

OPERATING INFORMATION

86601A
RF SECTION
.01 – 110 MHz

DUPLICATE OF SECTIONS 1 THRU 3
OF YOUR OPERATING AND SERVICE MANUAL
KEEP WITH INSTRUMENT

Printed: MARCH 1979
©Hewlett-Packard Co. 1972, 1979



V

D

HP 86601A



Figure 1-1. Model 86601A RF Section

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

1-2. The Hewlett-Packard Model 86601A RF Section is an rf output plug-in designed for use with the Hewlett-Packard Model 8660 Synthesized Signal Generator mainframes.

1-3. This manual contains all information required to install, operate, test, adjust, and service the HP Model 86601A. This section covers instrument identification, specifications and other basic information.

1-4. Figure 1-1 shows a front view of the HP Model 86601A installed in the HP Model 8660A mainframe ready for use.

1-5. The various sections of this manual provide information as follows:

a. SECTION II, INSTALLATION, provides information relative to incoming inspection, power requirements, mounting, packing and shipping, etc.

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

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

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

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

f. SECTION VII, MANUAL CHANGES, in this revised issue of the manual this section contains information to adapt this manual to instruments for which the content does not apply directly.

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

1-6. INSTRUMENTS COVERED BY MANUAL

1-7. A ten-digit number (see Figure 1-2) is affixed to the rear panel of all Hewlett-Packard instruments. When the first five digits (serial prefix) of

your instrument matches any of the serial prefix numbers listed on the inside title page of this manual, the manual applies directly to the instrument. When the instrument serial prefix does not appear on the inside title page of the initial issue of a manual, manual change sheets are provided. Later editions or revisions of the manual will provide the required back-dating and/or up-dating information.

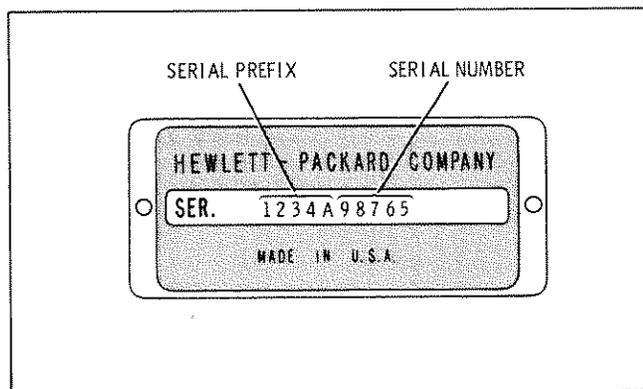


Figure 1-2. Instrument Identification

1-8. DESCRIPTION

1-9. The HP Model 86601A RF Section output plug-in provides a .01 to 109.999999 MHz output when installed in one of the HP Model 8660 mainframes. The output frequency may be selected in increments as low as 1 Hz or 100 Hz depending on the mainframe used.

1-10. The only operator controls on the Model 86601A are the attenuator (OUTPUT RANGE and VERNIER) controls. These controls provide a means of setting the rf output at any level between -146 dBm and +13 dBm. In remote operation these controls are inhibited; attenuation is controlled by a remote programming device in 1 dB and 10 dB steps.

1-11. Complete specifications for the Model 86601A are provided in Table 1-1.

1-12. OPTIONS

Option 001: No RF output attenuator. Output level adjustable from +13 to 0 dBm.

1-13. ACCESSORIES AVAILABLE

1-14. An extender cable, HP Part Number 11672-60001, is required to extend the plug-in for maintenance purposes. This extender cable is a part of the HP 11672A Service Kit, but may be ordered separately.

1-15. TEST EQUIPMENT AND ACCESSORIES

1-16. Table 1-2 lists the test equipment and accessories recommended to test, adjust and service the Model 86601A.

1-17. WARRANTY

1-18: Certification and warranty information for the Model 86601A appears on the inside front cover of this manual.

Table 1-1. Model 86601A Specifications

FREQUENCY CHARACTERISTICS	
<p>Frequency Range: 0.01 to 109.999999 MHz. Selectable in 1 Hz or 100 Hz steps (depending on mainframe used).</p> <p>Frequency Accuracy and Stability: CW frequency accuracy and long term stability are determined by the reference oscillator in the 8660 mainframe or by an external reference if used.</p> <p>Switching Time: Less than 5 ms to be within 100 Hz of any new frequency selected. Less than 100 ms to be within 5 Hz of any new frequency selected. Maximum stepping rate: 1 ms per step.</p> <p>Harmonic Signals: (Output terminated in 50 Ohms) All harmonically related signals are at least 40 dB below the selected output signal.</p>	<p>Spurious Signals (CW and AM only): All nonharmonically related spurious signals are at least 80 dB below the selected output signal. Power line related spurious signals are at least 70 dB below the carrier.</p> <p>Signal-to-Phase Noise Ratio (CW and AM only): Greater than 50 dB in a 30 kHz band centered on the carrier excluding a 1 Hz band centered on the carrier.</p> <p>Residual FM (CW and AM only): < 1 Hz rms in 2 kHz bandwidth centered on carrier.</p> <p>Signal-to-AM Noise Ratio: Greater than 70 dB in a 30 kHz band centered on the carrier, excluding a 1 Hz BW centered on the carrier.</p>
OUTPUT CHARACTERISTICS	
<p>Output Level: Continuously adjustable from +13 to -146 dBm (1.0 V to 0.01 μVrms) into 50-ohm resistive load; output attenuator calibrated in 10 dB steps from 1.0 V (+13 dBm) full scale to 0.03 μV (-137 dBm) full scale; vernier provides continuous adjustment between attenuator ranges; output level indicated on output level meter calibrated in volts and dBm into 50 ohms.</p> <p>Output Accuracy: (Local and Remote Modes) ± 1 dB from +13 dBm to -66 dBm. ± 2 dB from -67 dBm to -146 dBm.</p>	<p>Flatness: Output level variation with frequency is less than ± 0.5 dB across the entire frequency range.</p> <p>Output Level Switching Time: Any level change may be accomplished in less than 50 ms. Any change to another level on the same attenuator range may be accomplished in 5 ms in Remote mode.</p> <p>Impedance: 50 ohms. SWR less than 2.0 on +10 dBm (1.0 V) attenuator range; less than 1.3 on 0 dBm (0.3 V) range and below.</p>

Table 1-1. Model 86601A Specifications (Cont'd)

MODULATION CHARACTERISTICS
(With the Model 86632 AM/FM Modulation Section)

Amplitude Modulation:*

Modulation Depth: 0 to 95% on all output ranges.

ON/OFF Ratio: At least 25 dB with output meter at 0 dB or above.

Carrier Envelope Distortion: (Modulating signal distortion < 0.3%). Less than 1% at 30% AM. Less than 3% at 70% AM. Less than 5% at 90% AM.

Incidental PM: Less than 0.2 radians peak at 30% AM with the output meter between 0 and +3 dBm and typically 0.3 radians at -6 dBm.

Incidental FM: 0.2 x fmod at 30% AM with the output meter between 0 and +3 dBm and typically 0.3 x fmod at -6 dBm.

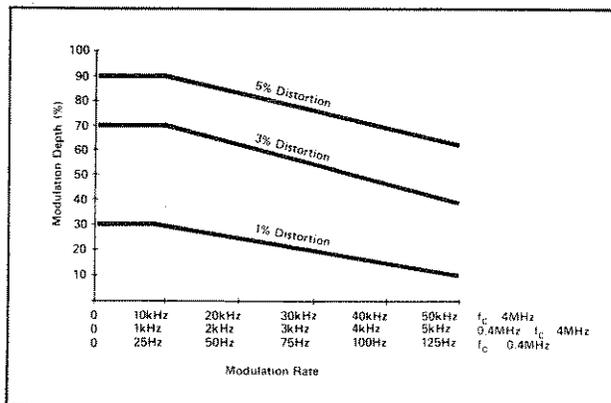
AM 3 dB Bandwidth:

Center Frequency	0 to 30% AM	70% AM	90% AM
$F_c < 0.4$ MHz	200 Hz	125 Hz	100 Hz
$0.4 \leq F_c < 4$ MHz	10 kHz	6 kHz	5 kHz
$F_c \geq 4$ MHz	100 kHz	60 kHz	50 kHz

AM Distortion: (at 400 Hz and 1 kHz rates)

Frequency Range	30%	70%	90%
0.4-110 MHz	<1%	<3%	<5%

Typical distortion for other conditions is shown in curves below.



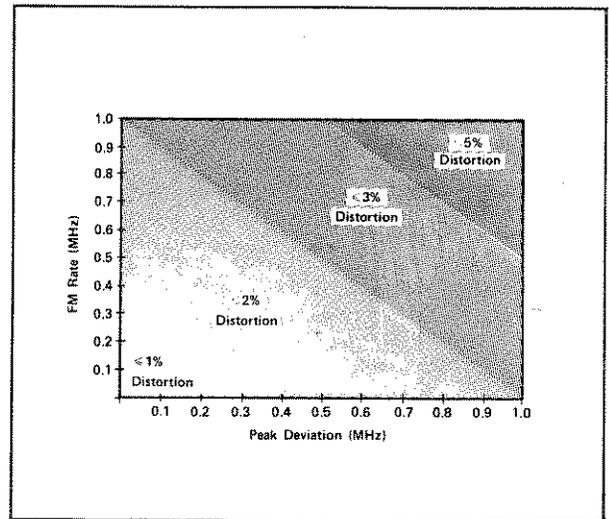
Typical 86601A AM distortion curves

Frequency Modulation:**

Rate: DC to 1 MHz.

Maximum Deviation: 1 MHz.

Incidental AM: With 75 kHz peak deviation at 1 kHz rate, AM modulation sidebands are < -60 dB.



Typical 86601A FM distortion curves

GENERAL

Leakage:

Meets radiated and conducted limits of MIL-I-6181D.

Size: Plut-in to fit Model 8660 mainframe.

Weight: Net, 11 lbs (5 kg). Shipping 15 lbs (6,8 kg).

*Uncalibrated amplitude modulation is also possible with the Model 86631 Auxiliary Section installed.

**In the FM mode, carrier frequency stability is determined by a free-running modulation oscillator in the Model 86632 Modulation Section. The oscillator can be phase-locked momentarily to remove drift by depressing the Model 86632 CF CAL button. Oscillator drift is less than 5 kHz/day after warmup.

SECTION II INSTALLATION

2-1. INITIAL INSPECTION

2-2. Mechanical Check

2-3. If the shipping carton shows visible signs of damage when received, the carrier's agent should be present when the instrument is unpacked. If the agent is not present, retain the packaging material to aid in evaluating the cause of damage if the instrument is physically damaged or is not functioning properly.

2-4. Inspect the instrument for physical damage such as bent or broken parts and dents or scratches. If damage is found refer to paragraph 2-7 for recommended claim procedure. If the instrument appears to be free of damage, perform the electrical check (see paragraph 2-5). The packaging material should be retained for possible future use.

2-5. Electrical Check

2-6. The electrical performance check consists of performing the performance test procedures in Section IV of this manual. These procedures enable the operator to determine that the instrument is, or is not, operating within the specifications listed in Table 1-1. The initial performance and accuracy of the instrument are certified as stated on the inside front cover of this manual. If the instrument does not operate as specified, refer to paragraph 2-7 for the recommended claim procedure.

2-7. Claims for Damage

2-8. If physical damage is found when the instrument is unpacked, notify the carrier and the nearest Hewlett-Packard Sales/Service office immediately. The HP Sales/Service office will arrange for repair or replacement without waiting for a claim to be settled with the carrier.

2-9. The warranty statement for the instrument is on the inside front cover of this manual. Contact the nearest Sales/Service office for information relative to warranty claim.

2-10. Preparation for Use

2-11. There are no special requirements for preparation for use for the Model 86601A. Be sure that the main frame preparation for use requirements are met.

2-12. Power Requirements

2-13. All power required for operation of the Model 86601A is furnished by the mainframe.

2-14. Operating Environment

2-15. Cooling air is provided by a fan in the mainframe. This assures that the ambient temperature of the instrument stays within reasonable temperature limits when the instrument is operated at room temperatures between 0 and 55 degrees C (32 to 131 degrees F).

2-16. Storage and Shipment

2-17. If the instrument is to be stored for an extended period of time it should be enclosed in a clean sealed enclosure.

2-18. Original Packaging

2-19. The same containers and materials used in factory packaging can be obtained through the Hewlett-Packard Sales/Service offices listed at the rear of this manual.

2-20. If the instrument is being returned to Hewlett-Packard for service 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.

2-21. In any correspondence refer to the instrument by model number and full serial number.

2-22. Other Packaging Material

2-23. The following general instructions should be followed when repackaging with commercially available materials:

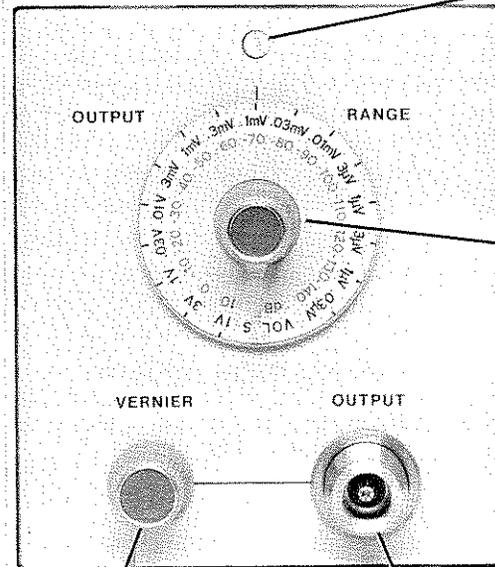
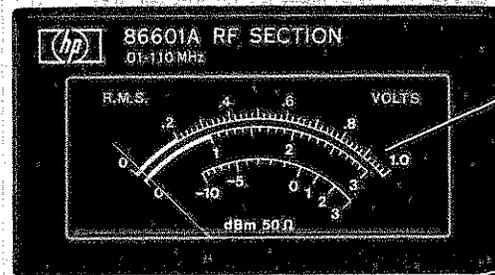
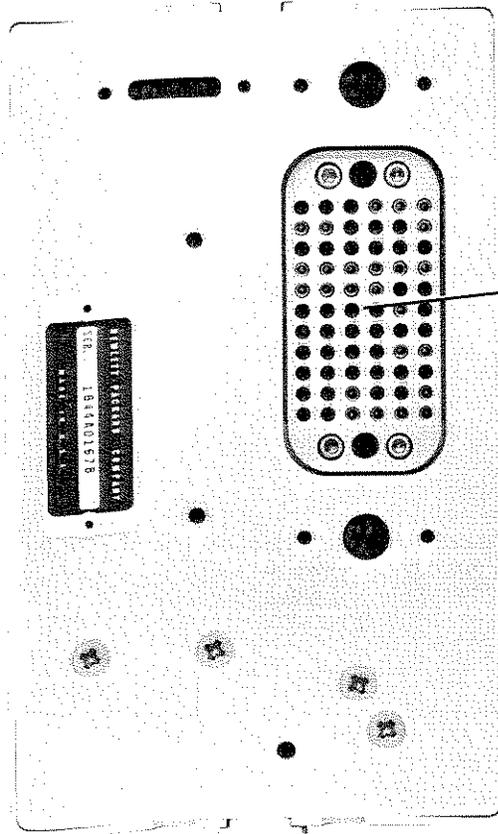
a. Wrap the instrument in heavy paper or plastic. (If shipping to a Hewlett-Packard Service office or center, attach a tag indicating the type of service required, return address, model number and full serial number.)

b. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.

c. Use enough shock-absorbing material (three to four inch layer) around all sides of the instrument to provide firm cushion and prevent movement inside the carton. Protect the control panel with cardboard.

d. Seal the shipping container securely and mark it FRAGILE to assure careful handling.

FRONT AND REAR PANELS



- ① **Rear Panel Connector.** Mates with plug in the RF Section compartment of the mainframe.
- ② **VERNIER.** Adjusts output level over a 13 dB range.
- ③ **OUTPUT.** RF Frequency output selected by mainframe or remote programmer.

- ④ **OUTPUT RANGE.** Provides 150 dB of attenuation. May be remotely programmed.
- ⑤ **Meter Adjust Screw.** For Meter Calibration.
- ⑥ **Output Meter.** Direct Reading; RMS volts or dBm into 50 ohms.

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

SECTION III OPERATION

3-1. INTRODUCTION

3-2. This section provides operating instructions for the Hewlett-Packard Model 86601A RF Section.

3-3. The Model 86601A was designed to accept the precise digitally controlled signals from the Model 8660 mainframe and convert them to the selected output frequency by means of mixing and filtering. It will be necessary to have the Operating Manuals for the mainframe and the modulation section (if used) to efficiently operate the instrument.

NOTE

If a modulation plug-in section is not used it will be necessary to have the Model 86631 Auxiliary Section in place in the modulation plug-in drawer.

3-4. PANEL FEATURES

3-5. Front and rear panel controls, indicators and connectors of the Model 86601A are shown in Figure 3-1.

3-6. OPERATING PRINCIPLES

3-7. The Model 86601A may be operated by front panel controls in the local mode or externally programmed in the remote mode.

3-8. The only operator controls on the Model 86601A are the attenuator controls. These controls

enable the operator to set the output level at any point between -146 and $+13$ dBm.

3-9. The front panel attenuator controls are inhibited when the instrument is operated in the remote mode.

NOTE

Model 86601A Option 001 instruments do not include the 150 dB (10 dB steps) programmable attenuator.

3-10. In Option 001 instruments the output of the Model 86601A may be adjusted, in the local mode, from $+13$ to 0 dBm by means of the VERNIER control; in the remote mode the output may be reduced by 9 dB in 1 dB steps.

3-11. OPERATOR'S CHECKS

3-12. During checkout at the factory the Model 86601A RF Section is adjusted for proper operation. No adjustment should be required when the instrument is received.

3-13. The Operator's Checks specified in Section III of the mainframe are adequate for checking the output frequency of the Model 86601A.

3-14. If a plug-in Modulation Section is being used, the checks specified in Section III of the Modulation Section Manual should also be performed.