Input Learn String function. The power of these instrument Learn/Teach functions are demonstrated by the following program using the 85A fast data transfer function.

PROGRAM 4

```
10 OPTION BASE 1
20 DIM A$[100]
30 IOBUFFER A$
40 OUTPUT 719 ;"IPM01"
50 LOCAL 719
60 PAUSE
70 OUTPUT 719 ;"OL"
80 TRANSFER 719 TO A$ FHS ; EOI
90 A$=A$[1,90]
100 PAUSE
110 OUTPUT 719 ;"IL"&A$
120 END
```

PROGRAM 4 EXPLANATION:

Line 10: Define the first element of any array to be at index number 1.

Line 20: Set the length of the A$ string to 100 characters.

Line 30: Set up the string A$ as an I/O Buffer for data storage in fast read/write data transfer operations.

Line 40: Set the 8350A to a predefined state via instrument preset and enable the square wave modulation.

Line 50: Return the 8350A to local control.

Line 60: Temporarily stop program execution.

Line 70: Program the 8350A to output the Learn String.

Line 80: Read the Learn String into the 85A via the fast data transfer function using the HP-IB EOI (End or Identify) signal to terminate the transfer. Store the Learn String in A$.

Line 90: Extract the Learn String information from the I/O Buffer by removing the buffer pointers. Re-save the Learn String only in A$.

Line 100: Temporarily stop program execution.

Line 110: Program the 8350A to accept a Learn String, then send the new Learn String to the 8350A.

Line 120: Stop program execution.

Setup the equipment as in example 3 using the analyzers' CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 85A, scratch the 85A memory, then type in the above program. Clear the 85A CRT display then run the program. The 8350A will undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state, then press CONT on the 85A.

2. Turn the 8350A line power off. Wait five seconds then turn the 8350A power back on. Press INSTR PRESET on the 8350A.

3. Press CONT on the 85A. Verify on the analyzers' CRT display and/or the 8350A that the original instrument state has been restored.

EXAMPLE PROGRAM 5: Interrogating The Present Value Of A Function

While the 8350A Learn String enables the user to completely save a string of characters that define the present instrument state, the information is densely packed and encoded to save memory space. If the user wishes to determine the actual value of a specific parameter, say the Start Frequency, it would require a tedious process to extract a numeric value from several characters within the Learn String. An easier approach is to use the Output Interrogated Parameter function of the 8350A. With this function the 85A instructs the 8350A to output the present numeric value of a specified function. Any function that has a numeric value associated with it (except Step Size) can be interrogated. Note that if the parameter is not presently active, the 8350A uses a computed value or its previous value. The following program demonstrates the capability of the interrogate function.

PROGRAM 5

```
10 OUTPUT 719 ;"IPMD1"
20 LOCAL 719
30 PAUSE
40 OUTPUT 719 ;"OPFA"
50 ENTER 719 ; A
60 PRINT "Start Freq=";A/100000
   0;"MHz"
70 OUTPUT 719 ;"OPFB"
80 ENTER 719 ; B
90 PRINT "Stop Freq=";B/1000000
   ;"MHz"
100 OUTPUT 719 ;"OPST"
110 ENTER 719 ; T
120 PRINT "Sweep Time=";1000*T;"
   msec"
130 END
```

PROGRAM 5 EXPLANATION:

Line 10: Set the 8350A to a predefined instrument state via instrument preset and enable the square wave modulation.

Line 20: Return the 8350A to local control.

Line 30: Temporarily stops program execution.

Line 40: Program the 8350A to output the present value of the Start Frequency.

Line 50: Read the value into the 85A and store it in the variable 'A'.

Line 60: Print on the internal printer the present value of the Start Frequency in MHz.

Line 70: Program the 8350A to output the present value of the Stop Frequency.

Line 80: Read the value into the 85A and store it in the variable 'B'.

Line 90: Print on the internal printer the present value of the Stop Frequency in MHz.

Line 100: Program the 8350A to output the present value of the Sweep Time.

Line 110: Read the value into the 85A and store it in the variable 'T'.

Line 120: Print on the internal printer the present value of the Sweep Time in milliseconds.

Line 130: Stops program execution.

Setup the equipment as in example 3 using the analyzers' CRT display to verify the sweep settings. Note that the original equipment setup can also be used with the 8350A front panel indicators used for verification. Reset the 85A, scratch the 85A memory, then type in the above program. Clear the 85A CRT display then run the program. The 8350A will

undergo an instrument preset, enable the square wave modulation, then return to local front panel control. Then perform the following:

1. Adjust the 8350A to a preferred instrument state using the Start Frequency, Stop Frequency, and Sweep Time controls.
2. Press CONT on the 85A.
3. The present values of the Start Frequency, Stop Frequency, and Sweep Time are sequentially interrogated and then printed on the internal printer of the 85A.

EXAMPLE PROGRAM 6: A Stepped CW Sweep

Present automatic measurement systems typically make measurements at a sequence of CW test frequencies instead of analog sweeping the frequency range of interest. If swept, the measurement data taking machine would need to sample the RF signal at a very fast rate to maintain accurate frequency information, too. This is typically not accomplished. Stepped CW sweeps can be accomplished in several ways with the 8350A:

1. Program sequential CW test frequencies.
2. Program the frequency sweep range then enable the manual sweep mode. Perform a stepped manual sweep by repetitively programming the step up/increment function.
3. Program the CW frequency to the start frequency, the Step Size to an appropriate value, then repetitively program the step up/increment function.

Considering the speed of programming the above approaches, the third is the most efficient time wise. This program illustrates a stepped sweep using this approach.

PROGRAM 6

```
10 OUTPUT 719 ;"IPMD1"
20 DISP "Start Freq (GHz)="
30 INPUT A
40 DISP "Stop Freq (GHz)=";
50 INPUT B
60 DISP "Step Size (GHz)=";
70 INPUT C
80 D=(B-A)/C
90 OUTPUT 719 ;"CWSS";C;"GZ"
100 OUTPUT 719 ;"CW";A;"GZ"
110 FOR I=1 TO D
120 OUTPUT 719 ;"UP"
130 WAIT 20
140 NEXT I
150 GOTO 100
```

PROGRAM 6 EXPLANATION:

Line 10: Set the 8350A to a predefined instrument state and enable the square wave modulation.
Line 20: The 85A displays "Start Freq (GHz) = ?".
Line 30: Input prompts for start frequency of the sweep. Store it in the variable 'A'.
Line 40: The 85A displays "Stop Freq (GHz) = ?".
Line 50: Input prompts for the stop frequency of the sweep. Store it in 'B'.
Line 60: The 85A displays "Step Size (GHz) = ?".
Line 70: Input prompts for the step size of the sweep. Store it in 'C'.
Line 80: Determine the number of frequency steps in sweep, store in 'D'.
Line 90: Set the CW Step Size.
Line 100: Set the CW frequency to the start frequency value.
Line 110: Iterate the CW step 'D' times.
Line 120: Program the Step Increment/Up function.
Line 130: Wait 20 milliseconds for settling.
Line 140: Continue step iteration.
Line 150: Go to line 100.

The equipment setup is the same as in the previous example. Reset the 85A, scratch the 85A memory, then type in the above program. Clear the 85A CRT display then run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. Then perform the following:

1. The 85A will display "Start Freq (GHz) = ?". Answer this prompt by inputting the desired Start frequency (value in GHz) of the sweep, then press END LINE
2. The 85A will display "Stop Freq (GHz) = ?". Answer this prompt with the desired Stop frequency (in GHz) of the sweep, then press END LINE
3. The 85A will display "Step Size (GHz) = ?". Answer this prompt with the desired Step size (in GHz) of the sweep, then press END LINE
4. The 8350A CW frequency will be programmed to the Start frequency of the sweep selected. Then the CW frequency is repetitively incremented by the step size value. The sweep is then restarted after reaching the stop frequency.

To stop the program press STOP.

Since part of the time involved in changing CW frequencies is in updating the numeric LED display if this could be defeated the CW frequency time can be optimized. Note that one drawback is that the numeric display will not indicate the present frequency. The 8350A provides a Display Update On/Off function and it can be implemented by modifying line 10 to be:

OUTPUT 719 ;"IPMD1DU0"

Then re-run the modified program using the same operation steps as above.

EXAMPLE PROGRAM 7: Using Service Requests, Status Bytes, and Request Mask

Certain error conditions of the 8350A can be detected by the 85A so that corrective action can be taken. Examples of some detectable error conditions are RF power unleveled, numeric data entry out of range, and line power failure. If an error condition exists, the user can instruct the 8350A to request service from the 85A by initiating a Service Request (SRQ). The 85A can detect whether an SRQ has taken place on the bus by analyzing bit 7 (see note below) of the Status Byte of the 82937A HP-IB Interface. Two modes are available for analyzing the 82937A Status Byte: 1) periodically read the Status Byte, or 2) enable bit 7 to interrupt the program when it is set. In either case, once it is determined that the 8350A has requested service, the specific error condition(s) can then be determined by reading and analyzing the Status Bytes of the 8350A. The 8350A has two Status Bytes, each consisting of 8 bits with each bit indicating the present status of a particular function or condition. See Figure 3 for a complete description of the conditions associated with each Status Byte bit. The user can analyze these Status Bytes for every SRQ, or more simply, instruct the 8350A to issue an SRQ only if a specific set of error conditions exists. The set of conditions is determined by a numeric value passed by the Request Mask function. This numeric value is generated by summing the decimal values of each Status Byte bit to be checked. This program demonstrates the capability of the SRQ and Status Bytes to detect an error condition.

TABLE 1: 8350A Status Byte Descriptions

STATUS BYTE (#1)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	Front Panel SRQ REQUEST	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	*SRQ on RF Settled	SRQ on Change in Extended Status Byte	SRQ on Front Panel Entry Complete	SRQ on Numeric Parameter Altered to Default Value

EXTENDED STATUS BYTE (#2)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	N/A	*RF Unleveled	Power Failure	*RF Unlocked	*External Freq. Ref. Selected	*Oven Cold	*Over Modulation	Self Test Failed

*Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.

NOTE

This assumes that the status bits are numbered 0 thru 7 with the least-significant bit being number 0. Other references may assume that the bits are numbered 1 thru 8 with the least-significant bit being number 1.

If using an 86200 Series Plug-in, the Status Bytes can provide only limited information. Table 1 indicates which Status Byte functions/bits are usable.

PROGRAM 7

```
 10 ABORTIO 7
 20 CLEAR 719
 30 OUTPUT 719 ;"IPMD1"
 40 ON INTR 7 GOSUB 110
 50 ENABLE INTR 7;8
 60 DISP "CW Freq (GHz)=";
 70 INPUT F
 80 OUTPUT 719 ;"CW";F;"GZ"
 90 WAIT 100
100 GOTO 60
110 STATUS 7,1 ; X
120 A=SPOLL(719)
130 IF BIT(A,0)=1 THEN PRINT "Pa
    rameter Altered"
140 IF BIT(A,5)=1 THEN PRINT "Sy
    ntax Error"
150 CLEAR 719
160 ENABLE INTR 7;8
170 RETURN
```

PROGRAM 7 EXPLANATION:

Line 10: Clear the status of the HP-IB.
Line 20: Clear the status of the 8350A.
Line 30: Preset the 8350A to a predefined instrument state and enable the square wave modulation.
Line 40: Indicate that if an interrupt from the 82937A HP-IB Interface is received that program execution will branch to the interrupt service routine located at the line 110.
Line 50: Specify and enable the controller to accept an interrupt from the 82937A if bit 3 (decimal value 8) is set.
Line 60: The 85A displays "CW Freq (GHz) = ?".
Line 70: Input prompts for the desired CW frequency value in GHz. Store it in the variable 'F'.
Line 80: Set the CW frequency as determined by 'F'.
Line 90: Wait 100 milliseconds to allow the 8350A to interrupt.
Line 100: Go to line 60.
Line 110: Read the 82937A interrupt cause register to enable another interrupt.
Line 120: Location of the interrupt service routine. Read the Status Byte of the 8350A and store it in 'A'.
Line 130: Check bit 0 of the 8350A Status Byte for an Altered Parameter error. Print on the internal printer "Parameter Altered" if one exists.
Line 140: Check bit 5 of the 8350A Status Byte for a Syntax Error. Print on the internal printer "Syntax Error" if one exists.
Line 150: Clear the status of the 8350A.
Line 160: Re-specify and re-enable bit 3 of the 82937A to cause an interrupt.
Line 170: Return from the interrupt service routine to the main program.

The equipment setup is the same as the previous example. Reset the 85A, scratch the 85A memory, then type in the above program. Clear the 85A CRT display then run the program. The 8350A will undergo an instrument preset and enable the square wave modulation. The 85A then displays "CW Freq (GHz) = ?". Answer this prompt by inputting the desired CW frequency in GHz, then press END LINE. Verify that the 8350A CW frequency has been properly programmed. Try several values that are out of range of the plug-in's frequency limits and verify that an error message was printed on the internal printer. The program repeats the above input prompt. To stop the program press PAUSE

† NOTE

For Program 7 to function properly change line 30 to: 30 OUTPUT 719; "IPMD1RM & CHR$(97). This change enables bit 5 (SRQ on Syntax Error) and bit 0 (SRQ on Numeric Parameter to Default Value).

HP-IB PROGRAM CODES

CODE	DESCRIPTION
AKm	Amplitude Marker On/Off
ALmn	Alternate Sweep On/Off
A1	Internal Leveling
A2	External Crystal Leveling
A3	External Power Meter Leveling
BK	Backspace
CAm	Amplitude Crystal Marker On/Off (83522/83525 Only)
CF	Center Frequency
CIm	Intensity Crystal Marker On/Off (83522/83525 Only)
CW	CW Frequency
C1	1 MHz Crystal Marker Frequency (83522/83525 Only)
C2	10 MHz Crystal Marker Frequency (83522/83525 Only)
C3	50 MHz Crystal Marker Frequency (83522/83525 Only)
C4	External Crystal Marker Frequency (83522/83525 Only)
DF	Delta F Frequency Span
DM	dBm
DN	Step Down/Decrement
DPm	Display Blanking On/Off
DUm	Display Update On/Off
E	Exponent Power Of 10
FA	Start Frequency
FB	Stop Frequency
FIm	CW Filter In/Out
GZ	GHz
HZ	Hz
IL	Input Learn String
IP	Instrument Preset
IX	Input Micro Learn String
KZ	KHz
MC	Marker To Center Frequency
MDm	Square Wave Amplitude Modulation On/Off
MO	Marker Off
MPm	Marker 1-2 Sweep On/Off
MS	Milliseconds
MZ	MHz
M0	Marker Off
M1	Marker #1
M2	Marker #2
M3	Marker #3
M4	Marker #4
M5	Marker #5
NT	Network Analyzer Trigger (8410B)
OA	Output Active Parameter
OL	Output Learn String
OM	Output Mode String
OP	Output Interrogated Parameter
OS	Output Status Bytes
OX	Output Micro Learn String
PL	Power Level
PSm	Power Sweep On/Off
RCn	Recall Register
RFm	RF Power On/Off
RM	Service Request Mask
RS	Reset Sweep
SC	Seconds
SH	Shift Function
SLm	Slope On/Off
SM	Manual Sweep
SS	Step Size
ST	Sweep Time
SVn	Save Register
SX	External Sweep
TS	Take Sweep
T1	Internal Sweep Trigger
T2	Line Sweep Trigger
T3	External Sweep Trigger
T4	Single Sweep
UP	Step Up/Increment
VR	CW Vernier
	0—9 + — Acceptable Numeric Data

NOTES

1. **Program codes of the form "XXm" use "m" to turn the function On or Off (1 or 0). For the storage register functions the "n" is 1 through 9.**
2. **The 8350A ignores spaces, plus signs, negative signs (except for vernier, offset, and power values), and any unexpected characters. Program codes can be upper or lower case alpha characters.**

For more information, call your local HP Sales Office or nearest Regional Office: **Eastern** (201) 265-5000; **Midwestern** (312) 255-9800; **Southern** (404) 955-1500; **Western** (213) 970-7500; **Canadian** (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland. **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaldo-Higashi 3-chome, Suginami-ku, Tokyo 168.

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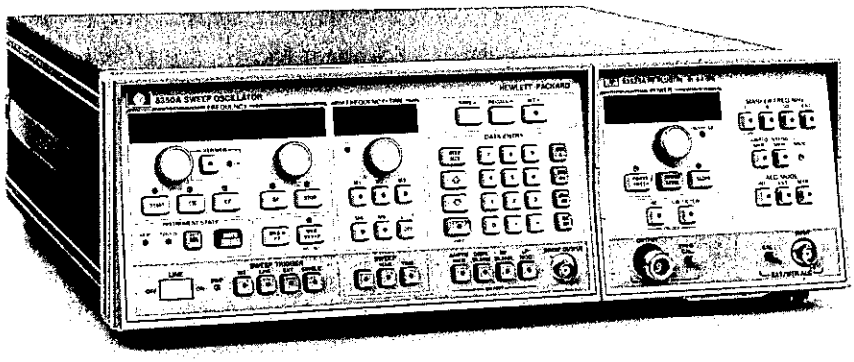
DESIGNED FOR HP-IB SYSTEMS

Programming Note

8350A/0000-2
Supersedes: None

SEPTEMBER 1980

Quick Reference Guide
for the HP 8350A Sweep Oscillator



INTRODUCTION

This programming note is a reference guide for the remote operation of the HP 8350A Sweep Oscillator and HP 85300 Series Plug-ins. This note is intended for use by those familiar with HP-IB programming and the basic functions of the HP 8350A Sweep Oscillator. For complete programming information refer to the HP 8350A Operating and Service manual.

INPUT DATA

The 8350A Sweep Oscillator and 83500 Series Plug-ins accept programming codes that contain information for programming all of the front panel and special HP-IB only functions except the Line switch and Set HP-IB Address. The programming data string consists of a string of ASCII coded characters composed of one or more the following control fields:

- Sweep Mode/Limits
- Frequency Markers
- Sweep Trigger
- Modulation/Blanking
- Step Size
- Instrument State/Registers
- Power Level
- Power Control
- ALC Modes
- Crystal Markers (83522/83525 Plug-ins only)
- Special HP-IB Only Functions

Input Syntax. The 8350A responds to program codes in the order in which they are received. Each function is programmed with a string of ASCII coded characters that follow one of the following sequences.

- [Function Code] [Numeric Value] [Units terminator] [EOS]
- [Function Code] [Numeric Value] [EOS]
- [Function Code] [EOS]

NOTE

The HP-IB program code sequence typically mirrors that of the local front panel keystroke sequence.

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Function Codes (Prefix Activate). Function codes are typically 2 to 4 character mnemonics. For functions that have a numeric value associated with it, passing the function code only will enable and activate the function for further data entry.

Numeric Value (Numeric Format). These are either a single decimal digit, a set of 14 characters or less representing a number, or a string of binary bytes. A string of 14 characters maximum can be expressed in exponential, decimal, or integer form. Acceptible numeric formats are referenced in further sections by the following format syntax:

Format #1: Exponential	±d***d.d***dE±dd
Format #2: Decimal	±d***d.d***d
Format #3: Integer	±d***d
Format #4: Single Digit	d
Format #5: Binary String	b***b
Format #6: Binary Byte	b

Where the character 'd' indicates a leading or trailing zero, a space, or a numeric digit (0 through 9). The character 'b' indicates an 8-bit binary byte. The characters "***" indicate a variable number of the previous character. Numeric values that are not binary in nature are scaled by the appropriate units terminator.

Units Terminator (Suffix). These are 2 character codes that terminate and scale the associated numeric value. Frequency values can be entered in GHz, MHz, kHz, or Hz. Sweep time values can be entered in seconds or milliseconds. Power values can be entered in dBm or dB. If a units terminator is not passed and a Line Feed (LF), semicolon (;) or comma (,) is encountered, the 8350A assumes the numeric value is in the fundamental units of Hz, seconds, or dB.

End Of String Message (EOS). This can be the ASCII characters Line Feed (LF, decimal 10), semicolon (";",decimal 59),comma(",",decimal 44) the bus EOI line true, or another function code string.

Valid Characters. The alpha program codes can be either upper or lower case since the 8350A will accept either type (they can be interchanged). Spaces, unnecessary signs (+,−), leading zeroes, and carriage returns (CR) are ignored.

Programming Data. See Table 1 for Input Programming Codes.

NOTE

If using an 83500 Series Plug-in that has Option 002 (70 dB Step Attenuator), the lifetime of the Step Attenuator will be reduced if using the Alternate Sweep function that alternates between two power levels using different Step Attenuator settings. Likewise rapid power level programming between step attenuator settings can cause a similar problem.

Instrument Preset. Instrument Preset turns off all functions then sets the following:

Sweep Mode: Start/Stop
  Start = minimum specified frequency
  Stop = maximum specified frequency
Sweep Type: Timed, minimum sweep time
Sweep Trigger: Internal
Vernier/Offset: set to 0 MHz
Markers: all values set to center of frequency span, all off
Modulation/Blanking: Display Blanking on
Frequency Step Size: set to default value (10% of span)
Status Bytes: cleared

83500 Series Plug-ins:
Power Level: maximum specified power (switch selectable to minimum power)
Power Sweep/Slope: set to 0 dB
RF/CW Filter: on/enabled
FM Sensitivity: determined by internal switch
Power Step Size: set to default value (1 dB)
Crystal Markers: 50 MHz, off

Instrument Preset does not affect Storage Registers, HP-IB address, or Service Request Mask value.

OUTPUT DATA

The 8350A has several output modes that allow the user to learn and interrogate the present instrument state. The following output modes are available:

- Learn String
- Micro Learn String
- Mode String
- Interrogated Function
- Active Function
- Status

The program codes and syntax to enable each function are described in the Input Data section. The Learn String, Micro Learn String, Mode String, and Status functions send a Data message consisting

Table 1. Input Programming Codes (1 of 4)

MODE	FUNCTION	PROGRAM CODE			NUMERIC VALUE		
		PREFIX ACTIVATE	NUMERIC FORMAT	SUFFIX	SCALE FACTOR	RANGE	RESOLUTION
SWEEP LIMITS/MODE							
Start/Stop Sweep	START	FA	1,2,3,4	GZ	$\times 10^9$ Hz	Plug-in Frequency Limits	Approximately 0.03% of Plug-in Bandwidth
	STOP	FB					
Center Frequency /ΔF Sweep	CF	CF		MZ	$\times 10^6$ Hz		
	ΔF	DF					
CW Frequency	CW	CW		KZ	$\times 10^3$ Hz		
	SWEPT CW	SHCW					
Frequency Offset	OFFSET	SHVR					
Frequency Vernier	VERNIER	VR		HZ	×1 Hz	±0.05% of BW	0.0004% of BW
FREQUENCY MARKERS							
Turn On and Set Marker Frequency	MARKER 1	M1	1,2,3,4	GZ	$\times 10^9$ Hz	Plug-in Frequency Limits	Approximately 0.4% of present ΔF
	MARKER 2	M2		MZ	$\times 10^6$ Hz		
	MARKER 3	M3		KZ	$\times 10^3$ Hz		
	MARKER 4	M4					
	MARKER 5	M5		HZ	×1 Hz		
Turn Off A Frequency Marker	M1 OFF	M1		MØ			
	M2 OFF	M2					
	M3 OFF	M3					
	M4 OFF	M4					
	M5 OFF	M5					
Turn Off All Markers	ALL OFF	SHMØ					
Turn On and Set Mkr Δ	MKRΔ, Marker "m", Marker "n"	SHM1	Mm Mn			where: m, n:1–5	
Turn Off Mkr Δ	MKRΔ OFF	MØ					
Active Marker to Center Frequency	MKR→ CF	MC					
Marker 1–2 Sweep	MARKER SWEEP ON	MP1					
	MARKER SWEEP OFF	MPØ					
Marker 1 to Start Marker 2 to Stop	M1→ST M2→SP	SHMP					
SWEEP TRIGGER TYPE							
Sweep Trigger Mode	INTERNAL	T1					
	LINE	T2					
	EXTERNAL	T3					
	SINGLE	T4					

Table 1. Input Programming Codes (2 of 4)

MODE	FUNCTION	PROGRAM CODE			NUMERIC VALUE		
		PREFIX ACTIVATE	NUMERIC FORMAT	SUFFIX	SCALE FACTOR	RANGE	RESOLUTION
SWEEP TRIGGER TYPE (Cont'd)							
Sweep Type	EXTERNAL SWEEP	SX					
	MANUAL SWEEP FREQUENCY	SM	1,2,3,4	GZ	$\times 10^9$ Hz	Present Start/ Stop Frequency	0.1% of Present ΔF
				MZ	$\times 10^6$ Hz		
				KZ	$\times 10^3$ Hz		
				HZ	X1 Hz		
	SWEEP TIME	ST	1,2,3,4	SC	X1 sec.	See Plug-in Typically .01 to 100 sec.	0.001 sec.
				MS	$\times 10^{-3}$ sec.		
MODULATION/BLANKING							
Amplitude Frequency Markers	AMPTD MKR ON	AK1					
	AMPTD MKR OFF	AKØ					
Display Blanking	DISP BLANK ON	DP1					
	DISP BLANK OFF	DPØ					
RF Blanking	RF BLANK ON	RP1					
	RF BLANK OFF	RPØ					
Square Wave Modulation	⊔⊓ MOD ON	MD1					
	⊔⊓ MOD OFF	MDØ					
STEP FUNCTIONS							
Setting Frequency Step Size	FREQUENCY STEP SIZE	SF	1,2,3,4	GZ	$\times 10^9$ Hz	Ø to 100% of Plug-in BW	Approximately 0.03% of Plug-in Bandwidth
				MZ	$\times 10^6$ Hz		
				KZ	$\times 10^3$ Hz		
				HZ	X1 Hz		
Setting Power Step Size*	POWER STEP SIZE	SP	1,2,3,4	DM	X1 dB	Ø to 15 dB	0.02 dB
Resetting Step Sizes To Default Values**	DEFAULT STEP SIZES	SHSS					
Increment Active Parameter	STEP UP ▲	UP					
Decrement Active Parameter	STEP DOWN ▼	DN					
INSTRUMENT STATE							
Instrument Preset	INSTR. PRESET	IP					
Saving An Instrument State	SAVE n	SV	4		X1	Registers 1 through 9	
Recalling An Instrument State	RECALL n	RC					
Alternate Sweep Mode	ALT n ON	AL1	4		X1	Registers 1 through 9	
	ALT n OFF	ALØ					
Undergo Self Test	SELF TEST #nn	SH	3		X1	00–99	

*These codes/functions do not apply to 86200 Series Plug-ins. **Both frequency and power step size.

Table 1. Input Programming Codes (3 of 4)

MODE	FUNCTION	PROGRAM CODE			NUMERIC VALUE		
		PREFIX ACTIVATE	NUMERIC FORMAT	SUFFIX	SCALE FACTOR	RANGE	RESOLUTION
SPECIAL HP-IB FUNCTIONS							
Status Bytes and Service Requests	OUTPUT STATUS	OS					
	SERVICE REQUEST MASK	RM	6			1 byte	
Full Learn String	OUTPUT LEARN STRING	OL					
	INPUT LEARN STRING	IL	5			90 bytes	
Micro Learn String***	OUTPUT MICRO LEARN STRING	OX					
	INPUT MICRO LEARN STRING†	IX	5			8 bytes	
Active Mode String	OUTPUT MODE STRING	OM	5			25 bytes	
Output Active Parameter Value	OUTPUT ACTIVE VALUE	OA					
Output Interrogated Parameter Value	OUTPUT INTERROGATED VALUE	OP	Interrogated Parameter Code				
Numeric Display Update	DISPLAY UPDATE ON	DU1					
	DISPLAY UPDATE OFF	DUØ					
Single Sweep Start/Stop	RESET SWEEP	RS					
	TAKE SWEEP	TS					
Network Analyzer Trigger (8410B)	NETWORK TRIGGER	NT					
PLUG-IN POWER LEVEL*							
Set Output Power Level	POWER LEVEL	PL	1,2,3,4	DM	X1 dBm	Plug-in Power Limits	0.02 dBm
Power Sweep Mode	POWER SWEEP ON	PS1	1,2,3,4	DM	X1 dB/Swp	Ø to 25.5 dB	0.02 dB
	POWER SWEEP OFF	PSØ					
Power Slope Mode	SLOPE ON	SL1	1,2,3,4	DM	X dB/GHz	Ø to 5 dB	0.01 dB
	SLOPE OFF	SLØ					
PLUG-IN ALC/SIGNAL CONTROL*							
ALC Leveling Modes	INTERNAL	A1					
	EXTERNAL (CRYSTAL)	A2					
	EXTERNAL POWER METER	A3					
RF Power	RF ON	RF 1					
	RF OFF	RF Ø					
CW Filter	FILTER ON	FI 1					
	FILTER OFF	FI Ø					

*These codes/functions do not apply to 86200 Series Plug-ins. ***Must be in CW mode, CW Filter off. †Exit this mode via "MØ " code.

Table 1. Input Programming Codes (4 of 4)

MODE	FUNCTION	PROGRAM CODE			NUMERIC VALUE		
		PREFIX ACTIVATE	NUMERIC FORMAT	SUFFIX	SCALE FACTOR	RANGE	RESOLUTION
PLUG-IN CRYSTAL MARKERS*							
Crystal Marker Frequency	1 MHz	C1					
	10 MHz	C2					
	50 MHz	C3					
	EXTERNAL INPUT	C4					
Amplitude Markers	AMPL MKR ON	CA 1					
	AMPL MKR OFF	CA Ø					
Intensity Markers	INTEN MKR ON	CI 1					
	INTEN MKR OFF	CI Ø					
PLUG-IN SPECIAL FUNCTIONS*							
FM Input Sensitivity	−20 MHz/V	F1					
	−6 MHz/V	F2					
Peak Output Power‡	PEAK	SHPL					

*These codes/functions do not apply to 86200 Series Plug-ins. ‡83590 Series Plug-in Only.

of a string of 8-bit binary bytes terminated using the bus EOI line true with the last byte. The Interrogate and Active functions send a Data message consisting of a 14 character ASCII string representing the numeric value in exponential form terminated with a Carriage Return/Line Feed (CR/LF).

Binary Syntax: [b***b] [EOI]

Numeric Syntax: [±d.ddddd E±dd] [CR] [LF]

Where the character 'b' indicates an 8-bit binary byte and 'd' indicates a decimal digit (0 through 9). Note that the binary output format could have bytes that may be misinterpreted as Carriage Returns and/or Line Feeds so the user should defeat the ASCII CR/LF as valid character string terminators and rely on the byte count.

Learn String:

Selected with the "OL" program code, the 8350A outputs a Learn String of 90 bytes in length. This binary data string completely describes the present instrument state (does not include the Storage Registers) of the 8350A and 83500 Series Plug-in. The information is packed and encoded for minimal storage requirements thereby making data analysis difficult. When stored in an ASCII character data string, the Learn String can later be input to the 8350A to restore that instrument state (See Input Data for Input Learn String information). The length of the Learn String is fixed, independent of the functions selected and the plug-in used.

Format: 90 [8 bit bytes] [EOI]

Micro Learn String:

Selected with the "OX" program code, the 8350A outputs a Micro Learn String of 8 bytes in length. This binary data string completely describes the present CW frequency, Vernier, Sweep Output voltage, and Power Level of the 8350A and 83500 Series Plug-in. The information is packed and encoded for minimal storage requirements thereby making data analysis difficult. When stored in an ASCII character data string, the Micro Learn String can later be input to the 8350A to restore that instrument state for rapid frequency programming (See Input Data for Input Micro Learn String information). Note the 8350A must be in CW mode and the CW Filter should be off when using this function. The length of the Micro Learn String is fixed, independent of the functions selected and the plug-in used.

Format: 8 [8 bit bytes] [EOI]

Mode String:

Selected with the "OM" program code, the 8350A outputs a Mode String of 25 bytes in length. This binary data string describes all presently active functions of the 8350A and 83500 Series Plug-in. The information is not packed thereby making data analysis simpler. The information passed includes only the active functions with no numeric values included. Use the Active or Interrogate Function if numeric values are desired. The length of the Mode String is fixed, independent of the functions selected and the plug-in used.

Format: 25 [8 bit bytes] [EOI]

Interrogate Function:

Selected with the "OP" program code and the program code for the function to be interrogated, the 8350A will output the present numeric value of the selected function. The units of the output data are Hz, dBm, dB, or sec., implied with the function selected.

Format: [±d.ddddd E±dd] [CR] [LF]

Active Function:

Selected with the "OA" program code, the 8350A will output the present numeric value of the presently active function (ie. enabled for modification from the keyboard or step keys). The units of the output data are Hz, dBm, dB, or sec., implied with the function selected.

Format: [±d.ddddd E±dd] [CR] [LF]

Status:

Selected with the "OS" program code, the 8350A will output 2 sequential bytes, 8 bits wide, giving the present instrument status. The first status byte is equivalent to the Status Byte of the Serial Poll, the second status byte is the Extended Status Byte which provides additional information. See Table 2 for a description of each Status Byte. Status Byte values are cleared upon execution of a Serial Poll (Status Byte message), Device Clear message, and/or the Instrument Preset function.

TRIGGER

The 8350A responds to the Group Execute Trigger (GET) command to the HP-IB bus select code and a Selective Device Trigger to the 8350A HP-IB address. The effect of the GET command is to trigger the sweep if presently in the Single Sweep Trigger mode only, otherwise no action is taken. The response is as if a Data message consisting of the Single Sweep Trigger (T4) program code were transmitted.

CLEAR

The 8350A responds to both Device Clear (DCL) and Selective Device Clear (SDC) messages by clearing the Status Byte and the Extended Status Byte.

REMOTE/LOCAL CHANGES

The Local to Remote change is programmed by the Selective Device Remote Enable message (REN and 8350A address). The 8350A instrument state is unchanged with all future changes affected by program codes only. Note that all front panel functions are disabled in Remote except the LCL key.

The Remote to Local change is programmed by the Go To Local (GTL) command or by setting the REN line false (high). The 8350A instrument state is unchanged with all future changes affected by the front panel controls. The 8350A can also be set to Local by pressing the LCL key. Note that the 8350A does not respond to the LCL key if the Local Lockout command has been executed. This command disables all front panel functions including the LCL key.

SERVICE REQUEST

The 8350A can initiate a Service Request (SRQ) whenever one of the following conditions exist:

- Error in syntax
- Parameter value modified to default value
- Hardware failure
- End of sweep

Further information can be obtained by conducting a Serial Poll or by executing the Output Status command, both of which access Status Byte information. The SRQ is cleared only by executing a Serial Poll. To select an SRQ for a particular set of circumstances, the Request Mask function can be used to select which of the bits in the first Status Byte can cause an SRQ. The mask value is determined by summing the decimal values of each selected function/condition that is desired. The default Request Mask at power on is '00000000' or decimal 0. This mask value is reset to the default value only at power on.

STATUS BYTE

The 8350A responds to a Serial Poll by sending its status byte as indicated in Table 2. A second status byte is available but must be accessed via the Output Status command. When Bit 6 (Request Service) of the Status Byte is true (one), an SRQ has occurred. See Service Request for the conditions causing a Service Request. Bit 4 indicates whether a change has occurred in the Extended Status Byte. If Bit 4 is true, then the second status byte should be accessed via the Output Status function to determine the cause of the status change. All other bits indicate the present status of the noted function. The bits are true (one) if and only if the associated function/condition is true.

STATUS BIT

The 8350A does not respond to a Parallel Poll.

PASS CONTROL

The 8350A does not have the ability to take or pass control.

ABORT

The 8350A responds to the Abort message (Interface Clear — IFC true) by stopping all Listener or Talker functions.

ADDRESS ASSIGNMENT INFORMATION

The 8350A has a primary address that is determined by an internal storage register. The register is initialized upon power turn on by reading the address bits A5 thru A1 from switches located on the 8350A A8 HP-IB Assembly. Note that these switches are factory preset to decimal 19. The 8350A HP-IB address can be dynamically changed from the front panel in local mode by executing the "Set HP-IB Address" command (Shift Local). See the 8350A Operating and Service Manual for further information.

Table 2. 8350A Status Byte Descriptions

STATUS BYTE (#1)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	N/A	REQUEST SERVICE (RQS)	SRQ on Syntax Error	SRQ on End of Sweep	N/A	SRQ on Change in Extended Status Byte	N/A	SRQ on Numeric Parameter Altered to Default Value

EXTENDED STATUS BYTE (#2)								
BIT #	7	6	5	4	3	2	1	0
DECIMAL VALUE	128	64	32	16	8	4	2	1
FUNCTION	Airflow Failure	*RF Unleveled	Power Failure/on	N/A	N/A	N/A	N/A	Self Test Failed

*Bit/Functions not usable with 86200 Series Plug-ins and 11869A Adapter.

For more information, call your local HP Sales Office or nearest Regional Office: **Eastern** (201) 265-5000; **Midwestern** (312) 255-9800; **Southern** (404) 955-1500; **Western** (213) 970-7500; **Canadian** (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland. **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Suginami-ku, Tokyo 168.

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