Notice

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Printed in USA   March 2000

By internet, phone, or fax, get assistance with all your test and measurement needs.

Table 1-1 Contacting Agilent

Online assistance: `www.agilent.com/find/assist`

United States	**Latin America**	**Canada**	**Europe**
(tel) 1 800 452 4844	(tel) (305) 269 7500	(tel) 1 877 894 4414	(tel) (+31) 20 547 2323
	(fax) (305) 269 7599	(fax) (905) 282-6495	(fax) (+31) 20 547 2390

New Zealand	**Japan**	**Australia**	
(tel) 0 800 738 378	(tel) (+81) 426 56 7832	(tel) 1 800 629 485	
(fax) (+64) 4 495 8950	(fax) (+81) 426 56 7840	(fax) (+61) 3 9210 5947	

Asia Call Center Numbers

Country	Phone Number	Fax Number
Singapore	1-800-375-8100	(65) 836-0252
Malaysia	1-800-828-848	1-800-801664
Philippines	(632) 8426802 1-800-16510170 (PLDT Subscriber Only)	(632) 8426809 1-800-16510288 (PLDT Subscriber Only)
Thailand	(088) 226-008 (outside Bangkok) (662) 661-3999 (within Bangkok)	(66) 1-661-3714
Hong Kong	800-930-871	(852) 2506 9233
Taiwan	0800-047-866	(886) 2 25456723
People's Republic of China	800-810-0189 (preferred) 10800-650-0021	10800-650-0121
India	1-600-11-2929	000-800-650-1101

HP 8643A, HP 8644B
Quick Reference Guide

HEWLETT PACKARD

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound DIN 45635 T. 19 (Typprufung).

This product has a sound pressure emission (at the operator position) < 70 dB(A).

- Sound Pressure Lp < 70 dB(A).
- At Operator Position.
- Normal Operation.
- According to ISO 7779 (Type Test).

Herstellerbescheinigung

Diese Information steht im Zusammenhang mit den Anforderungen der schinenlarminformationsverordnung vom 18 Januar 1991.

- Schalldruckpegel Lp < 70dB (A).
- AM Arbeitsplatz.
- Normaler Betrieb.
- Nach DIN 45635 T. 19 (Typprufung).

CERTIFICATION   *Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology, to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.*

WARRANTY   This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY   The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES   THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE   *Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.*

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office.

Safety Considerations

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).

Before Applying Power

Verify that the product is set to match the available line voltage and verify that the correct fuse is installed.

Safety Earth Ground

An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set.

Safety Symbols

The following symbols may be found on the instrument or throughout the instrument's documentation.

⚠ This is the instruction manual symbol. The product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).

⚡ This symbol indicates hazardous voltages.

⏚ This symbol indicates earth (ground) terminal.

Warning

The WARNING symbol denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the indicated conditions are fully understood and met.

Caution

The CAUTION symbol denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION symbol until the indicated conditions are fully understood and met.

Safety
Considerations for
this Product

Warning

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two conductor outlet is not sufficient protection.)

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

If this instrument is to be energized via an autotransformer (for voltage reduction) make sure the common terminal is connected to the earth terminal of the power source.

Servicing instructions are for use by service trained personnel only. To avoid dangerous electric shock, do not perform any servicing unless qualified to do so.

Adjustments described in the manual are performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

For continued protection against fire hazard, replace the line fuse(s) only with 250 V fuse(s) of the same current rating and type (for example, normal blow, time delay, and so forth). Do not use repaired fuses or short circuited fuseholders.

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Quick Reference Guide

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FRONT PANEL OPERATION

UTILITY   SWEEP   MODULATION CARRIER   DATA   INCR/DECR

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AUDIO
FREQ

HP-IB   SYNTHESIS MODE

UTILITY

1. DISPLAY   Use DISPLAY to display a list of the active special functions, the contents of a storage register, or to list the storage registers in the current sequence setting. Press (DISPLAY) then (SPECIAL), (RECALL), or (SEQ) to display the current settings.

2. MSSG   Use MSSG when the MSSG annunciator lights in the Frequency/Status display to view error and status messages.

To View Each Message

Press (MSSG) to view the first message in the list. Press (MSSG) again to view each additional message in the list. To return to the first message in the list, press (SHIFT), then (MSSG).

Note   Messages concerning transient events are removed from the message list after they have been displayed.

3. SPECIAL   Press (SPECIAL) to access the special functions. (For further information about special functions, refer to *Special Function Operation* on page 1—18.)

4. CLEAR ALL   Press (SHIFT), (SAVE) (CLEAR ALL), (ON) to delete all the information in all of the storage registers.

5. SAVE, RECALL   Press (SAVE), a storage register number (0 to 49), and (ON) (ENTER) to save an instrument setup.

Note   Storage registers 0 to 9 provide storage of all instrument settings. Storage registers 10 to 49 store frequency and amplitude settings only.

Press (RECALL), the desired storage register number, and (ON) (ENTER) to recall an instrument setup.

6. SET SEQ   Use SET SEQ to define a sequence of storage registers. Only storage registers 0 through 9 can be used with the sequence function.

To Set a Storage Register Sequence

Press (SHIFT), (RECALL) (SET SEQ). Then enter the storage register number you want to store in the first position (position 0), and press (ON) (ENTER). To add another register to the sequence, enter the number and press (ON) again. You can enter up to 10 registers. You can use a register more than once in the sequence. To exit the sequence, press (SHIFT) (⇐ +) (EXIT).

7. SEQ   Press (SEQ) to manually step through the storage register sequence.

8. AUTO SEQ   Use AUTO SEQ to automatically sequence through the storage register sequence. Press (SHIFT), (SEQ) (AUTO SEQ) to start the automatic sequence function. The sequence will repeat until you press (OFF).

HP-IB
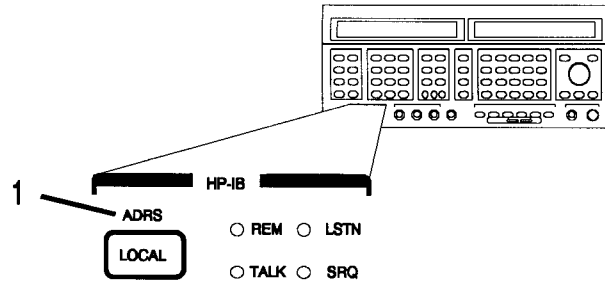
1. ADRS   **To View the HP-IB Address setting**

Press (SHIFT), (LOCAL) (ADRS).

To Change the HP-IB Address Setting

Press (SHIFT), (LOCAL) (ADRS), then enter a two digit address from 00 to 30 and press (ENTER) to set the HP-IB address.

SWEEP

Sweep Modes Use the sweep keys to sweep the RF carrier frequency in either of two modes, digitally-stepped sweep or phase-continuous sweep. Digitally-stepped sweep is the default sweep mode. It provides a broadband frequency sweep capability. Phase-continuous sweep provides a linear, narrowband frequency sweep. Turn on Special Function 112 to select phase-continuous sweep.

Press (AUTO), (SINGLE), or (MANUAL) to start or stop a sweep.

Phase-Continuous Sweep Spans*

Carrier Frequency (MHz)	(FREQ SPAN) Min. (Hz)	(FREQ SPAN) Max. (MHz)	Carrier Frequency (MHz)	(FREQ SPAN) Min. (Hz)	(FREQ SPAN) Max. (MHz)
1030 to 2060	400.0	40.0	8 to 16	3.13	0.31
515 to 1030	200.0	20.0	4 to 8	2.0	0.15
257 to 515	100.0	10.0	2 to 4	2.0	0.078
128 to 257	50.0	5.0	1 to 2	2.0	0.039
64 to 128	25.0	2.5	0.5 to 1	2.0	0.019
32 to 64	12.5	1.25	0.25 to 0.5	2.0	0.009
16 to 32	6.25	0.625			

* Limits for wide FM deviation for HP 8644B Synthesis Mode 1 and HP 8643A Special Function 125
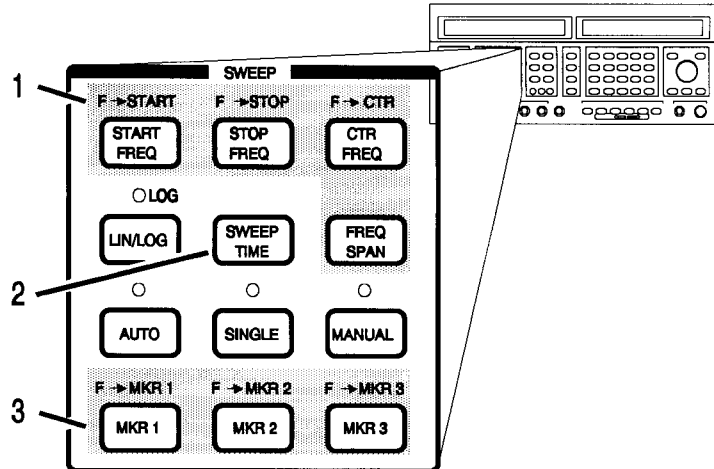
1. Sweep Formats There are two ways to set up the signal generator to sweep the carrier frequency. One way is to specify a start frequency and a stop frequency using the (START FREQ) and (STOP FREQ) keys. Another way is to set the frequency span you want to sweep using the (FREQ SPAN) key, and then enter the center frequency for the span using the (CTR FREQ) key.

Use F → START, F → STOP, and F → CTR to set the start, stop and center frequencies to the displayed RF carrier frequency.

2. Sweep Time Use (SWEEP TIME) to set the time to complete each sweep (within the range of 0.5 to 1000 seconds). The sweep time, frequency span, and synthesis mode you have selected determine the step time, number of steps, and step size for the digitally-stepped sweep mode.

Step Time

Step time is determined by the synthesis mode selected.

Synthesis Mode		Step Time
HP 8643	**HP 8644**	
(SPECIAL) (1) (2) (5)	(MODE 1)	0.125 s
Preset Condition	(MODE 2)	0.225 s
Not Used	(MODE 3)	0.3 s

Number of Steps

The number of steps is calculated with the following formula:

$$Number\ of\ Steps = \frac{Sweep\ Time-(Step\ Time \times 0.3)}{Step\ Time}$$

The maximum number of steps possible is 1023. Fractions are always rounded down (for example, 9.7 = 9 steps).

Step Size

The step size is calculated with the following formula:

$$Step\ Size\ (Hz) = \frac{Frequency\ Span\ (Hz)}{Number\ of\ Steps}$$

3. Markers   Use (MKR 1), (MKR 2), and (MKR 3) to set marker points within the frequency sweep span. The marker signals are available at the Z-AXIS connector on the rear panel. Press a marker key, then the desired frequency value and units. Use F→MKR 1, F→MKR 2, or F→MKR 3 to set the value of a sweep marker frequency to the displayed RF carrier frequency.

MODULATION
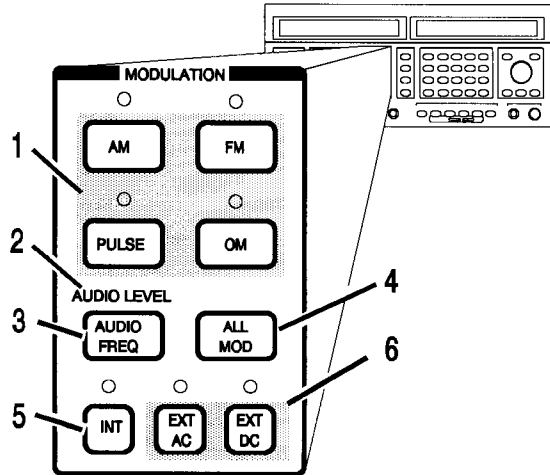
1. Modulation Mode Keys

Use the modulation keys to set the desired modulation mode.

To Set Modulation

Press a modulation key. Then enter the desired value and units, or press (ON) to select the modulation mode. The LED annunciator above the modulation key will light when a mode is selected.

2. AUDIO LEVEL

Use AUDIO LEVEL to set the level of the internal audio source.

To Set the Audio Level

Press (SHIFT), (AUDIO FREQ) (AUDIO LEVEL). Enter the audio level using the DATA keys, or turn the knob, or press the (⇩) or (⇧) key.

To Turn Off the Audio Level

Press (SHIFT), (AUDIO FREQ) (AUDIO LEVEL), then press (OFF).

Note

When using the internal audio source, the modulation level displayed on the front panel is accurate only when the audio level is set to 2.0 V. Reducing the audio level causes the actual modulation level to be less than the displayed level.

3. AUDIO FREQ   Use (AUDIO FREQ) to set the internal audio frequency for Channel 1 of the audio source. (For additional information about Channel 1 and Channel 2 operation, refer to Audio Source Operation on page 1—14.)

To Set the Audio Frequency for Channel 1

Press (AUDIO FREQ). Enter the desired frequency using the DATA keys, or turn the knob, or press the (⇓) or (⇑) key.

To Turn Off the Audio Frequency

Press (AUDIO FREQ), (OFF). This turns the internal audio source completely off.

4. ALL MOD   Use (ALL MOD) to turn all selected modulation modes (AM, FM, PM, or Pulse) on or off. (A modulation mode is selected if the LED annunciator above the key is lit.)

To Turn Modulation Off or On

Press (ALL MOD), (OFF) to turn all modulation off. To turn modulation back on, press (ALL MOD), (ON). This turns on all modulation modes that were on when (ALL MOD), (OFF) was pressed.
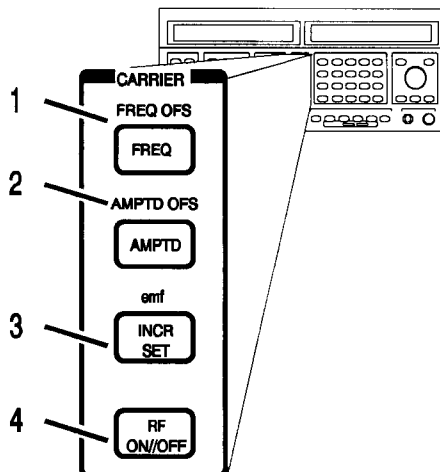
5. INT   Use (INT) to select the internal audio source for modulating the RF carrier signal.

To Select the Internal Audio Source

Select a modulation mode (AM, FM, PM, or Pulse), then press (INT).

6. EXT AC, EXT DC   Use (EXT AC) or (EXT DC) to modulate the signal generator with an external audio source connected at one of the modulation inputs.

CARRIER

1. FREQ OFS   Use FREQ OFS to offset the displayed Carrier Frequency from the output frequency. Press (SHIFT), (FREQ) (FREQ OFS), (ON). Enter the offset value using the DATA keys. The signal generator will display the Carrier Frequency as the sum of the Carrier Frequency setting and the offset value you have entered. To turn off the frequency offset, press (SHIFT), (FREQ) (FREQ OFS), (OFF).

2. AMPTD OFS   Use AMPTD OFS to offset the displayed Carrier Amplitude from the output amplitude (up to 50 dB maximum). Press (SHIFT), (AMPTD) (AMPTD OFS), (ON). Enter the offset value using the DATA keys. The signal generator will display the Carrier Amplitude as the sum of the carrier amplitude setting and the offset value you have entered. To turn off the amplitude offset, press (SHIFT), (AMPTD) (AMPTD OFS), (OFF).

3. INCR SET   Use (INCR SET) to set an increment value for RF frequency, amplitude, FM, AM, or the internal audio source. Use (⇑) and (⇓) to increment and decrement the selected function.

4. RF ON/OFF   Use (RF ON/OFF) to turn off the RF output. The instrument turns off the output by switching in full attenuation.

DATA
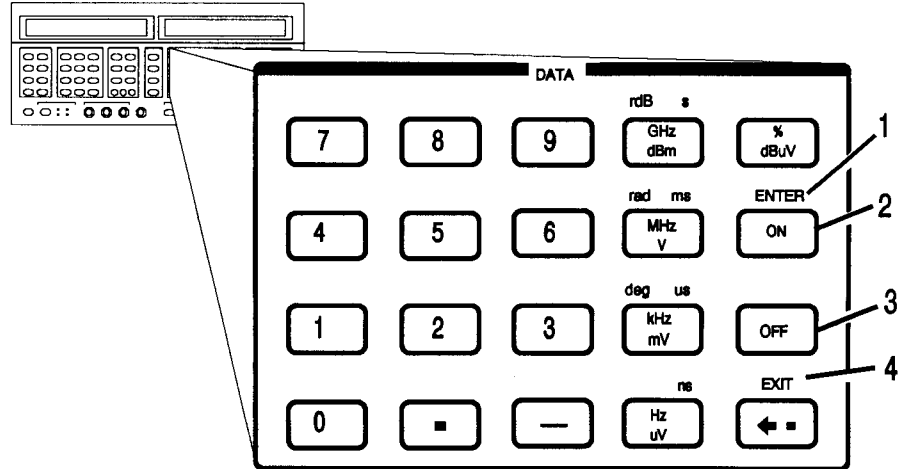
1. ENTER Press (ON) (ENTER) to terminate data entries that do not require specific units, such as Save/Recall entries and Special Function numbers.

2. ON Press (ON) to activate functions such as amplitude offset, frequency offset, audio level, and Special Functions.

3. OFF Press (OFF) to turn off functions such as amplitude offset, frequency offset, audio level, and Special Functions.

4. EXIT Press (SHIFT) (⇐) (EXIT) to exit a function and return to operation.

SYNTHESIS MODE
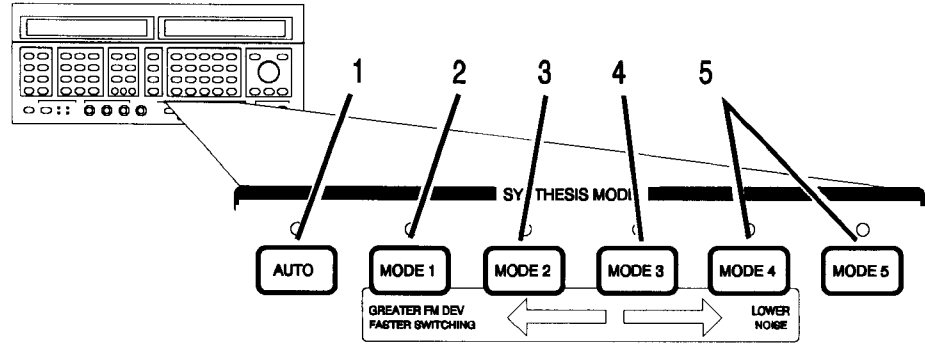
These keys are available only on the HP 8644B. (The HP 8643 defaults to Mode 2 operation. Mode 1 operation, for the HP 8643, can be selected using Special Function 125.)

1. AUTO   Press (AUTO) to have the Signal Generator automatically choose the signal path that provides the best spectral purity for the control settings you select.

2. MODE 1   Press (MODE 1) to get maximum FM deviation, and minimum RF output switching time. Noise level is highest in this mode, as shown in the following table.

3. MODE 2   Press (MODE 2) to get a median range of FM deviation and RF output switching time, with a medium noise level at the RF output, as shown in the following table.

4. MODE 3   Press (MODE 3) to get the lowest noise level at the RF output. FM deviation bandwidth is narrower, and RF switching time is slower than for Mode 1 or Mode 2.

5. MODE 4, MODE 5   Modes 4 and 5 are reserved for special applications.

Operating Characteristics for Modes 1, 2, and 3.

Characteristic	Synthesis Mode		
	MODE 1	**MODE 2**	**MODE 3**
RF Frequency Switching Time	90 ms	200 ms	350 ms
FM Deviation at 1 GHz	10 MHz	1 MHz	100 kHz
Phase Noise (20 kHz offset at 1 GHz)	−120 dBc	−130 dBc	−136 dBc

INCR/DECR (Increment/Decrement) Keys
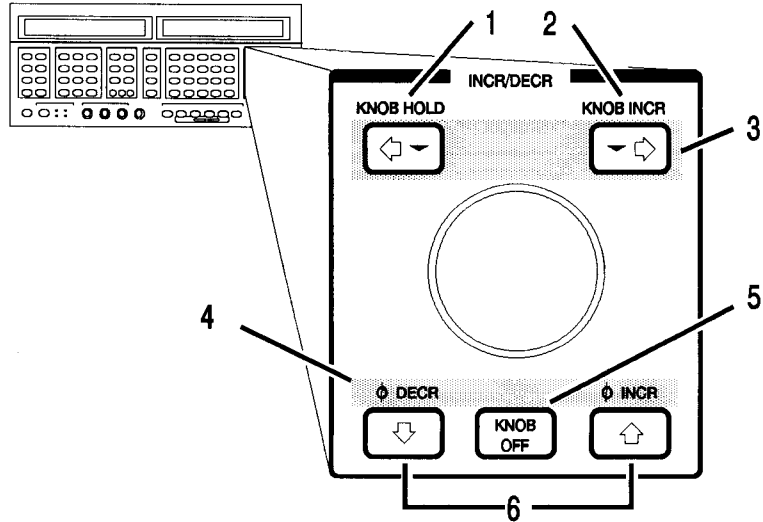
1. KNOB HOLD

Use KNOB HOLD to assign knob control to a specific function. Knob hold can be assigned to the following functions: Frequency, Amplitude, Audio Frequency, AM Depth, FM Deviation, Start Frequency, Stop Frequency, Center Frequency, Frequency Span, or Marker Frequency.

To Assign Knob Hold

Press a function key. Press (SHIFT), (⇐ ▽) (KNOB HOLD).

To Turn Off Knob Hold

Press (KNOB OFF).

2. KNOB INCR

Press (SHIFT), (▽ ⇒) (KNOB INCR) to configure the knob to emulate the operation of the (⇧) and (⇩) keys described in item 6, ⇑ ⇓.

To Turn off KNOB INCR

Press (KNOB OFF), or (⇐ ▽).

3. ⇐ ▽ **or** ▽ ⇒   Use (⇐ ▽), and (▽ ⇒) to move the cursor (▽) on the display. The cursor indicates which digit will be incremented when the knob is turned.

4. DECR, INCR   Press (SHIFT), (⇓) (Φ DECR) to decrease the phase of the RF output relative to another source that is locked to the same timebase as this signal generator. The phase is decreased by 1° each time the key is pressed.

Press (SHIFT), (⇑) (Φ INCR) to increase the phase of the RF output by 1° each time the key is pressed.

5. KNOB OFF   Use (KNOB OFF) to turn off the knob.

6. ⇓ ⇑   Use these keys to change the displayed value of the selected function by the INCR SET value.

To Set the Increment Set Value

Press (INCR SET) and enter the desired value.

Internal Audio Source

Two internal audio sources (Channels 1 and 2) are available in the signal generator. They can be used individually or summed together to modulate the carrier. In addition, four subcarrier sources are available for modulating the Channel 1 audio signal (an AM source, an FM source, a PM source, and a pulse modulation source). The subcarrier sources can be used individually or simultaneously.

Channel 1 is operated from the front panel. Channel 2 and the subcarrier sources are operated using Special Functions.
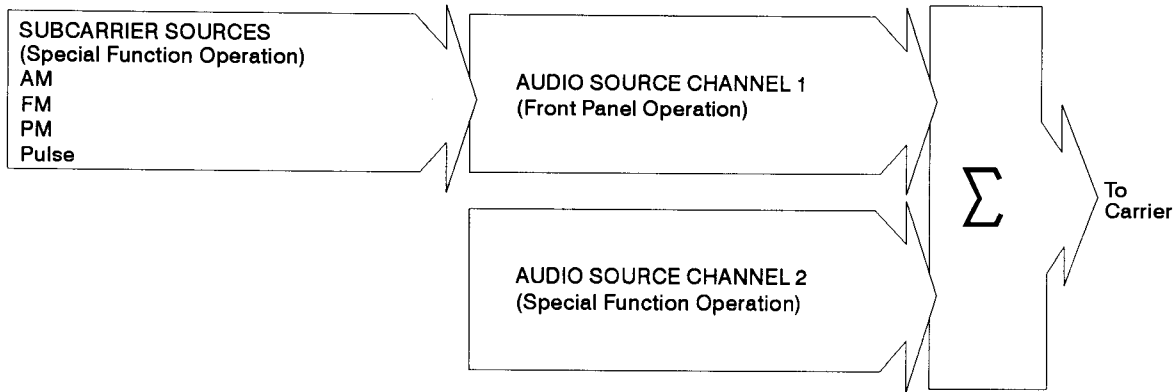
To Set Up the Audio Sources

Perform the following steps to set up each audio channel. (If you need additional information for entering the Special Functions shown in the table, refer to the Special Functions section of this *Quick Reference* on page 1—18).

Step	Audio Source Channel 1	Control
1. Frequency	Press (AUDIO FREQ)	Enter frequency
2. Audio Level	Press (SHIFT) (AUDIO FREQ)	Enter level
3. Waveform	Press (SPECIAL) (1) (3) (0) (ON)	Turn knob to select waveform

Step	Audio Source Channel 2	Special Function Control
1. Frequency	Press (SPECIAL) (1) (3) (3) (ON)	Enter frequency
2. Audio Level	Press (SPECIAL) (1) (3) (4) (ON)	Enter level
3. Waveform	Press (SPECIAL) (1) (3) (5) (ON)	Turn knob to select waveform
4. Phase	Press (SPECIAL) (1) (3) (6) (ON)	Enter phase (relative to Channel 1)

Note   The audio level of the internal source must be set to 2-volts-peak for the displayed FM deviation to be accurate. For two-tone testing, the composite audio level settings of Channel 1 and Channel 2 set the level of the audio source and cannot exceed 2-volts-peak. The FM deviation provided by each channel is proportional to its audio level setting. For example, when Channel 1 is set to 1 volt, the FM deviation it provides is one-half of the displayed deviation setting.

To Set Up the Subcarrier Source   Perform the following four steps to set up each subcarrier source. (If you need additional information for entering the Special Functions shown in the table, refer to the Special Functions section of this *Quick Reference* on page 1—18.)

Step	Special Function Number				Special Function Control
	AM	FM	PM	Pulse	
1. Subcarrier source	137	141	145	149	Press (ON)
2. Frequency	138	142	146	150	Enter frequency
3. Waveform	139	143	147	151	Turn knob to select waveform
4. Phase	140	144	148	152	Enter phase (relative to Channel 1)

For additional information about the Internal Audio Source, refer to chapter 5 in the *User's Guide*.

To Select a Special Function

1. PRESS — SPECIAL

2. ENTER the function number (from Table 1-1)
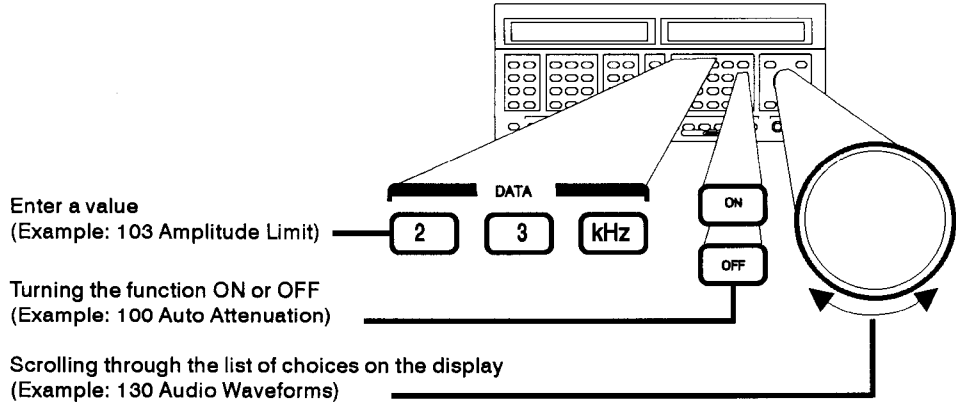
3. PRESS to select the function
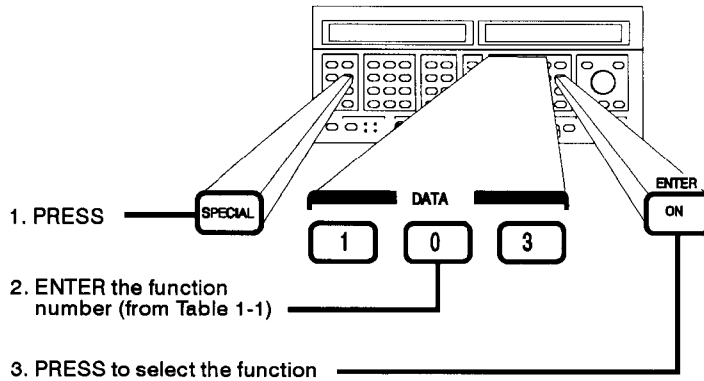
Note

After the SPECIAL key has been pressed, the knob can be used to scroll through the list of Special Functions.

To Control the Special Function

Once a Special Function has been selected, it may be necessary to perform an additional step to control its operation. If the Special Function you have selected requires an additional step, it will be one of the following control steps. (Refer to table 1—1 for further control information.)

Enter a value
(Example: 103 Amplitude Limit)

Turning the function ON or OFF
(Example: 100 Auto Attenuation)

Scrolling through the list of choices on the display
(Example: 130 Audio Waveforms)

To Reset all Special Functions

Press (INSTR PRESET) to reset all special functions to their preset conditions.

Table 1-1. Special Functions

Function Number	To Control	Preset Condition
Amplitude		
100: Auto Attenuation	ON = Automatic attenuator switching	ON
	OFF = Attenuators held at current setting providing transient-free level adjustment over a 20 dB range	
101: Attenuation	Turn knob to select attenuators and turn off Special Function 100	Auto
102: Amplitude Correction	ON = Internal calibration data is used, OFF = Internal calibration data is not used	ON
103: Amplitude Limit	Enter upper amplitude limit in dB	19.9 dBm
104: Wideband ALC	ON = Wide ALC bandwidth, OFF = Narrow ALC bandwidth	OFF
105: Amplitude Muting	ON = Output amplitude attenuated during frequency or amplitude changes.	ON
Frequency		
110: Rel ϕ Adjust	Turn knob to change carrier's phase in 1° steps	0°
111: Frequency Multiplier	Enter multiplier or divider value: + integer = Frequency multiplier − integer = Frequency divider	+1
112: Phase Continuous Sweep	ON = Phase-continuous sweep, OFF = Digitally-stepped sweep	OFF
FM		
120: FM Synthesis	Turn knob for Digitized or Linear FM	Digitized
121: F(t)	Displays phase-locked frequency during digitized FM	
122: FM Pre-emphasis	ON or OFF	OFF
124: FM Delay Equalizer	ON or OFF	ON
125: Wide FM Deviation (HP 8643 only)	ON = 10 times greater FM deviation OFF = 1 MHz maximum at 1 GHz	OFF

Table 1-1. Special Functions (continued)

Function Number	To Control	Preset Condition
Internal Audio Source		
130: Audio Waveform	Turn knob to select sine, square, triangle, sawtooth, or white-Gaussian-noise waveforms	Sine
131: Audio Triggered	ON = Special Function 132 and rear- panel AUDIO TRIG input enabled,	OFF
	OFF = Special Function 132 and rear-panel AUDIO TRIG input disabled	
132: Triggered Audio	ON = Trigger 360° cycle of audio (requires that Special Function 131 is on)	OFF
	OFF = Normal audio output	
133: Audio 2 Frequency	ON = Activate audio source in channel 2, and set its frequency	OFF
134: Audio 2 Level	Enter level of audio source in channel 2	100 mV
135: Audio 2 Waveform	Turn knob to select waveform of audio source in channel 2	Sine
136: Audio 2 Phase	Turn knob to select phase of audio source in channel 2 relative to channel 1	0.0°
137: Audio AM Depth	ON = Activate subcarrier AM source, and select its modulation depth	OFF
138: Audio AM Frequency	Enter frequency for subcarrier AM source	100.0 Hz
139: Audio AM Waveform	Turn knob to select audio waveform for subcarrier AM source	Sine
140: Audio AM Phase	Turn knob to select phase for subcarrier AM source	0.0°
141: Audio FM Deviation	ON = Activate subcarrier FM source, and select its deviation value	OFF
142: Audio FM Frequency	Enter frequency for subcarrier FM source	100.0 Hz
143: Audio FM Waveform	Turn knob to select audio waveform for subcarrier FM source	Sine
144: Audio FM Phase	Enter phase for subcarrier FM source	0.0°
145: Audio ϕM Deviation	ON = Activate subcarrier PM source, and select its deviation value	OFF
146: Audio ϕM Frequency	Enter frequency for subcarrier PM source	100.0 Hz
147: Audio ϕM Waveform	Turn knob to select audio waveform for subcarrier PM source	Sine
148: Audio ϕM Phase	Enter phase for subcarrier PM source	0.0°
149: Audio Pulse	ON = Activate subcarrier pulse source	OFF
150: Audio Pulse Frequency	Enter frequency for subcarrier pulse source	100.0 Hz
151: Audio Pulse Phase	Enter phase for subcarrier pulse source	0.0°

Table 1-1. Special Functions (continued)

Function Number	To Control	Preset Condition
Reference		
161: Reference Source	Monitors internal/external reference oscillator connection	EXT
Service		
170: Test	ON = Test instrument/modules for failures (takes several minutes)	OFF
171: Recalibration	ON = Recalibrate instrument (takes several minutes)	OFF
172: RAM Wipe	ON = Erase contents of RAM memory (takes several minutes)	OFF
300: Service Mode	ON = Allow access to diagnostic tests	OFF
Internal Meters		
180: DC Voltmeter	Displays internal dc voltmeter reading	
181: AC Voltmeter	Displays internal ac voltmeter reading	
182: Power Meter	Displays internal power meter reading (connector is located under top cover of instrument)	
Serial Number		
190: Serial #	Displays instrument serial number	
Display		
173: Security	ON = Secure Special Functions 191 through 195,	OFF
	OFF = Unsecure Special Functions 191 to 195 and perform Special Function 172 (RAM wipe)	
191: Blank Display	ON = Blank all front-panel displays	OFF
192: Blank Frequency	ON = Blank FREQUENCY/STATUS display	OFF
193: Blank Modulation	ON = Blank MODULATION display	OFF
194: Blank Audio	ON = Blank audio FREQUENCY display	OFF
195: Blank Amplitude	ON = Blank AMPLITUDE display	OFF
196: European Radix	ON = European decimal/comma separation	OFF
	OFF = U.S. decimal/comma separation	

Note   For additional information about Special Functions, refer to chapter 4 in the *User's Guide*.

Frequently Used
HP-SL Commands

Frequently Used HP-SL Commands

Command Statement	Choices Available	Comments	HP 8642 HP-IB Command
Amplitude Commands			
AMPL:LEV	\<value\> \<units\> UP | DOWN	Set amplitude level	AP \<value\> \<units\>
AMPL:LEV:STEP	\<value\> \<units\>	Set amplitude step increment	AP15 \<value\> \<units\>
AMPL:STAT	ON | OFF	Set RF on or off	APON or APOF
AMPL:UNIT	\<units\>	Set amplitude units (dBm, dBmW, V, or dBμV)	AP \<units\> (DM, VL, or DU)
AMPL:GAIN	\<value\> dB	Set amplitude offset	RA \<value\> DB
Amplitude Modulation			
AM:DEPT	\<value\> \<units\>	Set AM depth (% or PCT)	AM \<value\> \<units\>
AM:STAT	ON | OFF	Set AM on or off	AMON or AMOF
AM:SOUR	\<source list\>	Select AM source	AMNT or AMBD
AM:COUP	\<coupling type\>	Select type of AM coupling (ac or dc)	AMXA or AMXD
AM:FREQ	\<value\> \<units\>	Set Audio frequency (Hz or kHz). Same as LFS:FREQ	MF \<value\> \<units\>
Common Commands			
*RCL	\<value\>	Recall register	RC \<value\>
*RST		Instrument preset	IP
*SAV	\<value\>	Save instrument setting	SV \<value\>
Frequency Modulation			
FM:DEV	\<value\> \<units\>	Set maximum FM deviation	FM \<value\> \<units\>
FM:STAT	ON | OFF	Set FM on or off	FMON or FMOF
FM:MODE	LIN | DIG	Select type of FM synthesis	none
FM:SOUR	\<source list\>	Select FM source (INT, EXT or both)	FMNT or FMBD
FM:COUP	\<coupling type\>	Select type of FM coupling (ac or dc)	FMXA or FMXD
FM:FREQ	\<value\> \<units\>	Set audio frequency (Hz or kHz). Same as LFS:FREQ	MF \<value\> \<units\>

Frequently Used HP-SL Commands (continued)

Command Statement	Choices Available	Comments	HP 8642 HP-IB Command
Frequency Commands			
FREQ:CW	\<value> \<units>	Set RF frequency (HZ, KHZ, MHZ, MAHZ, or GHZ)	FR \<value> \<units> (HZ, KHZ, MHZ, MAHZ, or GHZ)
FREQ:STEP	\<value> \<units>	Set frequency step increment	FRIS \<value> \<units>
FREQ:STAR	\<value> \<units>	Sweep start frequency	FA \<value> \<units>
FREQ:STOP	\<value> \<units>	Sweep stop frequency	FB \<value> \<units>
FREQ:CENTER	\<value> \<units>	Sweep center frequency	none
FREQ:SPAN	\<value> \<units>	Sweep span frequency	none
FREQ:OFFS	\<value> \<units>	Set frequency offset	RF \<value> \<units>
FREQ:SYNT:AUTO	ON | OFF	Set Auto Synthesis Mode	none
FREQ:SYNT 1 (HP 8643)		Select Normal FM Deviation	none
FREQ:SYNT 2 (HP 8643)		Select Wide FM Deviation	none
FREQ:SYNT (HP 8644)	\<value>	Frequency synthesis mode	none
FREQ:MODE	CW | SWE	Selects CW or sweep operation	FAOF or FAON
Low Frequency Source			
LFS:FREQ	\<value> \<units>	Set audio frequency (Hz or kHz)	MF \<value> \<units>
LFS:WAV	SIN | SQU | SAWT | WGN | TRI	Select the type of audio waveform	none
LFS:STAT	ON | OFF	Set audio source state	none
LFS:LEV	\<value> \<units>	Set amplitude of audio source (V, mV, or μV)	ML \<value> \<units>
Pulse Modulation			
PULS:STAT	ON | OFF	Set pulse state	PLOF or PLON
PULS:SOUR	\<source list>	Select pulse source	PLNT or PLXD
Sweep Commands			
SWE:TIME	\<value> \<units>	Set sweep time (s, ms, μs, or ns)	ST \<value> \<units>
SWE:MODE	AUTO | MAN	Select type of sweep	SG or SM
SWE:SPAC	LIN | LOG	Select sweep spacing	none
SWE:GEN	STEP | ANAL	Select digitally-stepped or phase-continuous sweep	none

Example HP-SL Program

```
 100   OUTPUT 719;  "*RST"
 200   OUTPUT 719;  "FREQ:CW 500 MHZ"
 300   OUTPUT 719;  "AMPL:LEV 10 DBM"
 400   OUTPUT 719;  "AMPL:STAT ON"
 500   OUTPUT 719;  "FM:DEV 10 KHZ"
 600   OUTPUT 719;  "FM:STAT ON"
 700   OUTPUT 719;  "AM:DEPTH 50%"
 800   OUTPUT 719;  "AM:STAT ON"
 900   OUTPUT 719;  "AM:SOUR EXT"
1000   OUTPUT 719;  "AM:COUP AC"
```

To Combine Command Statements

A major advantage of HP-SL is that it allows instrument settings
to be programmed in a single output statement. The colon (:)
and semicolon(;) are used to string together HP-SL commands.
The semicolon is used to separate command statements in a single
message. The colon is used with the semicolon to restart commands
from the root (as shown in line 200 below).

```
100   OUTPUT 719;  "*RST"
200   OUTPUT 719;  "FREQ 500 MHZ;:AMPL:LEV 10 DBM;STAT ON"
300   OUTPUT 719;  "FM:DEV 10 KHZ;STAT ON"
400   OUTPUT 719;  "AM:DEPTH 50%;STAT ON"
500   OUTPUT 719;  "AM:SOUR EXT;COUP AC"
```

Special Function
HP-SL Commands

HP-SL Commands for Frequently Used Special Functions

Special Function	Command Statement	Choices Available
100: Auto Attenuation	AMPL:ATT:AUTO	OFF
105: Amplitude Muting	AMPL:MUT	ON | OFF
110: Rel ϕ Adjust	PHAS:ADJ	<value>
112: Phase Continuous Sweep	SWE:GEN	ANAL | STEP
120: FM Synthesis	FM:MODE	LIN | DIG
122: FM Pre-emphasis	FM:PRE:STAT	ON | OFF
124: FM Delay Equalizer	FM:DEL	ON | OFF
125: Wide FM Deviation (HP 8643 only)	FREQ:SYNT	1 | 2
130: Audio Waveform	LFS:WAV	SIN | SQU | TRI | SAWT | WGN
131: Audio Triggered	LFS:TRIG:IMM	
132: Triggered Audio	LFS:STAT2	ON | OFF
133: Audio 2 Frequency	LFS:STAT2	ON | OFF
	LFS:FREQ2	<value>
134: Audio 2 Level	LFS:LEV2	<value>
135: Audio 2 Waveform	LFS:WAV2	SIN | SQU | TRI | SAWT | WGN
170: Test	*TST?	
171: Recalibration	*CAL?	
180: AC Voltmeter	VMET:MODE	DC
181: DC Voltmeter	VMET:MODE	AC
190: Serial Number	*IDN?	
191: Blank Display	DISP:ANN:ALL	ON | OFF

Note   For additional information about remotely operating the signal generator, refer to the chapter 6 in the *User's Guide*.

Error Messages

The flowchart below describes a procedure for determining the appropriate response to the following error messages: Hardware Failure, Calibration Failure, Amplitude Error, User Memory Cleared, Reverse Power Detected. Each step is explained on the next page.

1 Record Messages

2 +100dBM — Check Settings

3 SAVE — Save Settings

4 Disconnect Cables

5 INSTR PRESET — Preset Instrument

6 MSSG — Check Messages

7 RECALL — Recall Settings

8 Messages Gone? — NO / YES

9 Record Settings

10 SPECIAL 1 7 2 — Erase RAM

11 Messages Gone? — NO / YES

12 DATA 8 9 GHz dBm — Re-Enter Settings

13 Messages Gone? — NO / YES

Continue Operation

Service Instrument
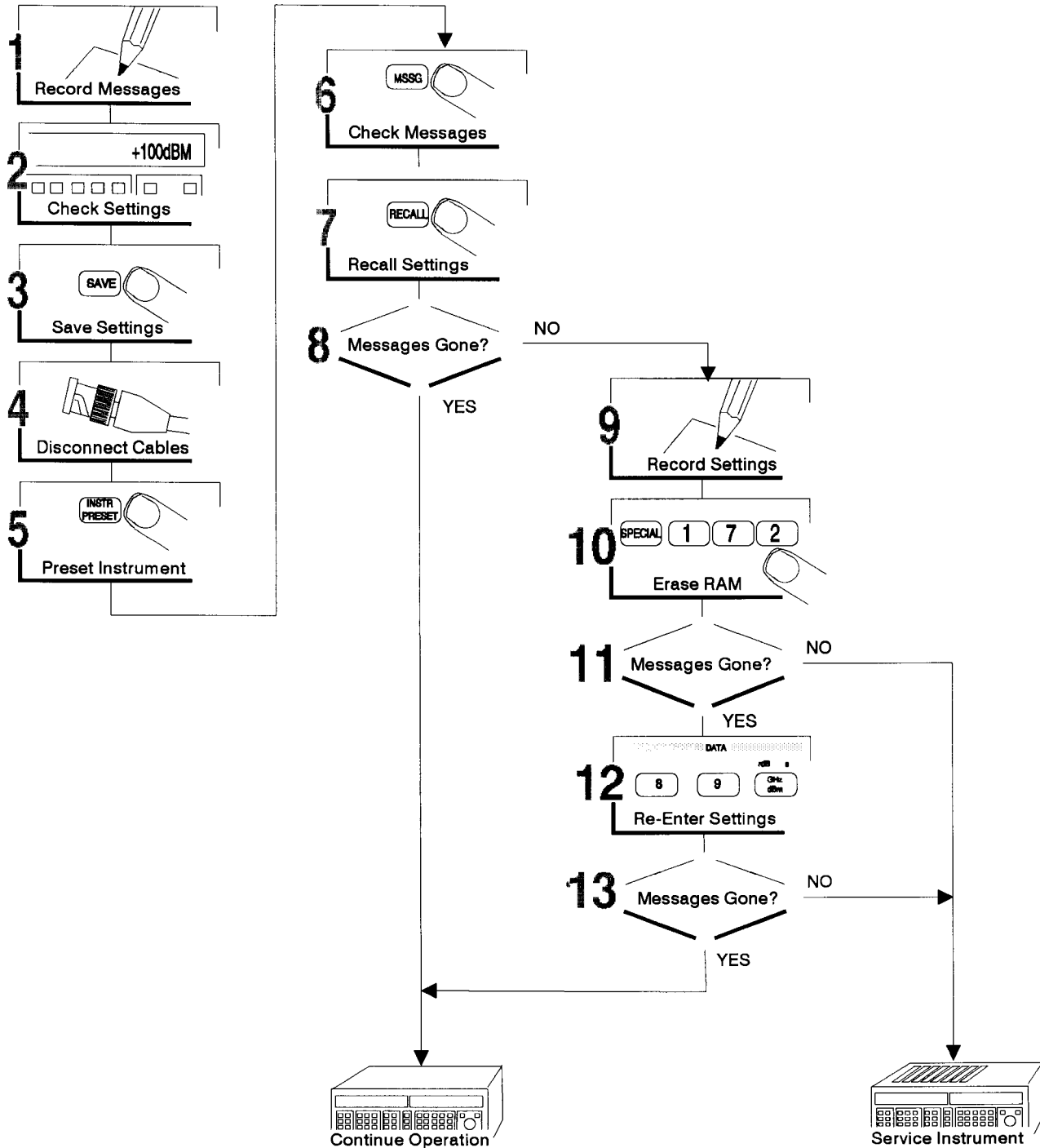
Procedure

1. Write down the error message(s) displayed by the instrument.
2. Ensure that the instrument settings are within the operating limits of the instrument.
3. Save the instrument settings, as they were when the message(s) occurred, in one of the instrument's storage registers.
4. Disconnect all cables from the front-panel and rear-panel connectors (except the power cable).
5. Press (INSTR PRESET).
6. Check the message list. Note whether the messages are the same when the instrument is in its preset condition.
7. Recall the storage register you saved in step 3.
8. Check the message list. Note whether the messages are gone, are changed, or are the same.
   - If the messages are gone, continue with normal operation.
   - If the messages are not gone, continue with step 9.
9. Write down the instrument settings you saved in step 3.
10. Select Special Function 172 and perform a RAM WIPE to erase the contents of RAM.
11. Check the message list.
    - If the messages are still present, write them down and send the instrument in for service.
    - If the messages are gone, continue with step 12.
12. Re-enter the settings you wrote down in step 9.
13. Check the message list.
    - If the message(s) return, write them down and send the instrument in for service.
    - If the message(s) are gone, reconnect the cables and continue with normal operation.

Note

Refer to the *Service Manual* for further troubleshooting information. For further information about error messages, refer to chapter 7 of the *User's Guide*.

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