SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. The Model 8699B RF Unit combines with the Model 8690 Sweep Oscillator to form an electronically tuned signal source covering 0.1 to 4.0 GHz in two bands (0.1 to 2 GHz and 2 to 4 GHz). The 8699B is an all solid-state RF Unit that uses a hybrid microcircuit YIG-tuned oscillator and mixer, an integrated circuit amplifier, and PIN modulator-attenuator. Complete specifications of the 8699B are given in Table 1-1 and supplementary characteristics are given in Table 1-2.

1-3. INSTRUMENTS COVERED BY MANUAL

1-4. Hewlett-Packard uses a two-section, eight-digit serial number for instrument identification (000-00000). The first three digits refer to a specific instrument. If the serial prefix of your instrument is not listed on the title page of this manual, there are differences between the manual and your instrument. These differences are described in a manual change sheet that is included with the manual or in Appendix I. Manual change sheets are also available from the nearest Hewlett-Packard Sales and Service office.

1-5. ACCESSORIES AVAILABLE

1-6. An Extender Cable, HP Model 10402A[1], is useful for troubleshooting the 8699B RF Unit. It allows access to the various test points and microcircuit outputs while maintaining the necessary bias voltages to the 8699B. Open-end wrenches are recommended for connecting and disconnecting the SMC and SMA connectors. For SMC connectors, HP Part number 08710-0946, a 15/64" open-end wrench is recommended. For SMA connectors, HP Part number 08720-0015, a 5/16" open-end wrench is recommended.

1-7. INCOMING INSPECTION

1-8. Inspect instrument for shipping damage as soon as it is unpacked. Check for broken knobs and connectors; inspect cabinet and panel surfaces for dents and scratches. A performance check is given in Paragraphs 3-15 through 3-25. If instrument is damaged in any way or fails to operate properly, notify carrier and your nearest Hewlett-Packard Sales and Service office. For assistance of any kind, including instruments under warranty, contact the nearest Hewlett-Packard Sales and Service office.

1-9. REPACKAGING FOR SHIPMENT

1-10. If the instrument is to be packaged for shipment, obtain new materials from your local Hewlett-Packard Sales and Service office, or follow these general instructions:

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

b. Use a strong shipping container. A carton made of 500- to 600-pound test material will usually provide adequate protection.

c. Use enough shock-absorbing material (3- to 4-inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard. With Hewlett-Packard "floater pack" packaging, the foam blocks provide sufficient shock protection, and additional material is unnecessary.

d. Seal the shipping container securely.

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

1-11. In any correspondence refer to instrument by model number and full serial number.

1-12. INSTALLATION

1-13. Install the RF unit into the 8690 Sweep Oscillator from the rear as follows:

a. Push the plastic retaining catch inward to release the handle on the rear of the RF Unit.

b. Raise the RF Unit handle 90 degrees to a position perpendicular to the RF Unit rear panel.

c. Gently push the RF Unit into the 8690 Sweep Oscillator from the rear.

d. Return the RF Unit handle to the locked position, in line with the RF Unit rear panel. This step should firmly secure the RF Unit into the 8690 Sweep Oscillator.

[1] When ordering Extender Cable 10402A use the description given under MISCELLANEOUS in Table 4-2.

Table 1-1. Specifications

HP 8699B RF UNIT INSTALLED IN HP 8690B SWEEP OSCILLATOR MAINFRAME

FREQUENCY

Range: 0.1 to 4 GHz in 2 bands (0.1—2 GHz and 2-4 GHz).

Accuracy (at 25°C): CW ± 10 MHz[1]. All other modes ± 20 MHz[2].

Linearity: ±0.5% of sweep width[2].

Stability:
With temperature (from 0 to 55°C): ±750 kHz/°C.
With 10 dB change from maximum leveled power: frequency shift is less than 500 kHz.
With 10% line voltage change: Less than 50 kHz change.
With load impedance change (for any impedance change): 0.1 - 2 GHz, less than 100 kHz; 2—4 GHz, less than 500 kHz.
With time (after 15 min. warmup): Less than 500 kHz/10 min.

Residual FM (in CW): Less than 3 kHz rms noise in a 10 kHz bandwidth.

OUTPUT POWER

Max. Leveled Power (at 25°C): 0.1—2 GHz, at least +13 dBm; 2—4 GHz, at least +8 dBm. The temperature coefficient is typically -0.1 dB/°C.

Flatness:
Leveled: ±0.1 dB plus coupler and detector variation at maximum leveled power.
Unleveled: 0.1—2 GHz, less than ±7 dB; and 2—4 GHz, less than ±3 dB.

Spurious Signals:
0.1—2 GHz: At rated power, harmonics are greater than 25 dB down and nonharmonics, greater than 30 dB down (from CW output). At 0 dBm, all spurious signals are typically greater than 40 dB down.

2-4 GHz: At maximum leveled power or below, harmonics are greater than 20 dB down and nonharmonics greater than 40 dB down (typically nonharmonics are greater than 60 dB down since a fundamental oscillator is used).

Residual AM: The RMS residual AM components in a 100 kHz modulation bandwidth are a minimum of 48 dB below the carrier.

MODULATION

External FM (through PHASE-LOCK INPUT on 8699B rear panel).

Frequency Response: Sensitivity of approximately -1 MHz/volt from dc to 500 kHz (negative voltage increases frequency).
Max Deviation: Approx. ±30 MHz from dc to 100 Hz and ±3 MHz to 200 kHz. (See Figure 1-7 for plot of max deviation vs. modulation rate).

Internal AM (from 8690B mainframe):
Square wave modulation on all sweep time ranges. On/off ratio greater than 20 dB at rated output.

External AM (through 8690B mainframe):
Frequency Response: Dc to 350 kHz unleveled, dc to 50 kHz leveled.
Sensitivity: -10V reduces RF output at least 25 dB below rated CW output (unleveled).

Weight:
Net, 11 lbs (5,0 kg).

Accessories Available:
Extender cable 10402A.

Option 004: Rear panel RF output.

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[1] Approach the desired CW frequency from the low frequency end of the band.

[2] On the fastest sweep range, there is an added constant frequency offset due to time delay between the SWEEP OUTPUT and the actual RF OUTPUT. The amount of the offset depends on both the SWEEP TIME and sweep width: Max frequency offset = 0.25 ms x sweep width (MHz)/ SWEEP TIME (ms). This offset affects linearity only on the first 10% of the sweep width.

Table 1-2. Supplemental Performance Characteristics

8699B INSTALLED IN 8690B

Remote Band Select:

A three-conductor phone plug inserted into the rear panel REMOTE RANGE SEL input disables the MANUAL RANGE switch on the front panel, and permits remote range selection with a contact closure to ground. For 0.1 to 2 GHz operation, the plug tip is grounded; for 2 to 4 GHz operation, the tip is open.

Phase Locking:

An error signal proportional to the phase difference between the 8699B output and a stable reference can be applied directly to the PHASE-LOCK INPUT on the 8699B rear panel. Modulation sensitivity is approximately -1 MHz/V.

External FM Capability:

In addition to the FM capability through the PHASE-LOCK INPUT, the 8699B can be frequency modulated through the EXT FM input on the front panel of the 8690B mainframe. This alternative FM input should be reserved for remote frequency control and for FM requiring wide deviations at low rates. With the SWEEP SELECTOR in MANUAL rather than CW position, the full band can be deviated at rates up to 150 Hz. Maximum deviation decreases to about 20% of the band for modulation at 600 Hz.

Sweep Reference Output:

Approximately 1.4 to 41.4 volts on 2—4 GHz range, no output on low band.

Output Impedance:

Nominally 50 ohms. When externally leveled, the source match depends on coupler used. Unleveled, output VSWR is typically less than 4:1.

1-14. Install the 8699B frequency scale in the 8690B Sweep Oscillator as follows:

a. Push up on the aluminum trim strip at the top of the scale. Push with both thumbs, near ends of the trim strip.

b. Lift out the scale and replace it with the 8699B scale.

c. Ensure that the key on the bottom strip fits in the notch in the bottom of the scale.

d. When the scale is properly positioned, push down on the top trim strip. The trim strip should snap into place and hold the scale securely.

1-15. OPERATION

1-16. Operating procedures of the Sweep Oscillator-RF Unit combinations are given in the 8690B Sweep Oscillator Manual. Figure 1-2 describes the front and rear panel features of an 8699B RF Unit.

1-17. OPERATOR'S CHECK

1-18. Check the 8699B operation using the procedures given in Figure 1-3. These tests are quick checks to verify instrument operation. For more detailed performance testing, refer to paragraph 3-15.