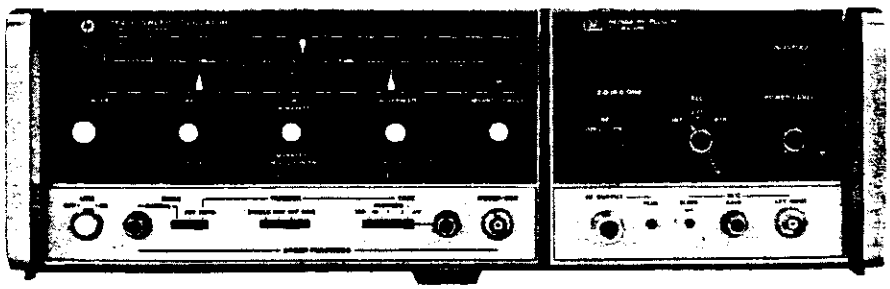
A-1

OPERATING AND SERVICE MANUAL

8620C SWEEP OSCILLATOR



HEWLETT PACKARD

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 Bureau of Standards, to the extent allowed by the Bureau'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 to return the product to Buyer. However, Buyer shall pay all 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. Addresses are provided at the back of this manual.

8620C
SWEEP OSCILLATOR
(Includes Options 001, 011, and 908)

SERIAL NUMBERS

This manual applies directly to instrumentw with serial numbers prefixed 1716A.

With changes described in Section VII, this manual also applies to instruments with serial numbers prefixed 1645A, 1641A, 1626A, 1542A, and 1537A.

For additional important information about serial numbers see INSTRUMENT COVERED BY MANUAL in Section I.

MANUAL PART NO. 08620-90093
Microfiche Part No. 08620-90094
Operating Information Supplement Part No. 08620-90093

Printed: OCTOBER 1977

HEWLETT PACKARD

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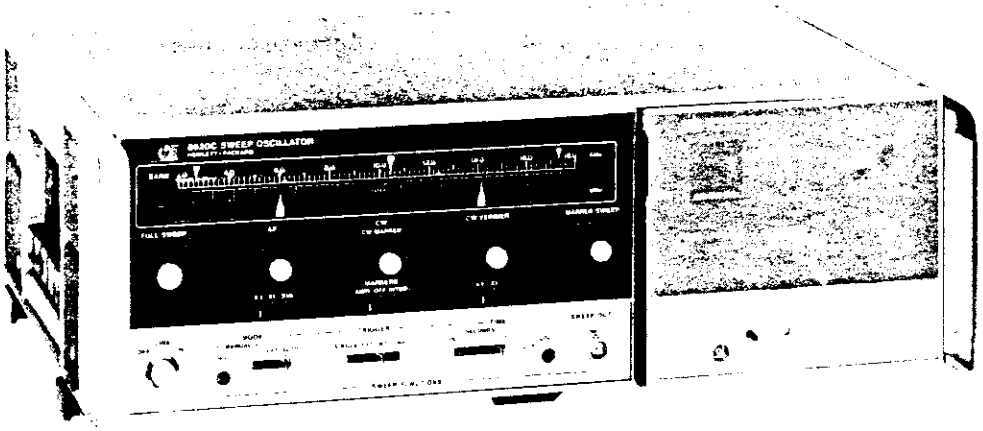
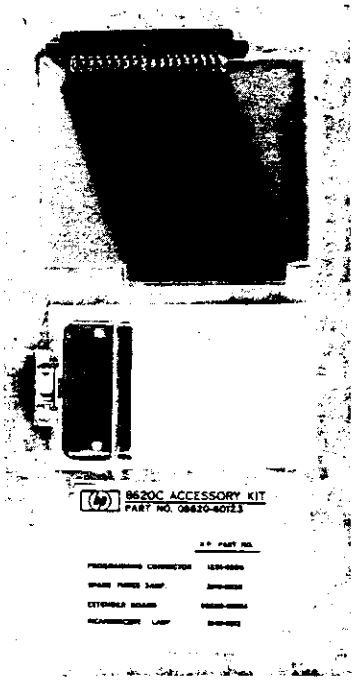
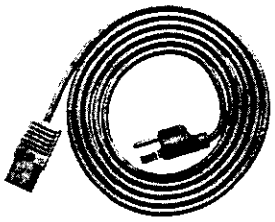


HP 8620C

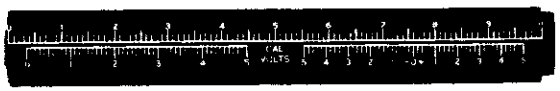
ACCESSORY KIT
08620C-60123



POWER CABLE*

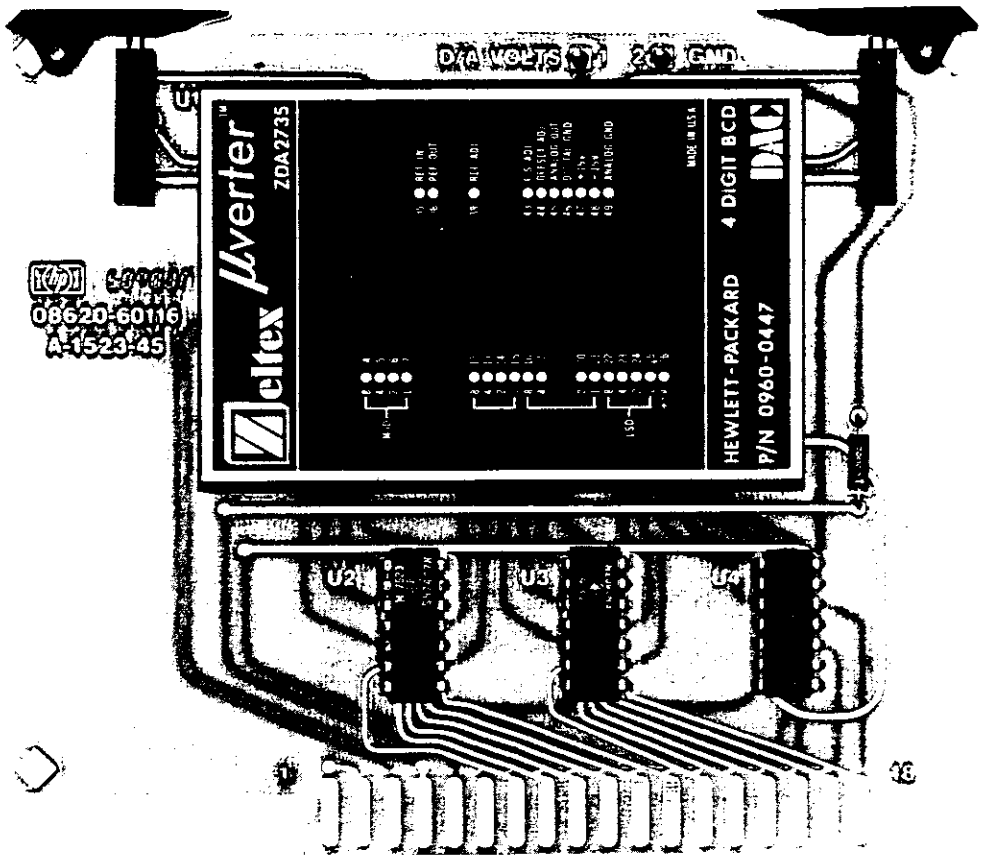


CALIBRATION SCALE
08620-00021



*Power cable/plug supplied depends on country of destination. Refer to Figure 2-2 for part number information.

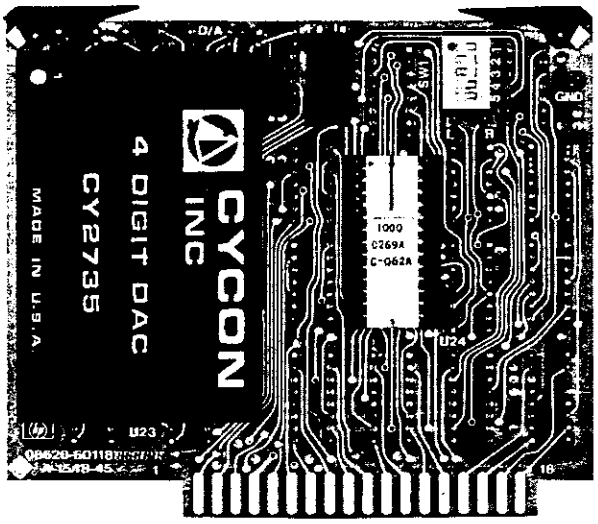
Figure 1-1. Model 8620C Sweep Oscillator with Accessories Supplied



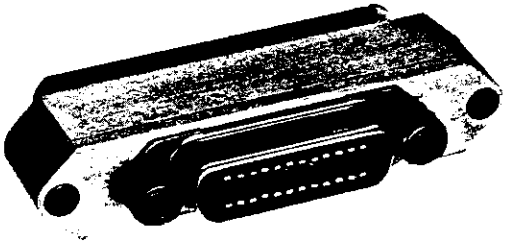
BCD PROGRAMMING ASSEMBLY

08620-60116

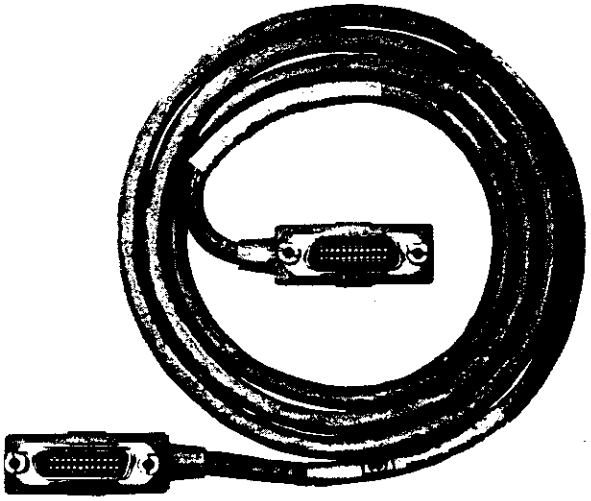
Figure 1-2. Model 8620C Option 001 Equipment Supplied



HP-IB INTERFACE ASSEMBLY
08620-60118



HP-IB CONNECTOR/ADAPTER
08620-60130



HP-IB INTERCONNECT CABLE
HP 10631B

Figure 1-3. Model 8620C Option 011 Equipment Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This Operating and Service manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard Model 8620C Sweep Oscillator mainframe. (See Figure 1-1.) An electronically-tuned sweep signal source is made up either by the combination of the Model 8620C and an RF Plug-in, or the combination of the Model 8620C with an RF Section and appropriate oscillator modules. Operating and Service information for the RF Plug-ins, RF Sections, and oscillator modules is contained in separate manuals.

1-3. This manual is divided into eight sections which provide information as follows:

a. SECTION I, GENERAL INFORMATION, contains the instrument description and specifications as well as the accessory and recommended test equipment list.

b. SECTION II, INSTALLATION, contains information relative to receiving inspection, preparation for use, mounting, packing, and shipping.

c. SECTION III, OPERATION, contains operating instructions for the instrument.

d. SECTION IV, PERFORMANCE TESTS, contains information required to verify that instrument performance is in accordance with published specifications.

e. SECTION V, ADJUSTMENTS, contains information required to properly adjust and align the instrument after repair.

f. SECTION VI, REPLACEABLE PARTS, contains information required to order all parts and assemblies.

g. SECTION VII, MANUAL CHANGES, contains backdating information to make this manual compatible with earlier equipment configurations.

h. SECTION VIII, SERVICE, contains descriptions of the circuits, schematic diagrams, parts location diagrams, and block diagrams to aid the user in maintaining the instrument.

1-4. Supplied with this manual is an Operating Information Supplement. The Supplement is a copy of the first three sections of this manual, and should be kept with the instrument for use by the operator.

1-5. Also listed on the title page of this manual is a Microfiche part number. This number can be used to order 4 x 6-inch microfilm transparencies of the manual. Each microfiche contains up to 60 photo-duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1-6. SPECIFICATIONS

1-7. Listed in Table 1-1 are the instrument specifications. These specifications are the performance standards, or limits against which the instrument may be tested.

1-8. SAFETY CONSIDERATIONS

1-9. General

1-10. This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been manufactured and tested in accordance with international safety standards.

1-11. Safety Symbols

Instruction manual symbol: the apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Indicates dangerous voltages.

Earth terminal.

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

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating 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 equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

Table 1-1. Specifications (1 of 2)

SPECIFICATIONS
8620C SWEEP OSCILLATOR
(with RF Section or RF Plug-in installed)

FREQUENCY

Frequency Range: Determined by band select lever and RF Plug-in installed.

Frequency Linearity: Refer to RF unit specifications.

SWEEP FUNCTIONS

FULL Sweep: Sweeps the full band as determined by plug-in and band select lever.

MARKER Sweep: Sweeps from START MARKER to STOP MARKER frequency settings.

Range: Both settings continuously and independently adjustable over the entire frequency range; can be set to sweep either up or down in frequency.

End-point Accuracy: Refer to RF unit specifications, same as frequency accuracy.

ΔF Sweep: Sweeps symmetrically upward in frequency, centered on CW setting. SW Vernier can be activated for fine control of center frequency.

Width: Continuously adjustable and calibrated from zero to 1%, zero to 10%, or zero to 100% of usable frequency band as selected with front-panel switch. Scale calibrated directly in MHz.

Width Accuracy: ±1% of maximum ΔF plus ±2% of ΔF being swept.

Center-Frequency Accuracy: Refer to RF unit specifications, same as frequency accuracy.

Frequency Markers: Three constant-width frequency markers are fully calibrated and independently adjustable over the entire range of FULL SWEEP; the markers are controlled by the START MARKER, STOP MARKER, and CW MARKER controls. In ΔF Sweep, Start and Stop Markers are available; in MARKER SWEEP, the CW Marker is available. A front panel switch provides for selection of either amplitude or intensity markers (amplitude modulating the RF output or Z-axis modulating the CRT display).

Accuracy: Refer to RF unit specifications, same as frequency accuracy.

Resolution: Better than 0.25% of RF unit bandwidth.

Marker Output: Rectangular pulse, typically −5 volts peak, available from Z-axis BNC connector or rear panel. Source impedance, approximately 1000 ohms.

CW Operation: Single-frequency RF output, adjusted by CW Marker control and activated by pressing CW pushbutton.

CW Vernier: Calibrated directly in MHz about CW setting. CW Vernier activated by pressing CW VERNIER pushbutton. Zero to ±0.5% or zero to ±5% of full bandwidth, selectable with front panel switch.

Accuracy: Refer to RF unit specifications, same as frequency accuracy.

Preset Frequencies: START MARKER, STOP MARKER, and ΔF end points in MANUAL and CW MARKER frequency, can be used as preset CW frequencies.

Table 1-1. Specifications (2 of 2)

SWEEP MODES

Auto: Sweep recurs automatically.

Manual: Front-panel control provides continuous manual adjustment of frequency between end frequencies set in any sweep function.

External: Sweep is controlled by external signal applied to rear-panel PROGRAMMING connector. Zero volts at start of sweep increasing linearly to approximately +10V at end of sweep.

SWEEP TRIGGERS

Line: Sweep can be synchronized with ac power line.

Internal: Sweep is controlled by internally generated trigger.

External Trigger: Sweep is actuated by external trigger signal applied to rear-panel EXT TRIGGER BNC connector. Trigger signal must ge greater than +2 Vdc, wider than 0.5 μsec, and not greater than 1 MHz in frequency.

Single: Activated by front-panel switch.

Sweep Time: Continuously adjustable in four decade ranges typically .01 to 100 seconds.

Sweep Output: Direct-coupled sawtooth, zero to approximately +10V, concurrent with swept RF output. Zero volts at start of sweep, approximately +10V at end of sweep regardless of sweep width or direction. In CW mode, dc output is proportional to frequency.

MODULATION

Internal AM: 1000 Hz square-wave modulation on all sweep times (internally adjusted from 950 to 1050 Hz). On/Off ratio, refer to RF unit specifications.

External AM: Refer to RF unit specifications.

External FM: Refer to RF unit specifications.

Phase Lock: Refer to RF unit specifications.

GENERAL

RF Blanking: With RF blanking switch enabled, RF is automatically turned off during retrace, and turned on after completion of retrace. On automatic sweeps, RF is on long enough before sweep starts to stabilize external circuits and equipment whose response is compatible with the selected sweep rate.

Display and Negative Blanking Outputs: Direct-coupled rectangular pulses of approximately +5V (Display Blanking) and approximately −5V (Negative Blanking) into 2500 ohms available at rear-panel Z-AXIS/MKR/PEN LIFT and NEGATIVE BLANKING connectors, respectively. Both pulses are coincident with RF Blanking pulse.

Pen Lift: For use with X-Y graphic recorders having positive power supplies only. Pen lift terminals available at rear panel PROGRAMMING connector or rear-panel Z-AXIS/MKR/PEN LIFT connector. Available only on slowest sweep speed.

Furnished: 229 cm (7½-foot) power cable with NEMA plug, and accessory kit.

Power: 100, 120, 220, and 240 Vac +5% −10%, 50 to 400 Hz. Approximately 140 watts.

Dimensions: 425 mm wide, 132,6 mm high, 33,7 mm deep (16¾" x 5-1/8" x 13¼").

Weight (not including RF unit): Net, 11,1 kg (24 lb). Shipping, 13,4 kg (30 lb).

OPTION 001 and OPTION 011 REMOTE FREQUENCY PROGRAMMING

Functions:

Band: Manual enable or remote control of four bands.

Mode: Seven modes; including digital-frequency control in three modes, with resolution of 10,000 points across full band or between START MARKER and STOP MARKER as set by front-panel controls, or across ΔF as set by front-panel ΔF and CW controls; or selection of any of four analog sweep functions: ΔF or MARKER SWEEP with end points set by appropriate front-panel controls, CW as set by CW MARKER control, or FULL SWEEP of band selected.

Frequency: Resolution of 10,000 points per band.

Marker (Option 011 only): With analog sweeps (FULL SWEEP, ΔF, or MARKER SWEEP), a programmable marker is available in either amplitude (AMPL) or intensity (INTEN) as selected with front-panel switch.

1-12. INSTRUMENTS COVERED BY MANUAL

1-13. Attached to the instrument is a serial number plate. (A typical serial number plate is shown in Figure 1-4.) The serial number is in two parts. The first four digits and letter are the serial number prefix; the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of the manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

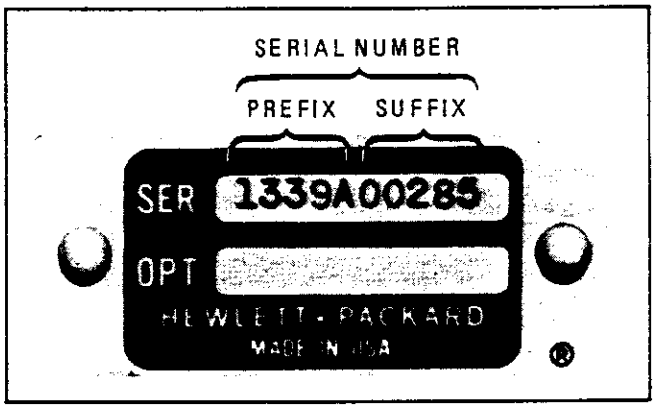


Figure 1-4. Typical Serial Number Plate

1-14. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a yellow Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument.

1-15. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified with this manual's print date and part number, both of which appear on the manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-16. For information concerning a serial number prefix that is not listed on the title page or in the manual Changes supplement, contact your nearest Hewlett-Packard office.

1-17. DESCRIPTION

1-18. The Hewlett-Packard Model 8620C Sweep Oscillator, together with either an RF Section and oscillator modules, or an RF plug-in forms a completely solid-state self-contained multiband swept signal source. The Model 8620C is designed for use with network analyzer systems such as the 8410B/8411A to provide a complete microwave measurement system. Other systems can also be built, using the Model 8620C as a swept signal source.

1-19. The front panel is designed for simplicity and ease of operation. It is hinged to the mainframe to facilitate changing of the frequency dial. Pressing a mode control selects the mode and causes the lamp in the control to light providing a positive identification of the mode selected.

1-20. Full Sweep Mode

1-21. Full Sweep mode is selected automatically when the mainframe is turned on. In this mode, three markers are available for frequency identification. One marker is adjusted by the CW MARKER control. When ΔF Sweep is selected, this CW Marker setting becomes the center frequency of the ΔF Sweep. The other two markers are adjusted by the START MARKER and STOP MARKER controls. The position of these two markers becomes the start/stop frequencies of the sweep when MARKER SWEEP mode is selected. These two markers are also available on the ΔF Sweep and again become the start/stop frequencies of the sweep when MARKER SWEEP is selected.

1-22. Marker Sweep Mode

1-23. When Marker Sweep mode is selected, one marker is available (controlled by CW MARKER) and its position identifies the center frequency of the ΔF Sweep. The Marker Sweep start/stop frequencies are determined by the position of the start and stop markers on the trace in Full Sweep or ΔF Sweep modes.

1-24. ΔF Sweep Mode

1-25. When ΔF Sweep mode is selected, the CW mode lamp is also lit and the center frequency is adjusted by the CW MARKER control. The ΔF control selects the full-width about the CW frequency. Start and stop markers are available in ΔF Sweep and become the start/stop frequencies of the Marker Sweep.

1-26. CW Mode

1-27. A single-frequency RF output is selected in CW operation. The frequency is selected by adjusting the CW MARKER control. Pressing the CW VERNIER control provides a vernier function for precise frequency adjustment around the CW setting.

1-28. OPTIONS

1-29. Option 001 provides remote programming of mode, band and frequency. The frequency may be selected at 10,000 points through each band by a 16-line BCD input.

1-30. Option 011 provides the HP-IB capability for remote programming. It provides remote programming of mode, band, frequency, and a remote marker. Frequency may be selected at 10,000 points through each band.

1-31. For maximum utility in automatic systems the 8620C is programmable through a rear panel fifity-pin connector. Frequency can be digitally programmed for 10,000 points across each band with the addition of one of the optional plug-in printed circuit boards.

1-32. ACCESSORIES SUPPLIED

1-33. Figure 1-1 shows the HP Model 8620C Sweep Oscillator mainframe and accessories supplied. The accessories consist of a 0—10V Calibration scale (HP Part No. 08620-00021) a power cable (see Figure 2-2 for HP Part Number) and the accessory kit (HP Part No. 08620-60123). The power cable is described in Section II, Installation.

1-34. The A12 HP-IB Interface Assembly (08620-60118). HP-IB connector/adapter (08620-60130), and HP-IB interconnect cable (10631B) are supplied for the 8620C Option 011 (See Figure 1-3). The A6 BCD Programming Assembly (08620-60116) is supplied for Option 001. (See Figure 1-2.)

1-35. ACCESSORY KIT

1-36. The accessory kit (shown in Figure 1-1) contains a reversing extender board, two three-amp fuses, an incandescent lamp, and a fifty-pin connector. The reversing extender board permits all the necessary interconnections to be made between the Model 8620C mainframe and the plug-in board assembly being serviced. The two three-amp fuses are spares for the A4 and A5 Regulator Assemblies. The fifty-pin connector plugs into the rear-panel PROGRAMMING connector. The incandescent lamp is a spare for the mode select pushbuttons.

1-37. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-38. To have a complete operating unit, the Model 8620C Sweep Oscillator mainframe must have an RF Plug-in installed. The plug-in may either be an HP Model 8621B RF Section with appropriate oscillator module(s) installed or an 86200 series RF Plug-in.

1-39. EQUIPMENT AVAILABLE

1-40. Service Acessories

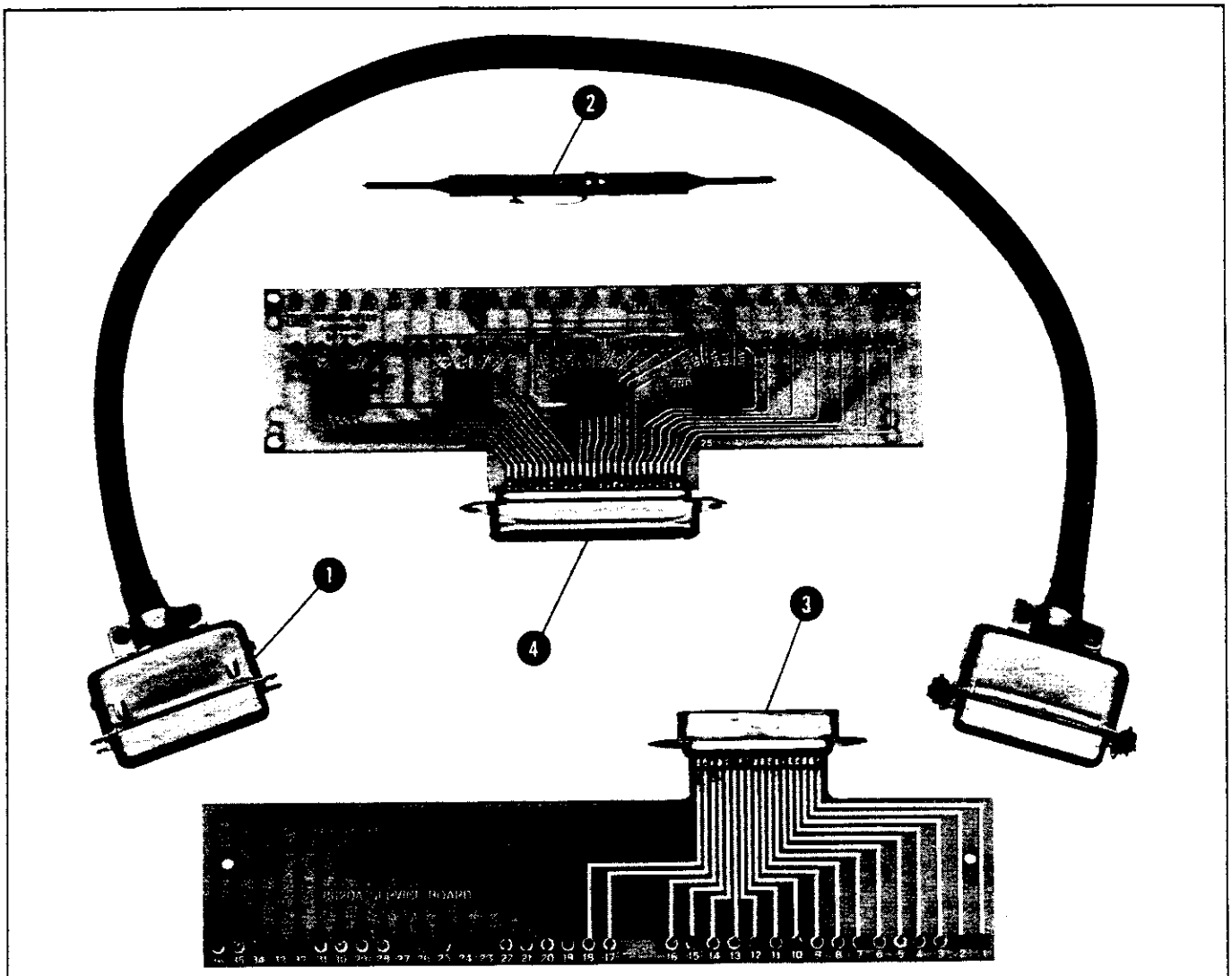
1-41. A service accessories package containing a plug-in extender cable, an adjustment tool, and two service boards may be obtained from Hewlett-Packard by ordering Service Accessories Part No. 08620-60124. This is supplied for convenience in aligning and troubleshooting the mainframe, the RF Section and oscillator modules, and an RF Plug-in units. Parts contained in the service accessories package are listed in Figure 1-5.

1-42. Model 8410B/8411A Network Analyzer

1-43. The Model 8620C Sweeper is compatible with the Hewlett-Packard Model 8410B Network Analyzer System. The combination of the Model 8410B Network Analyzer, the Model 8411A Frequency Converter, and an appropriate display plug-in forms a phasemeter and a ratiometer for direct phase and amplitude ratio measurement on RF voltages. These measurements can be made on single frequencies and on swept frequencies from 110 MHz to 18 GHz. Some plug-ins are capable of multi-octave sweeps in this range. Interface cable HP Part Number 8120-2208 must be used when sweeping octave or multi-octave bandwidths or the 8410B will not phase lock properly. (See Figure 1-6 for description of cable.)

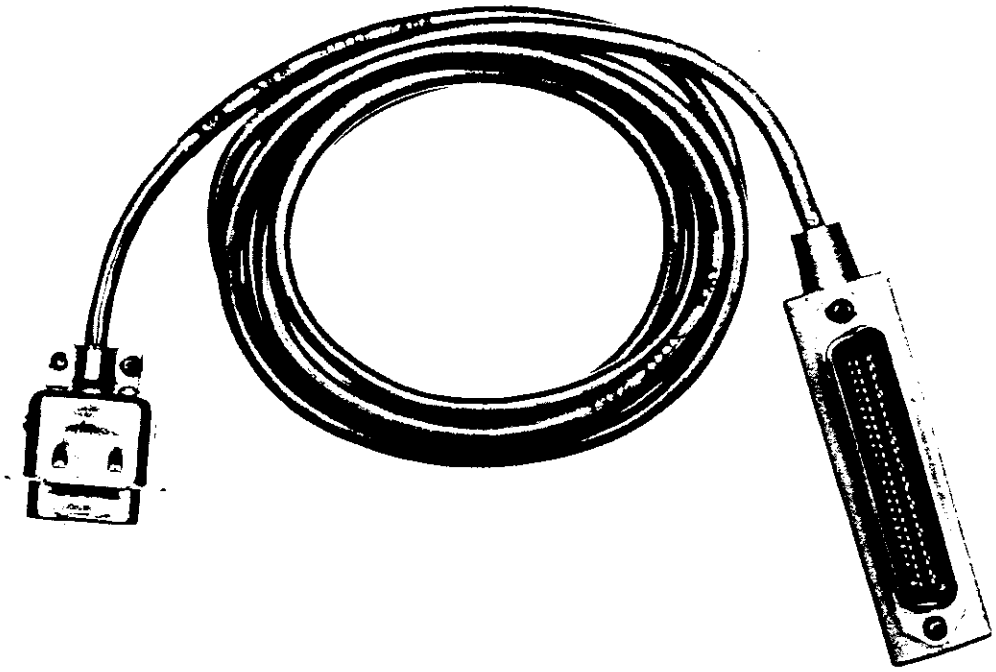
1-44. Power Meters and Crystal Detectors

1-45. Depending on the RF section used, the RF output can be externally leveled using power meters or crystal detectors. Refer to the Operating and Service Manual of the RF Plug-in used for detailed information on leveling systems that may be used with the 8620C/RF Plug-in combination.



Item	Name	Part No.	Use
1	Extender Cable	08620-60032	Moves RF Plug-in outside mainframe for alignment or service.
2	Adjustment Tool	8830-0024	Fits miniature adjustment slot on potentiometers.
3	36-Pin Service Board	08620-60037	Allows probing RF Section Interface connector, or rear-panel programming connector on all mainframes except 8620C, during performance testing or troubleshooting of 8260 Series mainframes.
4	50-Pin Service Board	08620-60125	Allows probing rear-panel programming connector during performance testing or troubleshooting of HP Model 8620 Sweep Oscillator mainframe.

Figure 1-5. Service Accessories, HP Part Number 08620-60124



The 8410B has an Auto-frequency range mode which gives it the capability of automatically tracking the HP Model 8620C Sweep Oscillator over octave and multi-octave frequency bands from 110 MHz to 18 GHz.

Interface cable HP Part Number 8120-2208 must be used when sweeping octave or mulit-octave bandwidths, or the 8410B will not phase-lock properly. Detailed wiring of this cable is shown in table below.

P/N 8120-2208 (For Use with 8410B and 8620C)			
J17 (8410B)	**Color Code**	**J2 (8620C/50 Pin)**	**Use**
Pin 7	(6)	Pin 34	Stop Sweep Pulse
Pin 1	(4)	Pin 26	Sequential Sweep Trigger
Pin 9	(2)	Pin 50	HP-IB Data Strobe Trigger
Pin 11	(0)	Pin 43	Ground

Figure 1-6. HP Model 8410B Auto-Frequency Mode Interface Cable

1-46. HP-IB Equipment

HP 10631A Cable-1 metre HP-IB Cable
HP 10631B Cable-2 metre HP-IB Cable
HP 10631C Cable-4 metre HP-IB Cable
HP 59401A Bus System Analyzer
Troubleshoots hardware and software problems on HP-IB
HP 8620C Cable Adapter (8120-2207)
(See Figure 2-11.)
Connects to 50-pin PROGRAMMING connector and has feed-through pins for troubleshooting and additional interfacing.

1-47. RECOMMENDED TEST EQUIPMENT

1-48. Equipment required to maintain the Model 8620C is listed in Table 1-2. Other equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

1-49. 8620C OPTION 011 DESCRIPTION

1-50. The Model 8620C Option 011 provides a remote programming capability for the 8620C sweeper, with the Hewlett-Packard Interface Bus (HP-IB) as the common link between instruments. It provides remote programming of the sweep modes, band selection, frequency, and a remote marker. The sweep functions may be digitally programmed and the frequency endpoints set by an internal remote control voltage. Sweep functions may also be programmed for local control with frequency endpoints set by front-panel controls and with a digitally controlled marker. All programming is routed through a rear-panel fifity-pin connector from either a computer or calculator.

1-51. HP-IB General Information

1-52. The Hewlett-Packard Interface Bus (HP-IB) is an instrumentation interface for integrating instruments, calculators, and computers into systems. The Bus uses sixteen signal lines to effect transfer of data and commands to interconnect up to 15 instruments. The HP-IB is normally the only communication link between the interconnected units. The instruments on the Bus are connected in parallel as shown in Figure 1-7. Eight of the signal lines (DI01—DI08) are used for the transfer of data and other messages in a byte-serial, bit-parallel form. The remaining eight lines are used for communication timing (Handshake), control, and status information. A glossary of HP-IB terms is contained in Table 1-3.

1-53. Data is transmitted on the eight HP-IB data lines as a series of eight-bit characters referred to as "bytes". The meaning of each byte is arbitrary, being different for each type of instrument. Normally, a seven-bit ASCII code (American Standard Code for Information Interchange) is used with the eighth bit available for a parity check, if desired. Data is transferred by means of an interlocked "handshake" technique. This sequence permits asynchronous communications over the range of data rates.

1-54. Three-Wire Handshake Description

1-55. Information is transferred on the data lines under control of a technique called the three-wire handshake. The handshake involves the use of three control lines and operates as follows:

a. The 8620C indicates that it is ready to accept data by letting the Not Ready for Data (NRFD) line go high. Listeners are connected to the NRFD line in a logical AND configuration so the NRFD line does not go high until all active listeners are ready for data.

b. After NRFD has gone high, the talker places a data byte on the eight data lines by setting the Data Valid (DAV) line low.

c. After DAV has gone low, the 8620C pulls NRFD low, accepts the data, and lets the Data Accepted (NDAC) line go high. Again, all listeners are logically ANDed and NDAC does not go high until all listeners have accepted the data.

d. After the NDAC line has gone high, the talker can let DAV go high again and take the data off the lines. When DAV goes high, the listeners set NDAC back to low and the sequence is ready to repeat with Step a.

NOTE

Data is transferred asynchronously as fast as the slowest active device on the bus.

Table 1-2. Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model	Use*
Oscilloscope	Variable persistence, Dual trace, 20 MHz minimum bandwidth, 5 mV/Div sensibility, and 1 μS/Div horizontal sweep rate. 10:1 probe and 1:1 probe.	HP 181A/1801A/1820C	P, A, T
Digital Multimeter[1]	Accuracy: 0.004% Input Impedance: 10 MΩ minimum	HP 3490A	P, A, T
Frequency Counter[1]	Range: As required by RF Plug-In	HP 5340A	P
Power Meter[1]	Frequency Range: As required by RF Plug-In Power Range: −20 dBm to +20dBm	HP 436A	P
Power Sensor	Frequency Range: As required by RF Plug-In Power: Up to 100 mW	HP 8481A	P
Pulse Generator	Amplitude: 2 volts positive peak Pulse Width: 0.5 μS Repetition Rate: 1 MHz	HP 8002A	P
Crytal Detector	As required by RF Plug-In	HP 423A or HP 8470A	P
Calculator		HP 9830A	P, A
10-dB Attenuator	Attenuation: 10 dB ±0.5 dB	HP 8491B, Option 001	P
HP-IB Interface Cable	Connectors: HP-IB, 24-pin	HP 10631A/B/C	A
Adapter	APC-7 to Type N, Male	HP 1250-0479	P
Wrench	Right Angle, Bristol, No. 6	HP 8710-0055	A
36-pin Service Board**		HP 08620-60037	P, A, T
50-Pin Service Board**		HP 08620-60125	P, A, T
Extender Cable**		HP 08620-60032	T
Adjustment Tool**		HP 8830-0024	A
HP-IB Calculator Interface		HP 59405A (Option 030)	A

* P = Performance Test; A = Adjustments; T = Troubleshooting

** These parts are included in Service Accessories package, 08620-60124 (Figure 1-5).

1 These instruments must contain HP-IB option when used for HP-IB testing the 8620C, Option 011.

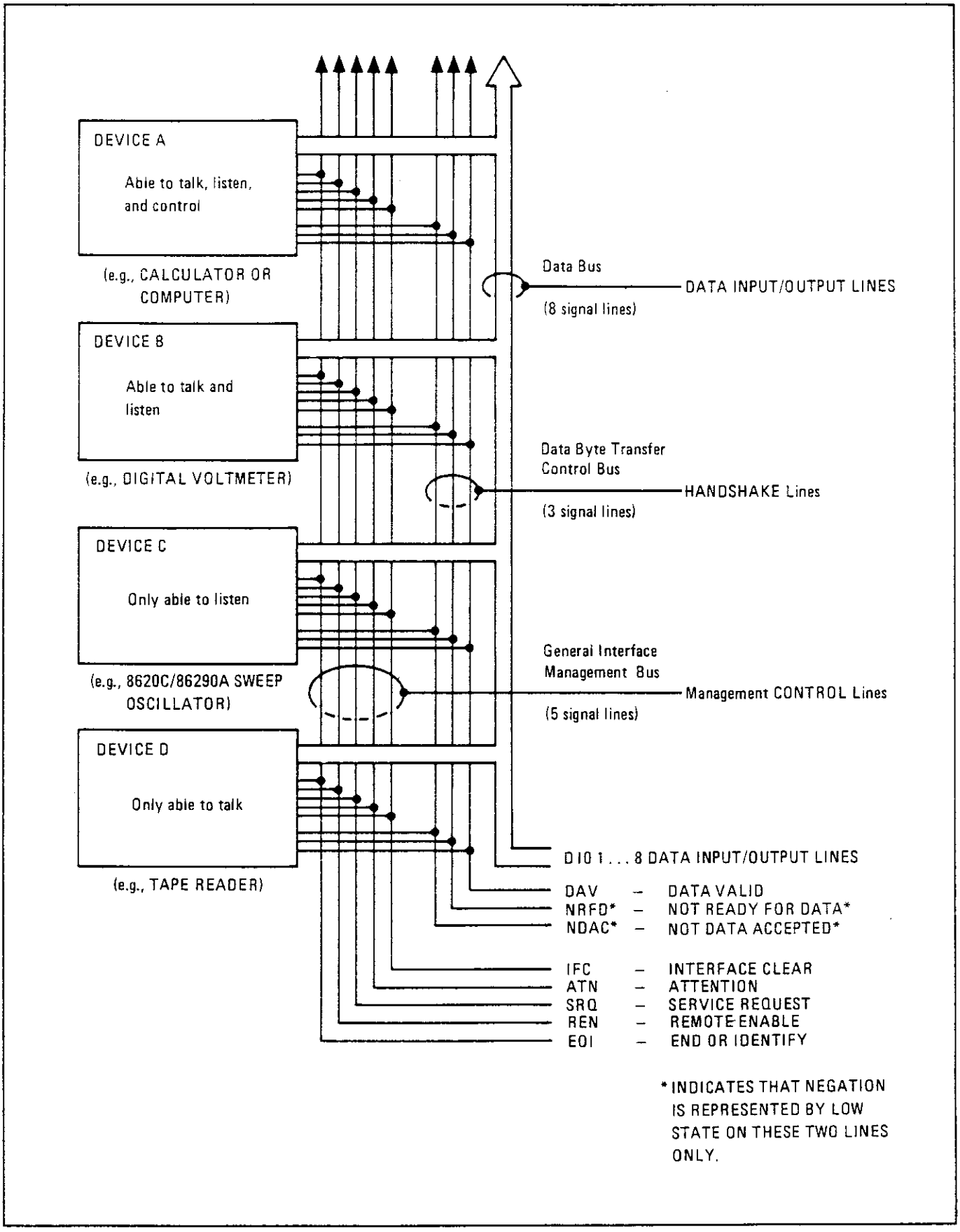


Figure 1-7. Interface Connections and Bus Structure

Table 1-3. Glossary of HP-IB Terms, Relating to 8620C (1 of 2)

ADDRESS – A 7-bit code applied to the HP-IB in Command Mode which enables the 8620C to listen on the Bus.

ADDRESSED COMMANDS – These commands allow the Bus controller to initiate simultaneous actions from addressed instruments which are capable of responding.

ATN – Mnemonic referring to the Attention control line on the HP-IB. This refers to the Command Mode of operation on the HP-IB, or the control line which places the HP-IB in this mode.

BIT – The smallest part of an HP-IB character (Byte) which contains intelligible information.

BUS COMMANDS – A group of Special Codes which initiate certain types of operation in instruments capable of responding to these codes. Each instrument on the HP-IB is designed to respond to those codes that have useful meaning to the device and ignore all others. (See Table 3-4.)

BYTE – An HP-IB character sent over the Data Input/Output (DIO) Lines, normally consisting of eight-bits.

COMMAND MODE – In this mode, devices on the HP-IB can be addressed or unaddressed as talkers or listeners. Bus commands are also issued in this mode.

CONTROLLER – Any device on the HP-IB which is capable of setting the ATN line and addressing instruments on the Bus as talkers and listeners. (Also see System Controller.)

DATA MODE – The HP-IB is in this mode when the ATN control line is high (false). In this mode, data or instructions are transferred between instruments on the HP-IB.

DAV – Mnemonic referring to the Data Valid control line on the HP-IB. This line is used in the HP-IB Handshake sequence.

DIO – Mnemonic referring to the eight Data Input/Output lines of the HP-IB.

EOI – Mnemonic referring to the End or Identify line on the HP-IB.

HANDSHAKE – Refers to the sequence of events on the HP-IB during which each data byte is transferred between addressed devices. The conditions of the HP-IB handshake sequence are as follows:

a. NRFD, when false, indicates that a device is ready to receive data.

b. DAV, when true, indicates that data on the DIO lines is stable and available to be accepted by the receiving device.

c. NDAC, when false indicates to the transmitting device that data has been accepted by the receiver.

HP-IB – An abbreviation that refers to the Hewlett-Packard Interface Bus.

IFC – Mnemonic referring to the Interface Clear control line on the HP-IB. Only the system controller can activate this line. When IFC is set (true) all talkers and listeners on the HP-IB are unaddressed, and controllers go to the inactive state.

LISTENER – A device addressed to receive data or instructions from other instruments on the HP-IB. (Also see Extended Listener.)

NDAC – Mnemonic referring to the Not Data Accepted line on the HP-IB.

Table 1-3. Glossary of HP-IB Terms, Relating to 8620C (2 of 2)

NRFD – Mnemonic referring to the Not Ready For Data control line on the HP-IB. This line is used in the HP-IB Handshake sequence.

REN – Mnemonic referring to the Remote Enable control line on the HP-IB. This line is used to enable Bus compatible instruments to respond to commands from the controller or another talker. It can be issued only by the system controller.

SRQ – Mnemonic referring to the Service Request line on the HP-IB.

SYSTEM CONTROLLER – An instrument on the HP-IB having all the features of a standard controller with the added ability to control the IFC and REN lines. (Also see Controller.)

UNLISTEN COMMAND – This is the Unlisten Command (?). When the Unlisten Command (?) is transmitted on the HP-IB, listeners on the Bus will be unaddressed as listeners.

UNIVERSAL COMMAND – These commands affect every device capable of responding on the HP-IB, regardless of whether they have been addressed or not.

UNADDRESS COMMAND – See UNLISTEN COMMAND.

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section provides installation instructions for the Model 8620C Sweep Oscillator and its accessories. This section also includes information about initial inspection and damage claims, preparation for using the Sweep Oscillator, and packaging, storage and shipment.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking electrical performance are given in Section IV. If the instrument combination does not pass the electrical performance tests, refer to the Adjustments (Section V) in this manual. If, after the Adjustments have been made, the instrument combination still fails to meet specifications, refer to RF Plug-in Adjustments in the applicable RF Plug-in manual. If a circuit malfunction is suspected, refer to troubleshooting procedures section of this manual or applicable RF Plug-in manual. If the instrument does not pass the above electrical tests, or if the shipment contents are incomplete, or if there is mechanical damage or defect, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. The Model 8620C requires a power source of 100, 120, 220, or 240 Vac, +5% −10%, 50 to 400 Hz single phase. Power consumption is approximately 140 watts with RF Section and oscillator module(s) installed.

2-8. Line Voltage Selection

CAUTION

BEFORE SWITCHING ON THIS INSTRUMENT, make sure the instrument is set to the voltage of the power source.

2-9. Figure 2-1 provides instructions for line voltage and fuse selection. The line voltage selection card and the proper fuse are factory installed for 120 Vac operation.

2-10. Power Cable

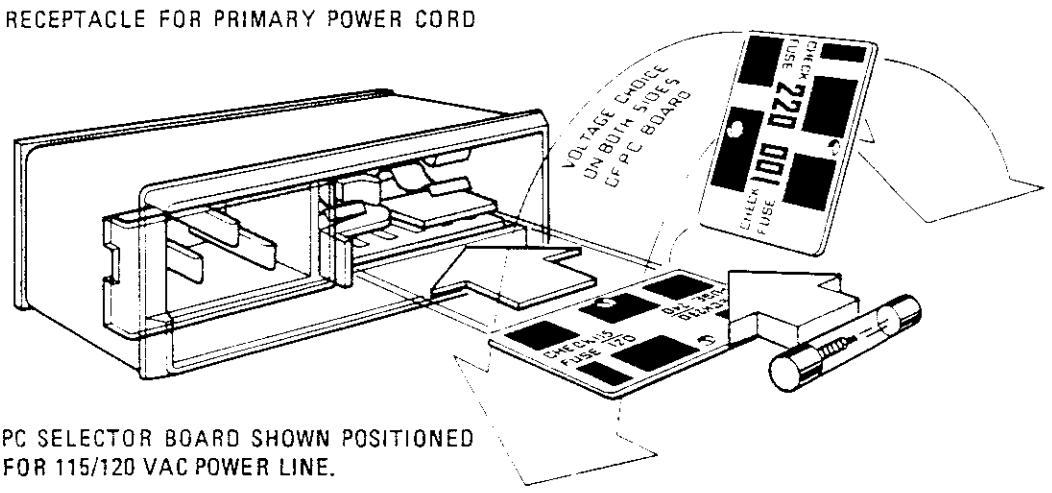
2-11. In accordance with international safety standards this instrument is equipped with a three wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. Figure 2-2 shows the styles of mains plugs available on power cables supplied with HP instruments. The numbers under the plugs are part numbers for complete power cables. The types of power cable/plug shipped depends on the country of destination.

WARNING

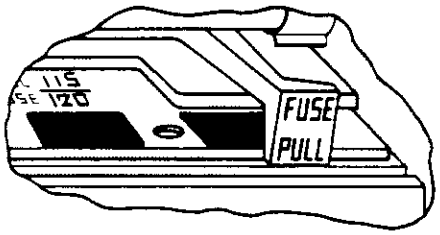
BEFORE SWITCHING ON THIS INSTRUMENT, be sure only the specified power cord is used. The instument is provided with a 3-wire power cord which grounds the instrument cabinet. This power cord should only be inserted in a socket outlet provided with a protective earth contact. This protective action should not be negated by the use of an extension cord (power cable) without a protective conductor (ground). Grounding one conductor of a two conductor outlet is not sufficient protection.

2-12. Interconnections

2-13. For the Model 8620C Sweep Oscillator to operate, an RF Plug-in or an RF Section with an oscillator module installed, must be plugged into the 8620C mainframe. Refer to RF Plug-in manual for RF Plug-in installation instructions.



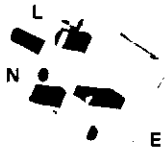
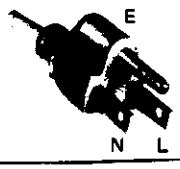
OPERATING VOLTAGE APPEARS IN MODULE WINDOW.



SELECTION OF OPERATING VOLTAGE

1. SLIDE OPEN POWER MODULE COVER DOOR AND PUSH FUSE-PULL LEVER TO LEFT TO REMOVE FUSE.
2. PULL OUT VOLTAGE-SELECTOR PC BOARD. POSITION PC BOARD SO THAT VOLTAGE NEAREST ACTUAL LINE VOLTAGE LEVEL WILL APPEAR IN MODULE WINDOW. PUSH BOARD BACK INTO ITS SLOT.
3. PUSH FUSE-PULL LEVER INTO ITS NORMAL RIGHT-HAND POSITION.
4. CHECK FUSE TO MAKE SURE IT IS OF CORRECT RATING AND TYPE FOR INPUT AC LINE VOLTAGE. FUSE RATINGS FOR DIFFERENT LINE VOLTAGES ARE INDICATED BELOW POWER MODULE.
5. INSERT CORRECT FUSE IN FUSEHOLDER.

Figure 2-1. Line Voltage Selection with Power Module PC Board

Plug Type	Cable HP Part Number	Plug Description	Cable Length (inches)	Cable Color	For Use In Country
250V 	8120-1351 8120-1703	Straight*BS1363A 90°	90 90	Mint Gray Mint Gray	Great Britain, Cyprus, Nigeria, Rhodesia, Singapore, So. Africa, India
250V 	8120-1369 8120-0696	Straight*NZSS198/ASC112 90°	79 87	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	Straight*CEE7-Y11 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, United Arab Republic (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754	Straight*NEMA5-15P 90° Straight*NEMA5-15P	80 80 36	Black Black Black	United States, Canada, Japan (100 or 200V), Mexico, Phillippines, Taiwan
	8120-1378 8120-1521 8120-1676	Straight*NEMA5-15P 90° Straight*NEMA5-15P	80 80 36	Jade Gray Jade Gray Jade Gray	
250V 	8120-2104	Straight*SEV1011 1959-24507 Type 12	79	Gray	Switzerland
250V 	8120-0698	Straight*NEMA6-15P			
250V 	8120-1860	Straight*CEE22-VI			

* Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.

E = Earth Ground; L = Line; N = Neutral

Figure 2-2. AC Power Cables Available

2-14. Mating Connectors

2-15. All of the externally mounted connectors on the mainframe are listed in Table 2-1. Opposite each mainframe connector is an industry identification, the part number of a mating connector, and the part number of an alternate source for the mating connector.

2-16. Operating Environment

2-17. Temperature. The instrument may be operated in temperatures from 0°C to +55°C.

2-18. Humidity. The instrument may be operated in environments with humidity from 5% to 95% at 0° to 40°C. However, the instrument should also be protected from temperature extremes which cause condensation within the instrument.

2-19. Altitude. The instrument may be operated at altitudes up to 4572 metres (15 000 feet).

2-20. Cooling

2-21. Clearances for ventilation should be three to four inches at the rear of the cabinet and two to three inches at the sides. The clearances provided by the plastic feed in bench stacking and the filler strips in rack mounting are adequate for the top and bottom cabinet surfaces.

2-22. Bench Operation

2-23. The instrument cabinet has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand inclines the instrument for ease of operating. The plastic feet provide clearance for air circulation and make the instrument self-aligning when stacked on other Hewlett-Packard full rack-width modular instruments.

2-24. Rack Mounting (Option 908)

2-25. Instruments with Option 908 contain a Rack Flange Kit. This kit supplies necessary hardware and installation instructions for preparing the instrument to be mounted on a rack of 482.6 mm (19 inch) spacing. Installation instructions are also given in Figure 2-3. A Rack Mounting Kit for the 8620C may be obtained from Hewlett-Packard by ordering HP Part Number 5060-8740.

2-26. Frequency Scale Installation

2-27. To install frequency scale, proceed as follows:

Table 2-1. Model 8620C Mating Connectors

8620C Connector		Mating Connector	
Connector Name	Industry Identification	HP Part No.	Alternate Source
J1 SWEEP OUT	BNC	1250-0256	Specialty Connector 25-P118-1
J2 PROGRAMMING	Micro-Ribbon 50-Contact Rack and Panel Plug	1251-0086	TRW Cinch Div. 57-30500-375
J3 EXT AM	BNC	1250-0256	Specialty Connector 25-P118-1
J4 EXT TRIGGER	BNC	1250-0256	Specialty Connector 25-P118-1
J5 NEGATIVE BLANKING	BNC	1250-0256	Specialty Connector 25-P118-1
J6 RF Plug-in Interface	Micro-Ribbon 36-Contact Rack and Panel Plug	1251-3066	Amphenol 222-42-36-058
J8 Z-AXIS/MKR/ PEN LIFT	BNC	1251-0256	Specialty Connector 25-P118-1

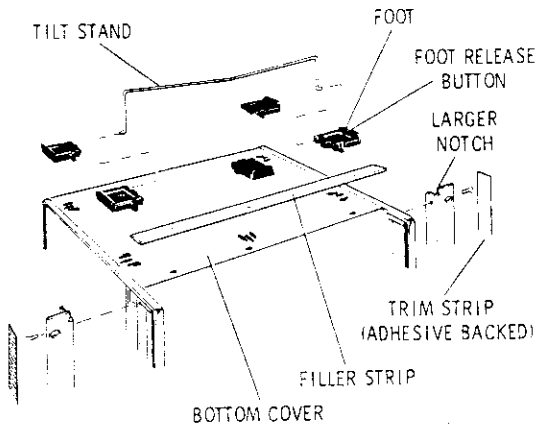


Figure 2-3. Preparation for Rack Mounting

NOTE

If RF Plug-in is installed in mainframe, it must be removed to install frequency scale. See RF Plug-in removal instructions in Operating and Service Manual for RF Plug-in.

a. Disengage mainframe front-panel latch handle, shown in Figure 2-4, by pushing downward on handle while pushing inward lightly on top of front panel.

b. Swing front panel forward and down to position shown in Figure 2-5.

c. Depress mainframe front-panel BAND select lever, shown in Figure 2-4, to rotate frequency scale drum until desired scale position is accessible.

NOTE

Drum positions 1 through 4 may be identified by tick marks (I, II, III, IIII) on left-hand side of drum.

NOTE

If necessary to remove a frequency scale, exert a pressure OUTWARD, away from drum, on right-hand edge of scale.

d. Insert frequency scale so key (a 1/16-inch long, 1/2-inch wide protrusion) on left end of scale fits into notch, shown in Figure 2-5 in roller on left-hand edge of drum.

e. Push inward on right-hand edge of frequency scale to snap it in place in frequency scale drum.

CAUTION

To prevent damage to frequency pointers when bandswitch drum is rotated, make certain that frequency scale is firmly in place and flush with band drum edges.

f. Return front panel to upright (closed) position, and, while pushing inward lightly on top of front panel, re-engage front-panel latch handle by pushing it upward to lock position as shown in Figure 2-4, exploded view.

2-28. MODEL 8620C HP-IB INTERFACE (OPTION 011) INSTALLATION

2-29. Interface Connectors and Cables

2-30. The HP-IB connector/adapter (HP Part No. 08620-60130) is a 50-pin-to-24-pin adapter that is connected to the rear-panel, 50-pin PROGRAMMING connector. The 24-pin connector interfaces directly to the HP-IB interconnect cable. The two-meter HP-10631B interface cable (Figure 2-6) interfaces the 8620C Sweep Oscillator with the HP-IB. The connectors on the cable consist of two standard HP-IB 24-pin connectors. (See Figure 2-7 for the pin configuration of the HP-IB connector.)

2-31. Cable Length Restrictions

2-32. As many as 15 instruments can be connected in parallel on the Hewlett-Packard Interface bus. To achieve design performance on the bus, proper voltage levels and timing relationships must be maintained. If the system cable is too long or if the accumulated cable length between instruments is too long, the data and control lines cannot be driven properly and the system may fail to perform. Therefore, the following restrictions must be observed:

a. With two instruments in a system, the cable length must not exceed four meters (12 feet).

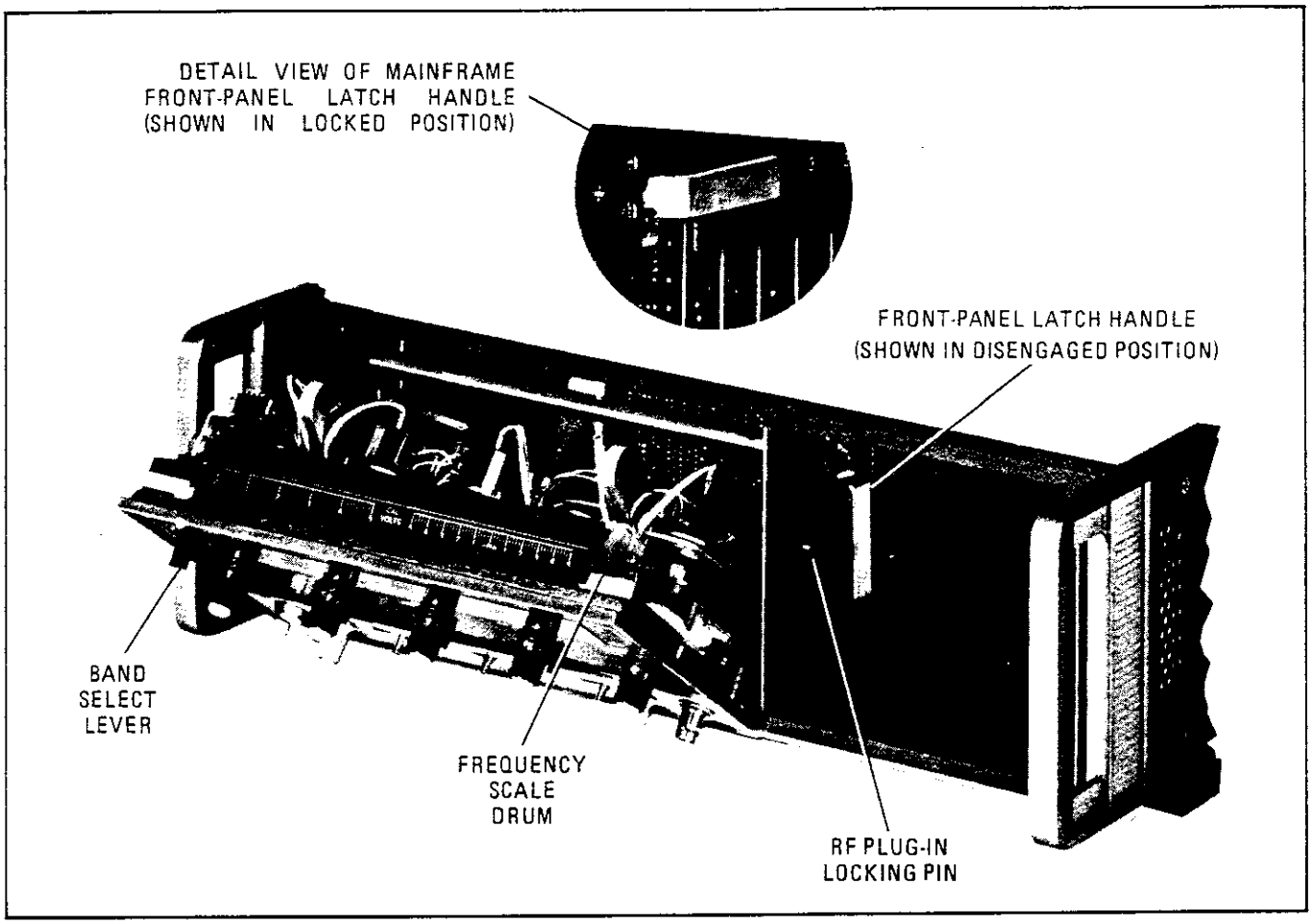


Figure 2-4. Location of Mainframe Parts Pertinent to Frequency Scale and RF Plug-in Installation

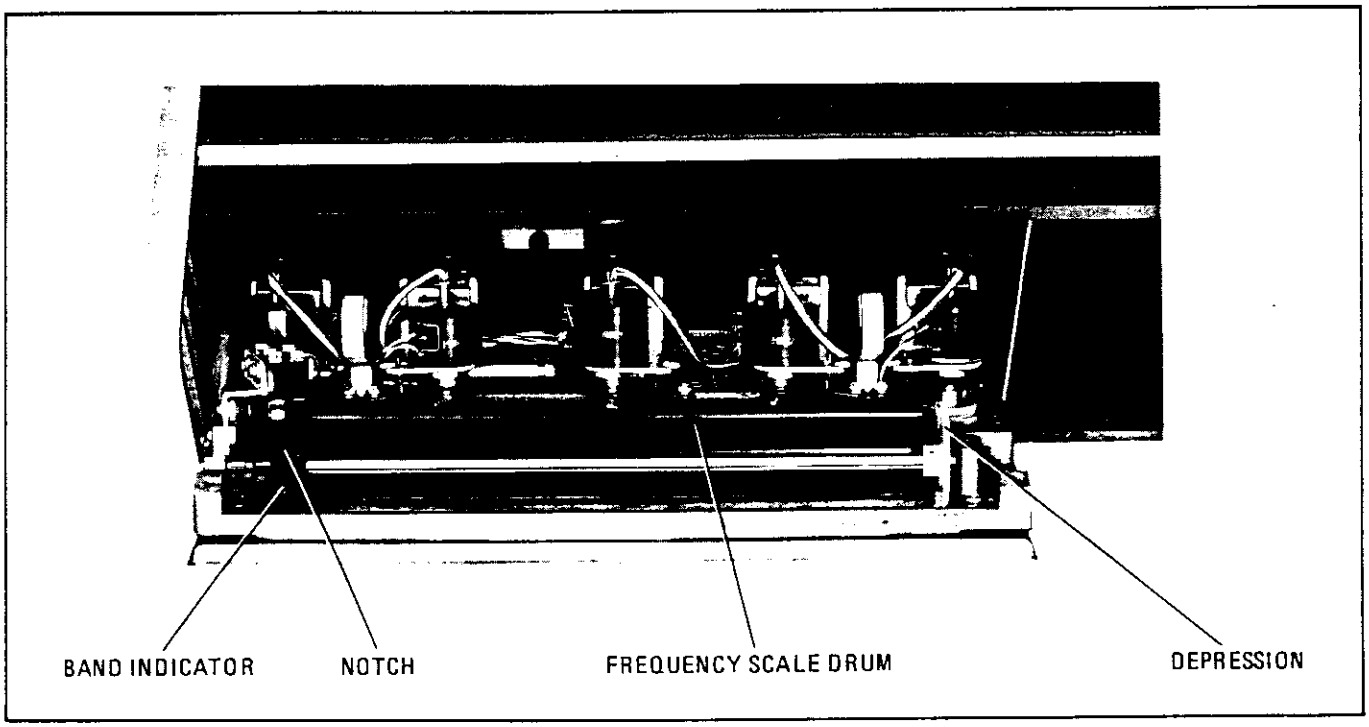
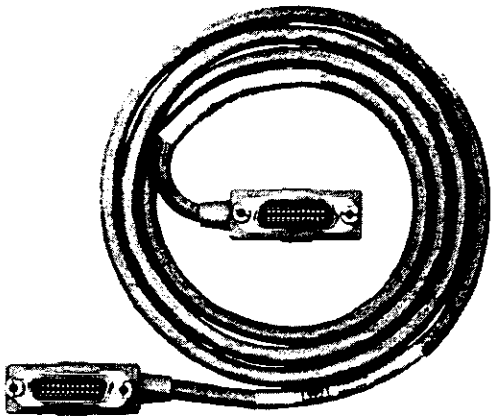


Figure 2-5. Mainframe Front Panel in Open Position



HP-IB CABLE PART NUMBERS	LENGTHS
HP 10631A	1 Meter
HP 10631B	2 Meters
HP 10631C	4 Meters

Figure 2-6. HP-IB Interface Cable

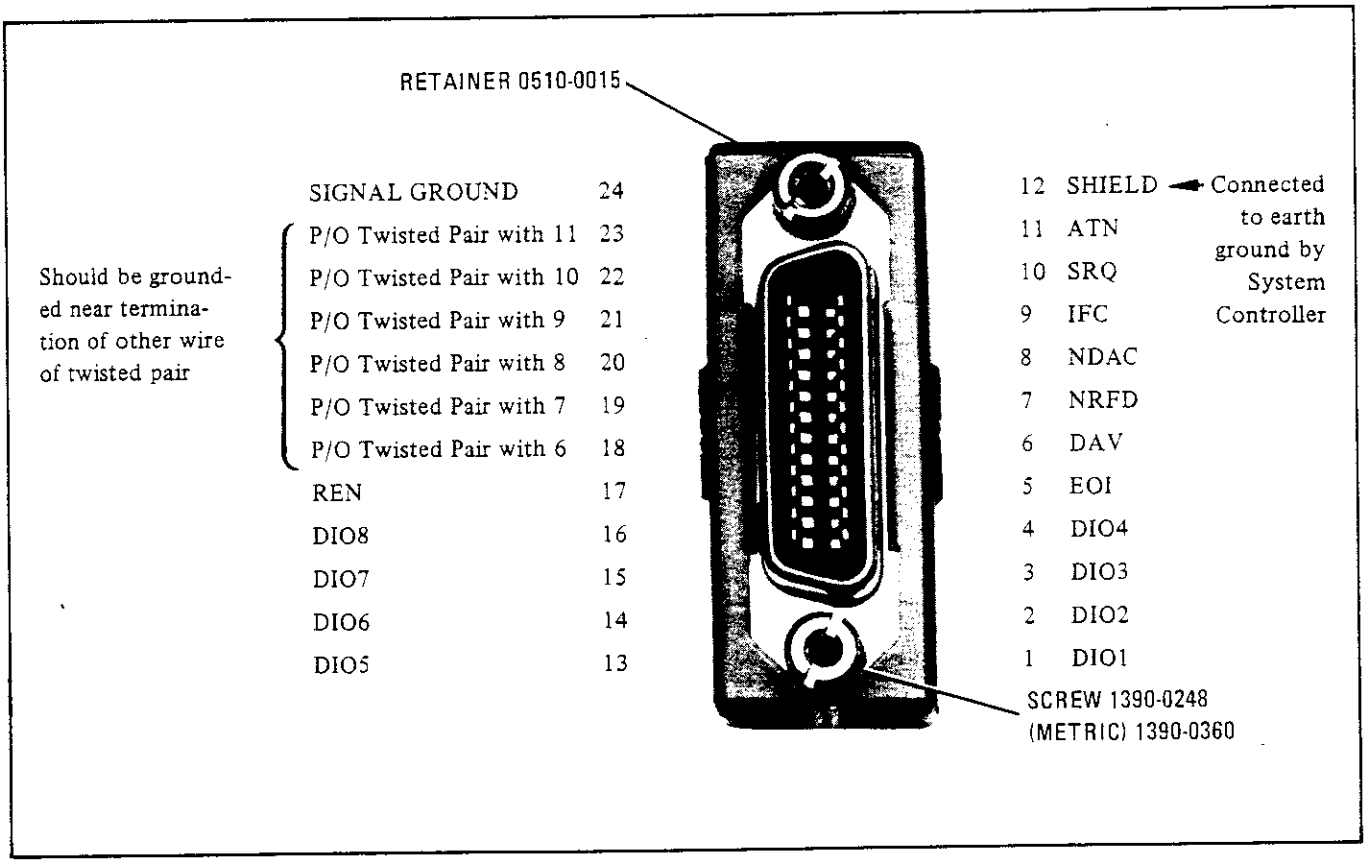


Figure 2-7. HP-IB Connector/Adaptor 08620-60130, Pin Configuration

b. When more than two instruments are connected on the bus, the cable length to each instrument cannot exceed two meters (six feet) per unit.

c. The total cable length between all units cannot exceed 20 meters (65 feet).

2-33. HP-IB Interface Assembly

2-34. The circuit board for the 8620C Option 011 is the A12 HP-IB Interface Assembly (Option 011), HP Part No. 08620-60118. (See Figures 1-3 and 8-26.) The HP-IB interface is available when this board is installed in the XA6 connector of the A11 Master Board.

2-35. Address Switch

2-36. The 8620C address switch A12SW1 is preset at the factory to ASCII character "&". Upon installation of the A12 HP-IB Interface Assembly, any of the 30 listen-address codes shown in Table 3-5 may be used. The code selected must of course be compatible with the system. The switches in Figure 2-8 are set in the ASCII character "&" address code (Octal 046). The numbers 1 through 5 etched on the A12 board correspond to b_1 through b_5 in Table 3-5. Number 1 is the Least Significant Bit (LSB) and number 5 is the Most Significant Bit (MSB).

2-37. HP-IB/Model 8410B Network Analyzer Installation

2-38. The following installation provides simultaneous operation between the 8410B Network analyzer, and the 8620C Sweeper with the HP-IB. The 8410B Cable (HP Part No. 8120-2208) has a standard 14-pin 8410B connector on one end and a 50-pin, piggy-back connector on the other end, which connects to the 8620C rear-panel PROGRAMMING connector J2. The HP-IB connector/adapter is connected and then the HP-IB cable. The installation procedure follows and the completed installation is shown in Figure 2-9.

a. Remove HP-IB Connector/Adapter 08620-60130 if it is connected to PROGRAMMING connector.

b. Install 8410B cable 8120-2208 (see Figure 1-6).

c. Install HP-IB Connector/Adapter 08620-60130.

d. Install HP-IB cable 10631B.

2-39. Installation for Additional Interface Capabilities

2-40. By using a combination of the 8620C cable adapter (8120-2207) and the programming connector (2151-0086) a configuration is available that provides additional remote programming and interface capabilities while retaining HP-IB operation. (Refer to Table 3-8 for a list of the available

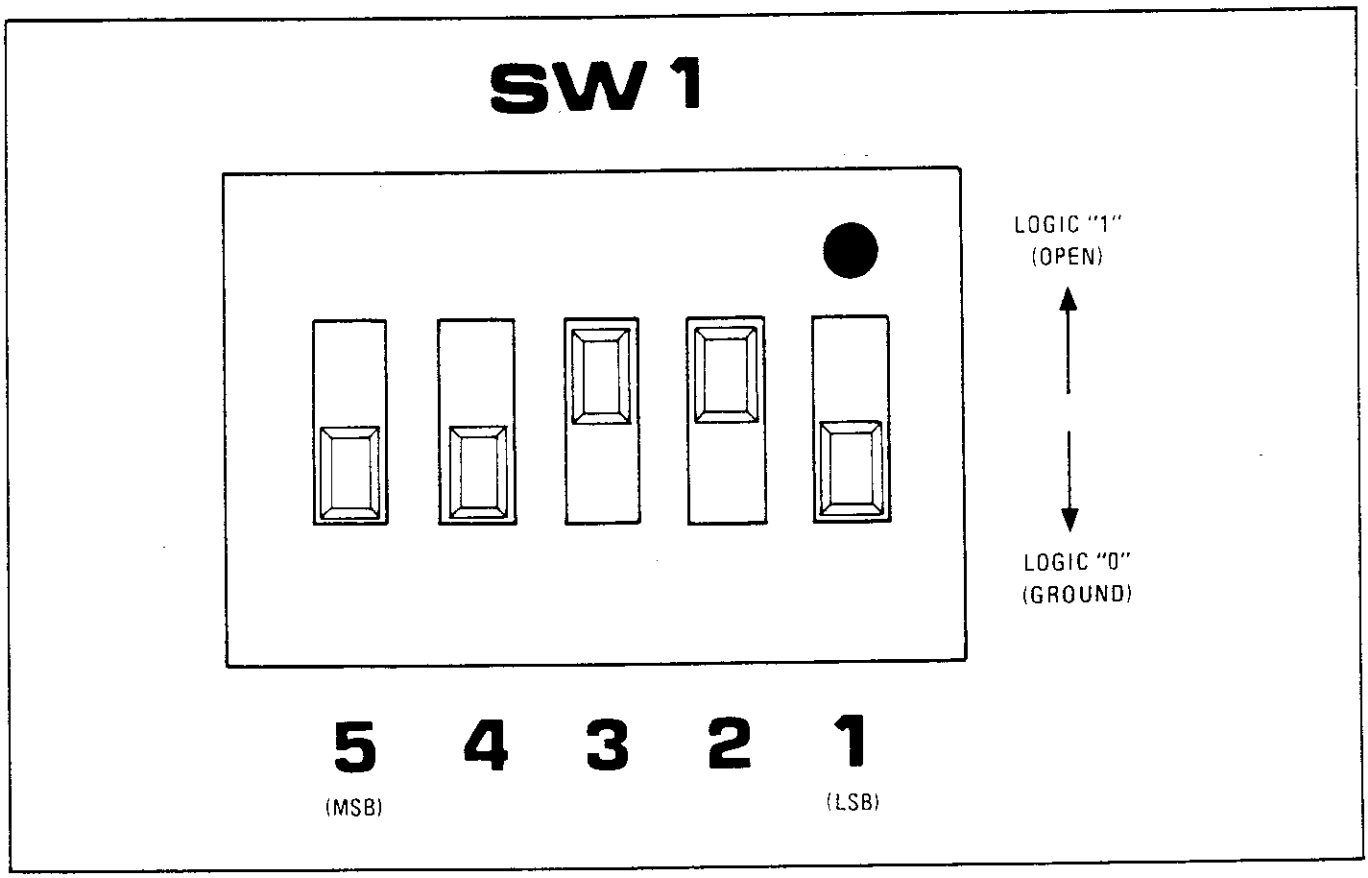


Figure 2-8. Address Switch A12SW1

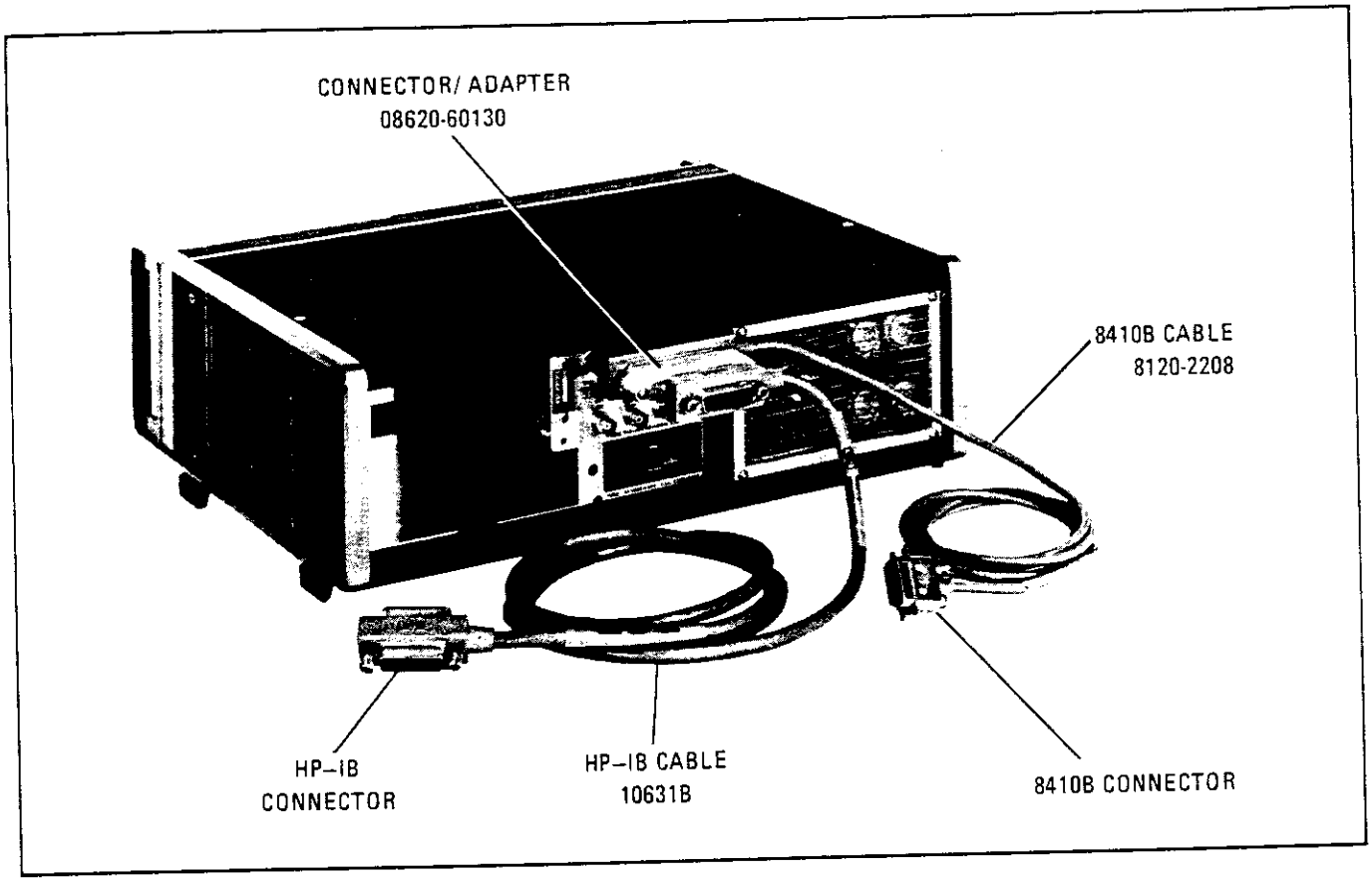


Figure 2-9. HP-IB/8410B Installation

commands, signals, and controls.) The 8620C cable adapter (HP Part No. 8120-2207) has a 50-pin, piggy-back connector on one end, which is connected to the 8620C rear-panel PROGRAMMING connector J2; on the other end is a standard 24-pin HP-IB connector. (See Figure 2-11.) The additional control lines are soldered to pins on the programming connector (HP Part No. 1251-0086, part of Accessory Kit 08620-60123). For example, if remote RF attenuation is desired, connections would be made to pins 36, 37, and 38. The installation procedure follows and the completed configuration is shown in Figure 2-10.

a. Remove HP-IB Connector/Adapter 08620-60130 if it is connected to PROGRAMMING connector.

b. Install 8620C cable adapter 8120-2207.

c. Connect programming connector 1251-0086 with new lines soldered to desired pins.

2-41. VERIFICATION

2-42. To ensure correct electrical performance and remote programming operation after installation, complete the verification procedure in either Figure 2-12 or Figure 2-13, whichever applies.

2-43. STORAGE AND SHIPMENT

2-44. Environment

2-45. The instrument may be stored or shipped in environments within the following limits:

Temperature	−40°C to +75°C
Humidity	5% to 95% at 0° to 40°C
Altitude	Up to 15240 metres (50000 feet)

The instrument should also be protected from temperature extremes which cause condensation within the instrument.

2-46. Packaging

2-47. **Original Packaging.** Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of

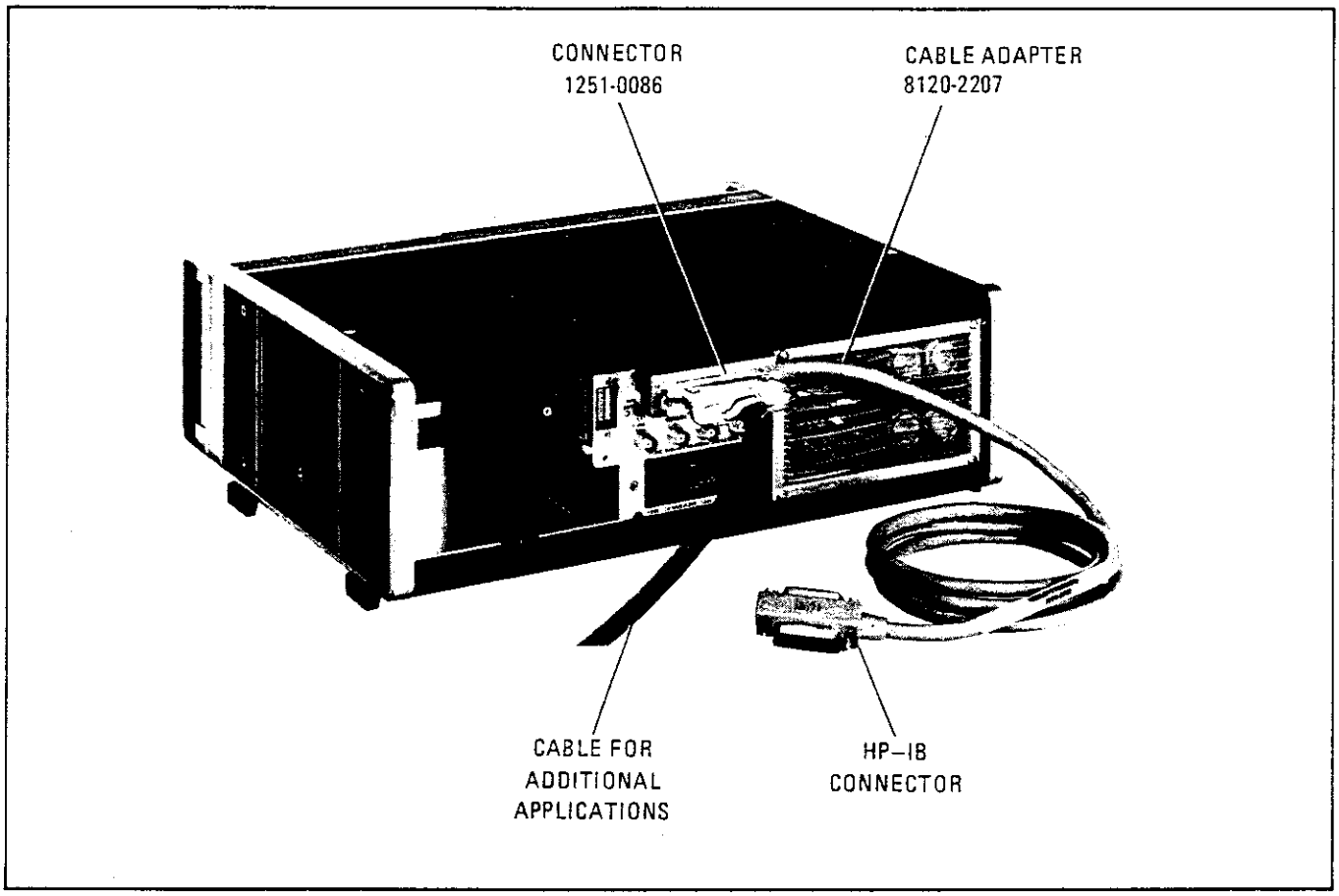


Figure 2-10. Installation for Additional Interface Capabilities

service required, return address, model number, and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-48. Other Packaging. The following general instructions should be used for re-packaging with commercially available materials:

a. Wrap instrument in heavy paper or plastic. (If shipping to Hewlett-Packard Office or Service Center, attach tag indicating type of service required, return address, model number and full serial number.)

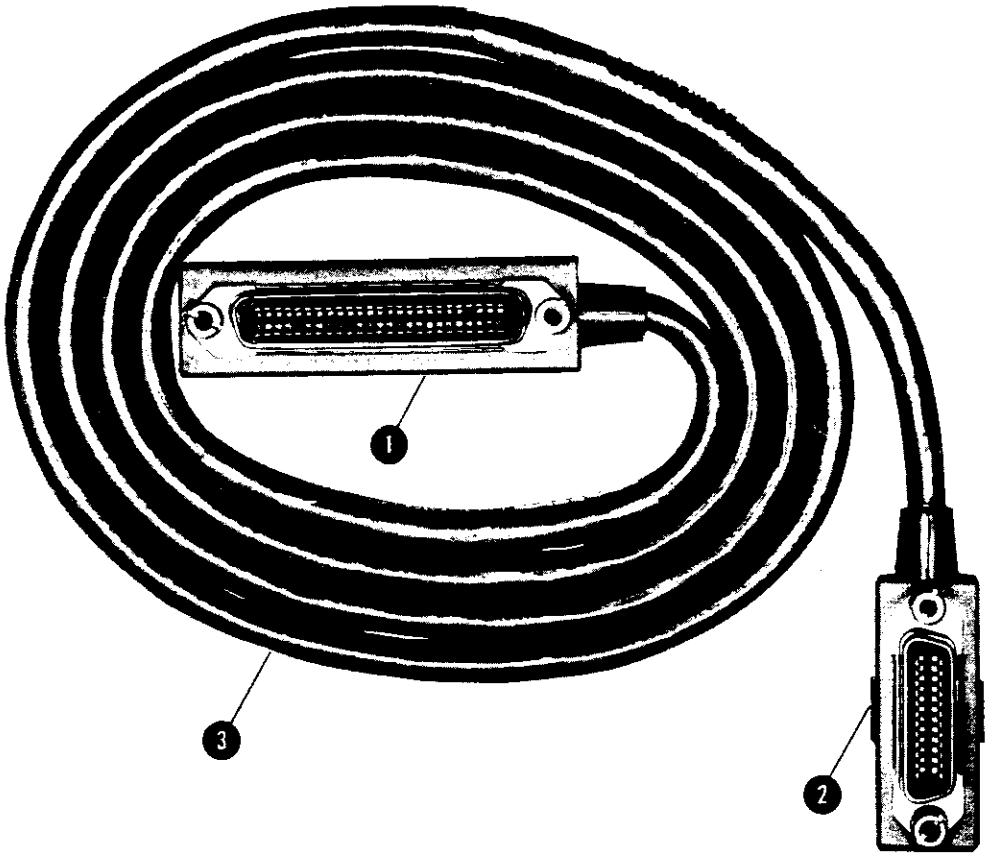
b. Use a strong shipping container.

c. Use enough shock-absorbing material around all sides of instrument to provide firm cushion and prevent movement inside container. Protect control panel with cardboard.

d. Seal shipping container securely.

e. Mark shipping container FRAGILE to assure careful handling.

f. In any correspondence, refer to instrument by model number and full serial number.



1. 50-pin, piggy-back connector
2. 24-pin HP-IB connector
3. 8620C cable adapter (8120-2207)

Figure 2-11. 8620C Cable Adapter for Additional Interface Capabilities

```
90 REM CHECK MODE OPERATION *******
95 DISP "MODES"
100 CMD "?U&"
110 FOR J=1 TO 5
120 FOR I=1 TO 4
130 OUTPUT (13,140)I
140 FORMAT "M",F1000.0
150 WAIT 200
160 NEXT I
170 NEXT J
180 CMD "","M1"
190 REM CHECK BAND OPERATION ******
195 DISP "BANDS"
200 FOR J=1 TO 5
210 FOR I=1 TO 4
220 OUTPUT (13,230)I
230 FORMAT "B",F1000.0
240 WAIT 200
250 NEXT I
260 NEXT J
270 CMD "","B1"
280 REM CHECK VOLTAGES       ******
290 CMD "","M1"
300 CMD "","V0E"
310 DISP "0.000 V"
320 STOP
330 CMD "","V:000E"
340 DISP "10.000 V"
350 STOP
360 CMD "","V7777E"
370 DISP "7.777 V"
380 STOP
390 CMD "","V8888E"
400 DISP "8.888 V"
410 STOP
490 REM  TEST ALL SWEEP MODES ******
500 CMD "?U&","M1B1"
510 DISP "REMOTE FULL SWEEP"
520 GOSUB 1500
530 CMD "?U&","M2"
540 DISP "REMOTE DELTA F SWEEP"
550 GOSUB 1500
560 DISP "REMOTE MARKER SWEEP"
570 CMD "?U&","M4"
580 GOSUB 1500
590 DISP "ANALOG FULL SWP -REMOTE MARKER"
600 CMD "?U&","M5R"
610 GOSUB 1500
620 DISP "ANALOG FULL SWP - LOCAL MARKER"
630 CMD "","L"
640 GOSUB 1500
650 DISP "ANALOG DELTA F SWP - REMOTE MKR"
660 CMD "?U&","M6R"
670 GOSUB 1500
680 DISP "ANALOG MKR SWP - REMOTE MKR"
690 CMD "?U&","M8R"
700 GOSUB 1500
999 BEEP
1000 DISP "DONE"
1490 STOP
1500 REM REMOTE TUNE D/A VOLTAGE
1505 FOR I=1 TO 3
1510 FOR V=0 TO 10 STEP 0.3
1511 WAIT 40
1520 OUTPUT (13,1530)V
1530 FORMAT "V",F1000.3,"E"
1540 NEXT V
1550 NEXT I
1590 RETURN
9999 END
```

Figure 2-12. HP-IB Verification Program (HP 9830A Calculator)

```
00: "CHECK MODE OPERATION ******":
01: ent "MODES",cmd 7;"U%"
02: for J=1 to 5
03: for I=1 to 4
04: fmt 1,"M",f.0,prt "%E.1,I":wait 200
05: next I
06: next J
07: "CHECK BAND OPERATION *****":
08: cmd 7;"U%","N1",ent "BANDS"
09: for J=1 to 5
10: for I=1 to 4
11: fmt 2,"B",f.0,prt "%E.2,I":wait 200
12: next I
13: next J
14: "CHECK VOLTAGES *****":
15: cmd 7;"L%","N1VSE",ent "1.000 V":stp
16: cmd 7;"V10E0E",ent "10.000 V":stp
17: cmd 7;"V7777E",ent "7.777 V":stp
18: cmd 7;"V3658E",ent "3.658 V":stp
19: "TEST ALL SWEEP MODES *****":
20: cmd 7;"?U%","M1E",ent "REMOTE FULL SWP",beep,"volt"
21: cmd 7;"?U%","N2",ent "REMOTE DELTA F SWP",beep,"volt"
22: cmd 7;"?U%","N4",ent "REMOTE MKR SWP",beep,"volt"
23: cmd 7;"?U%","M5R",ent "ANALOG FULL SWP-REMOTE MKR",beep,"volt"
24: cmd 7;"?U%","L",ent "ANALOG FULL SWP-LOCAL MKR",beep,"volt"
25: cmd 7;"?U%","M6R",ent "ANALOG DELTA F SWP-REMOTE MKR",beep,"volt"
26: cmd 7;"?U%","M3R",ent "ANALOG MARKER SWP-REMOTE MKR",beep,"volt"
27: beep,ent "DONE",stp
28: "volt":
29: "REMOTE TUNE D/A VOLTAGE":
30: for I=1 to 3
31: for V=0 to 10 by .3
32: wait 40
33: fmt 3,"V",f.3,"E",wrt 706.3,V
34: next V
35: next I
36: ret
37: end
#201"6
```

Figure 2-13. HP-IB Verification Program (HP 9825A Calculator)

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section explains the function of the controls and indicators of the Model 8620C Sweep Oscillator. It describes typical operating models in a measurement system and covers the typical operator maintenance such as fuse, indicator lamp, and fan filter replacement.

3-3. PANEL FEATURES

3-4. Front and rear panel features are described in Figures 3-1 and 3-2. Description numbers match the numbers on the illustration.

3-5. OPERATOR'S CHECK

3-6. The operator's check (Figure 3-4) allows the operator to make a quick check of the main instrument functions prior to use. This check assumes that an RF Plug-in or an RF Section with oscillator module is installed in the mainframe. Incorrect indications may indicate troubles in either the mainframe or RF Plug-in. To determine if the mainframe is working correctly, check the 8620C using the performance tests in Section IV.

3-7. OPERATING INSTRUCTIONS

3-8. Figures 3-5 through 3-8 show general operating procedures with the 8620C connected in a typical measurement test setup. There are many other applications for the 8620C but the general operating procedure is the same.

3-9. Safety

3-10. BEFORE APPLYING POWER, refer to SAFETY CONSIDERATIONS in Section I of this Operating and Service manual.

3-11. The information, cautions, and warnings in this manual must be followed to ensure safe operation and to keep the instrument safe.

WARNING

BEFORE SWITCHING ON THE INSTRUMENT, be sure only the specified power cord is used. The instrument is provided with a 3-wire power cord which grounds the instrument cabinet. This power cord should only be inserted in a socket outlet provided with a protective earth contact. This protection should not be negated by using an extension cord (power cable) without a protective grounding conductor. Grounding one conductor of a two-conductor outlet is not sufficient protection.

WARNING

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal could make this instrument dangerous. Whenever it is suspected that this protection has been impaired, the instrument should be made inoperative and secured against any unintended operation.

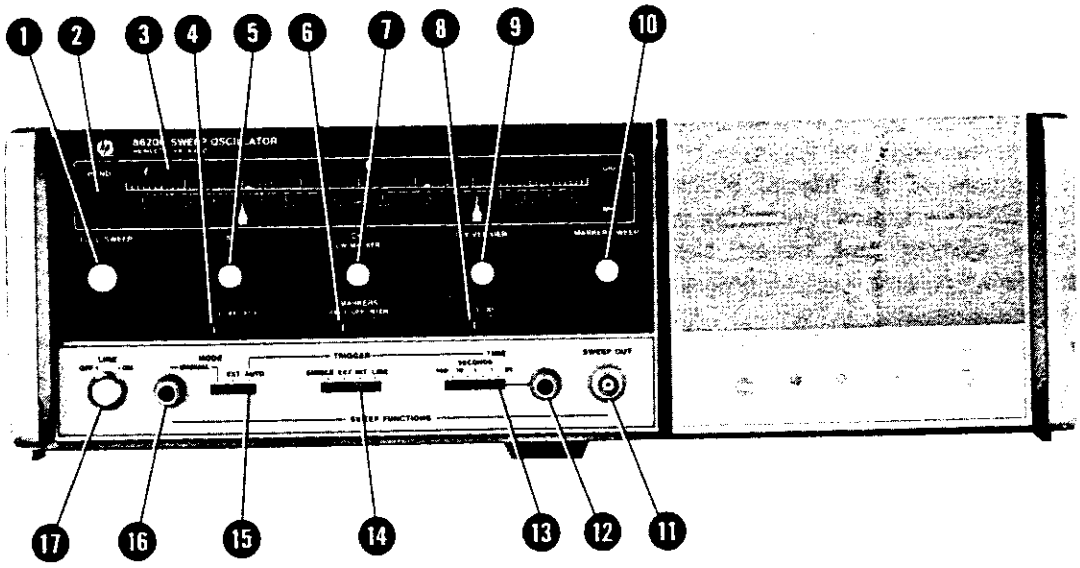
WARNING

BEFORE SWITCHING THE INSTRUMENT ON, ensure that all ac line powered devices connected to the instrument are connected to the protective earth ground.

CAUTION

BEFORE APPLYING POWER, make sure the ac input is set for the available ac line voltage, that the correct fuse is installed, and that all normal safety precautions have been taken.

FRONT PANEL FEATURES



1 START MARKER Control R2 and FULL SWEEP Pushbutton Switch S4. Pressing pushbutton switch selects FULL SWEEP mode and FULL SWEEP lamp DS1 lights. Sweep covers full band of frequencies of scale from low to high frequency. Green START MARKER lettering over control is color coded to green start pointer on scale. In FULL SWEEP mode, START MARKER control adjusts **only** Start Marker position and **not** start frequency. Three markers are available on sweep: Start Marker at position of green pointer, CW Marker at position of white pointer, and Stop Marker at position of red pointer.

2 BAND Switch S2/S3. Depressing lever advances drum containing frequency scales. It also changes position-sensing switches to activate oscillator module in RF section.

3 Frequency Scale Window. The band selected is displayed at the window. Top scale has pointers for START MARKER (green), STOP MARKER (red), and CW MARKER (white) controls. Bottom left scale is ΔF and bottom right scale is CW VERNIER. A calibration scale is included in one band position for ease of calibration, but is not essential to the calibration procedure. When an additional band is added to the RF drawer, a new scale may be installed by following procedure in Paragraph 2-26. Drum position may be identified by tick marks on left-hand side of drum. Position "I" of the BAND drum activities Heterodyne Module ("Position 1" in 8621A/B) and oscillator module installed in "Position 2" of 8621A/B or band 1 of 86290A. Position "II" of the BAND drum activates the oscillator installed in "Position 2" of 8621A/B or band 2 of 86290A. Position "III" activates oscillator installed in "Position 3" of 8621A/B or band 3 of 86290A. Position "IIII" activates circuits for use with the HP Model 86290A multi-octave sequential sweep band 4. Any BAND drum position will select an 86200 series plug-in.

4 ΔF Multiplier Slide Switch A9S4. Selects multiplier for ΔF scale. When set to X1 position, ΔF scale setting is read directly and when set to X.1 or X10 positions, ΔF scale setting is multiplied by either 0.1 or 10.

5 ΔF Control R3 Pushbutton Switch S5. Pressing pushbutton lights both ΔF DS2 and CW DS3 pushbuttons, indicating that center frequency is selected by CW MARKER control and full deviation about CW frequency is selected by ΔF control. ΔF scale is short scale above ΔF control. Start and Stop Markers are available on ΔF sweep.

6 MARKERS Slide Switch A9S5. Selects marker modes: AMPL, OFF, INTEN. In AMPL position,

Figure 3-1. Front Panel Controls, Connectors, and Indicators (1 of 2)

frequency marker is modulated on RF sweep signal. In OFF position, no marker is present. In INTEN position a frequency marker is obtained by intensity modulating Z-axis of oscilloscope or other display instrument on which sweep trace is shown. Intensity modulation signal is available at rear-panel Z-AXIS/MKR/PEN LIFT output J8.

7 CW MARKER Control R4 and CW Pushbutton Switch S6. Pressing pushbutton switch selects CW mode and CW lamp DS3 lights. White CW MARKER lettering over control is color coded to white pointer on scale and indicates CW frequency. With FULL SWEEP or MARKER SWEEP selected, a CW Marker is available and position of white pointer indicates frequency setting of CW Marker. CW light also comes on when ΔF mode is selected, indicating CW MARKER control selects center frequency of ΔF Sweep.

8 CW VERNIER Multiplier Slide Switch A9S6. Selects multiplier for CW vernier scale. In X1 position scale is read directly and in X.1 position scale indication is multiplied by 0.1.

9 CW VERNIER Control R5 and Pushbutton Switch S7. Pressing pushbutton switch connects vernier function for CW or ΔF modes. (DS4 lights.) Vernier control provides fine adjustment of frequencies about CW scale setting. Scale multiplier is controlled by slideswitch below pushbutton control.

10 STOP MARKER Control R6 and MARKER SWEEP Pushbutton Switch S8. Pressing pushbutton switch selects MARKER SWEEP mode and MARKER SWEEP lamp DS5 lights. Red STOP MARKER lettering over control is color coded to red stop pointer on scale. Sweep is between green START MARKER pointer and red STOP MARKER pointer. CW Marker is available on sweep.

11 SWEEP OUT BNC Connector J1. Output is linear ramp voltage from zero to 10 volts synchronous with RF sweep signal. Output is available for all operating modes.

12 TIME-SECONDS Vernier Control R8. Allows sweep time to be adjusted through range selected at TIME-SECONDS slide switch.

13 TIME-SECONDS Slide Switch A9S3. Sets range of sweep time. Sweep time may be selected from $>$ 100 seconds per sweep (slide switch to left position and vernier control counterclockwise) to $<$ 0.01 seconds per sweep (slide switch to right position and vernier control clockwise).

14 TRIGGER Slide Switch A9S2. Selects source of sweep-trigger pulse. Switch has spring return in SINGLE sweep mode position. Each time switch is pressed into SINGLE position, a single sweep is initiated; when released, switch returns to EXT. In EXT position, an external trigger pulse may be applied through rear-panel EXT TRIGGER connector. In INT position, sweep trigger pulse is derived from internal sweep oscillator and system is free running. In LINE position, sweep is triggered by power line sine wave peaks.

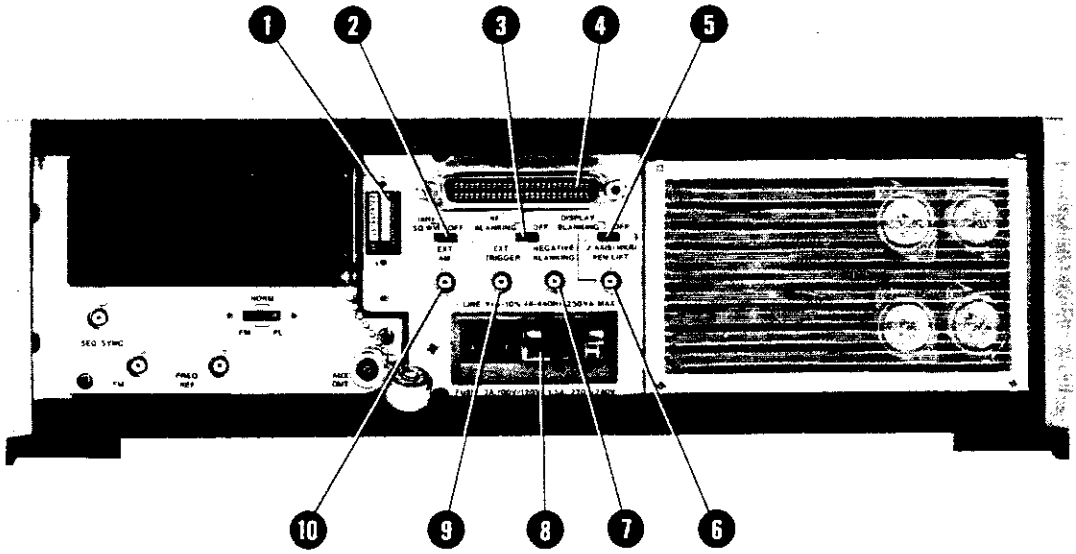
15 MODE Slide Switch A9S1. Selects source of sweep signal. In MANUAL position, the control at left of MODE switch controls sweep manually. In EXT position, an external sweep signal may be applied through rear-panel PROGRAMMING connector. In AUTO position, sweep signal is obtained from internal sweep oscillator, producing continuous sweep signal.

16 MANUAL MODE Control R7. Allows manual sweep of frequency range selected by FULL SWEEP, MARKER SWEEP, or ΔF controls. Selects start frequency in full counterclockwise position; selects stop frequency in full clockwise position. No markers are available.

17 LINE, OFF-ON Switch S1. Pressing LINE switch applies power to mainframe and plug-in, and switch illuminates DS6. Applying power to instrument always selects FULL SWEEP mode. Line on side of pushbutton indicates ON and OFF position.

Figure 3-1. Front Panel Controls, Connectors, and Indicators (2 of 2)

REAR PANEL FEATURES



1 Serial Number and Option Label. (See Paragraph 1-12.)

2 1 kHz SQ WV/OFF Slide Switch S9. Selects type of amplitude modulation of signal. In OFF position, an external modulation signal may be applied through EXT AM connector below switch. In 1 kHz SQ WV position, a 1 kHz internal oscillator modulates RF output signal.

3 RF BLANKING/OFF Slide Switch S10. Selects type of blanking. In RF BLANKING position, the RF signal is turned off during retrace portion of sweep. This mode of blanking should not be selected when sweeper is used with a phase lock system. For example, Model 8410B/8411A Network Analyzer requires the system to regain phase lock at beginning of each sweep rather than stay in continuous phase lock. For phase lock operation use OFF position. In OFF position, no blanking is selected.

4 PROGRAMMING Connector J2. Provides means to connect remote programming signals for standard instrument or when Options 001 or 011 are used. This input is also for programming remote manual commands and attenuation commands. Various outputs are available such as marker, blanking, and pen lift.

5 DISPLAY BLANKING/OFF Slide Swith S11. Selects blanking for Z-AXIS of display equipment during retrace. In DISPLAY BLANKING position, blanking is applied to Z-AXIS/MKR/PEN LIFT BNC connector below switch. Display instrument is blanked during retrace but RF signal from sweep continues to operate during retrace. In OFF position, there is no blanking output.

6 Z-AXIS/MKR/PEN LIFT Connector J8. BNC connector provides Z-axis modulation to display unit or pen lift signal to X-Y recorder. When slide switch above this BNC connector is in DISPLAY BLANKING position, blanking is applied to connector. Blanking signal is rectangular +5 volt pulse into 2500 ohms. Intensity modulation frequency marker is selected when front-panel MARKERS slide switch is in the INTEN position. Marker signal is rectangular −5 volt pulse into 10K ohms.

Figure 3-2. Rear Panel Controls and Connectors (1 of 2)

REAR PANEL FEATURES

7 NEGATIVE BLANKING Connector J5. BNC connector provides negative polarity blanking during retrace. Blanking signal is rectangular —5 volt pulse into 2400 ohms.

8 Power Line Module FL1. Line Voltage Selector Card FL1TB1 allows selection of 100, 120, 220, or 240 Vac operation. Instructions for line voltage selection is in Figure 2-1.

9 EXT TRIGGER Connector J4. BNC connector to input external trigger pulse. This input is selected when the front-panel TRIGGER slide switch is in EXT position. Trigger signal must be greater than +2 Vdc, wider than 0.5 μsec and not greater than 1 MHz in frequency.

10 EXT AM Connector J3. BNC connector to input external amplitude modulation signal. This input is selected when rear-panel 1 kHz SQ WV/OFF slide switch is in OFF position.

Figure 3-2. Rear Panel Controls and Connectors (2 of 2)

3-12. REMOTE PROGRAMMING

3-13. Remote programming control is applied through rear-panel PROGRAMMING connector. Tables 3-6 and 3-7 show the input commands and output signals for the programming connector and logic tables for the various commands. Table 3-6 applies to a standard 8620C and Table 3-7 applies when Option 001 is installed.

3-14. Computer or Calculator Programming

3-15. With the addition of Option 001 (A6 BCD Programming printed circuit board) the 8620C may be programmed remotely from a computer or calculator. A simulated sweep mode is provided by sequentially selecting up to 10,000 point frequencies for each band. Band switching, RF attenuation (with 8621B Option 001) and remote/manual operation may also be programmed from the computer.

3-16. The Option 001 BCD programming provides the same capabilities as the HP-IB Option with the exception that no digital marker is available in the programmed sweep modes.

3-17. Hewlett-Packard Interface Bus (HP-IB)

3-18. With the addition of Option 011, a capability is provided to control the sweeper directly via the HP Interface Bus. With Option 011 installed, any sweep function (ΔF, FULL SWEEP, etc.) can be selected and the 8620C will sweep according to the front-panel frequency settings. This option provides a flexible, digital frequency programming with a resolution of 10,000 points per band or 10,000 points across the frequency range set by the front-panel controls. With this operation, a programmable digital marker is available.

3-19. Manual Remote Programming

3-20. A manual remote control system may be used where repetitive operations are performed. The standard 8620C (without Options) contains remote control circuits to select operating mode and frequency range. This mode can be calculator or computer controlled.

3-21. HP-IB REMOTE PROGRAMMING INSTRUCTIONS

NOTE

Examples in this section are written using the HP Model 9830A Calculator with HP Model 59405A Option 030 HP-IB Calculator Interface.

3-22. The 8620C Option 011 sweeper is a remote programmable instrument designed for use in systems that interface with the HP-IB. The front-panel sweep modes that are programmable include FULL SWEEP, ΔF SWEEP, CW, and MARKER SWEEP. Control voltages (from a remote-control source) tune the frequency in FULL SWEEP, ΔF SWEEP, and MARKER SWEEP modes. Also a remote control voltage tunes a remote marker in Local operation. The selection of bands 1 through 4 is programmable and one code is available to place the 8620C in Local band control.

3-23. Interface Modes of Operation

3-24. The HP-IB uses two modes to communicate between instruments: Command Mode and Data Mode. During Command Mode, the system controller addresses the instrument to be programmed. The ASCII "&" character is the example address for the 8620C used in this manual. (Refer to paragraph 3-61.) During Data Mode, codes are sent that are instructions for the instrument addressed to listen. In Data Mode, there are no specific code assignments but devices communicating must agree on the meaning of the codes used.

3-25. The structure for a typical system controller statement would be:

CMD "?U&", "DATA"

Where "?" is the universal ASCII unlisten command to re-initialize the bus, "U" is the calculator talk address, and "&" is the sweeper listen address. The data string follows the address mode. Quotation marks are needed to obtain the keyboard alpha characters and the comma separates the address string from the data or instruction string. The "?U" preceding the 8620C listen address (&) clears the previously addressed instruments and re-addresses the calculator as a talker. (A complete summary of the programming codes is in Table 3-4.)

3-26. Mode Selection

3-27. The HP Model 8620C Option 011 allows several modes of digital and analog frequency control via the HP-IB. These modes are summarized in Table 3-1.

3-28. In Mode M1, the output frequency is totally independent of front-panel control settings and offers 10,000 points of frequency resolution per band for fine frequency selection.

Table 3-1. Program Modes

	Description	ASCII Code
Digital Modes	0.000 Volts → Low End of Band Selected = F_L 10.000 Volts → High End of Band Selected = F_U	M1
	0.000 Volts → Setting of Front Panel CW Control Minus $\frac{\Delta F \text{ Setting}}{2} = F_L$ 10.000 Volts → Setting of Front Panel CS Control Plus $\frac{\Delta F \text{ Setting}}{2} = F_U$	M2
	0.000 Volts → Setting of Front Panel Start Marker = F_L 10.000 Volts → Setting of Front Panel Stop Marker = F_U	M4
Analog Sweep Modes	Analog Sweep of Full Band Selected	M5
	Analog ΔF Sweep Controlled by Front Panel ΔF and CW Controls	M6
	Analog Marker Sweep Controlled by Front Panel Start- and Stop-Marker Controls	M8
Analog CW Mode	Output = Front Panel CW Control Setting	M3 or M7

3-29. For even more resolution, Modes M2 and M4 are available. In these modes, the digital frequency resolution is determined by front-panel frequency control settings on the 8620C. For example, with Mode M2 selected, the front-panel CW control set at 7.5 GHz, and the ΔF control set at 1 GHz, the source would have a digital frequency resolution of 10,000 points between 7.0 GHz and 8.0 GHz or a minimum increment of 100 kHz. The START MARKER and STOP MARKER controls might then be set at 8.0 and 9.0 GHz respectively allowing 10,000 points resolution between those settings in mode M4. In combination, this would provide a resolution or minimum increment capability of 100 kHz from 7.0 — 9.0 GHz in modes M2 and M4.

3-30. Often, it is desirable to be able to view a dynamic swept display, especially during set-up and fine-tuning of a device prior to final test, or as a quick preview to insure no gross discontinuities exist. Modes M5, M6 and M8 allow this flexibility. Mode M5 produces an analog sweep of the full band selected. Sweep speed, sweep mode, and trigger are all determined by 8620C front-panel controls. Similarly, modes M6 and M8 produce analog ΔF and MARKER SWEEP as determined by appropriate front panel control settings. In these three modes, mainframe markers or a digitally programmed marker are available.

3-31. The capability to place the sweeper in mainframe-controlled CW mode is provided in modes M3 and M7. This allows the operator to manually set CW frequencies or, with a counter, to accurately set the center frequency for ΔF modes.

3-32. If no mode is programmed, the sweeper retains its most recent mode. At the initial turn-on of the sweeper, it is in mode M5.

3-33. BAND PROGRAMMING

3-34. Any of the four bands of the 8620C Option 011 may be selected externally via the HP-IB.

Bands 1 through 4 are designated simply by the ASCII characters "B1" through "B4". In addition, band selection control may be returned to the 8620C front-panel lever by programming "Bφ". At turn-on, the sweeper is in Bφ. As with Mode programming, the sweeper retains its most recent Band instruction if not instructed otherwise.

3-35. Band programming capability is most useful with the multi-band plug-ins such as the 86290A 2—18 GHz plug-in and the 8621B RF drawer with HP 86300 series RF modules. Since the 86200 series of single-band plug-ins will operate equally with any band selected, this instruction is not necessary.

Table 3-2. Band Programming (All Modes)

Description	ASCII Code
Local Band (As Selected by Front-Panel Lever)	Bφ
Band 1	B1
Band 2	B2
Band 3	B3
Band 4	B4

3-36. FREQUENCY (VOLTAGE) PROGRAMMING

3-37. Since the YIG-tuned oscillators in the 8620 plug-ins are essentially VCO's, the programming instructions are in volts or millivolts. This allows the flexibility to use a large number of frequency plug-ins covering a wide variety of bandwidths and absolute frequencies.

3-38. For this reason, it is necessary to use the calculator to convert desired frequency to the required voltage information. This involves a simple conversion equation:

$$V_X = \frac{F_X - F_L}{F_U - F_L} \times 10$$

where F_X = the desired frequency
F_L = lower frequency limit of the Mode selected (see Table 3-1)
F_U = upper frequency limit of the Mode selected (see Table 3-1)

3-39. The 8620C Option 011 requires the following format to output the proper frequency: "Va.bcdE". The letter "E" indicates the end of the voltage string. The decimal point is optional and is disregarded by the sweeper. It processes up to four digits of information and assumes the information is in millivolts with leading zeros suppressed. If more than four digits come down the HP-IB, the 8620C processes only the four digits immediately preceding the "E".

3-40. EXAMPLE: With this information, we are prepared to execute an example using literals for the programming information. In this and following examples, we will use the 86290A 2—18 GHz plug-in with the 8620C. It has four bands covering 2—6.2 GHz, 6—12.4 GHz, 12—18 GHz, and 2—18 GHz respectively. Bands 1 through 3 allow greater resolution than band 4; so, in general, we will be more likely to use these narrower bands than the full 2—18 GHz band.

3-41. Let's assume the desired output frequency is 15 GHz. One approach is to use Mode M1 and band B3. The required voltage is then:

$$\frac{15-12}{18-12} \times 10 = 5.000.$$

The calculator statement required to output 15 GHz is:

```
10 CMD "?U&","M1B3V5,000E"
```

3-42. Note that the order of execution is unimportant, (i.e., GMD "?U&". "B3V5000EM1" would produce the same results). Note also that the 3 zeros must be present after the "5" whether or not the decimal point is present.

Table 3-3. Frequency (Voltage) Programming (Modes M1, M2, M4)

0.000 Volts correspond to low end of band and mode selected 10.000 Volts correspond to high end of band and mode selected.		
Examples		
Frequency (% of Band/Mode)	**Voltage Required (Volts)**	**ASCII Codes**
0%	0	Vφ E or Vφφφφφ E
0.1%	0.01	V.010E or V10E
55%	5.5	V5.500E or V5500E
100%	10.000	V:.000E or V:000E

3-43. As mentioned above, if more than four voltage digits travel down the HP-IB, only the last four are processed. What if the frequency desired is the same as F_U? This would require 10.000 volts. But only the last four zeros would be processed resulting in F_L instead of F_U! To obtain ten volts or more, there is a special ASCII character which signifies 10. The character is the colon (:). For 18 GHz output, the above string would be modified to:

```
10 CMD "?U&", "M1B3V:000E"
```

3-44. MARKERS

3-45. In modes M5, M6 and M8, a digitally programmed marker is available in addition to the standard mainframe markers. The programmable marker is selected by outputting the ASCII character "R" (which also disables the mainframe marker). The frequency of the marker is dictated by a voltage string programmed in the same manner as the digital frequency described above with F_L and F_U being the end points of the band selected. For example, to obtain a marker at 14 GHz in modes M5, M6 or M8, the following string is required:

```
10 CMD "?U&", "B3V3333ER"
```

This will result in either an AMPLitude or INTENsity marker dependent on the setting of the 8620C front-panel switch. In this mode, the mainframe-controlled markers are disabled.

3-46. To enable the mainframe markers and disable the programmable marker, output the ASCII character "L". This places the markers into totally local control.

3-47. FORMAT STATEMENTS

3-48. In order to program the frequency with variables, a format statement is required to insure the proper characters and sequence are used on the HP-IB. For the Band and Mode information, suppression of leading zeros is required. With the frequency information in volts, three digits are required after the decimal point and again it is desirable to suppress leading zeros.

3-49. EXAMPLE: In this example, the variable B is defined as the band number, X is defined as the voltage required, and mode M1 is used to output a CW frequency. The following program steps would output the proper frequency:

9825A

```
0:
cmd7, "?U&" ;fmt1"M
1B",f.0, "V",f.3,
"E"⊢
1:
wrt 706.1,B,x⊢
```

9830A

```
10 CMD "?U&"
20 OUTPUT (13,30)B,X
30 FORMAT "M1B",F1000.0, "V",F1000.3,"E"
```

3-50. There are two ways to handle ≥10 volts when programming in variables. If F_U is desired to the accuracy of the sweeper, a conditional statement resetting X to 9.999 whenever it is greater than or equal to 9.9995 will produce virtually 10 volts and a frequency within 0.005% of that produced with 10.000 volts. For frequency correction (see example below) or where frequencies $>F_U$ are required, a conditional output statement may be used. If X is ≥9.9995, then the program would branch to the following output steps:

9825A

```
8:
cmd7, "?U&"; fmt2"M
1B",f.0, "V:" ,f.3
, "E"⊢
9:
wrt 706.2,B,x−10⊢
```

9830A

```
70 CMD "?U&"
80 OUTPUT (13,90)B,X−10
90 FORMAT "M1B" ,F1000.0, "V:" ,F1000.3,"E"
```

3-51. HP 8620C HP-IB Configuration Code

3-52. The programming configuration code for the 8620C, as documented in IEEE Standard 488-1975 for the HP-IB, and selected by the calculator is:

```
SHØ AH1 TØ L2 SRØ RL2 PPØ DCØ DTØ CØ E1
```

3-53. Remote/Local Operation

3-54. The term remote/local refers to which device is controlling the 8620C sweeper. In local, the front panel of the sweeper has control; in remote,

Table 3-4. Summary of Programming Codes

CODES		FUNCTION	DESCRIPTION
MODE SELECTED	M1	FULL SWEEP	Remote control voltage of 0V corresponds to the low frequency end of the band and control voltage of 10V represents the high frequency end of the band.
	M2	ΔF	Remote control voltage of 0V represents CW − (ΔF WIDTH/2) and control voltage of 10V represents CW + (ΔF WIDTH/2).
	M3/M7	CW	Frequency corresponds to position of CW pointer.
	M4	MARKER SWEEP	Remote control voltage of 0V represents the START pointer frequency and control voltage of 10V represents the STOP pointer frequency.
	M5	FULL SWEEP	FULL SWEEP control operates same as in local operation.
	M6	ΔF	ΔF control operates same as in local operation.
	M8	MARKER SWEEP	MARKER SWEEP control operates same as in local operation.
BAND SELECTED	B1	Band 1 select	
	B2	Band 2 select	
	B3	Band 3 select	
	B4	Band 4 select	
	BØ	Local Control	Front-panel BAND lever selects the band.
MARKER MODE	L	LOCAL MARKERS only	Markers selected in Sweep Modes M5, M6, and M8.
	R	REMOTE MARKERS only	

the calculator or computer is in control. Three conditions of Local/Remote/Return-to-Local are explained below.

3-55. Power-On Conditions. When the 8620C is first turned on, it is in Local Control.

3-56. Remote Control. To set the 8620C to Remote, the HP-IB must be in remote (REN true) and the 8620C must receive its listen address. REN must be held true continuously to remain in remote control. When set to Remote control, the programming and conditions will be as follows:

Mode: Determined by mode set on front panel; Codes M5, M6, M7, or M8.

Band: Set by front-panel lever switch; Code B0.

Control Voltage: V is undefined.

Marker: Set to local; Code L.

3-57. Return-to-Local. The 8620C may be returned to local control by setting REN false, turning the 8620C or controller power OFF, or removing the HP-IB cable from either the 8620C or controller.

3-58. ADDRESSING

3-59. All instruments using the HP-IB share a common set of data and control lines. Since the controller must communicate with individual instruments on the bus, each instrument is given a unique address. The address is a seven-bit ASCII character (American Standard Code for Information Interchange) that the instrument recognizes and responds to.

3-60. Before addressing an instrument, the controller first pulls the ATN (attention) control line low (true) and then, during Command Mode, the address code is transmitted. When the instrument acknowledges receipt of the address (through the handshake lines), the controller releases the ATN line and clears the address code. The 8620C can be addressed (or unaddressed) in both local and remote control modes.

3-61. Listen Address Codes

3-62. In an HP-IB system, the 8620C Option 011 functions as a Listener. A listener is a device capable only of receiving data or commands from other instruments. The 8620C is enabled as a listener when the controller transmits the correct listen-address code. The 8620C HP-IB interface ignores all commands or addresses relating to talkers or controllers.

3-63. The seven-bit codes reserved for listen addresses and the corresponding ASCII character are listed in Table 3-5. (A total of 31 addresses is available.) Bits one through five of the data (DIO) lines are set either high or low to select the address. The address code is set with five address switches. A12SW1-1 — A12SW1-5 on the A12 HP-IB Interface Assembly. A contact to ground (low) indicates a true state. (Refer to Figure 2-8.)

3-64. The nominal 8620C listen address is ASCII Character "&" or octal 046. The address may be changed by the system designer since the 8620C does not require any particular address. When changing addresses, be sure the new address does not conflict with those of other instruments using the HP-IB.

3-65. Unaddressing

3-66. Once the 8620C is addressed, it remains addressed until it is unaddressed or cleared by the system controller. There are several ways to unaddress the 8620C:

a. Sending Unlisten command (077 octal ASCII ?). This command must be given in the Command Mode (ATN true).

b. Pulling Interface Clear (IFC) line true. This asynchronously clears all instruments on the HP-IB.

c. Turning 8620C mainframe OFF.

3-67. RESPONSE TIMING CONSIDERATION

3-68. The time required by the 8620C to accept each character is approximately 5 μsec. Any change of frequency in the plug-in will need 10 msec or less for stepping across the entire band and proportionally less time for smaller changes in frequency. (This time delay is required by the 8620C, after the command is received, and is due to inherent delays in the oscillator.)

Table 3-5. Listen Address Codes

Listen Addresses					
Bits					ASCII Character
b_5	b_4	b_3	b_2	b_1	
0	0	0	0	0	SP
0	0	0	0	1	!
0	0	0	1	0	"
0	0	0	1	1	
0	0	1	0	0	S
0	0	1	0	1	%
0	0	1	1	0	&
0	0	1	1	1	'
0	1	0	0	0	(
0	1	0	0	1	)
0	1	0	1	0	*
0	1	0	1	1	+
0	1	1	0	0	,
0	1	1	0	1	—
0	1	1	1	0	.
0	1	1	1	1	/
1	0	0	0	0	0
1	0	0	0	1	1
1	0	0	1	0	2
1	0	0	1	1	3
1	0	1	0	0	4
1	0	1	0	1	5
1	0	1	1	0	6
1	0	1	1	1	7
1	1	0	0	0	8
1	1	0	0	1	9
1	1	0	1	0	:
1	1	0	1	1	;
1	1	1	0	0	<
1	1	1	0	1	=
1	1	1	1	0	>

3-69. BUS OPERATING CONSIDERATIONS

3-70. When a device capable of activating IFC is powered ON during system operation, it may cause the active controller on the bus to relinquish control, resulting in errors. The controller must transmit IFC to regain active control.

3-71. Prior to addressing new listeners it is recommended that all previous listeners be unaddressed using the Unlisten Command "?".

3-72. OPERATOR'S MAINTENANCE

3-73. Operator's maintenance consists of replacing line fuse and indicator lamps, cleaning the air filter, and changing the frequency scales. These items are discussed in the following paragraphs.

3-74. Fuses

CAUTION

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of repaired fuses and other short-circuiting of ufse-holders should be avoided.

3-75. There are five fuses in the 8620C. The main ac line fuse is located at the back of the instrument next to the line cord jack. The ac line cord must be removed to gain access to the fuse compartment. The fuse may be removed by pulling the lever inside the fuse compartment. (See Figure 2-1.) For the 100 or 120 Vac supply source, use a 3-amp line fuse; for the 220 or 240 Vac supply, use a 1.5 amp line fuse. There are four other fuses inside the instrument. Access to these requires removing instrument top cover. These fuses should be replaced only by qualified service personnel who are aware of the hazard involved. Replacement of these fuses is covered in Section VIII.

3-76. Air Filter

WARNING

To avoid personal injury, set LINE switch to OFF and remove AC line cord from rear of instrument before removing fan filter.

3-77. The fan has a filter attached from the outside for ease of cleaning or replacement. To service the filter, remove the four screws holding filter to rear panel and either replace it with the appropriate part listed in Section VI or clean it, using a solution of warm water and soap.

3-78. Lamp Replacement

3-79. The five front-panel lamps located in the mode selector pushbutton switches and the LINE lamp are replaceable from the front. (See Figure 3-3 for procedure.)

3-80. Frequency Scale Installation

3-81. See procedure in Paragraph 2-26.

Table 3-6. Remote Programming Using Standard 8620C (1 of 2)

Programming Connector Input Commands and Output Signals

Pin on J2*	Input Commands or Output Signals	Pin on J2*	Input Commands or Output Signals
13	Band Select (Inputs)	32	Marker Sweep Select (Inputs)
14	Band Select (Inputs)	34	Stop Sweep Pulse (Inputs)
16	Pen Lift Common (Outputs)	36	40 dB (RF ATTN) (Inputs)
17	Z Axis/Mkr/Pen Lift (Outputs)	37	20 dB (RF ATTN) (Inputs)
19	+20V (Outputs)	38	10 dB (RF ATTN) (Inputs)
20	+5V (Outputs)	39	Remote Band Enable (Inputs)
26	Sequential Sync (Outputs)	40	RF Blanking – Output
27	Marker (Outputs)	41	Remote Attn Enable – Input
28	External Sweep (Inputs)	43	Ground
29	ΔF Mode Select (Inputs)	44	–10V (Outputs)
30	CW Mode Select (Inputs)	45	–40V (Outputs)
31	Full Sweep Select (Inputs)		*Pins not shown are unused in this application.

NOTE

8621A/B Option 010 programmable 70 dB attenuator is required to accept RF attenuation control signals from J2 pins 36 through 38.

RF Output Attenuation Programming

RF Output Attenuation	10 dB line J2 Pin 38	20 dB line J2 Pin 37	40 dB line J2 Pin 36	REMOTE ATTN SELECT J2 Pin 41
0 dB	X	X	X	1
0 dB	0	0	0	0
10 dB	1	0	0	0
20 dB	0	1	0	0
30 dB	1	1	0	0
40 dB	0	0	1	0
50 dB	1	0	1	0
60 dB	0	1	1	0
70 dB	1	1	1	0

Table 3-6. Remote Programming Using Standard 8620C (2 of 2)

Band Select Programming

Band	A J2 Pin 13	B J2 Pin 14	Remote Band Select J2 Pin 39
X	X	X	1
1	1	1	0
2	1	0	0
3	0	0	0
4	0	1	0

Manual Remote Mode Programming

Mode Selected	J2 Pin 29	J2 Pin 30	J2 Pin 31	J2 Pin 32
FULL SWEEP	1	1	0	1
MARKER SWEEP	1	1	1	0
CW	1	0	1	1
ΔF	0	1	1	1

NOTE

Each mode is selected by a momentary or steady state closure to ground (0). 1 indicates no closure to ground. Ground is pin J2-43.

NOTES

1 = Open or ≥ +2.0 Vdc.

0 = Closure to ground (pin J2-43) or ≤ +0.8 Vdc.

Table 3-7. Remote Programming Using 8620C Option 001 (1 of 2)

Programming Connector Input Commands and Output Signals

Pin on J2*	Input Commands or Output Signals		Pin on J2*	Input Commands or Output Signals	
1	BCD8, 8 Volts	Frequency Voltage Units	26	Sequential Sync	Outputs
2	BCD4, 4 Volts		27	Marker	
3	BCD2, 2 Volts		28	External Sweep	
4	BCD1, 1 Volt		29	ΔF Mode Select	
5	BCD8, 0.8 Volt	Frequency Voltage Tenths	30	CW Mode Select	
6	BCD4, 0.4 Volt		31	FULL SWEEP Mode Select	
7	BCD2, 0.2 Volt		32	MARKER SWEEP Mode Select	
8	BCD1, 0.1 Volt		33	BCD2, 0.002 Volt	Inputs
9	BCD8, 0.08 Volt	Frequency Voltage Hundreths	34	Stop Sweep Pulse	
10	BCD4, 0.04 Volt		35	BCD4, 0.004 Volt	
11	BCD2, 0.02 Volt		36	40 dB	RF Attenuation
12	BCD1, 0.01 Volt		37	20 dB	
13	Band Select	Inputs	38	10 dB	
14	Band Select		39	Remote Band Enable - Input	
15	Remote D/A Enable		40	RF Blanking – Output	
16	Pen Lift Common	Outputs	41	Remote Attn Enable	Inputs
17	Z Axis/Mkr/Pen Lift		42	BCD8, 0.008 Volt	
18	BCD1, 0.001 Volt – Input		43	Ground	Outputs
19	+20V	Outputs	44	–10V	
20	+5V		45	–40V	

* Pins not shown are unused in this application

NOTES

1. **8620C Option 001 digital-to-analog converter is required to accept frequency control signals from J2 pins 1 thru 12, 18, 33, 35, and 42.**

2. **8621A/B Option 010 programmable 70 dB attenuator is required to accept RF attenuation control signals from J2 pins 36 thru 38.**

Band Select Programming

Band	A J2 Pin 13	B J2 Pin 14	Remote Band Select J2 Pin 39
X	X	X	X
1	1	1	0
2	1	0	0
3	0	0	0
4	0	1	0

Table 3-7. Remote Programming Using 8620C Option 001 (2 of 2)

RF Output Attenuation Programming

RF Output Attenuation	10 dB line J2 Pin 38	20 dB line J2 Pin 37	40 dB line J2 Pin 36	REMOTE ATTN SELECT J2 Pin 41
0 dB	X	X	X	1
0 dB	0	0	0	0
10 dB	1	0	0	0
20 dB	0	1	0	0
30 dB	1	1	0	0
40 dB	0	0	1	0
50 dB	1	0	1	0
60 dB	0	1	1	0
70 dB	1	1	1	0

Manual Remote Programming

Mode Selected	J2 Pin 29	J2 Pin 30	J2 Pin 31	J2 Pin 32
FULL SWEEP	1	1	0	1
MARKER SWEEP	1	1	1	0
CW	1	0	1	1
ΔF	0	1	1	1

NOTES

1. Analog and digital sweep modes are available. The digital sweep mode is provided when the digital-to-analog converter is enabled.
2. The bandwidth is dependent upon the front-panel control when the digital-to-analog converter is enabled.
3. Each mode is selected by a momentary or steady state closure to ground (0). 1 indicates no closure to ground. Ground is pin J2-43.

NOTES

1 = Open or ≥ +2.0 Vdc.

0 = Closure to ground (pin J2-43) or ≤ +0.8 Vdc.

Table 3-8. Programming Connector Commands and Signals Available for Additional Interface Capabilities

Pin on J2*			Pin on J2*	
16	Pen Lift Common	Outputs	36	40 dB } RF
17	Z-Axis/Mkr/Pen Lift		37	20 dB } ATTENUATION**
19	+20V		38	10 dB }
20	+5V		40	RF Blanking — Output
26	Sequential Sync		41	Remote Attn Enable — Input
27	Marker		43	Ground
28	External Sweep	Inputs	44	−10V } Outputs
34	Stop Sweep Pulse		45	−40V }
			50	External Trig (8410B) — Input

* Pins and functions shown are only lines available for extended capabilities when using cable adapter HP 8120-2207.
(See paragraph 2-39 for installation.)

** 8621B Option 010 programmable 70 dB attenuator is required to accept RF attenuation control signals from J2 pins 36, 37, and 38.

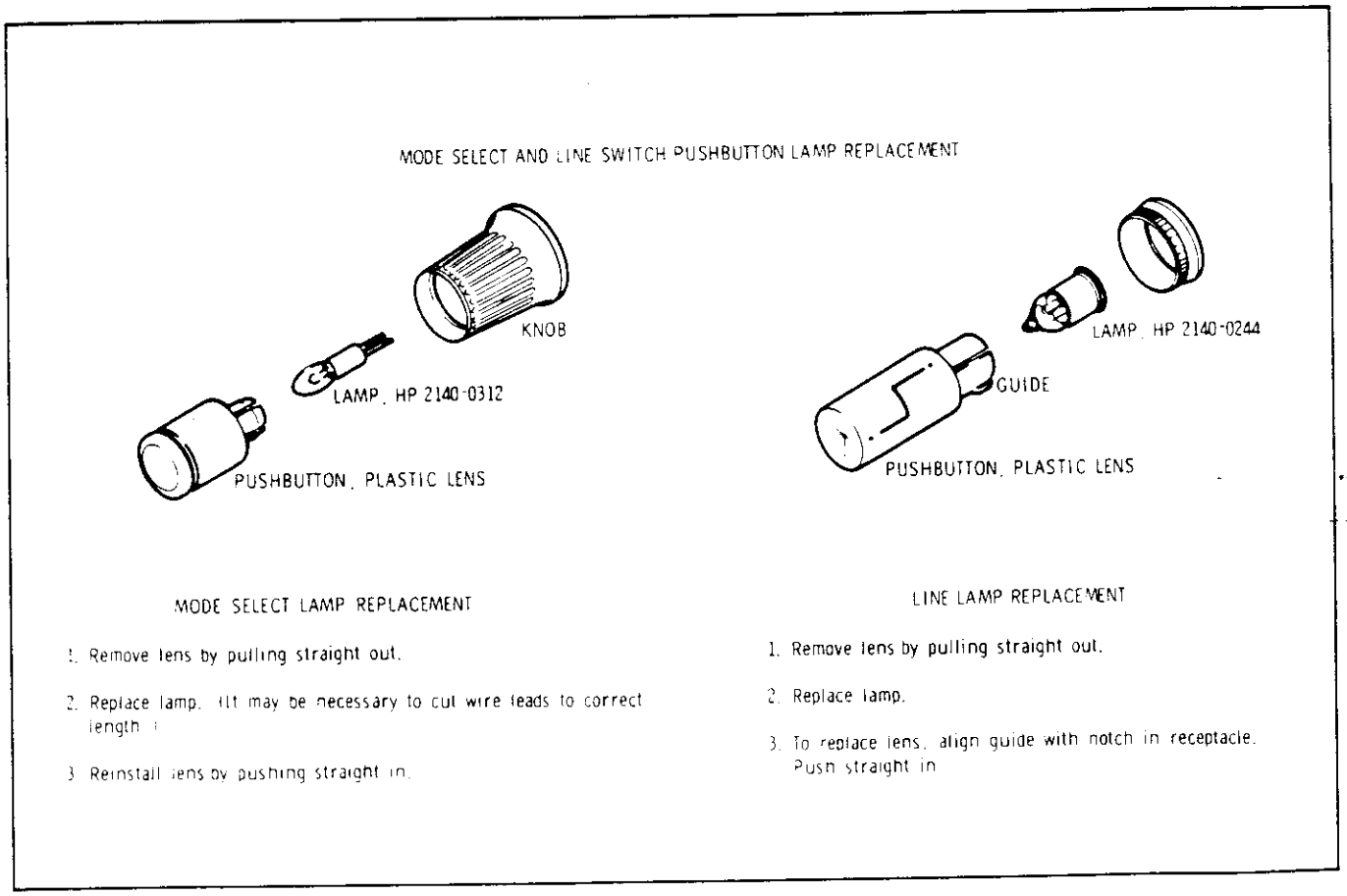
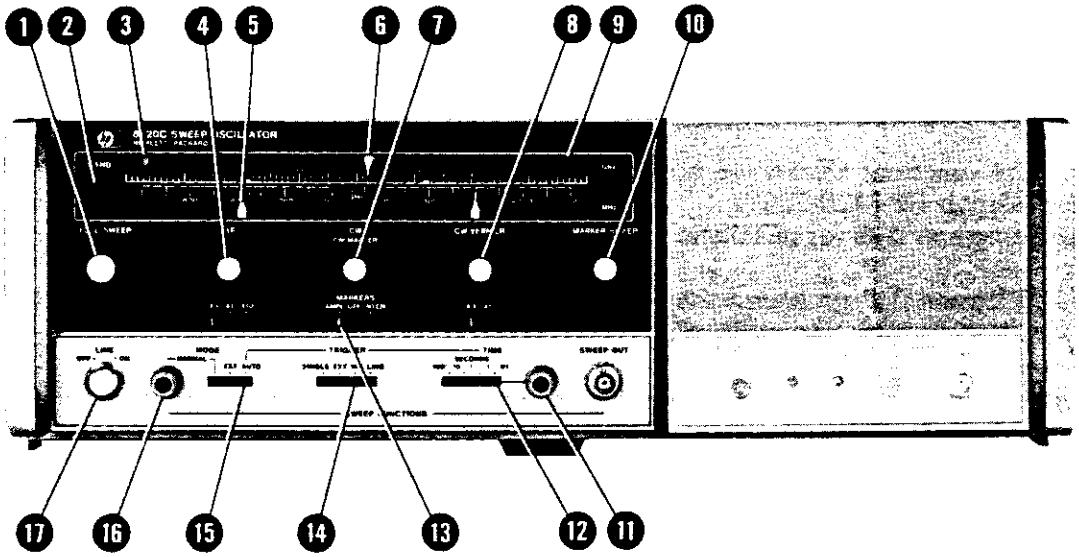


Figure 3-3. Lamp Replacement

OPERATOR'S CHECK

FRONT



REAR

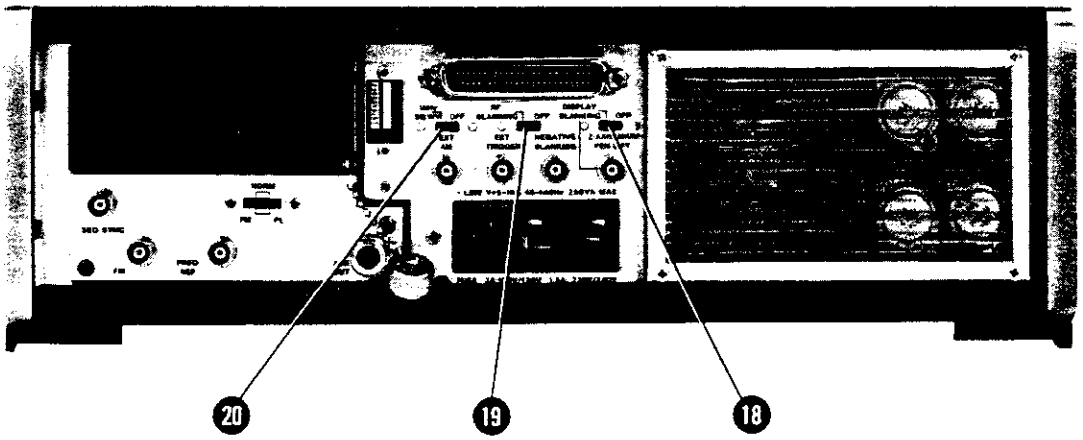
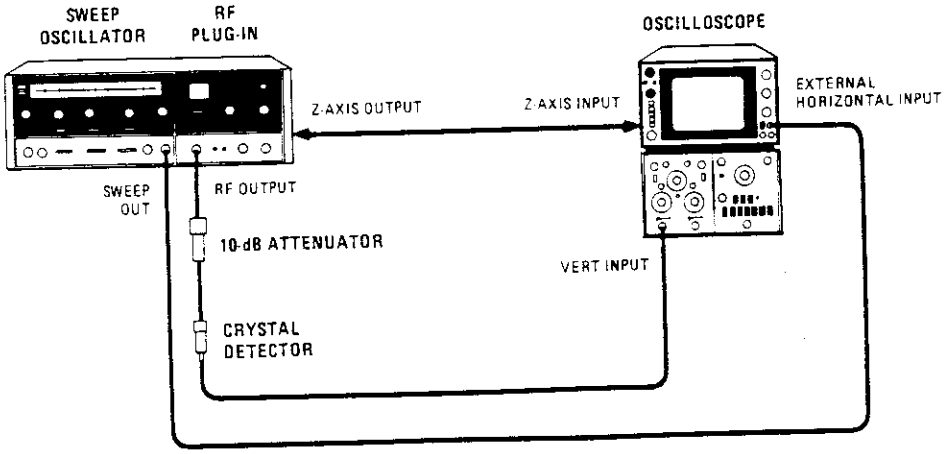


Figure 3-4. Operator's Check (1 of 3)

OPERATOR'S CHECK



1. Connect equipment as shown in test setup.

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 (mains) 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.

2. Set 8620C controls as follows:

BAND (2) ..... Depress to select frequency band
START MARKER pointer (3) ..... Left-hand end mark on scale
CW MARKER pointer (6) ..... Middle mark on scale
STOP MARKER pointer (9) ..... Right-hand end mark on scale
ΔF control (5) ..... Fully clockwise

Figure 3-4. Operator's Check (2 of 3)

OPERATOR'S CHECK

CW VERNIER pointer (8)	Center or 0
MARKERS (13)	AMPL
MODE (15)	AUTO
TRIGGER (14)	INT
TIME SECONDS (12)	1 — .01
TIME-SECONDS Vernier (11)	Fully clockwise
1 kHz SQ WV/OFF (Rear Panel) (20)	OFF
DISPLAY BLANKING/OFF (Rear Panel) (18)	DISPLAY BLANKING
RF BLANKING/OFF (Rear Panel) (19)	OFF

3. Press LINE pushbutton switch (17) to turn on instrument; LINE and FULL SWEEP (1) pushbuttons should light.

4. Set controls on RF Plug-in to obtain an RF signal output. Oscilloscope trace should show detected RF signal output below zero-volt reference. There should be no discontinuity in swept trace across band. Three markers should appear on sweep: Start Marker at position indicated by green pointer (3), CW Marker at position indicated by white pointer (6), and Stop Marker at position indicated by red pointer (9).

5. Press MARKER SWEEP pushbutton (10); pushbutton should light. CW Marker should appear at center of oscilloscope trace as indicated by position of white CW MARKER pointer (6). Sweep should begin at frequency setting of START MARKER pointer (3) and end at frequency setting of STOP MARKER pointer (9).

6. Set MODE switch (15) to MANUAL position and adjust MANUAL control (16). Trace dot should move across oscilloscope CRT. No markers are available in Manual mode.

7. Set MODE switch to AUTO.

8. Press CW pushbutton (7); pushbutton should light and trace on oscilloscope should be a dot. Change frequency setting of CW MARKER pointer and dot should move across oscilloscope CRT.

9. Press CW VERNIER pushbutton (8); pushbutton should light. Adjust CW VERNER control and oscilloscope dot should move across CRT at a very slow rate and through a narrow range. Press CW VERNIER pushbutton again to disable CW VERNIER function.

10. Press ΔF pushbutton (4); ΔF and CW pushbuttons should light. Sweep trace below zero volt reference should be displayed on oscilloscope CRT.

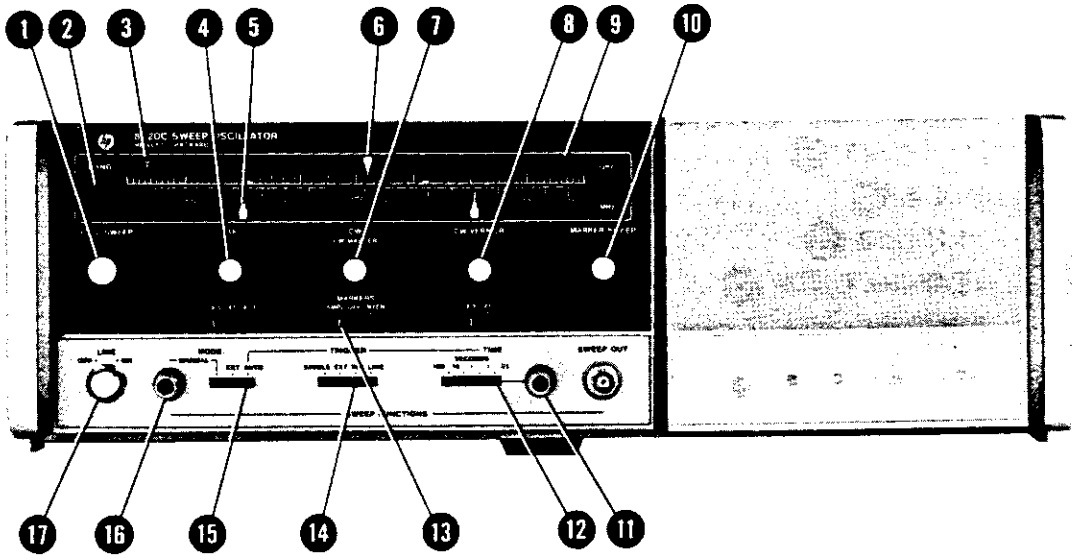
NOTE

In ΔF mode, two markers are available by adjusting the START MARKER and STOP MARKER controls.

Figure 3-4. Operator's Check (3 of 3)

FULL SWEEP MODE

FRONT



REAR

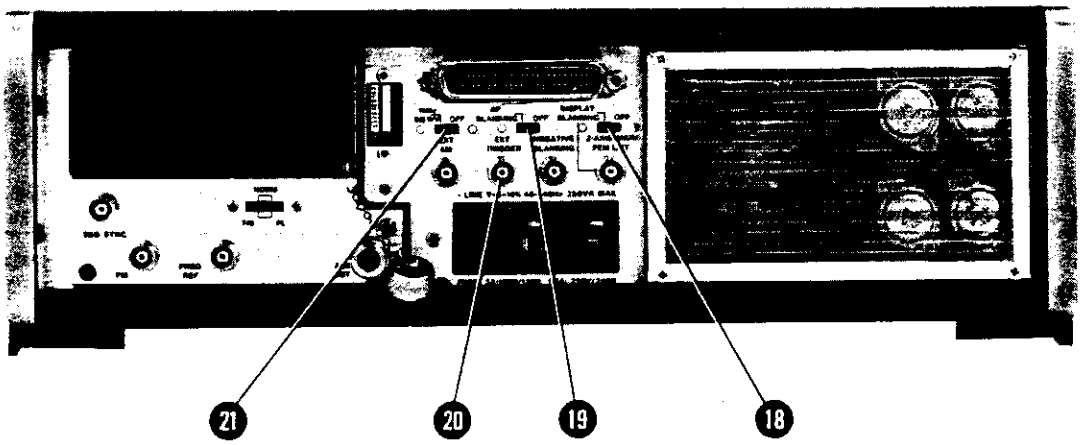


Figure 3-5. Full Sweep Mode (1 of 2)

FULL SWEEP MODE

1. Connect sweep oscillator as shown in Figure 3-4 test setup.

2. Set 8620C controls as follows:

BAND (2)	Depress to select frequency band
START MARKER pointer (3)	Left-hand end mark on scale
CW MARKER pointer (6)	Middle mark on scale
STOP MARKER pointer (9)	Right-hand end mark on scale
ΔF control (5)	Fully clockwise
CW VERNIER control (8)	Fully clockwise
MARKERS (13)	INTEN
MODE (15)	AUTO
TRIGGER (14)	INT
TIME-SECONDS (12)	.1 — .01
TIME-SECONDS Vernier (11)	Fully clockwise
1 kHz SQ WV/OFF (Rear Panel) (21)	OFF
RF BLANKING/OFF (Rear Panel) (19)	OFF
DISPLAY BLANKING/OFF (Rear Panel) (18)	DISPLAY BLANKING

3. Press LINE pushbutton switch (17) to turn on instrument; LINE and FULL SWEEP pushbuttons should light.

4. Set controls on RF plug-in to obtain an RF signal output. Oscilloscope trace should show detected RF signal output below zero-volt reference. There should be no discontinuity in swept trace across band. Three bright marker spots should appear on trace: Start Marker at position of green pointer (3) CW Marker at position of white pointer (6) and Stop Marker at position of red pointer (9). Set MARKERS switch (13) to AMPL to obtain amplitude markers on trace.

5. Sweep width is full band of frequencies of scale selected and cannot be changed.

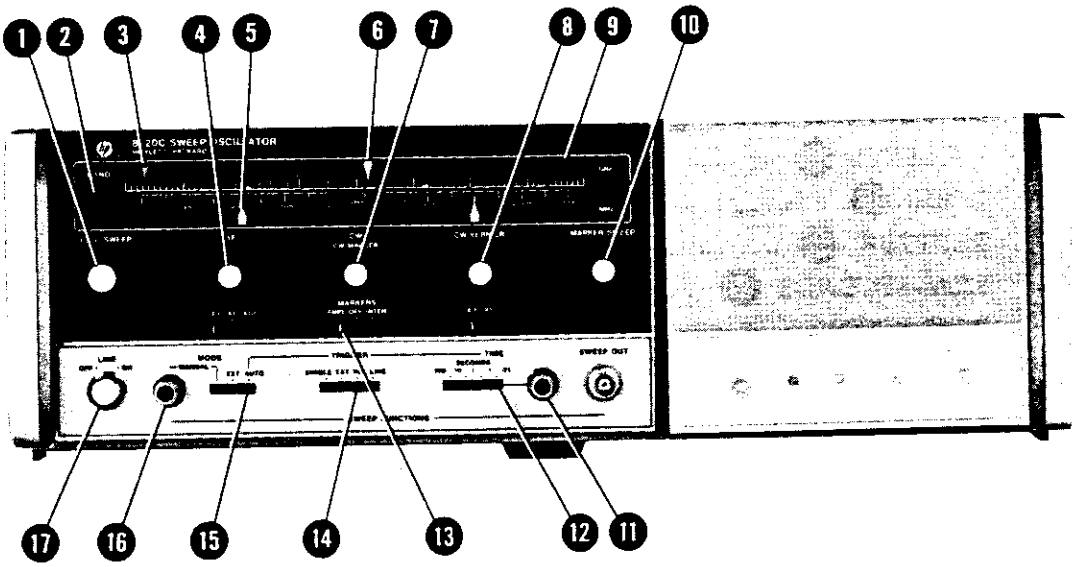
6. Band may be swept manually be setting MODE switch (15) to MANUAL and adjusting MANUAL control (16) through its range. Nor markers are available in Manual mode.

7. Select SINGLE sweep as follows: Set MODE switch (15) to AUTO. Press TRIGGER switch (14) to SINGLE position and release. Repeat this to obtain each single sweep. External (EXT) trigger mode is available by setting TRIGGER switch to EXT and applying external trigger pulse to rear-panel EXT TRIGGER (20). Sweep may be triggered from ac line by setting TRIGGER switch to LINE.

Figure 3-5. Full Sweep Mode (2 of 2)

MARKER SWEEP MODE

FRONT



REAR

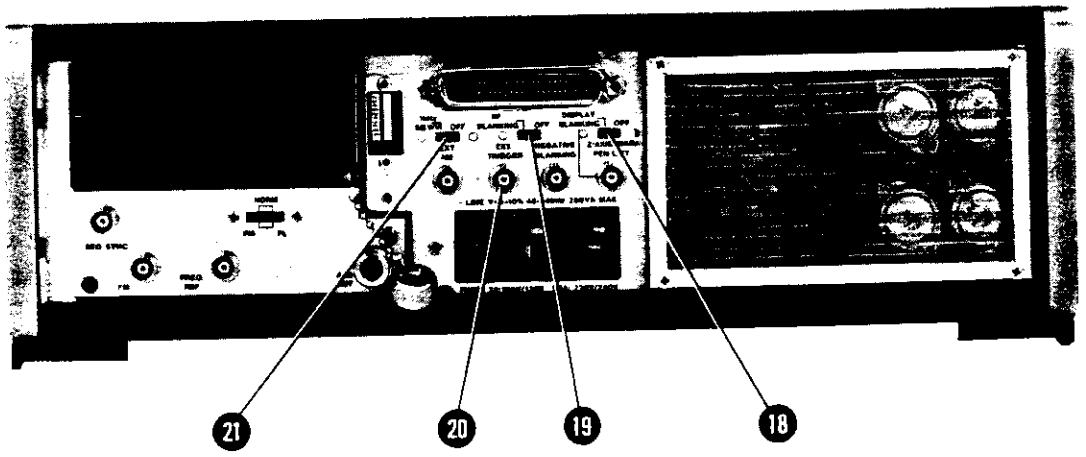


Figure 3-6. Marker Sweep Mode (1 of 2)

MARKER SWEEP MODE

1. Connect sweep oscillator as shown in Figure 3-4 test setup.

2. Set 8620C controls as follows:

BAND (2)	Depress to select frequency band
START MARKER pointer (3)	Left-hand end mark on scale
CW MARKER pointer (6)	Middle mark on scale
STOP MARKER POINTER (9)	Right-hand end mark on scale
ΔF Control (5)	Fully clockwise
CW VERNIER control (8)	Fully clockwise
MARKERS (13)	INTEN
MODE (15)	AUTO
TRIGGER (14)	INT
TIME-SECONDS (12)	.1 — .01
TIME-SECONDS Vernier (11)	Fully clockwise
1 kHz SQ WV/OFF (Rear Panel) (21)	OFF
RF BLANKING/OFF (Rear Panel) (19)	OFF
DISPLAY BLANKING/OFF (Rear Panel) (18)	DISPLAY BLANKING

3. Press LINE pushbutton switch (17) to turn on instrument; LINE and FULL SWEEP pushbuttons should light.

4. Press MARKER SWEEP pushbutton (10); pushbutton should light.

5. Set controls on RF plug-in to obtain an RF signal output. Oscilloscope trace should show detected RF signal output below zero-volt reference. There should be no discontinuity in swept trace across band. Bright marker spot should be at middle of trace.

6. Sweep width is changed by START MARKER (1) and STOP MARKER (10) controls marker position is changed by CW MARKER control (7).

7. Set MARKERS switch (13) to AMPL to obtain amplitude markers on trace.

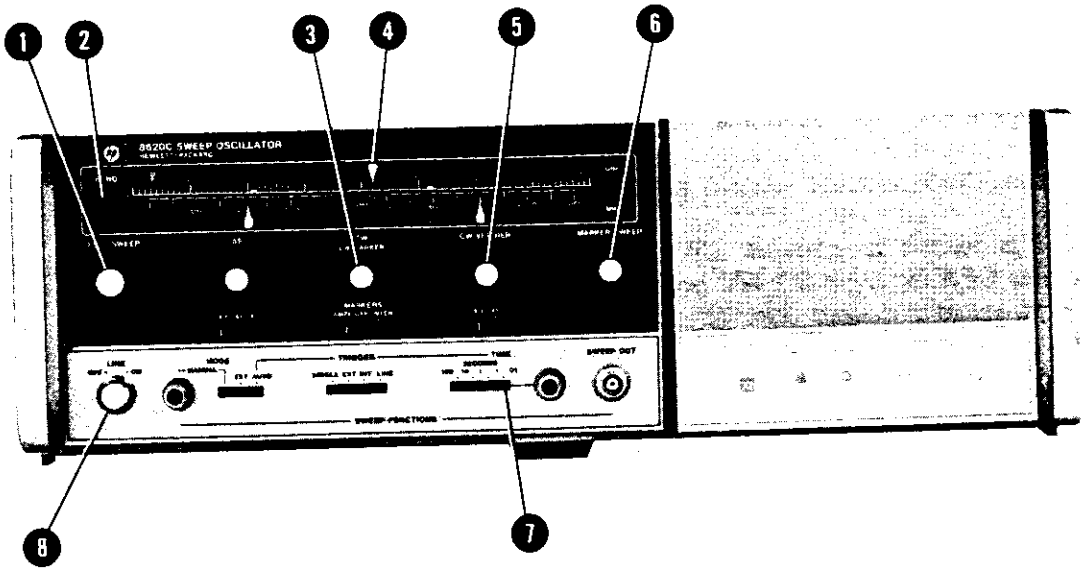
8. Band may be swept manually by setting MODE switch (15) to MANUAL and adjusting MANUAL control (16) through its range. No markers are available in Manual mode.

9. Select SINGLE sweep as follows: Set MODE switch (15) to AUTO. Press TRIGGER switch (14) to SINGLE position and release. Repeat this to obtain each single sweep. External (EXT) trigger mode is available by setting TRIGGER switch to EXT and applying external trigger pulse to rear-panel EXT TRIGGER input (20). Sweep may be triggered from ac line by setting TRIGGER switch to LINE.

Figure 3-6. Marker Sweep Mode (2 of 2)

CW MODE

FRONT



REAR

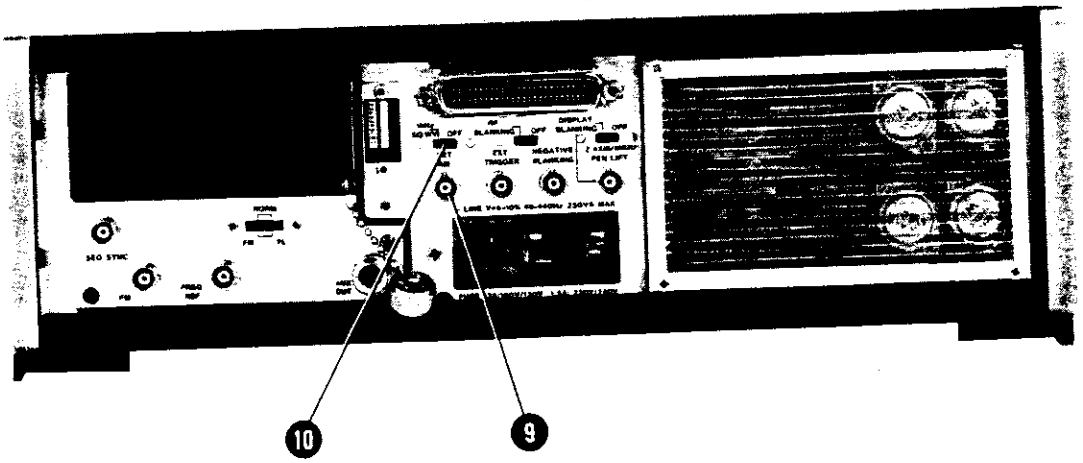


Figure 3-7. CW Operating Mode (1 of 2)

CW MODE

1. Connect sweep oscillator and set 8620C controls as shown in Figure 3-4.

2. Press LINE pushbutton switch (8) to turn on instrument; LINE and FULL SWEEP (1) pushbuttons should light.

3. Depress BAND switch (2) until correct band is displayed at window.

4. Press CW pushbutton (3). Pushbutton should light and trace on oscilloscope should be a dot. Change frequency with CW MARKER control and dot should move across oscilloscope CRT.

5. Rotate CW MARKER control (3) to set CW pointer (4) at selected frequency on scale.

6. If it is desired to modulate CW signal, set rear-panel 1kHz SQ WV/OFF slide switch (10) to either OFF or 1kHz SQ WV position. In OFF position, a modulation signal may be applied from external source through rear-panel EXT AM connector (9). In 1kHz SQ WV position, a 1 kHz internal oscillator modulates RF output signal.

7. To expand CW frequency dial, press CW VERNIER pushbutton switch (5). CW VERNIER control allows CW frequency to be changed by small amounts. Set X.1—X1 multiplier slide switch (7), located below CW VERNIER control, for bandspread desired.

Figure 3-7. CW Operating Mode (2 of 2)

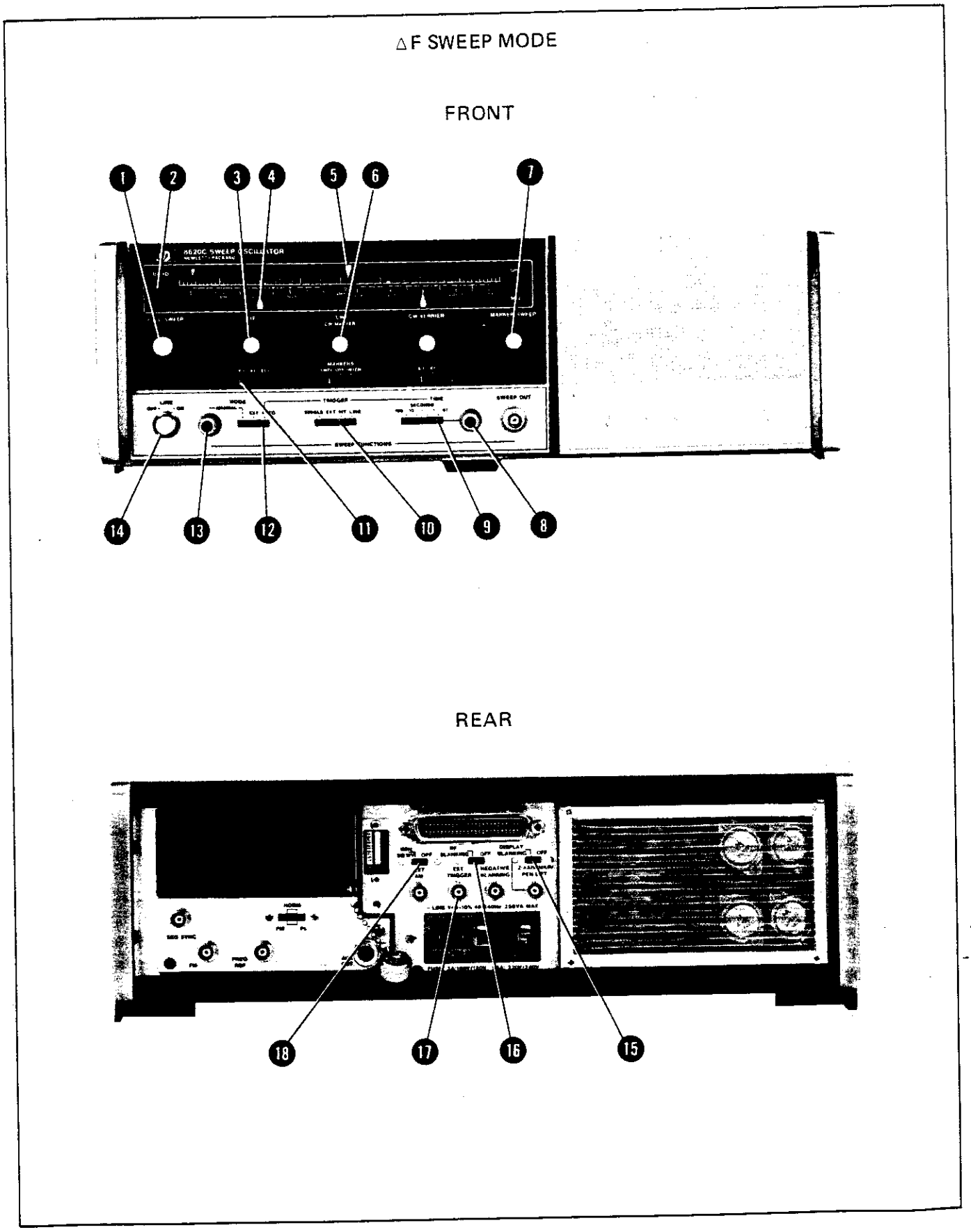


Figure 3-8. ΔF Sweep Mode (1 of 2)

ΔF SWEEP MODE

1. Connect sweep oscillator as shown in Figure 3-4 test setup.

2. Set 8620C controls as follows:

BAND (2)	Depress to select desired frequency band
CW MARKER pointer (5)	Selected ΔF center frequency
ΔF control (4)	Fully clockwise
MODE (12)	AUTO
TRIGGER (10)	INT
TIME-SECONDS (9)	.1 — .01
TIME-SECONDS Vernier (8)	Fully clockwise
1 kHz SQ WV/OFF (Rear Panel) (18)	OFF
RF BLANKING/OFF (Rear Panel) (16)	OFF
DISPLAY BLANKING/OFF (Rear Panel) (15)	DISPLAY BLANKING

3. Press LINE pushbutton switch (14) to turn on instrument; LINE and FULL SWEEP pushbuttons should light.

4. Set controls on RF plug-in to obtain an RF signal output.

5. Press ΔF pushbutton switch (3) ; ΔF and CW (6) pushbuttons should light.

6. CW MARKER control (6) sets center frequency of sweep. START MARKER (1) and STOP MARKER (7) controls adjust position of markers.

7. Set ΔF control (3) abd ΔF multiplier slide switch (11) below ΔF control for selected deviation from center frequency. Trace on oscilloscope should display across the swept band.

8. Band may be swept manually by setting MODE switch (12) to MANUAL and adjusting MANUAL control (13) through its range. No markers are available in MANUAL mode.

9. Select SINGLE sweep as follows: Set MODE switch (12) to AUTO. Press TRIGGER switch (10) to SINGLE position and release. Repeat this to obtain each single sweep. External (EXT) trigger mode is available by setting TRIGGER switch to EXT and applying external trigger pulse to rear-panel EXT TRIGGER input (17) . Sweep may be triggered from ac line by setting TRIGGER switch to LINE.

Figure 3-8. ΔF Sweep Mode (2 of 2)