Errata

Title & Document Type: 8350B Sweep Oscillator Operating Manual

Manual Part Number: 08350-99000

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HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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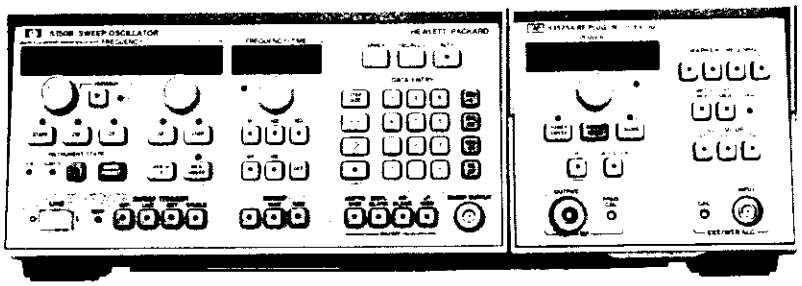
OPERATING INFORMATION

8350B SWEEP OSCILLATOR



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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

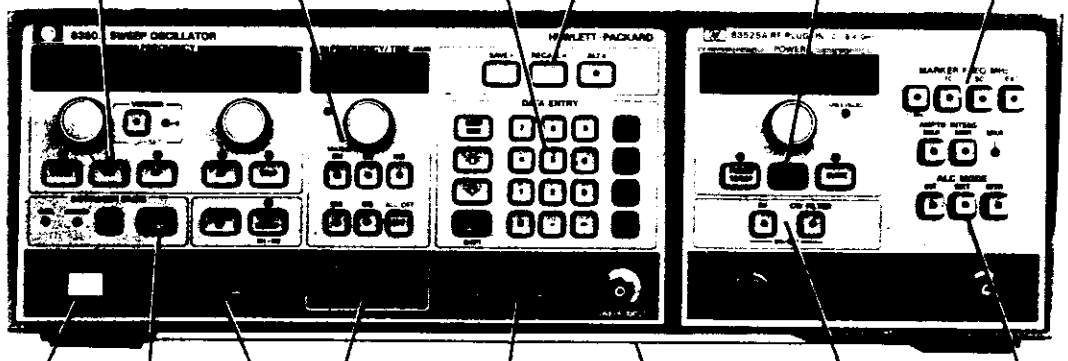
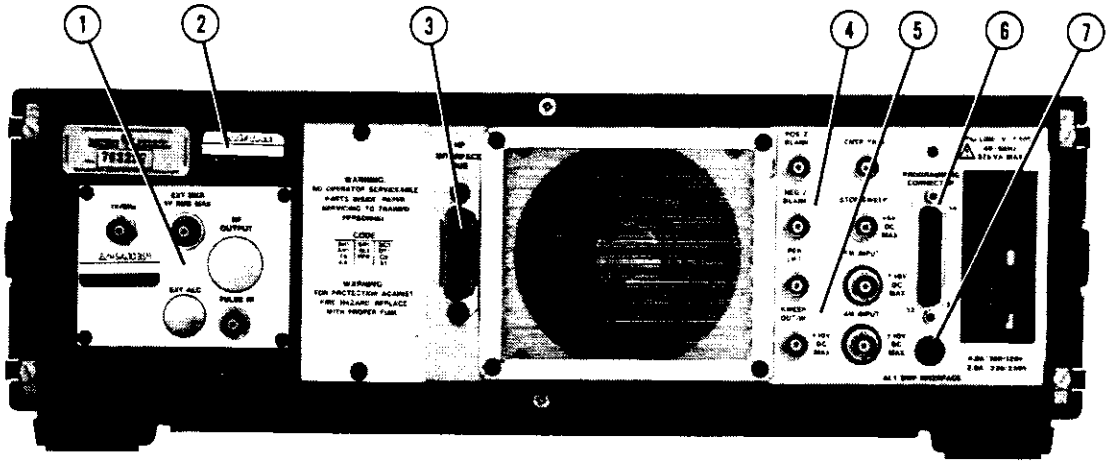


Figure 3-1. Front Panel Features

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.

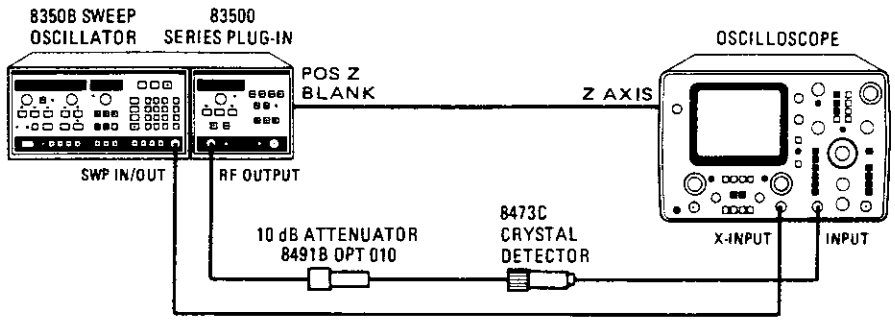
1. Set LINE switch to ON. Press **[INSTR PRESET]**. Observe display in START/STOP mode with display frequency equaling Plug-in range or E001 if no Plug-in is installed.

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.

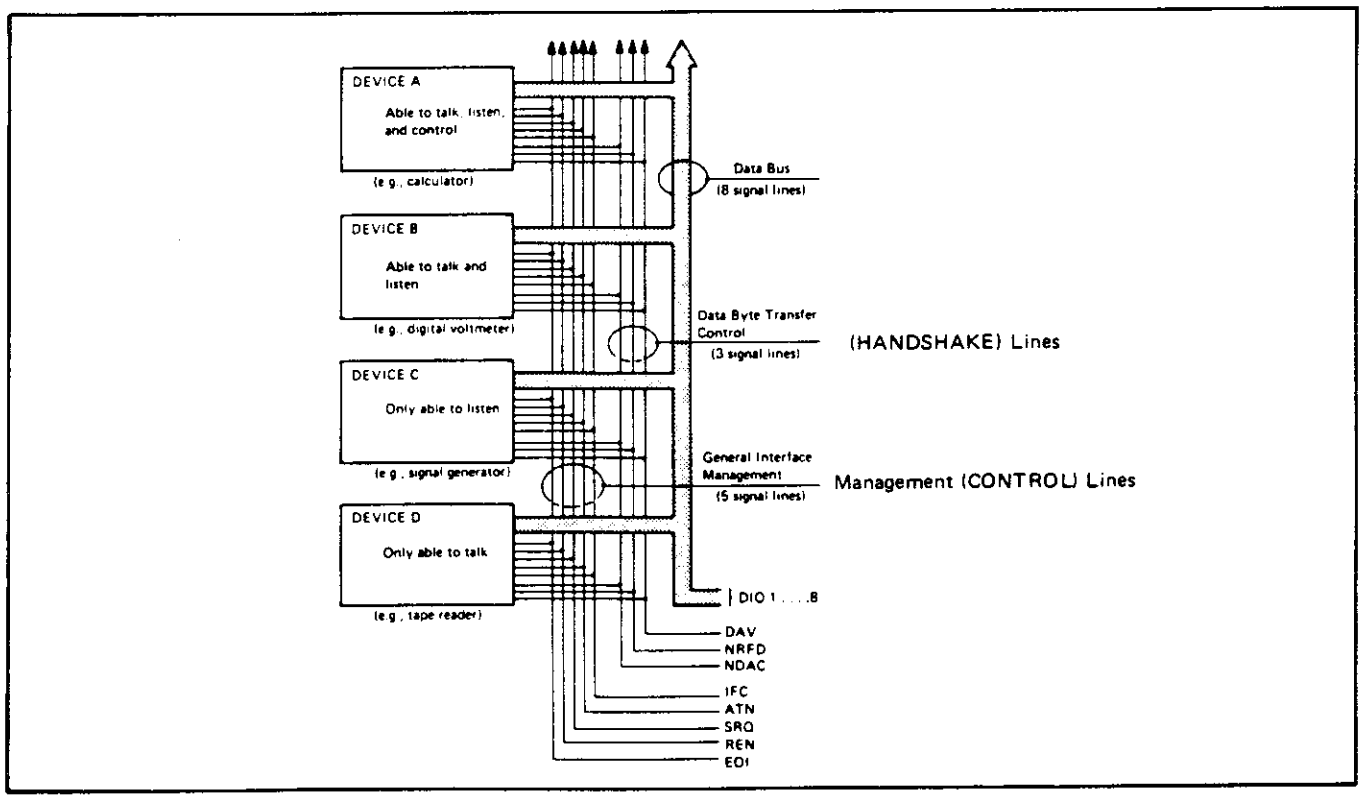


Figure 3-5. Interface Connections and Bus Structure

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	Applicable	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

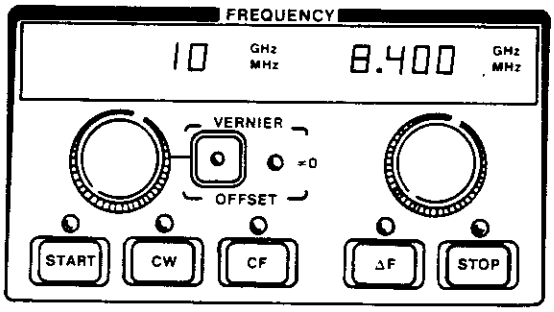
3-108. If the Sweep Oscillator requires service and the operators maintenance is not sufficient the instrument may be sent as per Section II to your local HP service organization. Before sending the instrument back, fill out and attach one of the blue service tags. If a sweep oscillator error code is 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.

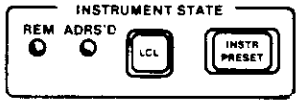
Figure 3-6. Frequency Sweep Mode (4 of 4)

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	

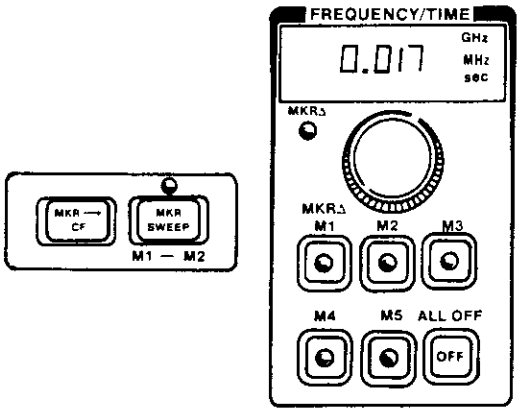
Figure 3-7. Instrument State (2 of 2)

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	

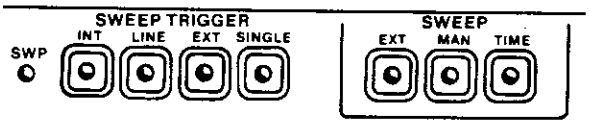
Figure 3-9. Storage Registers (2 of 2)

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			

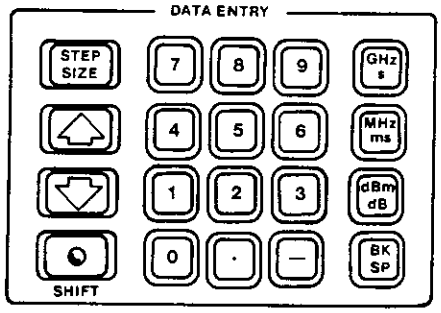
Figure 3-10. Sweep/Sweep Trigger (2 of 2)

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				

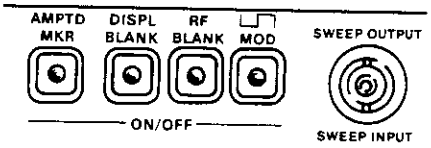
Figure 3-11. Data Entry-Step Keys/Keyboard (2 of 2)

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

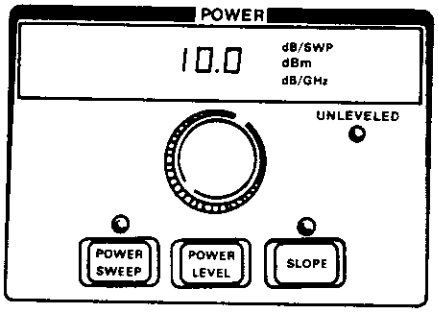
Figure 3-12. Modulation/Blanking (2 of 2)

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				

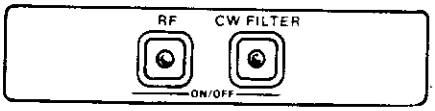
Figure 3-13. Power Control (83500 series Plug-ins) (2 of 2)

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

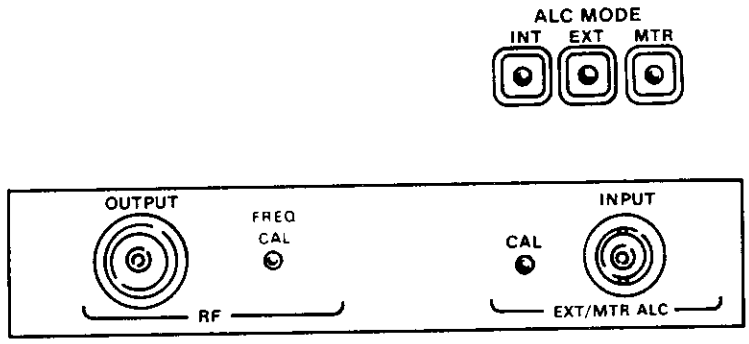
Figure 3-14. Signal Control (83500 series plug-ins)

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.

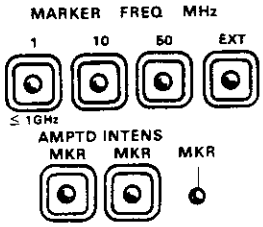
Figure 3-15. ALC Mode (83500 series plug-ins) (2 of 2)

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)