

MODEL 86632B



Figure 1-1. HP Model 86632B Modulation Section

SECTION I GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains all information required to install, operate, test, adjust, and service the HP Model 86632B Modulation Section plug-in.

1-3. The various sections of this manual provide information as follows:

a. SECTION I, GENERAL INFORMATION, such as description, specifications, accessories, and recommended test equipment.

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

c. SECTION III, OPERATION, provides information relative to operating the instrument.

d. SECTION IV, PERFORMANCE TESTS, provides information required to ascertain that the instrument is performing in accordance with published specifications.

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

f. SECTION VI, REPLACEABLE PARTS, provides ordering information for all parts and assemblies.

g. SECTION VII, MANUAL CHANGES, contains backdating information to make documentation in this manual applicable to all earlier versions of this instrument.

h. SECTION VIII, SERVICE, includes information required to service the instrument.

1-4. Figure 1-1 shows the Modulation Section.

1-5. Packaged with this manual is an Operating Information Supplement. This is simply a copy of the first three sections of this manual. This supplement should stay with the instrument for use by the operator. Additional copies may be ordered separately through your nearest Hewlett-Packard office. The part number is listed on the title page of this manual.

1-6. On the title page of this manual, below the manual part number, is a "Microfiche" part number. This number may be used to order 4 x 6-inch microfilm transparencies of the manual. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1-7. SPECIFICATIONS

1-8. Instrument specifications are listed in Table 1-1. These specifications are the performance standards, or limits against which the instrument may be tested.

1-9. INSTRUMENTS COVERED BY MANUAL

1-10. This instrument has a two-part serial number. The first four digits and the letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial number prefix as listed under SERIAL NUMBERS on the title page.

1-11. For information concerning a serial number prefix not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-12. MANUAL CHANGE SUPPLEMENT

1-13. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. This unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for this instrument is supplied with a yellow Manual Changes supplement that contains "change information" that documents the differences.

1-14. 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

MANUAL CHANGE SUPPLEMENT (Cont'd)

the latest Manual Changes supplement. The supplement for this manual is keyed to this manual's print date and part number, both of which appear on the title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-15. DESCRIPTION

1-16. The HP Model 86632B Modulation Section is one of several plug-in units available for use in a Model 8660-Series Synthesized Signal Generator System. This model features both amplitude and frequency modulation.

1-17. An internal oscillator provides modulation drive rates of 400 and 1000 Hz. The oscillator output is available at the front panel jack for test purposes or for a synchronizing trigger for an oscilloscope. External modulation signal sources are connected to the front panel jack and may be either ac coupled or dc coupled.

1-18. Amplitude modulation depth is continuously adjustable from 0 to 100% except as limited by the RF Section and the selected center frequency. Frequency modulation peak deviation is adjustable from dc to 1 MHz (2 MHz at center frequencies ≥ 1300 MHz) in three ranges. FM deviation is limited by the RF Section and center frequencies < 10 MHz.

1-19. Amplitude modulation rates are limited by the RF Section, system center frequency, and the mode of operation (external ac). FM rates may be used up to 1 MHz except as limited by the RF Section, system center frequencies < 10 MHz and ac coupling of an external source.

1-20. Programmed inputs (remote mode) may be used to control all the functions of the Modulation Section. Programmed data is routed through the Mainframe to the Modulation Section storage registers. The decoded data selects mode, source, and modulation level. The FM/CF CAL function may also be programmed.

1-21. COMPATIBILITY

1-22. With the exception of certain unmodified mainframes, the Model 86632B is compatible with all instruments which make up the Synthesized Signal Generator System. If the Modulation Section is installed in an unmodified mainframe, the modulation level meter reading will be incorrect in the FM mode at center frequencies ≥ 1300 MHz.

Refer to the paragraph entitled Modifications in Section II.

1-23. EQUIPMENT REQUIRED BUT NOT SUPPLIED**1-24. Mainframes**

1-25. The HP Model 8660-Series mainframe provides the power, control logic, and RF signal inputs needed to operate the Modulation Section, RF Section, and Frequency Extension Module plug-ins. The mainframe also serves to interconnect the plug-ins.

1-26. RF Sections and Frequency Extension Modules

1-27. The Model 86600-series RF Section and the 11661-series Frequency Extension Module mix the RF inputs from the mainframe and Modulation Section to produce the system center frequency. Systems with maximum center frequency less than or equal to 160 MHz do not use a Frequency Extension Module.

1-28. EQUIPMENT AVAILABLE**1-29. Accessories**

1-30. Extender cards for use in servicing the 8660 system are contained in the Rack Mount Kit (HP part number 08660-60070) which is supplied with the mainframe. A complete listing of the contents is found in Section I of the mainframe manual.

1-31. Service Kit

1-32. The HP 11672A Service Kit contains interconnecting cables, RF cables, various coaxial adapters, and an adjustment tool, all of which are useful in servicing the mainframe and plug-in units. Refer to HP 11672A Operating Note or the 8660-series mainframe manual for a listing and details of the contents.

1-33. SAFETY CONSIDERATIONS

1-34. The Modulation Section has been manufactured and tested in accordance with HP standards.

1-35. Documentation for the Modulation Section and other sections of the Synthesized Signal Generator System should be received before operating or servicing. Anyone who operates or services the system should be familiar with safety markings and instructions. Refer to the Safety Considerations

Table 1-1. Specifications

SPECIFICATIONS

Functions: Internal and external AM or FM. Both modes are fully programmable.

Meter: 0–100% AM. FM peak deviation 0–10, 100, and 1000 kHz for center frequencies <1300 MHz; 0–20, 200, and 2000 kHz for center frequencies \geq 1300 MHz.

Reduce Deviation Indicator: Lights when peak deviation exceeds approximately 110% of full scale.

FM-CF CAL: In the FM mode, pressing the front panel CF CAL button initiates a 5-second internal calibration cycle to correct any VCO drift. This feature is also programmable.

Internal Modulation

Internal Rates: 400 Hz and 1 kHz \pm 5%.

AM: Continuously adjustable from 0 to 100% or maximum specified for RF Section installed.

FM:

Deviation: Adjustable from 0 to 1 MHz peak (2 MHz at center frequencies \geq 1300 MHz) maximum specified for RF Section installed. Not to exceed 1/10 of carrier frequency.

Distortion: Maintains minimum AM/FM distortion specified for RF Section used.

Modulating Signal Output: Selected internal modulation signal provided at front panel BNC connector at level of 200 mVrms minimum into 10 kilohm resistive load.

External Modulation

Input Level Required:

AC Mode: External modulating signal must be between 1 and 2 Vrms to provide proper leveling amplifier performance.

DC Mode: External modulating signal must be approximately 1.8 Vrms (2.0 Vrms maximum) to maintain full vernier range and calibrated remote programming of modulation level.

Input Impedance: 600 ohms.

AM:

Rate: DC to maximum specified for RF Section. 20 Hz minimum in AC mode.

Depth: 0 to maximum specified for RF Section.

Distortion: External modulating signal distortion must be less than 0.3% to meet RF Section specifications.

Indicated AM Accuracy (at 400 and 1000 Hz rates):¹
 \pm 5% of full scale (\pm 10% of full scale at center frequencies \geq 1300 MHz).

FM:

Rate: DC to 1 MHz in DC mode, or 20 Hz to 1 MHz in AC mode. Not to exceed 1/10 of carrier frequency. Maximum usable modulation rate depends on specifications for RF Section installed.

Deviation: 0 to 1 MHz peak for center frequencies below 1300 MHz; 0 to 2 MHz for center frequencies \geq 1300 MHz. Maximum usable deviation depends on specifications for RF Section installed. Cannot exceed 1/10 of carrier frequency.

Distortion: External modulation signal distortion must be less than 0.3% to meet RF Section specifications.

Indicated FM Accuracy: \pm 5% of full scale up to 20 kHz rates.

Remote Programming

Modulation Setting Resolution: 1% depth for AM; 1/50 of range selected for FM.

Modulation Setting Accuracy: \pm 5% of setting or 1/2% of full scale, whichever is greater.

General

Size: Plug-in to fit all 8660 mainframes.

Weight: Net, 2.6 kg (6 lb).

¹With 86601A, \pm 5% <100 MHz; \pm 7% \geq 100 MHz.

SAFETY CONSIDERATIONS (Cont'd)

page found at the beginning of the manuals for a summary of safety information.

1-36. Safety information pertinent to the task at hand (installation, operation, performance testing, adjustments or service) is found throughout this manual.

1-37. RECOMMENDED TEST EQUIPMENT

1-38. Table 1-2 lists the equipment and accessories recommended for use in testing, adjusting, and servicing the Modulation Section. If any of the recommended test equipment is unavailable, instruments with equivalent specifications may be used.

Table 1-2. Recommended Test Equipment

Item	Minimum Specifications	Suggested Model	Use*
Analyzer, Spectrum	Measurement Accuracy ± 2.0 dB from 10 MHz to 2600 MHz. Resolution bandwidth 0.3 to 100 kHz.	HP 140T with HP 8555A and HP 8552B plug-ins	P, S
Analyzer, Modulation	10 kHz – 100 kHz FM measurement capability	HP 8901A	P, A
Attenuator	3 dB pad	HP 8491A, Option 003	A, S
Cable, Extender	Part of HP 11672A Service Kit	HP 11672-60002	A
Counter, Frequency	Range 200 Hz to 30 MHz	HP 5340A	P, A, S
Oscillator, Test	10 Hz to 1 MHz; 1.0 to 2.0 Vrms into 600 ohms	HP 651B	P, A, S
Oscilloscope	DC to 1 MHz, delayed sweep, time base 50 ns to 1s	HP 180C with HP 1801A and HP 1821A plug-ins	P, A, S
Oscilloscope Divider Probe, 10:1	10:1 divider 10 Megohm 10 pF	HP 10004A	P, A, S
Resistor, 10K	$\pm 2\%$	HP 0757-0442	P, S
Tee, Coaxial		HP 1250-0781 (BNC)	P
Voltmeter, Digital	Accuracy: $\pm 0.2\%$ Range: 0.00 to ± 30 Vdc	HP 34740A with HP 34702A plug-in	S
Voltmeter, True RMS	± 0.1 dB from 100 Hz to 1 MHz 1 mVrms to Vrms	HP 3403C	A, S
* A = Adjustment, P = Performance, S = Service			

SECTION II INSTALLATION

2-1. INTRODUCTION

2-2. This section provides information relative to initial inspection, preparation for use, and storage and shipment of the Model 86632B Modulation Section plug-in. Initial inspection provides instructions to be followed when an instrument is received in a damaged condition. Preparation For Use gives all necessary interconnection and installation instruction. Storage and Shipment provides instructions and environmental limitations pertaining to instrument storage; also provided are packing and packaging instructions which should be followed in preparing the instrument for shipment.

2-3. INITIAL INSPECTION

2-4. This instrument met all of its performance specifications when packaged for shipment. 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. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, 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 material for the carrier's inspection.

2-5. PREPARATION FOR USE

2-6. Meter Zeroing

2-7. With the power off, the Modulation Section meter indicator needle should be positioned on zero. If the needle is not on zero, turn the zero set screw adjustment counterclockwise to bring the needle below zero. Slowly rotate the zero set clockwise until the indicator is on zero. Rotate the zero set about 30 degrees counterclockwise.

2-8. Power Requirements

2-9. The power required for operation of the Modulation Section is furnished by the mainframe.

Power consumption of the Modulation Section is approximately 5 volt-amperes.

2-10. Operating Environment

2-11. **Temperature.** Cooling is provided to the Modulation Section by a fan in the mainframe. This assures the ambient temperature of the instrument stays within reasonable limits when the instrument is operated at temperatures between 0 and 55°C (32 to 131°F).

2-12. **Humidity.** The instrument may be operated in environments with humidity up to 95%. However, the instrument should also be protected from temperature extremes which may cause condensation within the instrument.

2-13. **Altitude.** The instrument may be operated at altitudes up to 4500 m (15 000 feet).

WARNING

The multiple pin connector at the rear of the plug-in cavity in the mainframe will be exposed when the Modulation Section is removed. Avoid contact with these exposed pins even with the line (mains) voltage off and the power cord disconnected. Power supply voltages may still remain which, if contacted, may result in personal injury.

2-14. Interconnections

2-15. With the 8660 line power turned off, insert the Modulation Section into the left plug-in cavity in the mainframe and push it about half way in. The latch, at the lower right corner of the front panel, should be rotated to the left until it protrudes perpendicular to the front panel. Push the plug-in all the way in and rotate the latch to the right until it snaps into place. Refer to Figure 2-1.

2-16. Modifications

2-17. The frequency doubler function modification must be installed to ensure correct frequency modulation level readings at all center frequencies. Model 8660A and 8660B mainframes with serial

Modifications (Cont'd)

prefix 1503A and below must have a field update kit installed. For mainframe configurations other than Option 005 (BCD programming format), order kit number 08660-60306. For Option 005 mainframes (HP-IB format), order kit number 08660-60308.

2-18. STORAGE AND SHIPMENT**2-19. Environment**

2-20. The storage and shipping environment of the Model 86632B should not exceed the following limits:

Temperature: -40°C to $+75^{\circ}\text{C}$

Humidity: Up to 95%

Altitude: Up to 7600 m (25 000 feet).

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

2-21. Packaging

2-22. **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 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.

2-23. Other Packaging. The following general instructions should be used for re-packaging with commercially available materials:

a. Wrap the instrument in heavy paper for plastic. If shipping to a Hewlett-Packard office or service center, attach a tag indicating the type of service required, return address, model number, and full serial number.

b. Use a strong shipping container. A double-wall carton made of 250-pound test material is adequate.

c. Use enough shock-absorbing material (3- to 4-inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the container.

d. Seal the shipping container securely.

e. Mark the shipping container **FRAGILE** to assure careful handling.



Figure 2-1. Model 86632B Being Installed in Mainframe

SECTION III OPERATION

3-1. INTRODUCTION

3-2. This section provides operating instructions for the Hewlett-Packard Model 86632B Modulation Section.

3-3. The Modulation Section is designed to select AM, FM, or CW output from the RF Section.

3-4. PANEL FEATURES

3-5. Front and rear panel controls, indicators, and connectors of the Modulation Section are shown in Figure 3-1.

3-6. OPERATOR'S CHECK

3-7. An operator's check which gives reasonable assurance that the instrument is capable of normal performance is shown in Figure 3-2.

3-8. OPERATING INSTRUCTIONS

3-9. Local and Remote Modes

3-10. The Modulation Section may be operated by front panel controls in the local mode or externally programmed in the remote mode.

3-11. Local (Front Panel) Operation. Figure 3-4 provides local mode operating instructions for the Modulation Section.

3-12. Remote (Programmed) Operation. Application Note 164-1, "Programming the 8660A/B Synthesized Signal Generator" provides most of the information needed for remote operation using the BCD interface. AN-164-2 "Calculator Control of the 8660A/B/C Synthesized Signal Generator" provides programming information for the Hewlett-Packard Interface Bus (HP-IB). Information pertaining to remote operation is also included in abridged form in Section III of the Mainframe manuals.

3-13. Additional operating information is found in the appropriate manual. For example, in this manual BCD and HP-IB programming codes for the Model 86632B are found in Tables 3-1 and 3-2. Table 3-3 contains examples of programmed modulation level and the actual modulation level at center frequencies above and below 1300 MHz.

3-14. Ensuring Calibrated Modulation Level

3-14. Ensuring Calibrated Modulation Level

3-15. The information in the following paragraphs may be used to ensure calibrated modulation level readings under different operating modes and conditions.

3-16. Source Control Settings and External Inputs.

The Modulation Section meter indicates the correct modulation level if the SOURCE selected is INTERNAL, or if the input to the front panel jack is 1 to 2 Vrms in the EXTERNAL AC mode, or if the input is 1.80 ± 0.02 Vrms in EXTERNAL DC mode.

3-17. FM DC Inputs. Due to internal signal inversion, the modulation meter circuit in the Modulation Section actually responds to the negative peaks of the input modulating signal. Therefore, for dc inputs, it is necessary to set the modulation level with a negative dc level. The value of this input should be 2.54 ± 0.03 Vdc (1.414 times 1.8 Vrms) which is the equivalent of the peak value of the specified input. Next, the MODULATION LEVEL control should be used to set the desired deviation. The polarity of the dc input may then be reversed and although the meter will indicate zero, the center frequency will be shifted in the opposite direction. After making this setup, programmed inputs are calibrated for dc modulation inputs.

3-18. Meter Driver Frequency Response. The modulation meter circuit responds properly to a dc input (negative) and to rates above 50 Hz. Between these limits the meter detector circuit will produce a low reading. To use the meter circuit properly, set the deviation desired at either dc or at rates above 50 Hz (to 100 Hz) and ignore the meter reading at the low rates.

3-19. Deviation Direction

3-20. In the FM mode, a positive going modulation signal causes the system center frequency to be increasing.

Table 3-1. BCD Programming

Data		Data Description	Command Function
D ₁	D ₂		
0001 0010 0100 1000		INT 1 kHz 400 Hz EXT DC AC	Modulation Type: Source
	0000 0001 0010 0100 1000	OFF FM X10 X1 X .1 AM	
1111	0100		
0001 0010 0011 . . . 0000 0001 0010 . . . 1001 0000	0000 0000 0000 . . . 0001 0001 0001 . . . 1001 1010	1 2 3 . . . 10 11 12 . . . 99 100	Modulation Level: AM% or number of increments of 1/50 FM full scale deviation (see Table 3-3).
1111	0101		
1111	0110		FM-CAL

1. Programming modulation level and modulation type requires two words each. Each word consists of two BCD digits. The first word is formed by taking one BCD digit from each column of the upper part of each section of the table. The second word (specified in the last line of each section of the table) consists of a transfer command and function address.

2. FM-CAL is programmed by inputting the two BCD digits (transfer command and function address) as shown.

3. Example. To program the internal 1 kHz source in the FM X1 range, 76 kHz peak deviation and FM-CAL, the following words are input:
 0001 0010 INT 1 kHz; FM X1
 1111 0100 TRANSFER COMMAND; SOURCE/MODE ADDRESS
 1000 0011 76 kHz peak deviation (38%)
 1111 0101 TRANSFER COMMAND; MODULATION LEVEL ADDRESS
 1111 0110 TRANSFER COMMAND; FM-CAL ADDRESS

Table 3-2. HP-IB Programming

Command		Data Description	Command Function
Data	Program Code		
1 2 4 8		INT 1 kHz 400 Hz EXT DC AC	Modulation Type: Source
	\$	OFF FM X10 X1 X .1 AM	
1 2 3 . . . 0 1 2 . . 9 <blank>	0 1 2 4 8 . . . 1 1 1 . . 9 .	1 2 3 . . . 10 11 12 . . 99 100	Modulation Level: AM% or number of increments of 1/50 FM full scale deviation (see Table 3-3)
	&		

1. Programming modulation level and modulation type requires a three character command for each. This command is formed by taking one character from each of the first three columns in each section of the above table.

2. FM-CAL is programmed by a one character command.

3. Example. To program the internal 1 kHz source in the FM X1 range, 76 kHz peak deviation and FM-CAL, the following command is sent: 83%12\$&.

3-21. OPERATOR'S MAINTENANCE (LAMP REPLACEMENT)

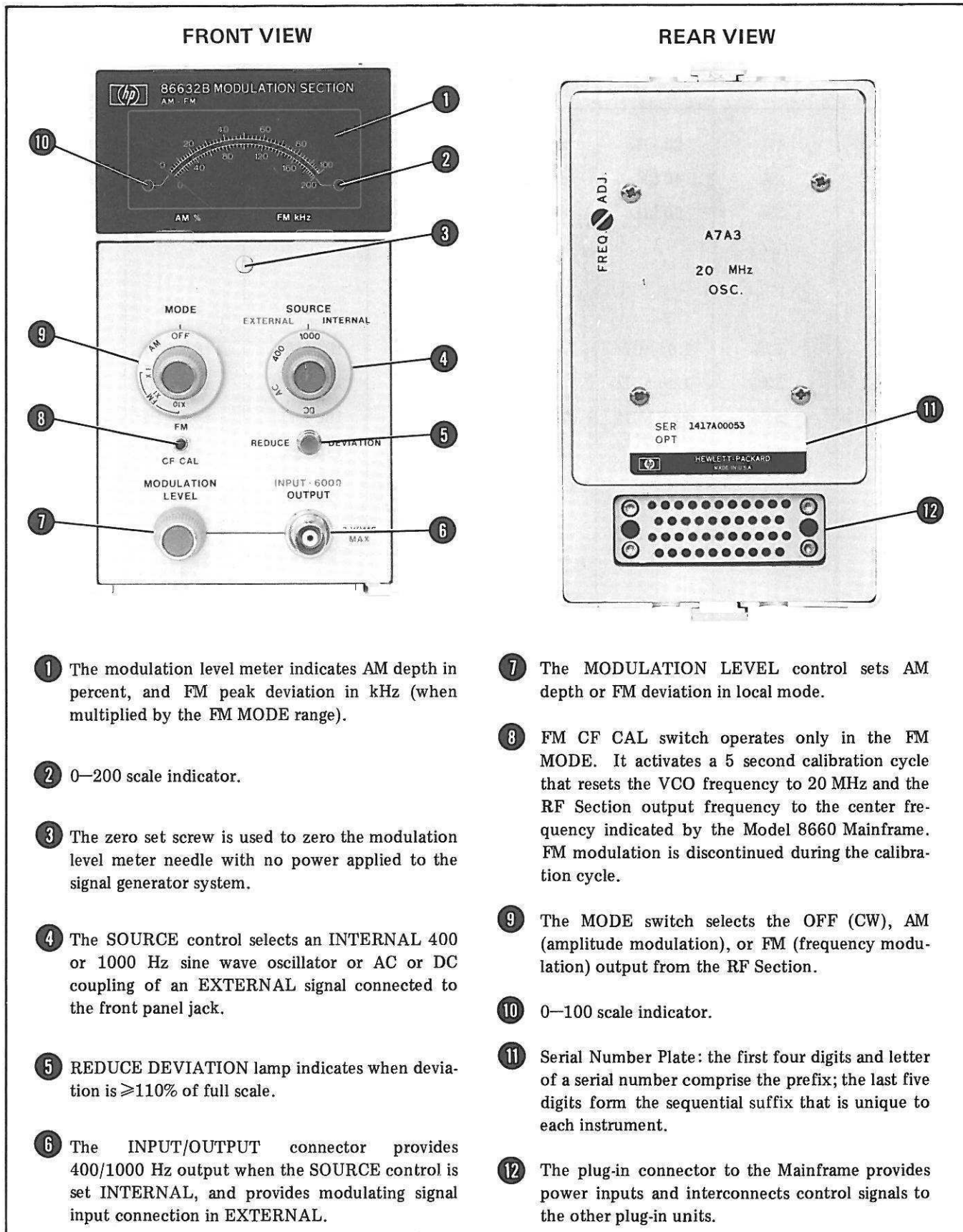
3-22. The only operator's maintenance is the REDUCE DEVIATION lamp replacement. To replace this bulb, proceed as follows:

- a. Unscrew the orange lens covering the REDUCE DEVIATION lamp.
- b. Remove the lamp and replace it with a new HP Part No. 2140-0092.
- c. Replace the orange lens.

Table 3-3. AM Depth and Frequency Deviations for Remote Programmed Modulation Levels

Programmed Level	AM Depth	FM x 10		FM x 1		FM x 0.1	
		<1300 MHz	≥1300 MHz	<1300 MHz	≥1300 MHz	<1300 MHz	≥1300 MHz
1%	1%	20 kHz	20 kHz	2 kHz	2 kHz	0.2 kHz	0.2 kHz
2%	2%	40 kHz	40 kHz	4 kHz	4 kHz	0.4 kHz	0.4 kHz
3%	3%	60 kHz	60 kHz	6 kHz	6 kHz	0.6 kHz	0.6 kHz
.
.
.
52%	52%	1.04 MHz	1.04 MHz	104 kHz	104 kHz	10.4 kHz	10.4 kHz
53%	53%	1.06 MHz	1.06 MHz	106 kHz	106 kHz	10.6 kHz	10.6 kHz
54%	54%	1.08 MHz	1.08 MHz	108 kHz	108 kHz	10.8 kHz	10.8 kHz
55%	55%	*	1.10 MHz	*	110 kHz	*	11.0 kHz
56%	56%		1.12 MHz		112 kHz		11.2 kHz
.
.
.
98%	98%		1.96 MHz		196 kHz		19.6 kHz
99%	99%		1.98 MHz		198 kHz		19.8 kHz
100%	100%	*	2 MHz	*	200 kHz	*	20.0 kHz

*Overrange, reduce deviation warning light is on.

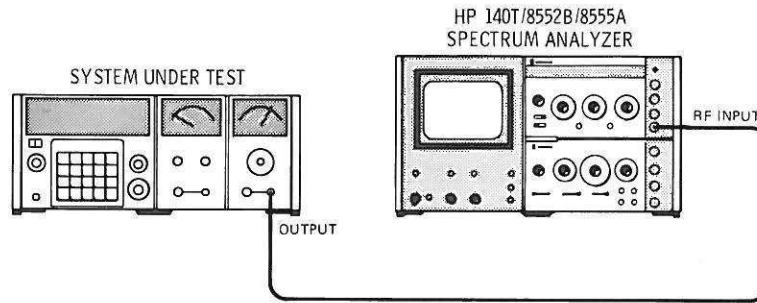


- 1 The modulation level meter indicates AM depth in percent, and FM peak deviation in kHz (when multiplied by the FM MODE range).
- 2 0–200 scale indicator.
- 3 The zero set screw is used to zero the modulation level meter needle with no power applied to the signal generator system.
- 4 The SOURCE control selects an INTERNAL 400 or 1000 Hz sine wave oscillator or AC or DC coupling of an EXTERNAL signal connected to the front panel jack.
- 5 REDUCE DEVIATION lamp indicates when deviation is $\geq 110\%$ of full scale.
- 6 The INPUT/OUTPUT connector provides 400/1000 Hz output when the SOURCE control is set INTERNAL, and provides modulating signal input connection in EXTERNAL.

- 7 The MODULATION LEVEL control sets AM depth or FM deviation in local mode.
- 8 FM CF CAL switch operates only in the FM MODE. It activates a 5 second calibration cycle that resets the VCO frequency to 20 MHz and the RF Section output frequency to the center frequency indicated by the Model 8660 Mainframe. FM modulation is discontinued during the calibration cycle.
- 9 The MODE switch selects the OFF (CW), AM (amplitude modulation), or FM (frequency modulation) output from the RF Section.
- 10 0–100 scale indicator.
- 11 Serial Number Plate: the first four digits and letter of a serial number comprise the prefix; the last five digits form the sequential suffix that is unique to each instrument.
- 12 The plug-in connector to the Mainframe provides power inputs and interconnects control signals to the other plug-in units.

Figure 3-1. Front and Rear Panel Controls, Connectors, and Indicators

OPERATOR'S CHECK



WARNING

BEFORE CONNECTING THIS SYSTEM TO LINE (MAINS) VOLTAGE, the safety and installation instructions found in Sections II and III of the mainframe manual should be followed.

NOTE

If the Modulation Section is installed in older model 8660A or 8660B mainframes, the modulation level meter reading will be incorrect at center frequencies ≥ 1300 MHz. Refer to the paragraph entitled Modifications in Section II.

- a. Connect equipment as shown above.
- b. Set the Spectrum Analyzer controls as follows:

Center Frequency	100 MHz
Resolution Bandwidth	0.3 kHz
Frequency Span per Division	2 kHz
Input Attenuation	50 dB
Sweep Time per Division	50 ms
Reference Level	+10 dBm
Vertical Sensitivity per Division	10 dB
- c. Set CENTER FREQUENCY on mainframe to 100 MHz.
- d. Set the RF Section output level to 0 dBm.
- e. Set Modulation Section SOURCE switch to INTERNAL 1000 and MODE switch to OFF (CW).
- f. Verify the presence of the 100 MHz CW signal.
- g. Change the Modulation Section MODE control to AM and adjust the MODULATION LEVEL control for an indication of 50% on the meter. Verify that the first sidebands are 12 dB down from the carrier.
- h. Change the Spectrum Analyzer controls as follows:

Resolution Bandwidth	100 kHz
Frequency Span Per Division	0.1 MHz
Reference Level	-10 dBm
Vertical Sensitivity per Division	10 dB

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

OPERATOR'S CHECK

- i. Change the Modulation Section MODE switch to FM X10, SOURCE switch to INTERNAL 400, and adjust the MODULATION LEVEL control to 200 kHz peak deviation (meter reading of 20).
- j. Verify that the display is similar to Figure 3-3.
- k. Change the Modulation MODE switch to FMx1 and set the MODULATION LEVEL control for a meter reading of 100 (100 kHz peak deviation).
- l. Change the Spectrum Analyzer controls as follows:
 - Resolution Bandwidth 10 kHz
 - Frequency Span per Division 0.05 MHz
- m. Verify that the display is similar to Figure 3-3.
- n. Change the Modulation Section MODE switch to FM X0.1.
- o. Change the Spectrum Analyzer controls as follows:
 - Resolution Bandwidth 1 kHz
 - Scan width per division 5 kHz
- p. Verify that the display is similar to Figure 3-3.

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

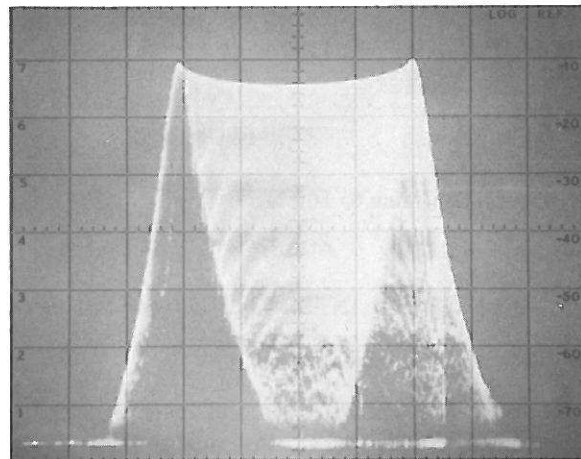
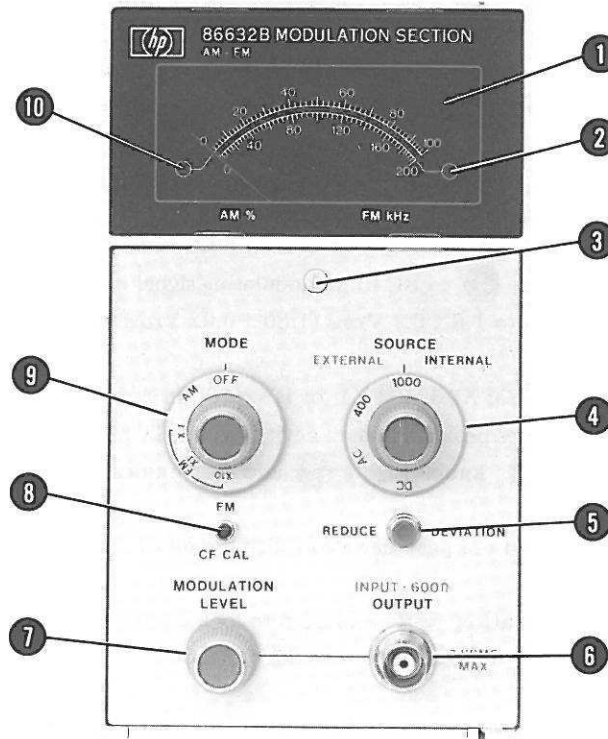


Figure 3-3. Frequency Modulation Spectrum (Vertical Sensitivity 10 dB/Division)

FRONT PANEL OPERATING INSTRUCTIONS

FRONT VIEW



- a. With mainframe LINE switch turned off, check position of needle on meter **1**. If off zero, adjust screw **3** until meter indication is on zero. (Refer to Meter Zeroing in Section II.)

WARNING

BEFORE CONNECTING THIS SYSTEM TO THE LINE (MAINS) VOLTAGE, the safety and installation instructions found in Sections II and III of the mainframe manual should be followed.

NOTE

If the Modulation Section is installed in older model 8660A or 8660B mainframes, the modulation level meter reading will be incorrect at center frequencies ≥ 1300 MHz. Refer to the paragraph entitled Modifications in Section II.

- b. Turn on instrument.
- c. Set modulation SOURCE switch **4** to either INTERNAL (black) or EXTERNAL (green) positions, as desired.

Figure 3-4. Front Panel Operating Instructions (1 of 2)

FRONT PANEL OPERATING INSTRUCTIONS

1. For INTERNAL positions, set to either 400 or 1000 Hz. In these positions, a modulation signal (200 mVrms minimum into 10kΩ load) for oscilloscope synchronization is provided at the OUTPUT port ⑥.

2. For EXTERNAL POSITIONS, the INPUT port ⑥ requires an external modulation signal.

Set SOURCE switch ④ to AC for modulating signals between 20 Hz and up to 1 MHz depending on the RF Section. The input signal should be 1.5 ± 0.5 Vrms.

Set SOURCE switch ④ to DC for a modulating signal between DC and up to 1 MHz.

Set the input signal to 1.8 ± 0.1 Vrms (1.80 ± 0.02 Vrms in the remote mode).

d. Set MODE switch ⑨ to AM, FM X0.1, FM X1, or FM X10. In AM the meter indicates percentage AM-depth. In FM the meter indicates peak frequency deviation in kHz when multiplied by the indicated range factor on the MODE switch ⑨ knob. Lights ② and ⑩ indicate the correct range to use.

e. Adjust percentage AM depth and FM peak deviation with the MODULATION LEVEL control ⑦.

f. In FM Mode, the FM CF CAL button ⑧ is pressed to lock the internal VCO to the mainframe reference oscillator. The calibration cycle takes about 5 seconds.

Figure 3-4. Front Panel Operating Instructions (2 of 2)



SALES OFFICES

Arranged alphabetically by country (cont.)

Mushko & Company, Ltd
10, Bazar Rd
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