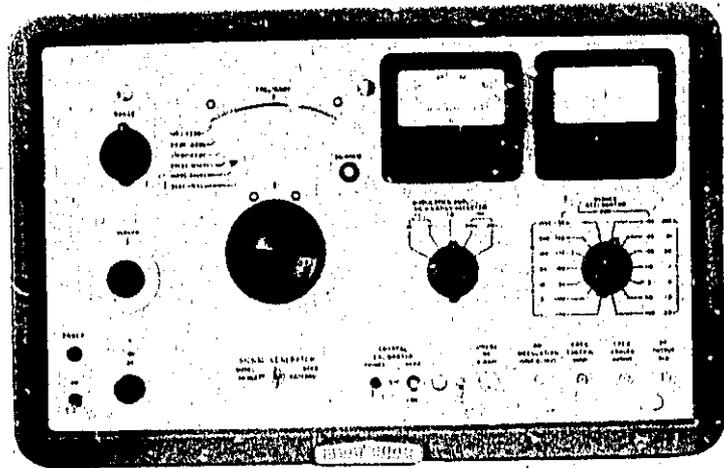


HP 606B

# OPERATING AND SERVICE MANUAL

## HF SIGNAL GENERATOR 606B



HEWLETT **hp** PACKARD

HP 606B

## **CERTIFICATION**

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# OPERATING AND SERVICE MANUAL

## HIGH FREQUENCY SIGNAL GENERATOR

**606B**

### SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1152A.

With changes described in Appendix I, MANUAL CHANGES, this manual also applies to instruments with serial numbers prefixed 608, 724, 811, 959 and 0959A.

For instruments with serial number prefixes greater than 1152A, a Manual Changes supplement which keeps the manual up-to-date, may be obtained, on request, from your nearest HP office.

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HEWLETT  PACKARD

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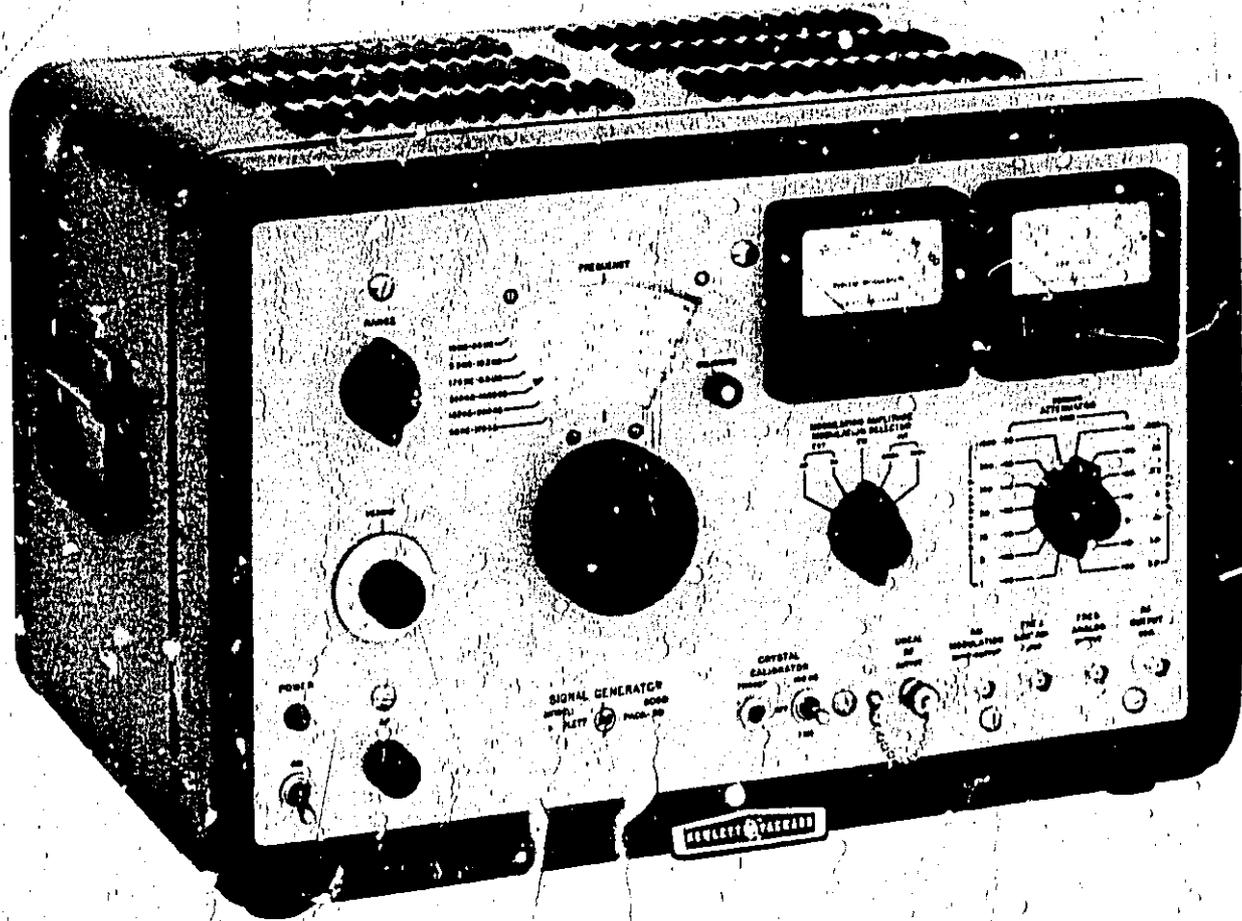


Figure 1-1. Model 606B Signal Generator

## SECTION I

### GENERAL INFORMATION

#### 1-1. DESCRIPTION.

1-2. The Hewlett-Packard Model 606B (Figure 1-1) is a general purpose, high-frequency signal generator. The instrument is a self-contained unit with all operating controls on the front panel. The direct reading frequency dial is calibrated to an accuracy of 1 percent. An RF output meter indicates RF output voltage level and a percent modulation meter indicates the percent of amplitude modulation for frequencies within the modulation bandwidth.

1-3. The amplitude-modulation system provides modulation up to 90% with low distortion and incidental FM. This feature provides a precision distortion check capability for receivers from antenna to output. Modulation capabilities include internal modulation at 400 or 1000 Hz and external modulation from dc to 20 kHz or more, depending on the RF frequency in use. In addition, complex waveforms, square waves, and dc voltages may be used to modulate the signal generator for testing and evaluating filters, networks, amplifiers, and receivers. Detailed specifications are contained in Table 1-1.

Table 1-1. Specifications

FREQUENCY CHARACTERISTICS	OUTPUT CHARACTERISTICS
<p>Range: 50 kHz to 65 MHz in 6 bands (50 to 170 kHz, 165 to 560 kHz, 530 to 1800 kHz, 1.76 to 6 MHz, 5.8 to 19.2 MHz, 19 to 65 MHz). Total scale length approximately 95 in.</p> <p>Accuracy: <math>\pm 1\%</math></p> <p>Drift: (Attenuator on 1 volt range and below). Less than 50 parts in <math>10^6</math> (or 5 hertz, whichever is greater) per 10 minute period after 2 hour warm-up. Less than 10 minutes to restabilize after changing frequency.</p> <p>Stability when used with 8708A Synchronizer: <math>5 \times 10^{-8}</math>/minute, <math>2 \times 10^{-7}</math>/10 minutes, <math>2 \times 10^{-6}</math>/day; <math>2 \times 10^{-1}/^{\circ}\text{C}</math>, <math>0^{\circ}</math> to <math>55^{\circ}\text{C}</math>; <math>2 \times 10^{-7}</math>/10% line voltage change.</p> <p>Resettability: VERNIER control resettability better than 0.15% after initial warmup.</p> <p><math>\Delta F</math> Control: Ultra-fine frequency vernier provides better than 10 parts in <math>10^6</math> resettability; total range of <math>\Delta F</math> control approximately 0.1%.</p> <p>Crystal Calibrator: Provides frequency checkpoints every 100 kHz and 1 MHz. Headphone jack provided for audio frequency output (headphone not included). Crystal frequency accuracy better than 0.01% from <math>0^{\circ}</math> to <math>50^{\circ}\text{C}</math>. Cursor on frequency dial adjustable over small range to aid in interpolation adjustment. Calibrator may be turned off when not in use.</p> <p>Residual FM: Less than 1 part in <math>10^6</math> or 20 hertz peak, whichever is greater.</p> <p>Frequency Control Input: BNC female connector for "Frequency Control Output" from 8708A Synchronizer. Can also be used for external frequency control: Voltage change from -2 to -32 volts changes frequency approximately 0.2% at low end of each band and approximately 0.1% at high end. Nominally 4K ohm input impedance, direct-coupled. Voltage limits: 0 volts applied &gt; applied voltage &gt; -50 volts.</p>	<p>Output Level: Continuously adjustable from 0.1 microvolt to 3 volts into 50 ohm resistive load. Output ATTENUATOR calibrated in 10 dB steps from 3 volts full scale to 1.0 microvolt full scale (into 50 ohms), also calibrated in dBm (0 dBm = 1 milliwatt in 50 ohms). VERNIER control provides continuous adjustment of voltage between full scale ranges. Output level indicated on RF Output Meter calibrated in volts (0 to 1 and 0 to 3 volts) and dBm (-10 to +3 dBm).</p> <p>Frequency Response and Output Accuracy (Attenuator range 1 volt and below; 50 ohm resistive load): At any output voltage setting, output level variation with frequency change is less than 2 dB, total, across entire frequency range. Output accuracy better than <math>\pm 1</math> dB at any frequency.</p> <p>Impedance: 50 ohms, SWR less than 1.2 on 0.3 volt attenuator range, and below.</p> <p>RFI: Meets all conditions specified in MIL-I-6181D; permits receiver sensitivity measurements down to at least 0.1 microvolt.</p> <p>Harmonic Output: At least 30 dB below the carrier.</p> <p>Spurious AM: Hum and noise sidebands are 70 dB below carrier down to thermal level of 50 ohm output system.</p> <p>Auxiliary RF Output: Fixed level CW signal from RF oscillator (minimum amplitude 100 mV into 50<math>\Omega</math> on Bands 1-5; 200 mV into 50<math>\Omega</math> on Band 6) provided at front panel BNC female connector for use with HP 8708A Synchronizer or other external equipment (e.g., frequency counter).</p>

Table 1-1. Specifications (cont'd)

**MODULATION CHARACTERISTICS****Internal AM:**

Frequency: 400 and 1000 Hz,  $\pm 5\%$ . Modulation signal available at front panel BNC female connector for synchronization of external equipment.

Modulation Level: 0 to 95% on 1 volt range and below; 0 to at least 30% on 3 volt range.

Carrier Envelope Distortion: Less than 1% at 30% AM; less than 3% at 70% AM (Attenuator on 1 volt range and below).

**External AM:**

Frequency: dc to 20 kHz maximum, dependent on carrier frequency ( $f_c$ ) and percent modulation as tabulated:

**Maximum Modulation Frequency**

30% Mod	70% Mod	Squarewave Mod
$0.06 f_c$	$0.02 f_c$	$0.003 f_c$ (3 kHz max)

Modulation Level: 0 to 95% on 1 volt attenuator range and below, 0 to at least 30% on 3 volt range.

Input required: 4.5 volts peak produces 95% modulation (maximum input 50 volts peak); input impedance 1000 ohms.

Carrier Envelope Distortion: Less than 3% at 70% AM (Attenuator, on 1 volt range and below).

**Modulation Meter:**

Accuracy:  $\pm 5\%$  of full scale, 0 to 90%, for modulation frequencies to 10 kHz,  $\pm 10\%$  of full scale for frequencies from 10 kHz to 20 kHz.

Modulation Level Constancy (internal or external AM; Attenuator on 1 volt range and below): Modulation level stays constant within  $\pm 1/2$  dB regardless of carrier frequency and output level changes.

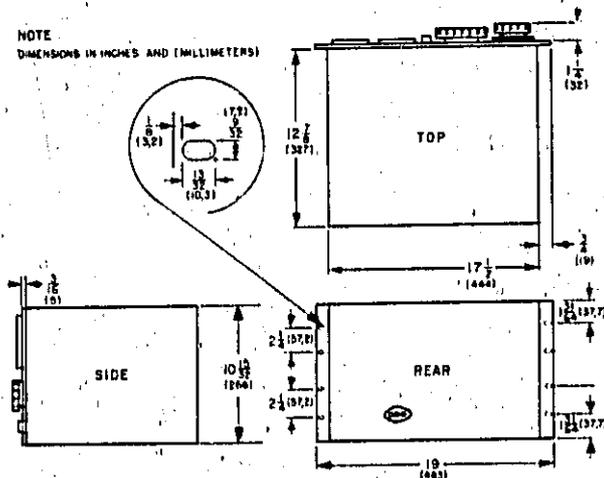
Incidental Frequency Modulation (attenuator on 1 volt range and below, 30% modulation): Less than  $5 \times 10^{-6} \pm 100$  hertz peak.

**GENERAL**

Power: 115 or 230 volts  $\pm 10\%$ , 50 to 400 Hz, 135 watts.

**Dimensions:**

Cabinet Mount: 20-3/4 in. wide, 12-1/2 in. high 14-3/4 in. deep (527 x 318 x 370 mm).

**Rack Mount:****Net Weight:**

Cabinet Mount: 53 lbs (23,9 kg); Rack Mount, 48 lb (21,6 kg).

**Accessories Available:**

11507A Output Termination, provides 3 positions: 50 ohms (for use into high impedance); 5 ohms (10:1 voltage division); IEEE Standard Dummy Antenna (driven from 10:1 divider);

11509A Fuse Holder, provides protection for output attenuator when 606B is used for transceiver tests;

10514A Mixer, for use as nanosecond pulse modulator;

8708A Synchronizer

1-4. Accessories available for use with the Model 606B include the 8708A Synchronizer, the 11507A Output Termination and the 11509A Fuseholder. The Output Termination has three capabilities. It can be used as a 50-ohm termination which reduces the source impedance to 25 ohms, as a 20-dB attenuator (10:1 voltage divider) which reduces the source impedance to 5 ohms, or it can be used to simulate an IEEE standard dummy antenna (10:1 voltage division) for precision measurements on receivers. The Fuseholder protects the signal generator output attenuator from damage when transceiver type equipment is being tested. If the transmitter is accidentally keyed, the fuse prevents power from being applied to the signal generator RF OUTPUT connector. The Fuseholder requires two type BNC-to-N adapters, UG-201A/U and

UG-349A/U (not furnished), unless equipment cables are used. The Model 8708A Synchronizer is a frequency stabilizer by means of which the 606B can be phase-locked on any carrier frequency with  $2 \times 10^{-7}$  settability.

**1-5. INSTRUMENT IDENTIFICATION.**

1-6. Hewlett-Packard instruments have a two-part serial number. The first three digits are the serial prefix. If the prefix on your instrument is not listed on the title page of this manual, in the appendix, or on a Manual Change sheet enclosed with the manual, the correct information may be obtained from any Sales and Service Office listed at the rear of this manual.

## SECTION II INSTALLATION

### 2-1. INCOMING INSPECTION.

2-2. This instrument was inspected mechanically and electrically prior to shipment. Inspect for damage in transit, and test electrical performance using the procedure given in paragraph 5-3. If there is damage or deficiency, or if electrical performance is not within specifications, contact the carrier and your nearest Hewlett-Packard Sales Office immediately. (See list at rear of this manual.)

### 2-3. PREPARATION FOR USE.

#### 2-4. POWER REQUIREMENTS.

2-5. The Model 606B requires a power source of 115 or 230 volts  $\pm 10\%$ , single phase, 50 to 400 Hz, which can deliver approximately 135 watts. To prepare the Model 606B for operation, remove the rear cover, position the 115-230 volt switch to correspond with line voltage, and install line fuse of correct rating (slow blow, 2.5 ampere for 115 volts, 1.25 ampere for 230 volts).

### CAUTION

To avoid damage to the instrument, set the 115-230 volt switch for the line voltage to be used before connecting the power cable.

#### 2-6. POWER CABLE.

2-7. To protect operating personnel, the National Electrical Manufacturers' Association (NEMA) recommends that instrument panel and cabinet be grounded. This instrument is equipped with a three-connector power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset round pin on the power cable connector is the ground pin.

2-8. To preserve the protection feature when operating the instrument from a two-contact outlet, use a three-prong to two-prong adapter (HP Part No. 1251-0048) and connect the green pigtail on the adapter to ground.

#### 2-9. COOLING.

2-10. No forced cooling is used in this instrument. Louvers in the chassis are used for heat dissipation. If the 606B is mounted in a rack cabinet, supply sufficient cooling to assure that the ambient air around the 606B does not exceed 50° C.

### 2-11. REPACKAGING FOR SHIPMENT.

2-12. If the Model 606B is to be packaged for shipment, use original shipping container and packing materials. If these have been discarded or are not in condition for reuse, obtain new materials from your local Hewlett-Packard sales and service office (see rear of this manual for locations), or follow these general instructions:

a. Wrap the instrument in heavy paper or plastic. (If the instrument is being shipped 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 500-600 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 firm cushion and prevent movement inside the container. Protect the front control panel with cardboard. With Hewlett-Packard "float pack" packaging, the foam blocks provide sufficient shock protection. Additional material is unnecessary.

d. Seal the shipping container securely.

e. Mark the shipping container "FRAGILE".

2-13. In any correspondence, refer to the instrument by model number and full serial number.

# OPERATION

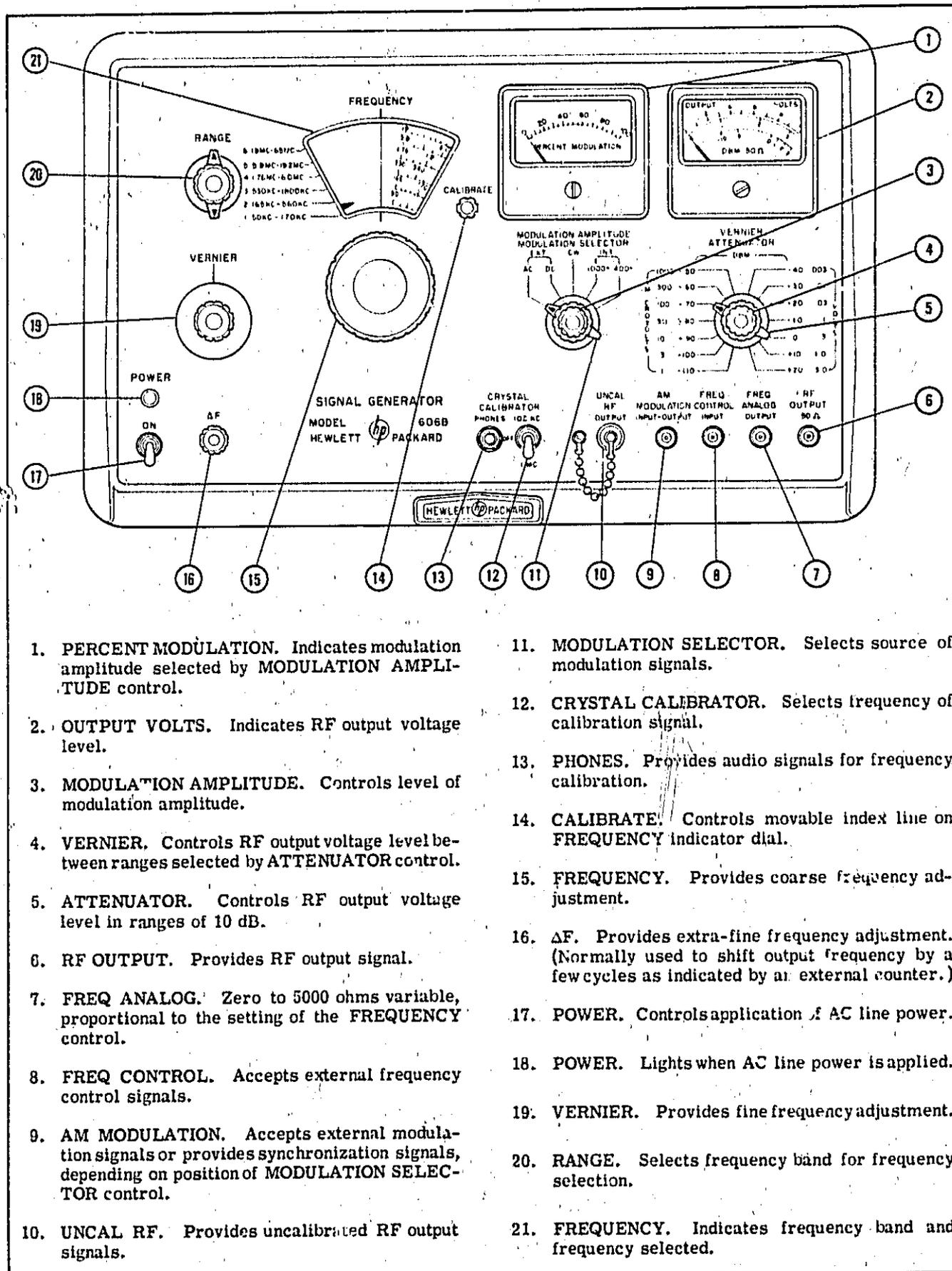


Figure 3-1. Front Panel Controls, Connectors, and Indicators

## SECTION III OPERATION

### 3-1. INTRODUCTION.

3-2. This section provides instructions for operating the Model 606B Signal Generator and identifies operating controls and indicators. Front panel controls, connectors, and indicators are shown and described in Figure 3-1. Three fuses and an ac line power connector are located on the rear panel. The power connector accepts either 115- or 230-volt power. The upper fuse on the rear panel protects the overall unit from circuit overloads. The center fuse protects the +300-volt power supply, and the lower fuse protects the -200-volt power supply.

### 3-3. BASIC OPERATING PROCEDURES.

3-4. Prepare the instrument for operation by performing the following basic operating procedures:

- a. Set 115-230 line power switch to match line voltage and check that line fuse has correct rating. (Refer to paragraph 2-5.)
- b. Connect instrument to power source.
- c. Set front panel power switch to ON and ensure that POWER indicator lights.

### 3-5. OPERATING MODES.

#### 3-6. GENERAL OPERATION.

3-7. USE OF OUTPUT ATTENUATOR. The output attenuator contains resistors that can be burned out by careless usage.

### CAUTION

Damage to output attenuator may be incurred if: (1) output is shorted in the 3-volt range, (2) external voltage is applied to the attenuator output.

If the output is shorted out in the 3-volt range, or if voltage is applied into the attenuator accidentally, the resistors may be burned out or heated up so that the resistance is no longer calibrated. This may occur while measuring the sensitivity of a receiver in a mobile transmitter-receiver installation if the transmit button is activated. An attenuator fuse, HP Model 11509A, is available as an accessory when it is desired to use the Signal Generator under conditions where the attenuator may be damaged. The resistors in the attenuator are NOT field replaceable. Do not open the attenuator to check the resistors as placement of resistors is critical. The attenuator may be removed from the instrument and returned to the factory for repair.

3-8. The unusually high output range of 3 volts is useful for driving RF bridges or other equipment requiring a calibrated high-level, high-frequency voltage. This useful range is obtained at the expense of operating the power amplifier stage near the overload point. You will obtain best life from these tubes by not leaving the generator on the 3 VOLT range any longer than necessary to make your measurement. Never leave it on this range while warming up or during standby operation.

3-9. FREQUENCY STABILIZATION. The frequency of the Model 606B may be stabilized by using the phase-lock capability of the Model 8708A Synchronizer. The procedure is described in the Operating and Service Manual for the Model 8708A.

3-10. USE OF SYNCHRONIZATION SIGNAL. When the Model 606B is modulated internally, a signal is available at the AM MODULATION jack for synchronization purposes. This signal is supplied from the same oscillator which modulates the carrier. It is of approximately 3-volts rms amplitude from a high-impedance source. Since the signal comes from a high-impedance source, use it only as a voltage source and do not attempt to draw current.

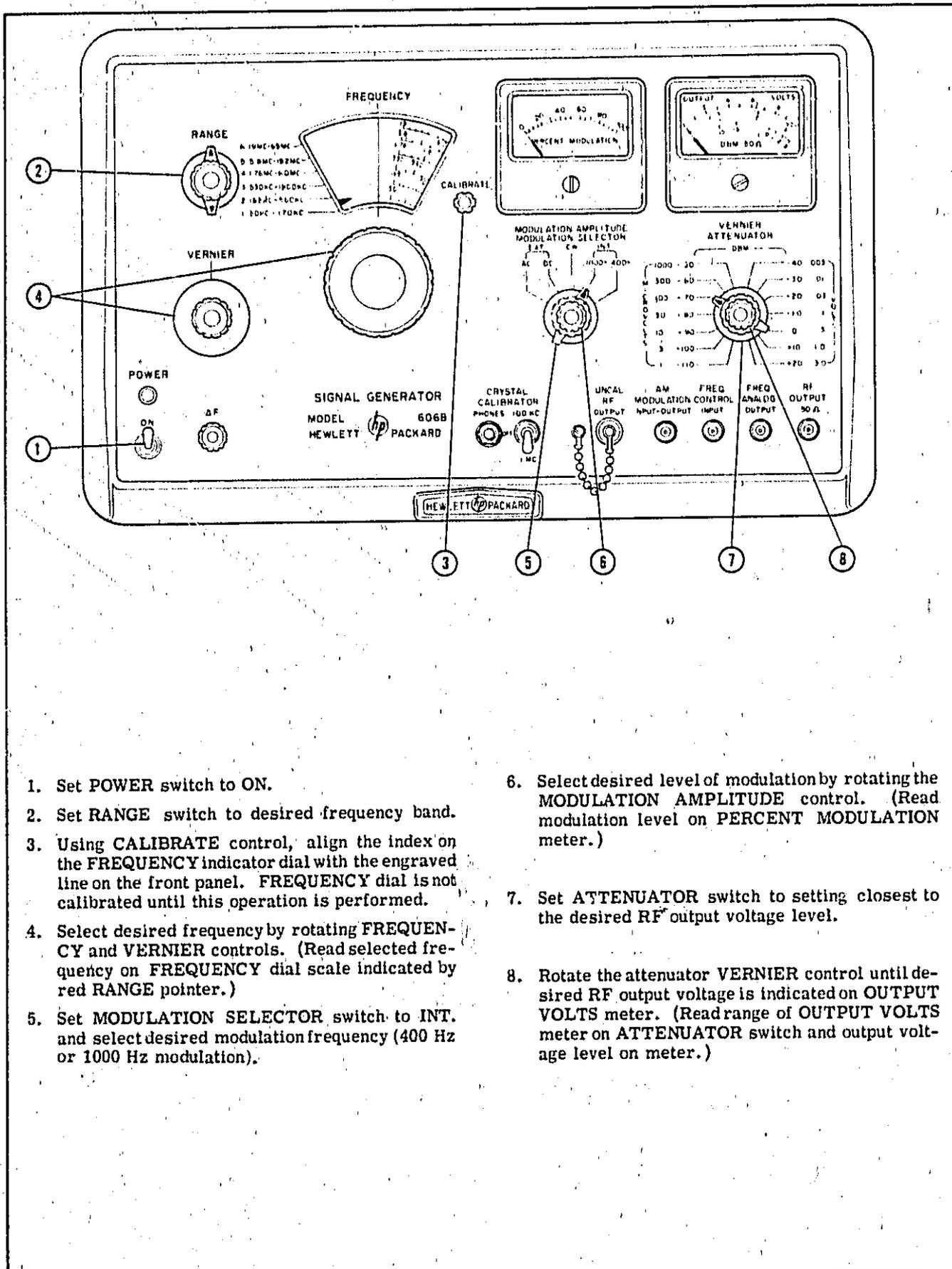
3-11. The use of all remaining controls for the Model 606B are of a general nature, and step-by-step instructions for operating the unit are given in Figure 3-2.

#### 3-12. EXTERNAL OUTPUT TERMINATION OPERATION.

3-13. The Model 606B output level is calibrated only when terminated with a 50-ohm resistive load. For use with any other load, the HP Model 11507A Output Termination is recommended (refer to Table 1-1).

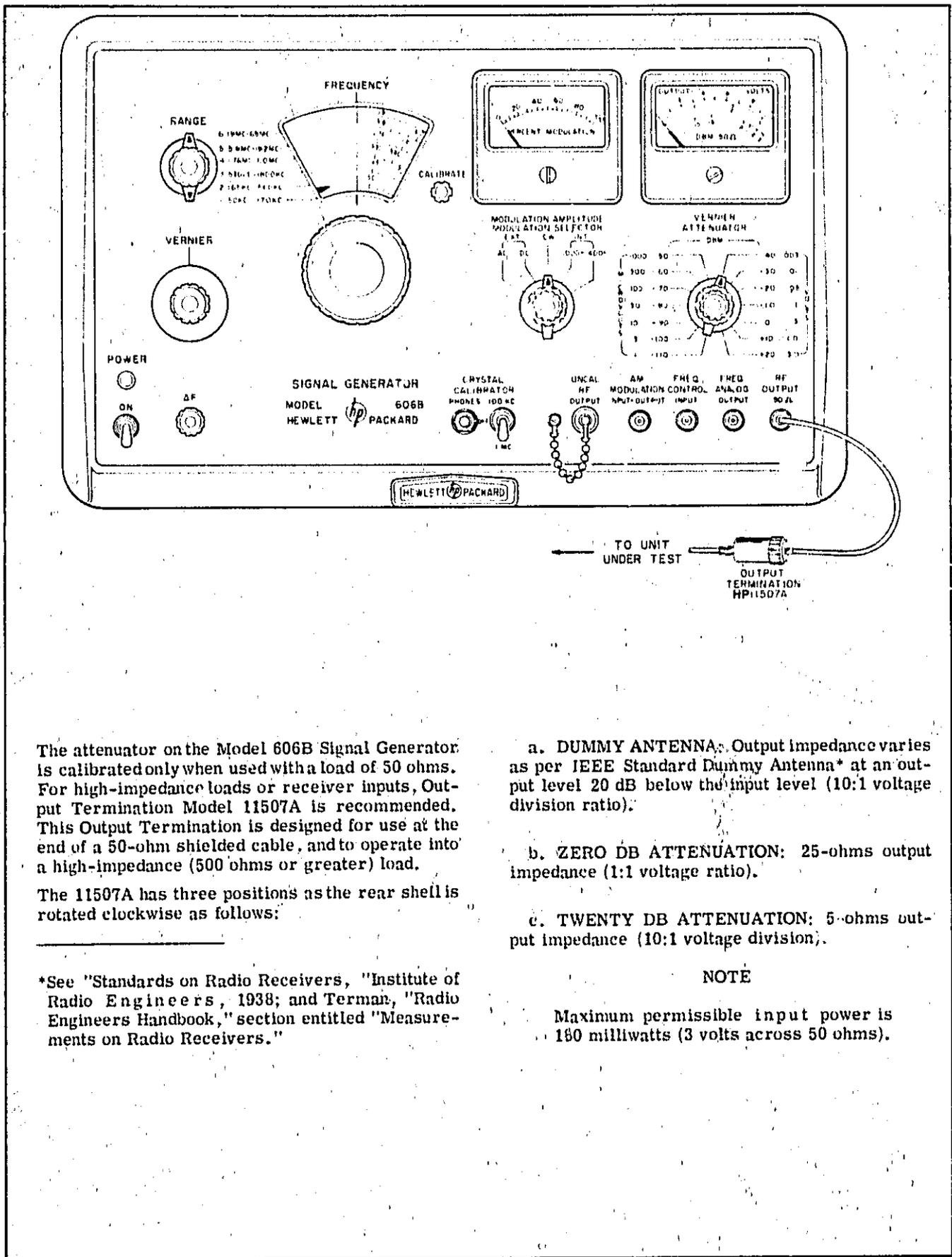
3-14. A coaxial cable of 50-ohms nominal impedance with BNC male connectors is suitable for use with the 606B. Single braid shield types are suitable for use from maximum output to approximately -80 dBm (30 microvolts). Double braid or solid types are recommended for use over the entire attenuation range. A good general-purpose cable is 3 feet of RG-55/U (double braid shield) with UG-88C/U BNC connectors on each end.

3-15. The output jack on the HP 11507A has been provided as a BNC connector for maximum shielding. Clip-lead connection may be provided easily by inserting a UG-290/U connector with soldered-on clip leads into the output jack of the Output Termination. Keep the length of the clip leads as short as possible. See Figure 3-3 for information concerning output cable termination.



1. Set POWER switch to ON.
2. Set RANGE switch to desired frequency band.
3. Using CALIBRATE control, align the index on the FREQUENCY indicator dial with the engraved line on the front panel. FREQUENCY dial is not calibrated until this operation is performed.
4. Select desired frequency by rotating FREQUENCY and VERNIER controls. (Read selected frequency on FREQUENCY dial scale indicated by red RANGE pointer.)
5. Set MODULATION SELECTOR switch to INT. and select desired modulation frequency (400 Hz or 1000 Hz modulation).
6. Select desired level of modulation by rotating the MODULATION AMPLITUDE control. (Read modulation level on PERCENT MODULATION meter.)
7. Set ATTENUATOR switch to setting closest to the desired RF output voltage level.
8. Rotate the attenuator VERNIER control until desired RF output voltage is indicated on OUTPUT VOLTS meter. (Read range of OUTPUT VOLTS meter on ATTENUATOR switch and output voltage level on meter.)

Figure 3-2. General Operation



The attenuator on the Model 606B Signal Generator is calibrated only when used with a load of 50 ohms. For high-impedance loads or receiver inputs, Output Termination Model 11507A is recommended. This Output Termination is designed for use at the end of a 50-ohm shielded cable, and to operate into a high-impedance (500 ohms or greater) load.

The 11507A has three positions as the rear shell is rotated clockwise as follows:

a. **DUMMY ANTENNA:** Output impedance varies as per IEEE Standard Dummy Antenna\* at an output level 20 dB below the input level (10:1 voltage division ratio).

b. **ZERO DB ATTENUATION:** 25-ohms output impedance (1:1 voltage ratio).

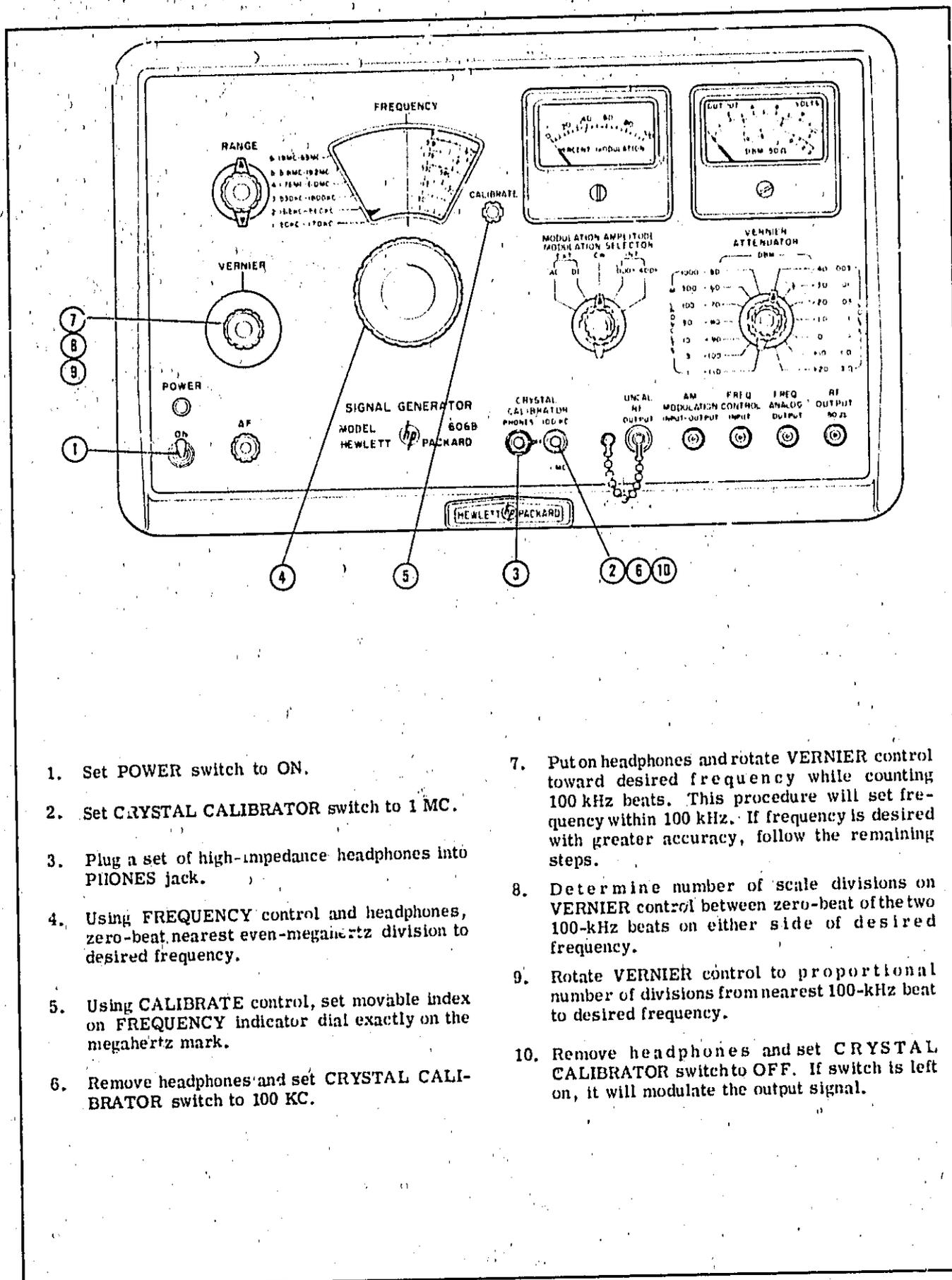
c. **TWENTY DB ATTENUATION:** 5-ohms output impedance (10:1 voltage division).

\*See "Standards on Radio Receivers," Institute of Radio Engineers, 1938; and Terman, "Radio Engineers Handbook," section entitled "Measurements on Radio Receivers."

**NOTE**

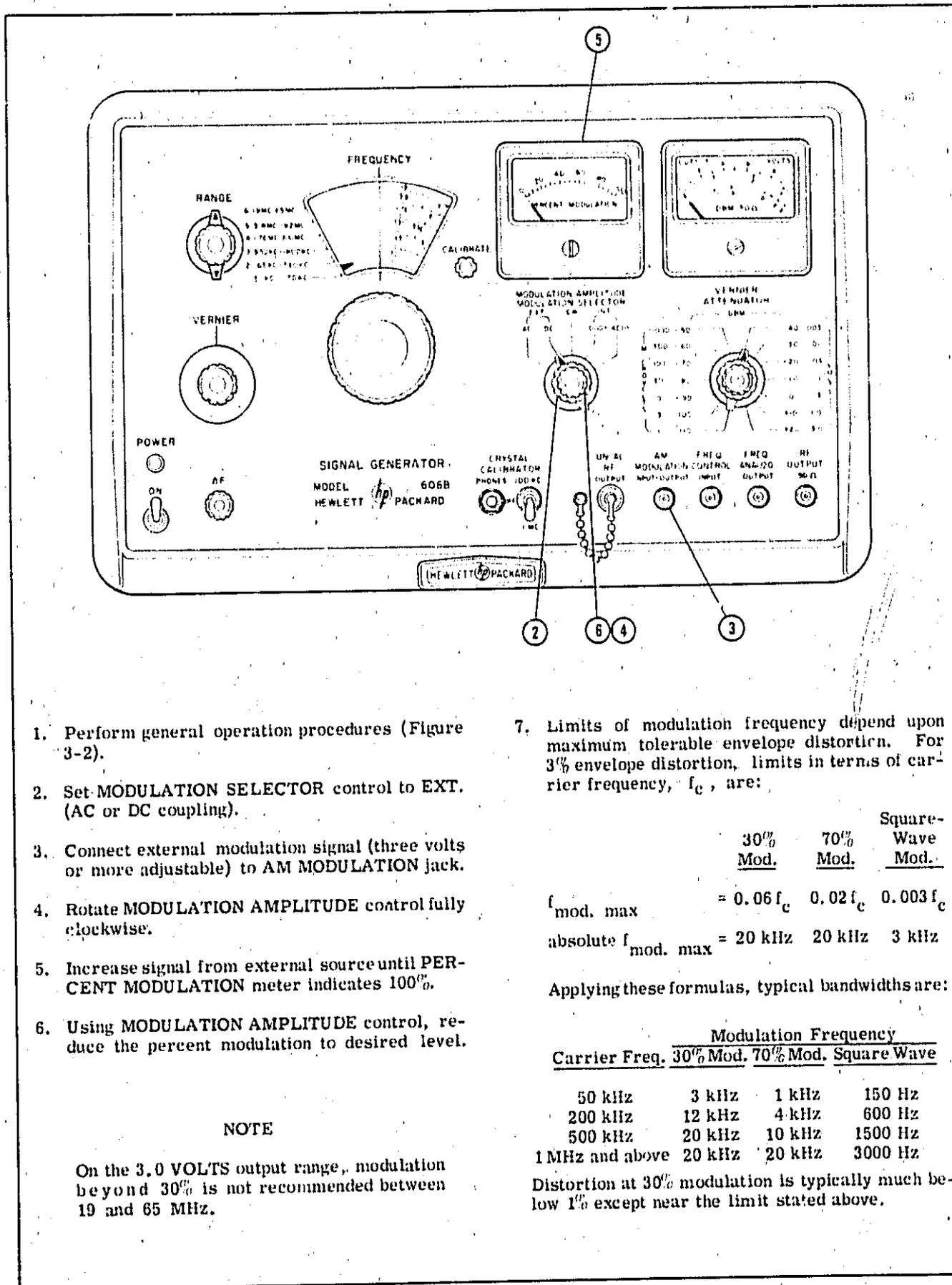
Maximum permissible input power is 180 milliwatts (3 volts across 50 ohms).

Figure 3-3. External Output Termination



1. Set POWER switch to ON.
2. Set CRYSTAL CALIBRATOR switch to 1 MC.
3. Plug a set of high-impedance headphones into PHONES jack.
4. Using FREQUENCY control and headphones, zero-beat nearest even-megahertz division to desired frequency.
5. Using CALIBRATE control, set movable index on FREQUENCY indicator dial exactly on the megahertz mark.
6. Remove headphones and set CRYSTAL CALIBRATOR switch to 100 KC.
7. Put on headphones and rotate VERNIER control toward desired frequency while counting 100 kHz beats. This procedure will set frequency within 100 kHz. If frequency is desired with greater accuracy, follow the remaining steps.
8. Determine number of scale divisions on VERNIER control between zero-beat of the two 100-kHz beats on either side of desired frequency.
9. Rotate VERNIER control to proportional number of divisions from nearest 100-kHz beat to desired frequency.
10. Remove headphones and set CRYSTAL CALIBRATOR switch to OFF. If switch is left on, it will modulate the output signal.

Figure 3-4. Calibration



1. Perform general operation procedures (Figure 3-2).
2. Set MODULATION SELECTOR control to EXT. (AC or DC coupling).
3. Connect external modulation signal (three volts or more adjustable) to AM MODULATION jack.
4. Rotate MODULATION AMPLITUDE control fully clockwise.
5. Increase signal from external source until PERCENT MODULATION meter indicates 100%.
6. Using MODULATION AMPLITUDE control, reduce the percent modulation to desired level.

**NOTE**

On the 3.0 VOLTS output range, modulation beyond 30% is not recommended between 19 and 65 MHz.

7. Limits of modulation frequency depend upon maximum tolerable envelope distortion. For 3% envelope distortion, limits in terms of carrier frequency,  $f_c$ , are:

	30% Mod.	70% Mod.	Square-Wave Mod.
$f_{mod. max}$	$= 0.06 f_c$	$0.02 f_c$	$0.003 f_c$
absolute $f_{mod. max}$	$= 20 kHz$	$20 kHz$	$3 kHz$

Applying these formulas, typical bandwidths are:

Carrier Freq.	Modulation Frequency		
	30% Mod.	70% Mod.	Square Wave
50 kHz	3 kHz	1 kHz	150 Hz
200 kHz	12 kHz	4 kHz	600 Hz
500 kHz	20 kHz	10 kHz	1500 Hz
1 MHz and above	20 kHz	20 kHz	3000 Hz

Distortion at 30% modulation is typically much below 1% except near the limit stated above.

Figure 3-5. External Modulation Operation

## Section III

## 3-16. CALIBRATION.

3-17. Step-by-step instructions for calibrating the Model 606B are given in Figure 3-4.

3-18. EXTERNAL MODULATION OPERATION.

3-19. Take care when using external modulation with direct coupling. The dc level of the signal will affect the average RF level. If only the ac component of the modulating signal is desired, switch the MODULATION SELECTOR to EXT. AC. Do not apply more than 10 volts dc or ac to the AM MODULATION jack. Overloading will shorten the life of the MODULATION AMPLITUDE control. Step-by-step instructions for externally modulating the Model 606B are given in Figure 3-5. Figure 3-6 shows the modulation limits

for various types of modulation over the operating frequency range.

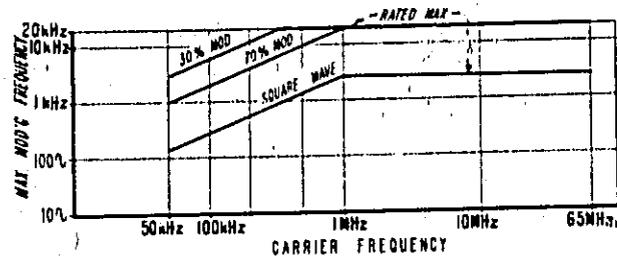


Figure 3-6. Modulation Frequency vs. Carrier Frequency

# THEORY

## SECTION IV PRINCIPLES OF OPERATION

### 4-1. INTRODUCTION.

4-2. This section contains explanations of the operation of the Model 606B circuits. Figure 4-1 is a simplified block diagram showing principal circuit sections and major operating controls. Each circuit section and important individual circuits are explained in succeeding paragraphs.

4-3. As illustrated in Figure 4-1, the Model 606B consists of an RF Oscillator and Level Control Circuit, a  $\Delta F$  Assembly, a Buffer Amplifier, an Amplifier Circuit, an RF Feedback and Level Control Circuit, an RF Attenuator, a Crystal Calibrator Circuit, and a Modulation Circuit. Signal outputs are generated in the RF Oscillator and Level Control Circuit. These signals are amplified and applied to the RF Attenuator by the RF Amplifier Circuit. External or internal modulation is provided by the Modulation Circuit, and overall stabilization is provided by the RF Feedback

and Level Control Circuit. Two calibration frequencies are generated by the Crystal Calibrator Circuit. Generally, the block diagram represents the standard for signal generators.

### 4-4. THE RF OSCILLATOR AND LEVEL CONTROL CIRCUIT.

4-5. The RF oscillator and Level Control Circuit (Figure 4-2) consists of tuned-plate, push-pull RF Oscillator A4V2, Detector A4CR1, dual-purpose Oscillator Level Control A4V1, and associated circuits. The frequency of oscillation is controlled by either the FREQUENCY and frequency VERNIER controls or an external signal through the FREQ CONTROL jack and the  $\Delta F$  Assembly. The level of the RF oscillator is stabilized by a feedback circuit from A4V2 to A4V1 across detector A4CR1. The pentode section of A4V1 acts a variable cathode resistor for A4V2 to control the oscillator level. The control grid of this pentode

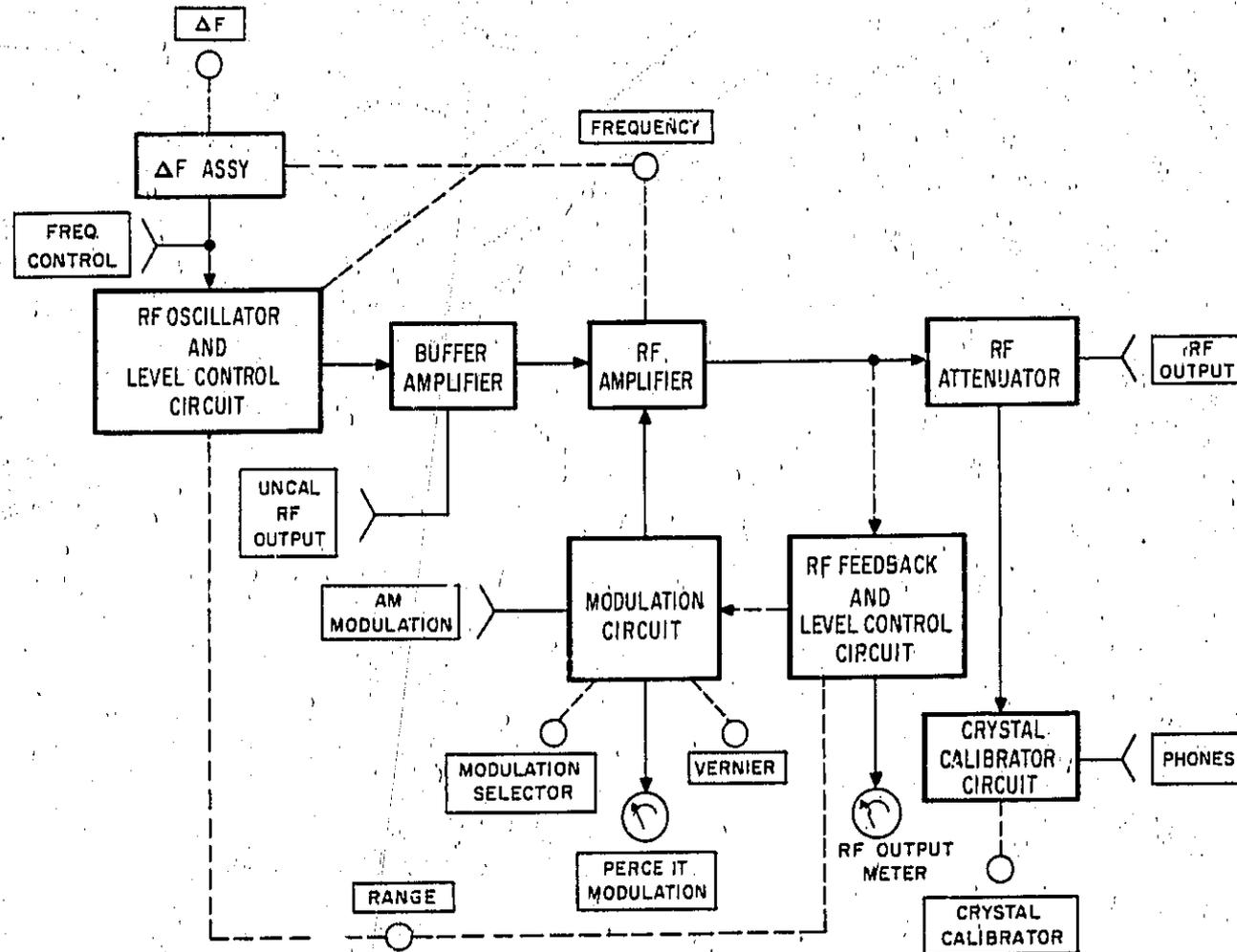


Figure 4-1. Simplified Block Diagram

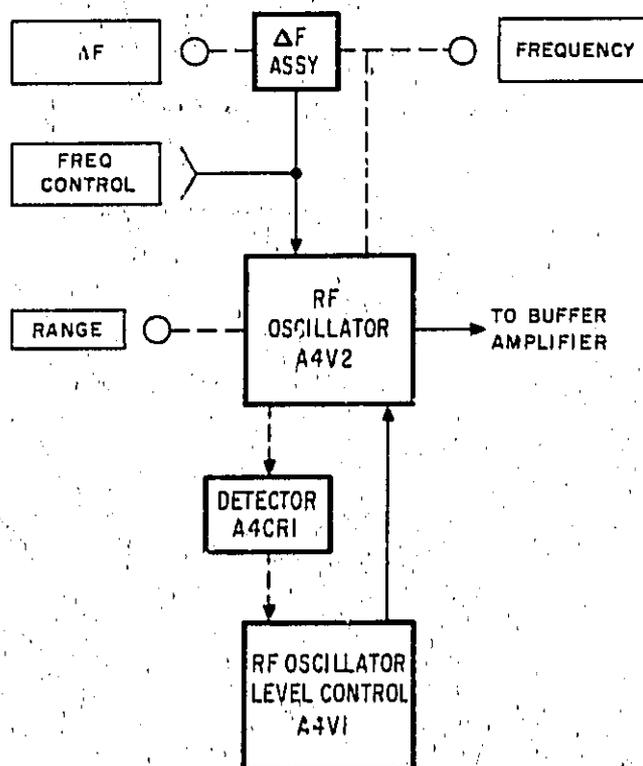


Figure 4-2. RF Oscillator and Level Control Circuit Block Diagram

receives a rectified portion of the oscillator signal. This voltage decreases the current through A4V1 when the oscillator level rises and increases the current when the oscillator level drops. Since this current is also the cathode current of RF oscillator A4V2, the level of oscillation is held constant. The triode section of A4V1 is a cathode follower which provides a bias voltage for the oscillator.

#### 4-6. THE $\Delta F$ ASSEMBLY.

4-7. The  $\Delta F$  Assembly (Figure 4-2) provides a means of shifting the output frequency of the RF Oscillator by a very few hertz. Breakdown diode VR1 provides a stable -23.7 volts across a voltage divider network consisting of potentiometers R6 and R7. The resistance of R6 is controlled by the FREQUENCY dial. Rotating the  $\Delta F$  control changes the bias on A5CR3 and A5CR4. As the voltage drop is increased or decreased across the voltage divider network (R6 and R7), the capacitive reactance of A5CR3 and A5CR4 changes proportionally, which minutely varies the output frequency of the RF Oscillator.

#### 4-8. THE BUFFER AMPLIFIER AND THE RF AMPLIFIER CIRCUIT.

4-9. The output of the oscillator is fed to the control grids of the push-pull Buffer Amplifier stage, A4V3 and A4V4 (Figure 4-3). An uncalibrated RF signal is transformer-coupled from the cathode circuit of the Buffer Amplifier and applied to the UNCAL RF OUTPUT jack. The Oscillator signal is amplified and applied to the control grids of the push-pull Amplifier stage, A4V5 and A4V6, through the plate circuits of

A4V3 and A4V4 respectively. The cathode current for the Amplifier stage is varied by Modulator A4V9 which, in turn, amplitude-modulates the RF signal level. This modulated and amplified RF signal is transformer-coupled to the RF Attenuator.

#### 4-10. THE RF ATTENUATOR.

4-11. The RF output signal is center-tapped from the secondary winding of the RF output transformer in use in Amplifier Turret Assembly A8 and applied to the input of the RF Attenuator. The RF Attenuator provides a maximum attenuation of 120 dB in 10-dB ranges. The output level may be varied between steps by changing the input voltage to the Attenuator with the attenuator VERNIER control (refer to paragraph 4-22).

#### 4-12. THE RF FEEDBACK AND LEVEL CONTROL CIRCUIT.

4-13. The RF Feedback and Level Control Circuit (Figure 4-4) consists of Detector diodes CR1 and CR2, an RC filter, a two-position attenuator circuit, an RF output meter, and associated circuitry. The modulated RF output signal from the RF Amplifier Circuit is sampled at the secondary winding of the RF output transformer in use in Amplifier Turret Assembly A8 and rectified by Detector diodes CR1 and CR2. This detected signal is applied across an RC filter and a two-position attenuator. The time constant of the RC filter is determined by the position of frequency RANGE switch S4. The time constant is selected to bypass the RF component but not the modulation or dc level. The demodulated RF signal is then applied to one control

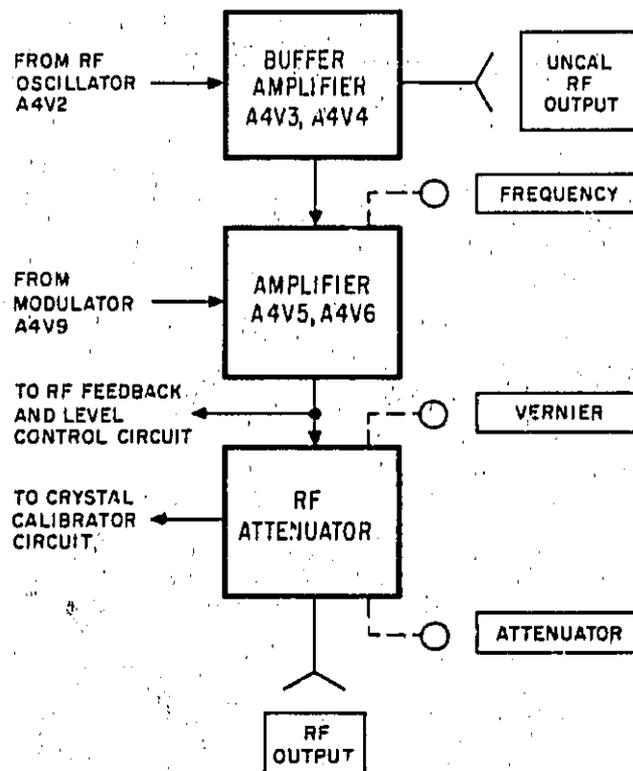


Figure 4-3. Buffer Amplifier, RF Amplifier, and Attenuator Block Diagram

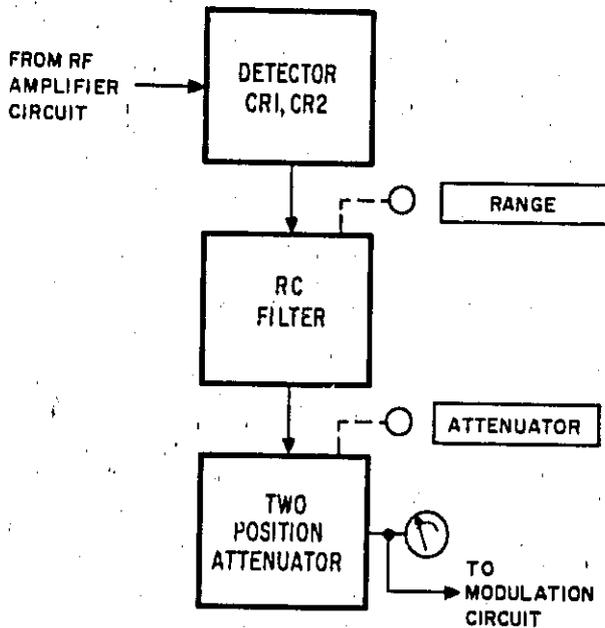


Figure 4-4. RF Feedback and Level Control Circuit Block Diagram

grid of Differential Amplifier A4V8 (refer to paragraph 4-23). The signal is dc-coupled and therefore has a dc component corresponding to the RF voltage level. The demodulated RF signal also passes through an RF filter (A4R52, A4C27, A9C4, and A9L1) which produces a dc-current proportional to the CW RF level. This current is applied to, and monitored by, RF output meter M2, which indicates the RF level input to the RF Attenuator.

4-14. The amount of RF feedback is controlled by a two-position attenuator between the Detector diodes and Differential Amplifier A4V8. When the ATTENUATOR control is set to +10 DBM or lower, relay A4K1 is not energized, and the RF feedback is obtained through divider resistors A4R49 and A4R52. Only when the ATTENUATOR control is set to +20 DBM is relay A4K1 energized. With A4K1 energized, resistor A4R52 is shunted by resistor A4R51 which raises the current through the RF Amplifier Circuit by 10-dB.

**4-15. THE MODULATION CIRCUIT.**

4-16. The Modulation Circuit (Figure 4-5) consists of Audio Oscillator A1V5, a Percent Modulation Meter Circuit (Modulation Monitor A1V9A and meter M1), Differential Amplifier and Bias Supply Circuit (A4V8 and A4V7), Modulator A4V9, and associated circuitry.

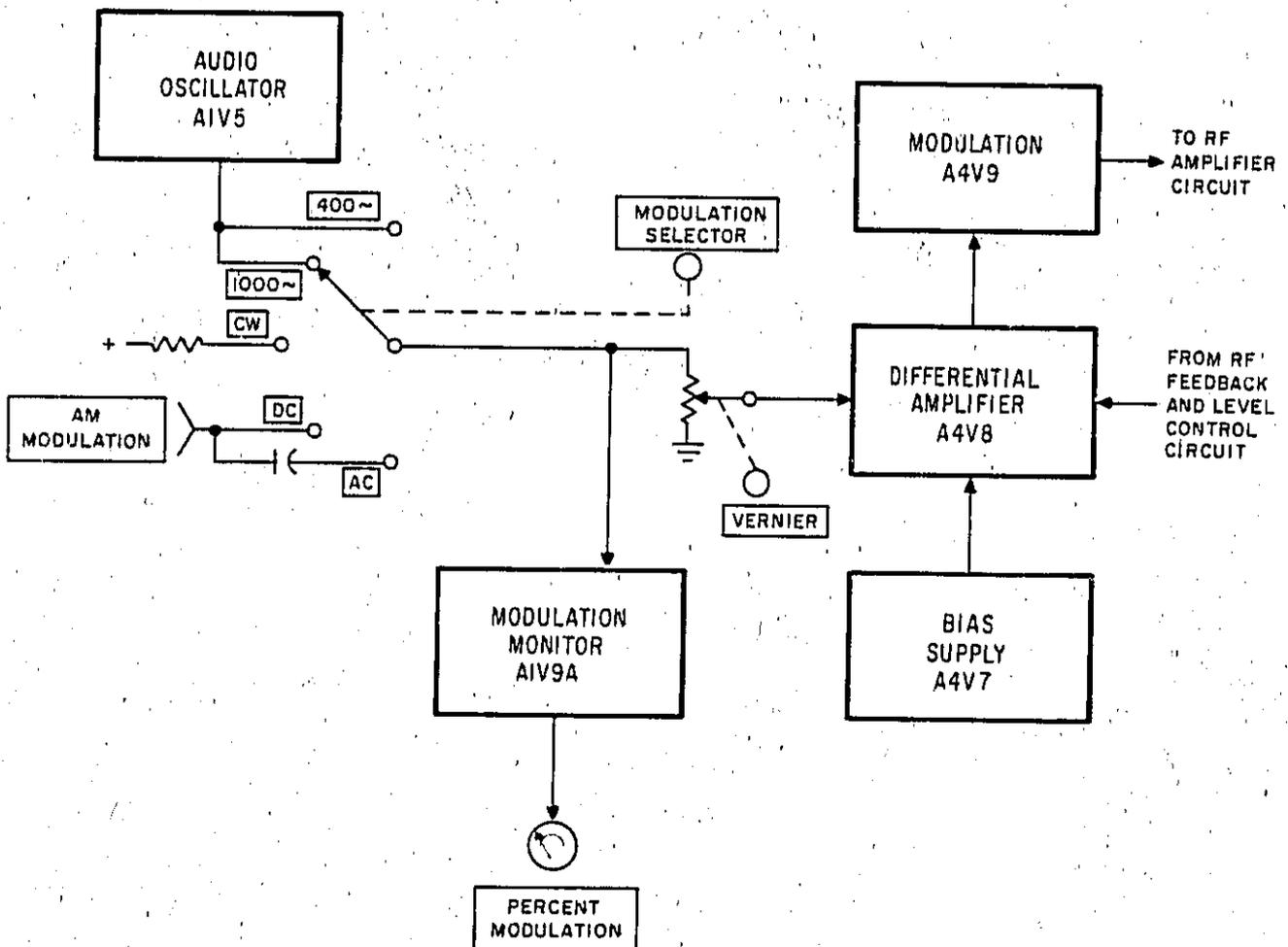


Figure 4-5. Modulation Circuit Block Diagram

**4-17. THE AUDIO OSCILLATOR.**

4.18. Audio Oscillator A1V5 is a modified Wien-bridge oscillator with amplitude stabilization. The feedback signal is taken from the secondary winding of the output transformer. Two oscillation frequencies (400 and 1000 Hz) can be selected by switching resistors of different values into the Wien bridge with MODULATION SELECTOR switch S1. Modulation amplitude for internal or external modulation is controlled by MODULATION AMPLITUDE potentiometer R2. The level of oscillation is set by MOD OSC ADJ potentiometer R51 which controls the amount of feedback to lamp RT1. Increased feedback causes the temperature of RT1 to rise, which increases its resistance. The increased resistance causes more degeneration in the cathode of A1V5, thus limiting the gain. With MODULATION SELECTOR switch S1 set to INT., the modulating voltage is available at the front panel AM MODULATION jack. This voltage is supplied for synchronization purposes and has a source impedance of 82K ohms.

**4-19. THE PERCENT MODULATION METER CIRCUIT.**

4-20. The Percent Modulation Meter Circuit (Figure 4-5) consists of modulation monitor A1V9A, PERCENT MODULATION meter M1, and associated circuits. A portion of the modulation signal is applied to the control grid of A1V9A. The output of this cathode follower is rectified by diode CR5 and a dc voltage corresponding to the modulation signal is applied to PERCENT MODULATION meter M1. Clamping diode CR4 prevents the cathode of A1V9A from going negative, which protects capacitor C56 whose voltage rating is 25 volts. This point would otherwise go toward -200 volts should A1V9A be removed or have low emission.

**4-21. THE DIFFERENTIAL AMPLIFIER AND BIAS SUPPLY CIRCUIT.**

4-22. The Differential Amplifier and Bias Supply Circuit (Figure 4-5) consists of Differential Amplifier A4V8, Cathode Follower A4V7, and associated circuits. The external or internal modulation signal is combined with a dc reference level and applied to Differential Amplifier A4V8. The modulation signal is applied to a resistive network consisting of R57, R4, and R3 and added to the dc reference voltage. The combined voltages appear at VERNIER potentiometer R5. This control varies the dc, which controls the carrier and the modulation signal at the same rate. Therefore, the percentage of modulation remains constant regardless of carrier level. This circuit is also used to reduce the voltage on the RF amplifier during switching. When the RANGE switch is rotated out of its detent position, switch S3 disconnects the +300-volt power supply which causes the grid voltage of A4V8 to drop to ground potential. The +300 volts is not reconnected until after the turret has made contact in its new position. Therefore, switch S3 prevents the amplifier tubes from drawing excessive screen current when the turret is disengaged from the plate circuit.

4-23. The dc (carrier level) and ac (modulation) signals are applied through an RF filter to the control grid of A4V8A as a reference signal to be compared with a signal from the output which is applied to the control grid of A4V8B. The triode plus the pentode section of A4V8 form the Differential Amplifier. The ac level of both control grid signals is proportional to the modulation. The modulating signal is the reference signal and the actual modulation of the output is compared to this reference. The dc level of the output (proportional to the RF) is compared to a reference dc level that is proportional to the desired RF level controlled by VERNIER potentiometer R5.

4-24. Since the cathodes of A4V8 are connected, the reference signal applied to the triode section also appears on the cathode of the pentode section. This signal will be compared to the signal from the output which is applied to the grid. Any deviation from a fixed voltage between these two signals results in an output signal with a polarity to reduce the difference which, in turn, restores the original conditions. For example, if the RF level drops, the voltage on the control grid of A4V8B will become more negative. This reduces the amount of current flow through the tube, and the plate becomes more positive. The grid voltage of Modulator A4V9 is proportional to the plate voltage of A4V8. As this grid voltage becomes more positive, the current through A4V9 will increase. This current is also the cathode current for the RF Amplifier and, therefore, the output will continue to increase until the original conditions are restored. Therefore, the output is stabilized and is constant to better than  $\pm 1$  dB over the entire frequency range. The RF level can be changed by varying the VERNIER control which will change the reference bias. In a similar manner the modulation is held constant. Since the crystal detector circuit has a time constant fast enough to follow the modulation envelope, the output modulation is compared to the modulating frequency and distortion is minimized.

4-25. Bias voltages required by the Differential Amplifier are supplied by cathode follower A4V7. One half of A4V7 is used as a constant voltage source to furnish the plate potential for A4V8A. The other half of A4V7 supplies the screen grid potential for A4V8B. The screen grid potential is adjusted by CARRIER ZERO SET potentiometer R21 for RF Amplifier cutoff when both grids of the Differential Amplifier are at ground potential. This establishes the zero point for the VERNIER control.

**4-26. MODULATOR.**

4-27. The cathode current for the Amplifier stage is controlled by Modulator A4V9 which acts as a variable cathode resistor. Modulator A4V9 provides cathode modulation for the amplifier stage. The internal resistance of A4V9 varies according to the modulation signal applied to its control grid from the Differential Amplifier. (Refer to paragraph 4-24).

**4-28. THE CRYSTAL CALIBRATOR CIRCUIT.**

4-29. The Crystal Calibrator Circuit (Figure 4-6) consists of a Crystal Oscillator, a Frequency Divider

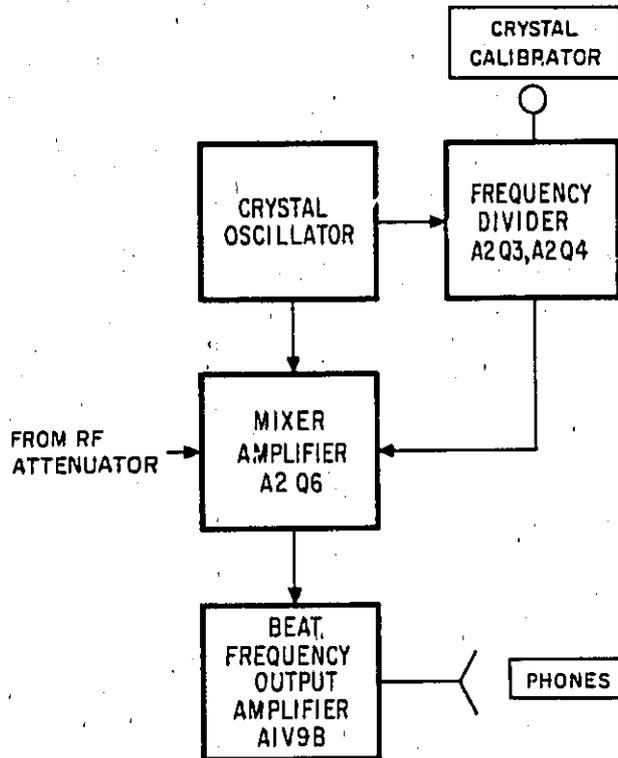


Figure 4-6. Crystal Calibrator Circuit Block Diagram

(A2Q3 and A2Q4), Mixer/Amplifier A2Q6, Beat-Frequency Amplifier A1V9B, and associated circuits. A small signal coupled from the RF Attenuator and the output signal of the Crystal Oscillator are mixed and applied to the base of Mixer/Amplifier transistor A2Q6. The output signal from A2Q6 is applied to the control grid of Beat-Frequency Amplifier A1V9B,

which amplifies and applies the signal to the PHONES output jack.

4-30. When CRYSTAL CALIBRATOR switch S2 is set to 100 KC or 1 MC, crystal A2Y1 provides 1-MHz oscillations for the calibration signal, which appears at the collector of transistor A2Q2. This signal is applied to the base of Driver Transistor A2Q5. Transistor A2Q5 amplifies and applies the signal to the mixer stage where it is mixed with the signal coupled from the RF attenuator. This combined signal is applied to the base of transistor A2Q6. The frequency of the signal applied to A2Q6 is controlled by Crystal Calibrator switch S2. With switch S2 set at 100 KC, Frequency Divider transistors A2Q3 and A2Q4 are biased into conduction, dividing the 1-MHz output frequency of the oscillator by ten, which provides a signal frequency of 100 kHz. With switch S2 set to 1 MC, transistors A2Q3 and A2Q4 are cut off, and the signal frequency is that of crystal A2Y1, 1 MHz.

**4-31. THE POWER SUPPLIES.**

**4-32. GENERAL OPERATING PRINCIPLES.**

4-33. All of the dc operating voltages are electronically regulated, and obtained directly from regulated supplies. There are three transistor type electronic regulators which supply +300, -200, and +25.6 volts.

4-34. The +300 and -200 volt supplies operate as follows. As shown in Figure 4-7, a regulating element (Series Regulator) is connected in series with the load and the dc power source (Rectifier). The resistance of the regulating element is made adjustable so that the voltage at its output will be adjustable. The resistance is adjusted by a control voltage; the higher the control voltage, the higher the output voltage. A sample of the Series Regulator output voltage is compared

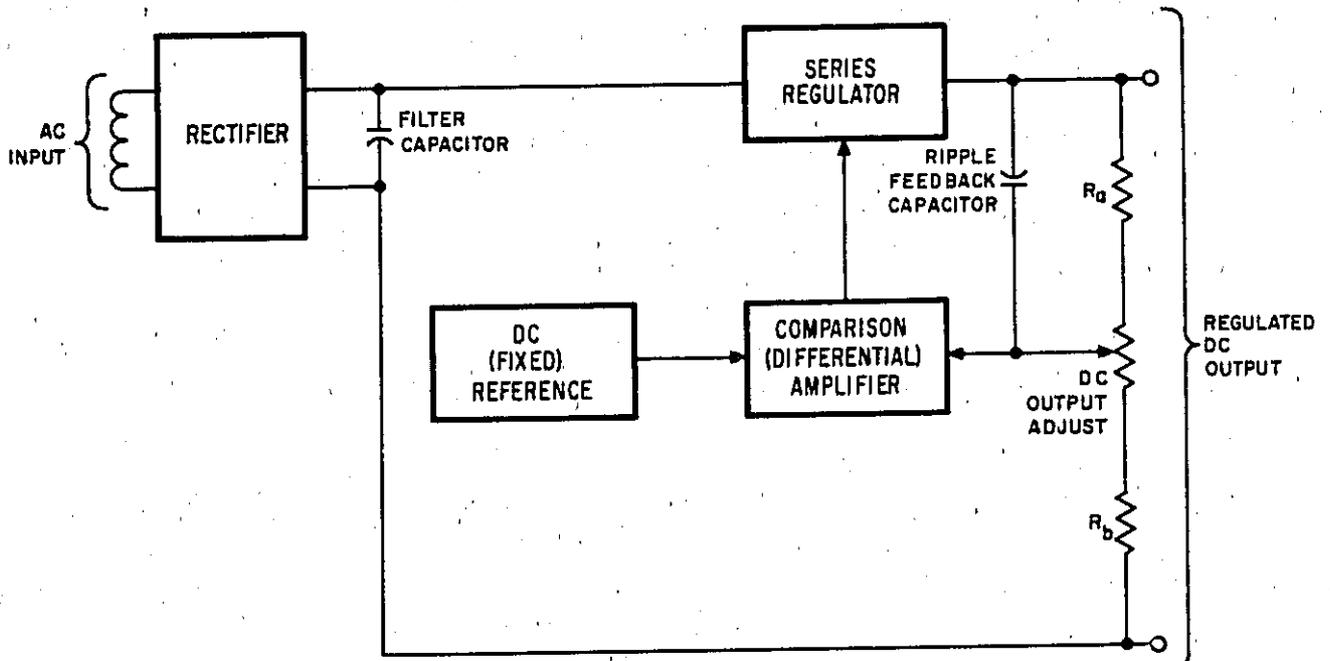


Figure 4-7. Regulated Power Supply Block Diagram

against a stable dc reference voltage by a Comparison Amplifier and the difference voltage is inverted and fed to the Series Regulator through a Control Amplifier. Since the gain of the Comparison Amplifier determines the degree of regulation, it is followed by a Control Amplifier to improve regulation. As a result, any tendency for output voltage change is counteracted by the control voltage, and the output voltage remains substantially constant.

#### 4-35. THE +300 VOLT SUPPLY.

4-36. The +300 volt supply operates as explained under General Operating Principles. Reference voltage for the Comparison (Differential) Amplifier, A11Q2 and A11Q3, is obtained from Reference Diode A11VR1. The Series Regulator, Q1, receives its control voltage from the Comparison (Differential) Amplifier through Control (Driver) Amplifier A11Q1. This supply is independent and does not rely on other supplies for reference voltages.

#### 4-37. THE -200 VOLT SUPPLY.

4-38. The -200 volt supply operates as explained under General Operating Principles. Reference voltage for the Comparison (Differential) Amplifier A11Q5 and A11Q6, is obtained from Reference Diode A11VR3. The Series Regulator, Q2, receives its control voltage from the Comparison (Differential) Amplifier through Control (Driver) Amplifier A11Q4. This supply is independent and does not rely on other supplies for reference voltages.

#### 4-39. THE +25.6 VOLT SUPPLY

4-40. The +25.6 volt supply operates as an emitter follower. The output voltage is that of reference diode A11VR5 less the base-emitter voltage drops of A11Q7 and Q3 and the drop across A11R20. When the supply draws current in excess of 2 amperes, diodes A11CR13-16 are biased into conduction and decrease the current drive to A11Q7, limiting the output current. Because the +300 volt supply acts as a current source for A11Q7 and A11VR5, through A11R21, the 25.6 volt supply will become inoperative if the +300 volt supply fails.

# MAINTENANCE

## SECTION V MAINTENANCE

### 5-1. INTRODUCTION.

5-2. This section provides instructions for performance testing, calibrating, troubleshooting, and repairing the Model 606B.

### 5-3. PERFORMANCE TESTS.

5-4. **PURPOSE.** The procedures of paragraphs 5-6 through 5-21 check instrument performance for incoming inspection, periodic evaluation, troubleshooting, and calibration. The tests can be performed without access to the instrument interior. The specification of Table 1-1 are the performance standards.

5-5. **TEST EQUIPMENT REQUIRED.** The test instruments required to make the performance tests are listed in Table 5-1. Test instruments other than those listed may be used provided performance equals or exceeds Critical Specifications.

### 5-6. RF OUTPUT IMPEDANCE.

5-7. The following procedure tests the output impedance of the Signal Generator:

- a. Connect test equipment as shown in Figure 5-1.
- b. Set line voltage to 115 (230) volts and set VTVM to the 1-volt range and the attenuator to the 0.3 volt range.
- c. Set Signal Generator FREQUENCY dial to 20 MHz and adjust ATTENUATOR until VTVM indicates 1 on the 0-1 VTVM scale.
- d. Remove the 50-ohm output termination and re-measure RF output. VTVM should indicate  $2 (\pm 0.2)$ .
- e. Set FREQUENCY dial to 65 MHz and reconnect the 50-ohm output termination.
- f. Adjust ATTENUATOR until VTVM indicates 1 volt.

g. Remove the 50-ohm output termination and re-measure RF output. VTVM should indicate  $2 (\pm 0.2)$  volts.

### 5-8. RF OUTPUT ACCURACY.

5-9. The following procedure tests the RF output accuracy of the Signal Generator. Test the RF output accuracy as follows:

- a. Connect test equipment as shown in Figure 5-2, test setup A.
- b. Set MODULATION SELECTOR switch to CW.
- c. Set RANGE switch to band 6 and adjust FREQUENCY control to 65 MHz.
- d. Rotate VERNIER control and check that OUTPUT VOLTS meter pointer sweeps full range of meter.
- e. Set ATTENUATOR control to +20 DBM and adjust VERNIER control until OUTPUT VOLTS meter indicates 0 DBM. Power Meter should indicate  $0 \pm 1$  dB.

#### NOTE

In all of the following steps, maintain 0 DBM indication on the OUTPUT VOLTS meter by adjusting the VERNIER attenuator control, if necessary.

- f. Set ATTENUATOR control to +10 DBM. Power meter should indicate  $-10 \pm 1$  dB.
- g. Set ATTENUATOR control to 0 DBM. Power meter should indicate  $-20 \pm 1$  dB.
- h. Set ATTENUATOR control to -10 DBM. Power meter should indicate  $-30 \pm 1$  dB.
- i. Without changing any Signal Generator control settings, connect test equipment as shown in Figure 5-2, test setup B.

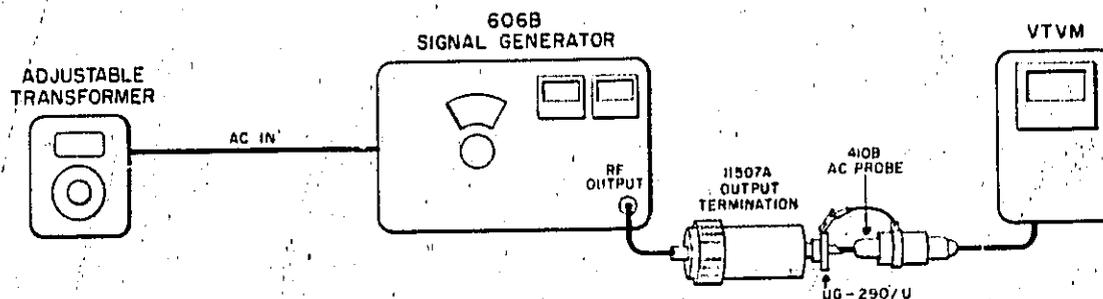


Figure 5-1. RF Output Impedance and RF Frequency Response Test Setup

Table 5-1. Test Equipment Required for Performance Testing, Adjustment, and Troubleshooting

Test Instrument	Critical Specifications	Recommended Models
Vacuum Tube Voltmeter	AC Range: 1 to 300 volts full scale Frequency Range: 20 Hz to 65 MHz DC Range: 1 to 500 volts full scale Resistance Range: 0.2 ohm to 500 megohms Accuracy: $\pm 3\%$ of full scale	HP 410B
Electronic Counter	Range: 50 kHz to 65 MHz Accuracy: $\pm 0.005\%$	HP 5245L with 5253A Converter
Oscilloscope	Vertical Bandwidth: 10 MHz Vertical Sensitivity: 5 V/cm	HP 140A with 1402A and 1420A plug-ins
Adjustable Line Voltage Transformer	Voltage Range: 102 to 127 volts Current: 7.5 amperes Voltmeter Accuracy: $\pm 1$ volt	General Radio W10MT3A Superior Electric UC1M
Power Meter	Range: 10 microwatts to 10 milliwatts Accuracy: $\pm 5\%$ of full scale	HP 431B
Thermistor Mount	Frequency Range: 50 kHz to 65 MHz VSWR: 1.6 max.	HP 478A
SWR Meter	Sensitivity: 1 microvolt (min.) full scale Attenuator Range: 70 dB Attenuator Accuracy: $\pm 0.1$ dB	HP 415E
Crystal Detector	Frequency Range: 10 to 65 MHz VSWR: 1.2 max. Deviation from Square Law: $\pm 0.5$ dB max. over 30 dB range	HP 423A, Option 02
Coaxial Attenuator	Attenuation: 20 dB	HP 8491A
Audio Oscillator	Frequency: 1000 Hz Output: 5 volts across 600 ohms	HP 200CD
Receiver	Frequency: 5, 10, or 15 MHz	Collins 51J series
Square-Wave Generator	Frequency: 1000 Hz Output: 10 volts across 600 ohms	HP 211A
Clip-On DC Milliammeter	Range: 15 to 30 milliamperes Accuracy: $\pm 5\%$ of full scale	HP 428B
AC Voltmeter	Range: 1 millivolt to 300 volts Accuracy: 1%	HP 400E

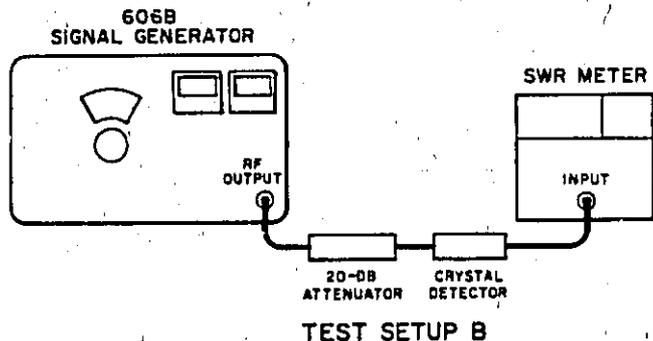
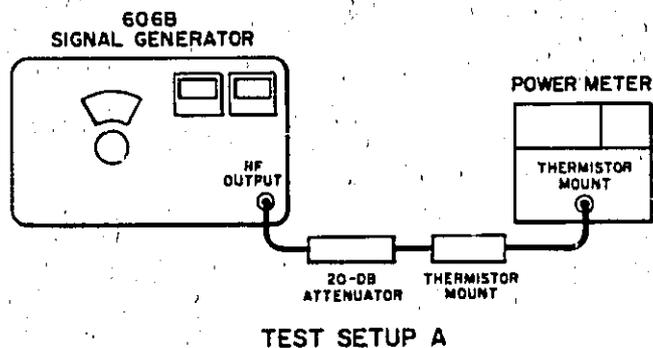


Figure 5-2. RF Output Accuracy Test Setups

j. Set MODULATION SELECTOR switch to INT. 1000~ and adjust MODULATION AMPLITUDE control until PERCENT MODULATION meter indicates 100.

k. Adjust SWR Meter for convenient reference level and, starting with -30 DBM, set ATTENUATOR control through remaining settings in 10-dB steps until lower limit of SWR Meter is reached.

m. Compare each ATTENUATOR setting with SWR Meter indication. Maximum deviation from linearity on SWR Meter should not exceed 1 dB.

n. Remove 8491A Attenuator from test setup and adjust SWR Meter for convenient reference level.

p. Set ATTENUATOR control through remaining settings and compare each setting with SWR Meter indication. Maximum deviation from linearity should not exceed 1 dB.

#### 5-10. OUTPUT FREQUENCY RESPONSE.

5-11. The following procedure tests the output level frequency response of the Signal Generator. Test the output level frequency response as follows:

- Connect test equipment as shown in Figure 5-1.
- Solder tip of AC probe to center conductor of UG-290/U connector and clip ground lead of probe to skirt of the connector.
- Set line voltage to 115 (230) volts.
- Set RANGE switch to band 3 and adjust ATTENUATOR until VTVM indicates 0.9 volt.
- Tune Signal Generator through its full frequency range and check that VTVM does not vary more than  $\pm 11\%$  (1 dB).
- Set line voltage to 103.5 (207) volts and repeat steps d and e.
- Set line voltage to 126.5 (253) volts and repeat steps d and e.

#### 5-12. OUTPUT AND CRYSTAL CALIBRATOR FREQUENCY CALIBRATION.

5-13. The following procedures test the frequency calibration of the Signal Generator. Frequency calibration can be tested with an Electronic Counter or with a WWV receiver.

5-14. ELECTRONIC COUNTER METHOD. Test frequency calibration with an Electronic Counter as follows:

- Connect test equipment as shown in Figure 5-3 and allow Signal Generator to warmup for fifteen minutes.
- Set line voltage to 115 (230) volts.
- Set  $\Delta F$  control to midrange and using CALIBRATE control, align cursor on FREQUENCY indicator dial with engraved index line above dial.
- Tune Signal Generator through its full frequency range and check that Electronic Counter indications are within 1% of FREQUENCY indicator dial settings.

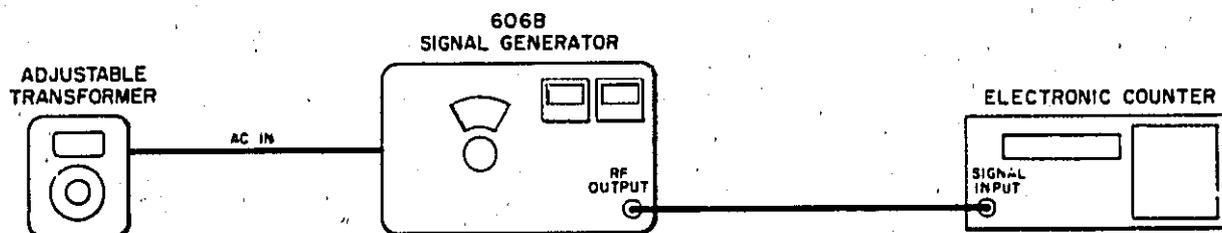


Figure 5-3. Frequency Calibration Test Setup Using Electronic Counter

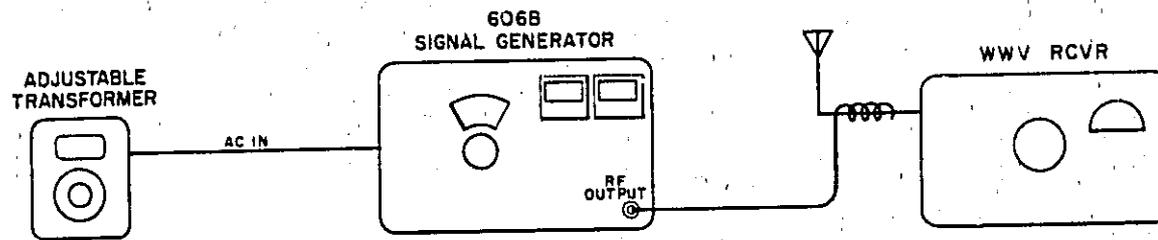


Figure 5-4. Frequency Calibration Test Setup Using WWV Receiver

e. Adjust Signal Generator for output of 15 MHz, as indicated on Electronic Counter.

f. Set CRYSTAL CALIBRATOR switch to 1 MC and insert headset into PHONES jack. Beat note should be less than 1000 Hz.

g. Set CRYSTAL CALIBRATOR switch to 100 KC. Beat note should be less than 1000 Hz.

h. Set line voltage to 103.5 (207) volts and repeat steps d through g.

i. Set line voltage to 126.5 (253) volts and repeat steps d through g.

5-15. WWV RECEIVER METHOD. Test frequency calibration with a Receiver capable of receiving WWV as follows:

a. Set line voltage to 115 (230) volts and allow both Receiver and Signal Generator to warm up for fifteen minutes.

b. Tune in WWV on 5, 10, or 15 MHz, whichever gives best reception.

c. Lightly couple a single wire from the RF OUTPUT jack to receiver antenna, as shown in Figure 5-4.

d. Tune RANGE and FREQUENCY controls of Signal Generator to frequency of incoming WWV signal. Set MODULATION SELECTOR switch to CW (no modulation) and center  $\Delta F$  control.

e. Adjust output level to be about the same as WWV (use S meter on Receiver if it has one). Too much signal will block receiver and obscure beat note.

f. Zero-beat frequency of Signal Generator to WWV signal during period that WWV has no modulation. Do not disturb FREQUENCY dial after this adjustment. Set CALIBRATE adjustment to align window.

g. Set CRYSTAL CALIBRATOR switch to 1 MC and insert headset into PHONES jack. Beat note should be less than 1000 Hz.

h. Set CRYSTAL CALIBRATOR switch to 100 KC. Beat note should be less than 1000 Hz.

i. Tune Signal Generator throughout ranges of bands 1 through 3, and check calibration at each 100-kHz

point. Zero-beat should occur within 1% of dial marking.

j. Reset CRYSTAL CALIBRATOR switch to 1 MC.

k. Tune Signal Generator throughout ranges of bands 4 through 6, and check calibration at each megahertz point. Zero-beat should occur within 1% of dial marking.

m. Set line voltage to 103.5 (207) volts and repeat steps d through k.

n. Set line voltage to 126.5 (253) volts and repeat steps d through k.

5-16. FREQUENCY DRIFT.

5-17. The following procedure tests the amount of drift in the output frequency of the Signal Generator. Test for the amount of frequency drift as follows:

a. Connect test equipment as shown in Figure 5-3 and set line voltage to 115 (230) volts.

b. Allow Signal Generator to warm up for at least two hours.

c. Using FREQUENCY and VERNIER controls, set output frequency at 1 MHz.

d. Monitor frequency output of the Signal Generator with Electronic Counter for 10 minutes and check that frequency drift is less than 50 hertz.

5-18. MODULATION METER ACCURACY.

5-19. The following procedure tests the calibration of the PERCENT MODULATION meter. Test the meter as follows:

a. Connect test equipment as shown in Figure 5-5 and set line voltage to 115 (230) volts.

b. Set RANGE switch to band 3.

c. Set FREQUENCY control to 1000 kHz.

d. Set MODULATION SELECTOR switch to CW.

e. Set ATTENUATOR switch to 1 VOLT.

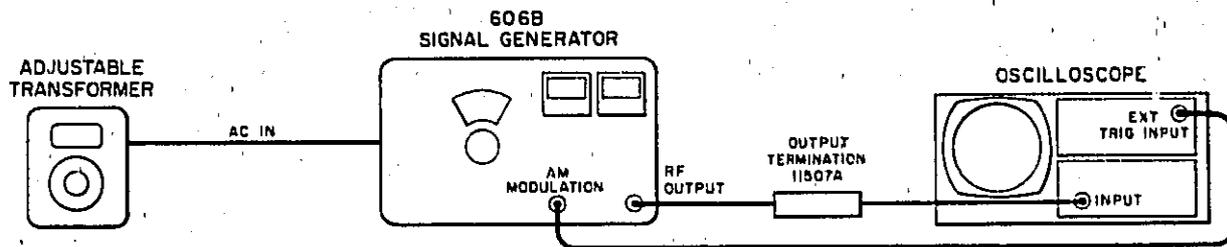


Figure 5-5. Modulation and Percent Modulation Meter Test Setup

- f. Adjust vertical sensitivity of Oscilloscope for 4 cm deflection.
- g. Set MODULATION SELECTOR switch to INT. 1000~.
- h. Adjust MODULATION AMPLITUDE control until Oscilloscope indicates that maximum deflection is exactly 6 cm high; see Figure 5-6.
- i. Check that PERCENT MODULATION meter indicates between 45 and 55.
- j. Adjust MODULATION AMPLITUDE control until oscilloscope indicates zero deflection and check that PERCENT MODULATION meter indicates 0.
- k. Adjust MODULATION AMPLITUDE control until oscilloscope indicates that maximum deflection is exactly 7.6 cm high and check that PERCENT MODULATION meter indicates between 85 and 95.

#### 5-20. MODULATION TEST.

5-21. The following procedure tests the modulation of the Signal Generator. Test the modulation as follows:

- a. Perform procedure outlined in paragraph 5-18.
- b. Tune the Signal Generator through its full frequency range and check oscilloscope indication for excessive distortion.
- c. Repeat steps a and b with line voltage set at 103.5 (207) and 126.5 (253) volts.
- d. Reset line voltage to 115 (230) volts.
- e. Set MODULATION SELECTOR switch to EXT. AC.
- f. Rotate MODULATION AMPLITUDE control fully clockwise.
- g. Using FREQUENCY and VERNIER controls, set output frequency at 1000 kHz.
- h. Connect 1000-Hz output from Audio Oscillator to Signal Generator AM MODULATION jack and to EXT SYNC jack on oscilloscope.
- i. Adjust Audio Oscillator for output of 4.5 volts peak (3.18 volts RMS) and check that Oscilloscope

pattern has twice amplitude of unmodulated output. PERCENT MODULATION meter should indicate 100.

j. Set line voltage to 103.5 (207) volts and repeat steps f through i.

k. Set line voltage to 126.5 (253) volts and repeat steps f through i.

#### 5-22. CABINET AND RF SHIELD REMOVAL.

5-23. To perform adjustments, troubleshoot, and repair the Signal Generator it is necessary to remove the main chassis from the cabinet. Remove the chassis as follows:

- a. Disconnect power cord from the receptacle.
- b. Remove the screw attaching the power inlet bracket to rear panel.
- c. Remove four screws from rear cover and remove rear cover from cabinet.

#### CAUTION

Do not tip the Signal Generator completely onto its back. You may damage the three fuseholders mounted on the rear of the unit.

- d. Tip Signal Generator partially up on its back and loosen the two screws on bottom of cabinet which clamp

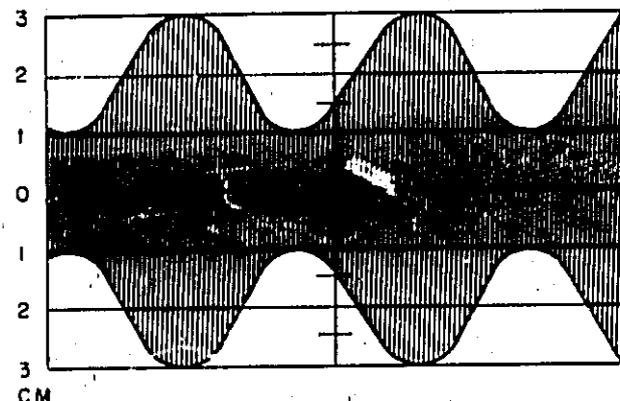


Figure 5-6. Waveform for 50% Modulation

## Section V

cabinet to front panel. (Do not remove any screws from front panel.)

- e. Set Signal Generator back on its four rubber feet and slide chassis out of cabinet.

**WARNING**

With the cabinet removed, dangerous voltages are exposed. Contact with these voltages may result in personal injury or death. Take adequate safety precautions.

5-24. If it is necessary to remove the RF shield, proceed as follows:

- Remove two screws holding the inlet bracket and allow bracket to hang free.
- Remove all screws securing RF shield to chassis. (Use Allen wrench clipped to top of shield to remove cap screws.)
- Hold inlet bracket to one side and remove shield by pulling it toward rear of chassis.

**5-25. ADJUSTMENTS.**

5-26. **PURPOSE.** The following adjustment and calibration procedures include all instructions required to keep the Signal Generator operating at peak performance. Usually, the Signal Generator will not need all adjustment and calibration procedures performed at one time. This is particularly true when repair has been accomplished without changing any internal adjustments. Prior to performing any internal adjustments, refer to paragraph 5-53. Allow the Signal Generator to warm up for at least 15 minutes prior to performing any internal adjustments.

5-27. **TEST EQUIPMENT REQUIRED.** Test instruments required to perform the adjustments and calibrations are listed in Table 5-1. Instruments other than those listed may be substituted provided their specifications equal or exceed the Critical Specifications.

**5-28. MECHANICAL ZERO METER ADJUSTMENT.**

5-29. When the PERCENT MODULATION and OUTPUT VOLTS meters are properly zero-set, meter pointers should indicate exactly zero when the instruments are at normal operating temperature and turned off. To obtain best accuracy and mechanical stability, perform zero adjustment on each meter as follows:

- Operate Signal Generator for at least 20 minutes to allow meter movement to reach normal operating temperature.
- Turn instrument off and allow 30 seconds for all capacitors to discharge.
- Rotate mechanical zero-adjustment screw on face of meter clockwise until meter pointer is left of zero and moving upscale toward zero.
- Continue to rotate adjustment screw until pointer indicates exactly zero. If pointer overshoots zero, repeat steps c and d.

5-6

- e. When pointer indicates exactly zero, rotate adjustment screw a few degrees counterclockwise to free adjustment screw from meter suspension. If pointer moves during this step, repeat steps c through e.

**5-30. POWER SUPPLY ADJUSTMENT.**

5-31. The power supplies in this instrument are extremely stable and will require infrequent adjustment. The output voltages may be measured at regular intervals or as a first troubleshooting step but unnecessary adjustment should be avoided. A defective tube or component may overload the power supply and lead you to believe that the power supply is not functioning properly. As long as the power supply regulator is functioning properly, you need not know the absolute values of the power supply output voltages. However, when power supply adjustment is necessary, you should use a voltmeter with a known calibration accuracy.

5-32. Regulation of the power supply can be checked by varying the power line voltage between 103 (206) and 127 (254) volts. The output voltage will vary only slightly, if at all, from the value measured with a 115 (230)-volt line. Loss of power supply regulation is most easily detected, as a sudden large increase in power supply ripple as the line voltage is raised and lowered  $\pm 10\%$  from 115 (230) volts. When the power supply output voltages are within limits with the line voltage at 115 (230) volts, adjustment is not necessary. Only the +300-volt power supply output is adjustable. The -200-volt and +25.6-volt supply outputs are non-adjustable.

5-33. To test the power supplies proceed as follows:

- Measure power supply outputs. They should be within the limits shown in Table 5-2.

Table 5-2. Regulated Power Supply Tolerances

Nominal Voltage	Nominal Ripple at 115/230 V RMS Input	Output Voltage Range
-200	10 mV	200+5, -15 volts
+300	10 mV	300 $\pm 12$ volts
+25.6	10 mV	25.6 $\pm 1$ volts

- If the output voltage of the +300-volt supply is outside the limits in the table adjust B+ SET potentiometer A11R8 for +300 volts. See Figure 5-7 for adjustment location.

c. You may wish to check the regulation of the power supplies as the line voltage is varied between 103 (206) and 127 (254) volts. All regulated voltages should remain within  $\pm 1\%$  over this range of line voltage.

d. Measure the ripple voltage on the various supplies. They should be less than the values indicated in Table 5-2 with the power line voltage set at 115 or 230 volts.

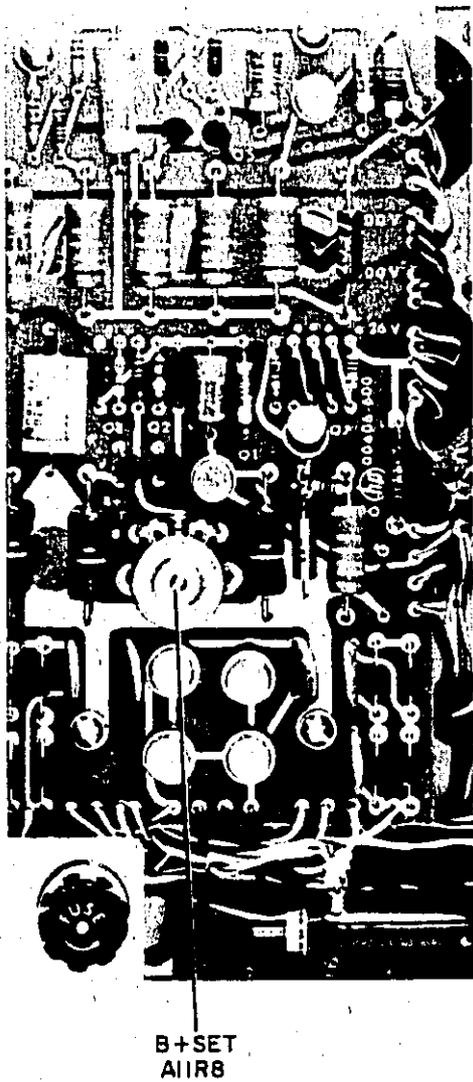


Figure 5-7. Power Supply Adjustment Location

5-34. AUDIO OSCILLATOR ADJUSTMENT.

5-35. Perform audio oscillator adjustment as follows:

- a. Connect an AC VTVM to output tap on audio transformer A1T1 (yellow lead on signal tie point behind OUTPUT VOLTS meter). Connect ground lead of VTVM to chassis.
- b. Set RANGE switch to band 3.
- c. Set MODULATION SELECTOR switch to INT. 400~.
- d. Set POWER switch to ON.
- e. Adjust MOD. OSC. ADJ. potentiometer A1R51 until VTVM indicates 3.2 volts. See Figure 5-8 for adjustment location.

5-36. CRYSTAL OSCILLATOR ADJUSTMENT.

5-37. Perform crystal oscillator adjustment as follows:

- a. Connect an electronic counter to test point A2R11.
- b. Set CRYSTAL CALIBRATOR switch to 1 MC.
- c. Set POWER switch to ON.
- d. Adjust trimmer capacitor A2C3 until electronic counter indicates 1 MHz. See Figure 5-9 for adjustment location.

Table 5-3. Checks Following Tube and Semiconductor Replacement

Reference Designation	Check	Paragraph
A4V1, A6VR1, A5CR1-A5CR4, A4CR1	Output Frequency Calibration	5-12
	Frequency Drift	5-16
A4V2	Same as A4V1	
A4V3, A4V4, CR1, A4CR2, A4CR3	RF Output Accuracy	5-8
A4V5-A4V9, A1CR4, A1CR5	RF Output Accuracy	5-8
	Modulation Test	5-20
A1V9	Crystal Calibrator Frequency Calibration	5-12
	Modulation Test	5-20
A1V5	Modulation Test	5-20
A2Q1-A2Q5, A2CR1-A2CR9	Crystal Calibrator Frequency Calibration	5-12
A11Q1-A11Q3, Q1, A11CR1-A11CR4, A11VR1, A11VR2	+300 Volt Power Supply Check	5-30
A11Q4-A11Q6, Q2, A11CR5-A11CR8, A11VR3, A11VR4	-200 Volt Power Supply Check	5-30
A11Q7, Q3, A11CR9-A11CR16, A11VR5	+25.6 Volt Power Supply Check	5-30

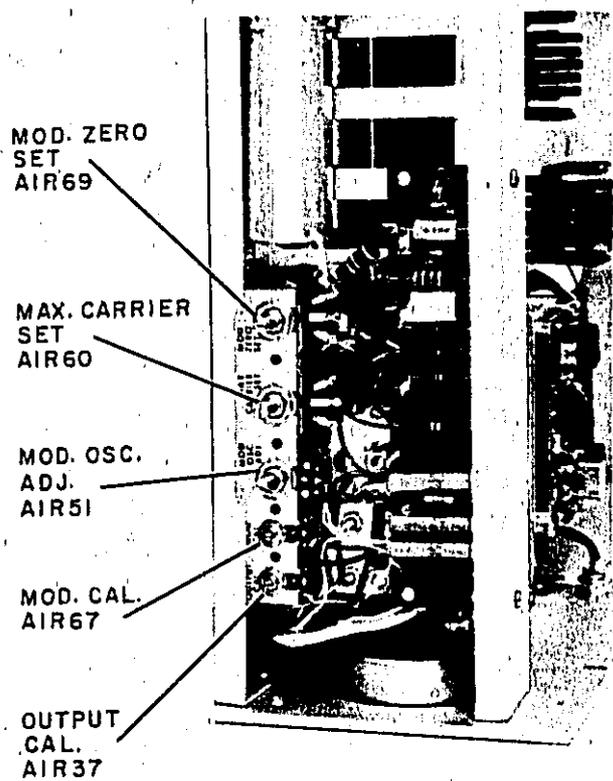


Figure 5-8. Modulation Deck Adjustment Locations

- e. Set CRYSTAL CALIBRATOR switch to 100 KC.
- f. Adjust potentiometer A2R11 until Electronic Counter indicates 100 kHz. See Figure 5-9 for adjustment location.
- g. Set potentiometer A2R11 approximately halfway between limits at which frequency jumps to values other than 100 kHz.

#### 5-36. RF OSCILLATOR AND AMPLIFIER ADJUSTMENT.

##### NOTE

This procedure should be performed only if there is a definite indication that the oscillator is off frequency. It should NOT be done on a routine basis.

##### RF OSCILLATOR

5-39. Perform RF oscillator and amplifier adjustment as follows:

- a. Connect Electronic Counter with converter to RF OUTPUT jack.
- b. Set CALIBRATE movable index in line with etched FREQUENCY centerline.
- c. Set ATTENUATOR switch to 0.3 volt and MODULATION SELECTOR switch to CW.
- d. Set  $\Delta F$  control to midrange (arrow vertical) and adjust FREQUENCY to low end of any band except band 6.

5-8

- e. Set POWER switch to ON.

f. If Electronic Counter indicates a frequency in error of more than 1% from frequency indicated on FREQUENCY dial, adjust tuning slug (A8T1, T2, T3, T4, or T5) of oscillator coil in use until frequency output is within limits. Clockwise rotation of slugs will decrease frequency.

g. Shift frequency to high end of same band. If frequency as read on FREQUENCY dial is off more than 1%, adjust trimmer capacitor across oscillator coil to correct. Always use a plastic screwdriver when making this adjustment.

h. Repeat steps f and g until no further adjustment is necessary.

i. Repeat steps d through h on all other bands. On band 6 adjust slug with a plastic Allen wrench (#8). If any adjustment is necessary, check maximum oscillator current as in paragraph 5-40.

##### RF AMPLIFIER

j. Connect probe of an oscilloscope to cathode of A4CR3. This point can be found on pink-white wire between amplifier stator turret terminal block and tie-point for 34.8K resistor, A4R49.

k. Set MODULATION SELECTOR switch to EXT. DC.

m. Connect a square-wave generator, set to 1 kHz, to AM MODULATION jack. Feed in sufficient square-wave signal so that carrier is cut off for at least part of the cycle.

n. Tune throughout all bands and check pattern on oscilloscope for ringing or squegging. Reduce frequency of external modulation to 300 Hz on lowest frequency band to keep from overmodulating. If ringing is found, tune amplifier.

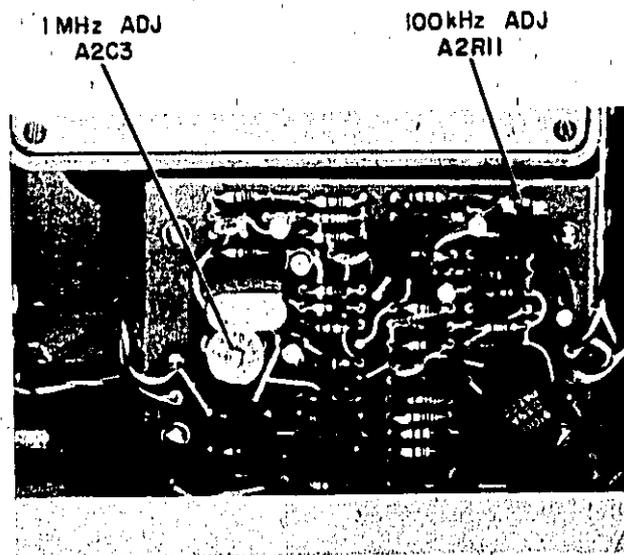


Figure 5-9. Calibrator Adjustment Locations

o. Measure the RF amplifier plate current with a clip-on milliammeter clipped over red lead going to 100-ohm resistor A4R9 on turret stator contact terminal block (beneath RF amplifier chassis). If a Model 428B is not available, unsolder red lead on B+ side and insert a conventional 300-mA dc milliammeter. Bypass point between 100-ohm resistor and meter with a 0.1- $\mu$ F capacitor.

p. Tune inner slug in amplifier coil from top for a plate current dip at low end of one band.

q. Tune trimmer capacitor for a plate current dip at high end of same band. This adjustment is made through a hole in chassis between A4V5 and A5V6 underneath amplifier turret shaft. Use a plastic screwdriver for this adjustment. In addition, if this tool has a metal tip, slide a tiny piece of tubing over metal tip to prevent trimmer shorting to ground when making this adjustment.

r. Recheck ringing as in step n.

s. Repeat steps n through r on all bands.

#### 5-40. OSCILLATOR MAXIMUM CURRENT ADJUSTMENT.

5-41. Perform maximum current adjustment as follows:

a. Set MODULATION SELECTOR switch to CW.

b. Set RANGE switch to band 6.

c. Set POWER switch to ON.

d. Measure RF oscillator plate current with a clip-on DC milliammeter clipped over red lead going to control assembly A5 from oscillator-amplifier assembly A4. If a Model 428B is not available, unsolder the red lead on oscillator-amplifier assembly A4 (B+) side and insert a conventional 300-mA dc milliammeter. Bypass point between 100-ohm resistor and meter with a 0.1- $\mu$ F capacitor.

e. Tune FREQUENCY dial throughout the 19 MC-65MC band while noting the current.

f. Adjust oscillator level control potentiometer A4R10 on the oscillator-amplifier deck for a maximum current of 25 mA at frequency of maximum current. See Figure 5-10 for adjustment location. If this adjustment is made, check the following:

(1) Paragraph 5-42, Carrier Zero Adjustment

(2) Paragraph 5-44, Maximum Carrier and Modulation Zero Adjustment

(3) Paragraph 5-46, Modulation Meter Adjustment

#### 5-42. CARRIER ZERO ADJUSTMENT.

5-43. Perform carrier zero adjustment as follows:

a. Set RANGE switch to band 1.

b. Set ATTENUATOR switch to 1 VOLT.

c. Set MODULATION SELECTOR switch to EXT. DC.

d. Set attenuator VERNIER control fully counterclockwise.

e. Set MODULATION AMPLITUDE control fully counterclockwise.

f. Set CARR ZERO potentiometer A4R21 fully counterclockwise. See Figure 5-10 for adjustment location.

g. Mechanically zero output meter in accordance with paragraph 5-28.

h. Set POWER switch to ON.

i. Connect an oscilloscope to RF OUTPJT jack.

j. Slowly turn CARR ZERO potentiometer A4R21 on RF amplifier chassis clockwise until there is some output on oscilloscope. Then adjust carrier zero set until indication on oscilloscope, set to its most sensitive range, just collapses. Set sweep on oscilloscope for a free-running condition so that indication will not disappear for lack of synchronizing signal.

k. Check for zero output across each band. Bands 5 and 6 typically have a minimum output of 0.03 volt RMS. If this adjustment is made, check the following:

(1) Paragraph 5-44, Maximum Carrier and Modulation Zero Adjustment

(2) Paragraph 5-46, Modulation Meter Adjustment

#### 5-44. MAXIMUM CARRIER AND MODULATION ZERO ADJUSTMENT.

5-45. Perform maximum carrier and modulation zero adjustment as follows:

a. Set attenuator VERNIER control fully clockwise.

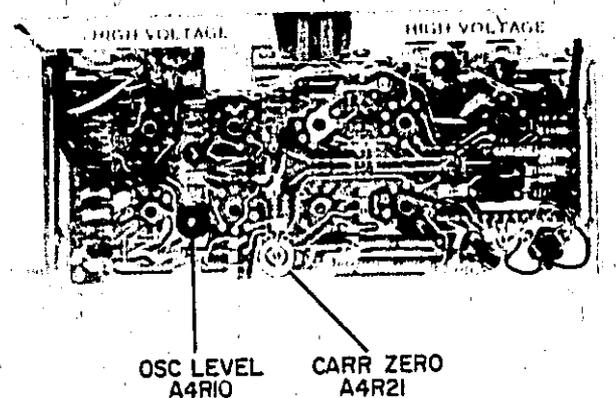


Figure 5-10. Oscillator-Amplifier Deck Adjustment Locations

b. Set MODULATION SELECTOR switch to EXT. AC.

c. Connect VTVM ac probe to end of output termination. Solder tip of ac probe to center conductor of a UG-290/U connector. Clip ground end of probe to skirt of connector. (See Figure 5-1.) Insert connector into RF OUTPUT jack of Signal Generator.

d. Set POWER switch to ON.

e. Set RANGE switch to band 1 and turn FREQUENCY dial over band at moderate speed, noting minimum output voltage read on VTVM.

f. Repeat step e on bands 2, 3, 4, and 5. Repeat on band 6, but turn much more slowly.

g. Set Signal Generator to range and frequency having lowest output voltage, typically 1.76 MHz. Set MODULATION SELECTOR switch to CW, adjust MAX. CARRIER SET potentiometer A1R60 for 1.05 volt RF output on VTVM. See Figure 5-8 for adjustment location.

h. Switch MODULATION SELECTOR from CW to EXT. AC while noting output-voltage change on VTVM. There should be no change in voltage. If necessary adjust MOD. ZERO SET potentiometer A1R69 until there is no change of output when MODULATION SELECTOR is switched. See Figure 5-8 for adjustment location. Turn MODULATION AMPLITUDE control; output should not change. If necessary, readjust potentiometer A1R69.

i. Recheck steps g and h and adjust, if necessary. Controls A1R69 and A1R60 interact with each other. Recheck other adjustment any time one control is adjusted.

#### 5-46. MODULATION METER ADJUSTMENT.

5-47. Perform PERCENT MODULATION meter adjustment as follows:

a. Mechanically zero meter in accordance with paragraph 5-28.

b. Connect test equipment as shown in Figure 5-5.

c. Perform test of paragraph 5-18, steps a through i.

d. If PERCENT MODULATION meter indication is not within limits, adjust MOD. CAL. potentiometer A1R67 until meter indicates 50. See Figure 5-8 for adjustment location.

e. Set ATTENUATOR switch to 0.3 VOLT.

f. Repeat step c. If PERCENT MODULATION meter does not indicate  $50 \pm 5\%$ , adjust MODULATION AMPLITUDE control until it does. Adjust CARR ZERO potentiometer A4R21 slightly until pattern on oscilloscope is as shown in Figure 5-6. See Figure 5-10 for adjustment location. Recheck maximum carrier adjustment (paragraph 5-44) and readjust potentiometer A1R60, if necessary.

#### 5-48. OUTPUT METER ADJUSTMENT.

5-49. Perform the OUTPUT VOLTS meter adjustment as follows:

a. Mechanically zero the meter in accordance with paragraph 5-28.

b. Connect ac probe of VTVM (1 volt range) to end of output termination using a UG-290/U connector. Solder tip of ac probe to center conductor of connector (see Figure 5-1). Insert connector into RF OUTPUT jack.

c. Set attenuator VERNIER control so that the OUTPUT VOLTS meter indicates 0.9 volt RMS.

d. Rotate FREQUENCY dial and RANGE switch through all frequencies, keeping indication on OUTPUT VOLTS meter at 0.9 volt. Record lowest and highest readings on VTVM.

e. Determine average of two readings recorded in step d.

f. Set FREQUENCY dial and RANGE switch to a frequency that will give this average reading on VTVM.

g. Set attenuator VERNIER control so that VTVM indicates 0.9 volt.

h. Set the OUTPUT VOLTS meter to read 0.9 volt by adjusting OUTPUT CAL. potentiometer A1R37. See Figure 5-8 for adjustment location.

#### 5-50. TROUBLESHOOTING.

5-51. PURPOSE. The following paragraphs explain how to isolate a malfunction to a circuit section, how to isolate a malfunction to a circuit within a section, and how to isolate a malfunction in transistor circuits.

5-52. TEST EQUIPMENT REQUIRED. The test equipment required to troubleshoot the Signal Generator is listed in Table 5-1. Instruments other than those listed may be used provided their specifications equal or exceed the Critical Specifications.

#### 5-53. TUBE REPLACEMENT.

5-54. In many cases instrument malfunction can be corrected by replacing a weak or defective tube. Before changing the setting of any internal adjustment check the tubes. Adjustments made in an attempt to restore operation when the cause is a defective tube will often complicate the repair problem.

5-55. Check tubes by substitution rather than using a tube checker. The results obtained from the tube checker can be misleading. Before removing a tube, mark it so that if the tube is good it can be returned to the same socket. Replace only those tubes proved to be weak or defective.

5-56. Any tube with corresponding standard EIA characteristics can be used as replacement. Where variations in tube characteristics will affect circuit performance, an adjustment is provided. Table 5-3 lists the tests to make and the adjustments that may be necessary if such tubes are replaced.

**5-57. TRANSISTOR CIRCUIT TROUBLESHOOTING.**

5-58. The following procedures and data are given to aid in determining whether a transistor is operational. Tests are given for both in-circuit and out-of-circuit transistors.

5-59. **IN-CIRCUIT TESTING.** The common causes of transistor failures are internal short- and open-circuits. In transistor circuit testing the most important consideration is the transistor base-emitter junction. Like the control grid of a vacuum tube, the base is the operational control point in the transistor. This junction is essentially part of a solid-state diode. For the transistor to conduct, the diode must conduct; that is, the diode must be forward biased. As with simple diodes, the forward-bias polarity is determined by the materials forming the junction. Use the transistor symbol on the schematic diagram to determine the bias polarity required to forward bias the base-emitter junction. Part A of Figure 5-11 shows transistor symbols with terminals labeled. Notice that the emitter arrow conventionally points toward the type N material. The other two columns of the illustration compare the biasing required to cause conduction and cut-off in transistors and vacuum tubes. If the transistor base-emitter diode (junction) is forward biased the transistor conducts. If the diode is heavily forward biased, the transistor saturates. However, if the base-emitter diode is reverse biased, the transistor is cut off. The voltage drop across a forward-biased emitter-base diode varies with transistor collector current. For example, a germanium transistor has a typical forward-bias base-emitter voltage of 0.2-0.3 volt when collector current is 1-10 mA, and 0.4-0.5 volt when collector current is 10-100 mA. In contrast, forward-bias voltage for silicon transistors is about twice that for germanium types: about 0.5-0.6 volt when collector current is low, and about 0.8-0.9 volt when collector current is high.

5-60. Figure 5-11, part B, shows simplified versions of the three basic transistor circuits and gives the operating characteristics of each. When examining a transistor stage, first determine if the emitter-base diode is biased for conduction (forward-biased) by measuring the voltage difference between emitter and base. When using an electronic voltmeter, do not measure directly between emitter and base: there may be sufficient loop current between the voltmeter leads to damage the transistor. Instead, measure each voltage separately with respect to a voltage common point (e.g., chassis). If the emitter-base diode is forward biased, check for amplifier action by short-circuiting the base to emitter while observing collector voltage. The short-circuit eliminates base-emitter bias and should cause the transistor to stop conducting (cut off). Collector voltage should then shift to near the supply voltage. Any difference is due to leakage current through the transistor and, in general, the smaller this current, the better the transistor. If collector voltage does not change, the transistor has either an emitter-collector short circuit or emitter-base open circuit.

5-61. **OUT-OF-CIRCUIT TESTING.** Two common causes of transistor failure are internal short- and

open-circuits. Remove the transistor from the circuit and use an ohmmeter to measure internal resistance. See Table 5-4 for measurement data.

**CAUTION**

Most ohmmeters can supply enough current or voltage to damage a transistor. Before using an ohmmeter to measure transistor forward or reverse resistance, check open-circuit voltage and short-circuit current output **ON THE RANGE TO BE USED.** Open-circuit voltage must not exceed 1.5 volts and short-circuit current must be less than 3 mA. See Table 5-5 for safe resistance ranges for some common ohmmeters.

**5-62. GENERAL TROUBLESHOOTING PROCEDURES.**

5-63. In general, internal adjustments have only a limited range and are designed to compensate for minor variations in tubes and/or circuit components. If a major section or the complete instrument is inoperative, internal adjustments will seldom, if ever, restore operation. To avoid complications and reduce down-time, locate and correct the cause of trouble before attempting internal adjustments. The loss of a major function of the Signal Generator will appear as one or more of the following symptoms.

- a. Very low or no RF output level.
- b. Excessive RF output with ATTENUATOR and VERNIER controls having little or no effect on RF output.
- c. Normal RF output with very low or no modulation.
- d. RF output normally modulated but PERCENT MODULATION meter has abnormal indication.
- e. Normal RF output but no beat note output at PHONES jack.

5-64. A good starting point when troubleshooting is the power supply. Check line cord, the three fuses, and the power supply output voltages. If a defective power supply transistor is found, replacement will normally restore instrument operation without any internal adjustments. Check the output voltages of each supply to see if the output is within limits. If the output is within the limits given in the power supply section do not attempt to refine the adjustments. **IF THE INSTRUMENT IS INOPERATIVE, FIRST TRY BLOWING OUT THE PLATES OF THE TUNING CAPACITOR WITH A LOW VELOCITY AIR STREAM SUCH AS THAT FROM A VACUUM CLEANER.** Blow out these plates every time you remove the instrument from the cabinet for maintenance. Do not use high-pressure air or air saturated with lubricating oil.

5-65. Assuming that all power supply outputs are normal, very low or no RF output could be caused by the failure of the RF Oscillator, the RF Buffer, the RF

A. TRANSISTOR BIASING			
DEVICE	SYMBOL	CUT OFF	CONDUCTING
VACUUM TUBE			
N P N TRANSISTOR			
P N P TRANSISTOR			

B. AMPLIFIER CHARACTERISTICS			
CHARACTERISTIC	COMMON BASE	COMMON EMITTER	COMMON COLLECTOR
INPUT Z	30-50 $\Omega$	500-1500 $\Omega$	20-500K $\Omega$
OUTPUT Z	300-500K $\Omega$	30-50K $\Omega$	50-1000 $\Omega$
VOLTAGE GAIN	500-1500	300-1000	< 1
CURRENT GAIN	< 1	25-50	25-50
POWER GAIN	20-30 dB	25-40 dB	10-20 dB

Figure 5-11. Transistor Biasing and Operating Characteristics

Table 5-4. Out-of-Circuit Transistor Resistance Measurement

Transistor Type		Connect Ohmmeter		Measure Resistance (ohms)
		Pos. lead to	Neg. lead to	
PNP Germanium	Small Signal	emitter	base*	200 - 500
		emitter	collector	10K - 100K
	Power	emitter	base*	30 - 50
		emitter	collector	several hundred
NPN Silicon	Small Signal	base	emitter*	1K - 3K
		collector	emitter	very high (might read open)
	Power	base	emitter*	200 - 1000
		collector	emitter	high, often greater than 1 M

\*To test for transistor action, add collector-base short. Measured resistance should decrease.

Amplifier, or the Modulator. Excessive RF output with little or no control by the VERNIER control could be caused by the failure of the RF leveling feedback loop of the Modulator Section. Little or no modulation could be caused by the failure of Audio Oscillator. If modulation is normal with the PERCENT MODULATION meter indicating abnormally, the trouble is probably in the Modulation Monitor circuit or the PERCENT MODULATION meter. No beat note output at the PHONES jack probably indicates trouble in the Crystal Calibrator. The performance tests contained in paragraph 5-3 will serve as an aid in further isolating a trouble to a specific circuit section. Since the operation of certain circuit sections is dependent upon the proper operation of other sections, troubleshooting must be performed in the proper sequence. After determining the faulty section, refer to the appropriate section of Table 5-6 and perform the tests indicated. If the trouble cannot be found by any other means, perform the steps of Table 5-6 in the indicated sequence until the trouble is found. If the trouble is in the output termination or attenuator you may return them separately to the factory for repair. They are not field repairable.

5-66. If an output is obtained, troubleshoot the particular section giving difficulty by referring to the appropriate part of Table 5-6. If no output is obtained, the trouble may be anywhere in the RF leveling feedback loop. Refer to Table 5-7, Troubleshooting the Feedback Loop, for instructions.

**5-67. REPAIR PROCEDURES.**

**5-68. ETCHED CIRCUITS.**

5-69. The etched circuit boards in the Signal Generator are of the plated-through type consisting of metallic conductors bonded to both sides of insulating material.

The metallic conductors are extended through the component mounting holes by a plating process. Soldering can be done from either side of the board with equally good results. Table 5-8 lists recommended tools and materials. Following are recommendations and precautions pertinent to etched circuit repair work.

a. Avoid unnecessary component substitution: it can result in damage to the circuit board and/or adjacent components.

b. Do not use a high-power soldering iron on etched circuit boards. Excessive heat may lift a conductor or damage the board.

c. Use a suction device (Table 5-8) or wooden toothpick to remove solder from component mounting holes. **DO NOT USE A SHARP METAL OBJECT SUCH AS AN AWL OR TWIST DRILL FOR THIS PURPOSE. SHARP OBJECTS MAY DAMAGE THE PLATED-THROUGH CONDUCTOR.**

d. After soldering, remove excess flux from the soldered areas and apply a protective coating to prevent contamination and corrosion. See Table 5-8 for recommendations.

e. When removing a multiple-connection component held tightly in a socket, such as a vacuum tube, loosen it gradually using gentle side-to-side motion to avoid damage to the plated-through conductors

Table 5-5. Safe Ohmmeter Range for Transistor Resistance Measurements

Ohmmeter	Safe Range(s)	Open Ckt Voltage	Short Ckt Current	Lead	
				Color	Polarity
HP 412A	R x 1K	1.0V	1 mA	Red	+
	R x 10K	1.0V	100 μA		
	R x 100K	1.0V	10 μA	Blk	-
	R x 1M	1.0V	1 μA		
	R x 10M	1.0V	0.1 μA		
HP 410C	R x 1K	1.3V	0.57 mA	Red	+
	R x 10K	1.3V	57 μA		
	R x 100K	1.3V	5.7 μA	Blk	-
	R x 1M	1.3V	0.5 μA		
	R x 10M	1.3V	0.05 μA		
HP 410B	R x 100	1.1V	1.1 mA	Blk	+
	R x 1K	1.1V	110 μA		
	R x 10K	1.1V	11 μA	Red	-
	R x 100K	1.1V	1.1 μA		
	R x 1M	1.1V	0.11 μA		
Simpson 260	R x 100	1.5V	1 mA	Red	+
				Blk	-
Simpson 269	R x 1K	1.5V	0.82 mA	Blk	+
				Red	-
Triplett 630	R x 100	1.5V	32 mA	Varies with Serial Number	
	R x 1K	1.5V	3.25 mA		
Triplett 310	R x 10	1.5V	750 μA		
	R x 100	1.5V	75 μA		

Table 5-6. Troubleshooting Chart

Measurement	Normal Indication	Possible Cause of Malfunction
<b>A. +300 VDC SUPPLY</b>		
PREPARATION: Unless otherwise specified, measure the voltage to ground at the following points:		
1. Transformer T1, pin 1	115 Vac $\pm$ 10%	Open F1 or S6
2. Across A11C18 and A11C19	300 Vac $\pm$ 10%	Open secondary of T1
3. A11Q1 (collector)	+400 Vdc $\pm$ 10%	Check A11C1, C18, C19, A11CR1, A11CR2, A11CR3, and A11CR4
4. Test point 19	+300 Vdc $\pm$ 5%	Check Q1, A11Q2, A11Q3, and F2. Also check voltage across A11VR1 and A11VR2
<b>B. -200 VDC SUPPLY</b>		
PREPARATION: Unless otherwise specified, measure the voltage to ground at the following points:		
1. Across A11C5	220 Vac $\pm$ 10%	Open secondary of T1
2. A11Q4 (collector)	+100 Vdc $\pm$ 5%	Check A11Q5, A11CR5, A11CR6, A11CR7, A11CR8, and A11C21
3. Test point 20	-200 Vdc $\pm$ 5%	Check A11Q2, A11Q4, A11Q5, A11Q6, and F3. Also check voltage across A11VR3 and A11VR4
<b>C. +25.6 VDC SUPPLY</b>		
PREPARATION: The +300-volt power supply is assumed to be operating correctly. Measure the voltage to ground at the following points:		
1. Across A11C10	21 Vac $\pm$ 10%	Open secondary of T1
2. A11Q7 (collector)	+40 Vdc $\pm$ 5%	Check A11C10, A11C11, A11CR9, A11CR10, A11CR11, A11CR12 and A11C22
3. Test point 21	+25.6 Vdc $\pm$ 5%	Check Q3, A11Q7, A11CR13, A11CR14, A11CR15, and A11CR16. Also check voltage across A11VR5.
<b>D. RF OSCILLATOR</b>		
PREPARATION: This procedure assumes that the power supplies are operating correctly. Use a clip-on lead to short across A4R27 (caution -200 volts) to disable RF Amplifier temporarily while measuring the following voltages. Unless otherwise specified measure the voltage to ground at the following points.		
1. a. A4V2, pin 9	+20 Vdc $\pm$ 10%	Check filament circuits of A4V1, A4V2, A4V7, A4V8, and A4V9
b. A4V2, pins 5 and 4	+13.4 Vdc $\pm$ 10%	Same as a.
2. a. A4V1, pin 5	+20 Vdc $\pm$ 10%	Same as step 1
b. A4V1, across pins 4 and 5	0.3 Vdc	Same as step 1
c. A4V1, pin 3	+300 Vdc (nominal)	Check RF filter (A3C2, A4C3, C7A, C7B, C2, and A4C29 for shorts, A3L1 for open circuit.

Table 5-6. Troubleshooting Chart (Cont'd)

Measure	Normal Indication	Possible Cause of Malfunction
<b>D. RF OSCILLATOR (CONT'D)</b>		
d. A4V1, pin 2	+100 Vdc	Check A4R1, A4R2, A4R10 and A4C1
e. A4V1, pin 1	+102 Vdc	Check A4R4, A4V1 or RF lead to 12HG7's
3. a. A4V2, pin 1 & 6	+300 Vdc (nominal)	Check A5R2, C3A, and C3B for shorts
b. A4V2, pin 2 & 7	+107 Vdc	Check A4V1 and associated components
c. A4V2, pin 3 & 8	+108 Vdc	Check A4V1, A4CR1 or associated components
d. A4V2, pin 2 & 7	6 volts rms (nominal) to 19 MHz, 3 to 5 volts rms to 65 MHz (measure with HP 410B ac probe).	Check A4V2, A4CR1, C3A, C3B, A7T2 (tank coil) and grid line to 12HG7's
4. Across A5R2 (turn off instrument and measure resistance)	100 ohms $\pm$ 10%	Check C3A, C3B, or A4V1 or A4V2 for shorts
<b>E. RF BUFFER</b>		
<p>PREPARATION: This procedure assumes the power supplies and RF Oscillator are operating correctly. (Disconnect short across A4R27, if installed in step D.) Measure voltage at:</p>		
1. Across filaments of A4V3, A4V4, A4V5, and A4V6	6.3 Vdc $\pm$ 10%	A4L1, A4L2 open; A4C5, A4C7 shorted, A4V3-A4V6 faulty
2. A4V3, V4, V5, and V6 (across heaters)	6.3 Vdc $\pm$ 10%	Same as 1
3. A4V3 and V4 (12HG7's)		
a. Test Points 1 & 2	+220 Vdc (nominal)	Check A4R37-A4R40, A4C23, A4C24
b. Pin 8	+180 Vdc (nominal)	Check A4R38, A4R40, A4C23, and A4C24
c. Test Points 3 & 4	+0 Vdc (nominal)	Check A4R29, A4R30, A4R31, A4R32, A4C19, A4C20, and triode section of A4V1
d. Pin 1	+3.75 Vdc (nominal)	Check A4R33, A4R34, A4R35, and A4C22
<b>F. RF AMPLIFIER, DIFFERENTIAL AMPLIFIER, AND MODULATOR</b>		
<p>PREPARATION: This procedure assumes that the power supplies, RF Oscillator, and RF Buffer are operating correctly. Measure voltage at:</p>		
1. Junction of R8 and R9	+295 Vdc $\pm$ 10%	A1L8, R9 open; C7A, C7B, A4C25 shorted
2. A4V8 (6AW8)		
a. Test Point 8	+3.0 Vdc	A4R18, A4CR2 faulty
b. Pin 2	0 to 3.5 Vdc as R5 is rotated	A4R17, A9R1, A1R57, A1R60, A1R61, A1R62 faulty
c. Pin 9	+90 Vdc (nominal)	A4R22, R21, A4R25, A4R26, A4R27, A4V8 faulty
d. Pin 3	+150 Vdc (nominal)	A4C16, A4C17, A4R19, A4R20, A4R21, A4V7
e. Pin 8	+43 Vdc (nominal)	Same as c.

Table 5-6. Troubleshooting Chart (Cont'd)

Measure	Normal Indication	Possible Cause of Malfunction
<b>F. RF AMPLIFIER, DIFFERENTIAL AMPLIFIER, AND MODULATOR (CONT'D)</b>		
1. Test Point B	0 to +3.4 Vdc as R5 (VERNIER) is rotated	A4C27, A4C26, CR1, A4CR3, A4R49, A4R50, A4R51, A4R52, A4V8
3. A4V9 (12B4)		
a. Test point 6	-10 to -25 Vdc as R5	A4C18, A4R22, R21, A4R25, A4R26, A4R27, A4V7 or A4V8
b. Pin 9	112 Vdc (nominal)	A4R28, A4V5, A4V6, A4V9
4. A4V5 and V6 (12HG7's)		
a. Test point 5	+300 Vdc (nominal)	Shorted C9A, C9B; open turret transformer; or contacts on turret
b. Pin 8	+300 Vdc (nominal)	Check A4C3, C7, A4C25, C9, R9
c. Pin 2	+104 Vdc (nominal). If this voltage is incorrect the RF buffer or oscillator is not functioning properly.	A4R41, A4R42, A4L6, A4L7, A4V3, A4V4, triode section of A4V1
d. Pin 1	+112 Vdc (nominal)	A4R46, A4R48, check voltage on pin 9, A4V9
5. Test point 18	6 volts rms (nominal) with 1 VOLT output level. Varies from 0 to 6 volts rms as VERNIER is rotated.	Check A4V5 and A4V6 plate voltage and output voltages
<b>NOTES</b>		
<p>If a sharp drop (hole) occurs in power output level, or a sharp increase (peak) occurs in RF Oscillator or RF Amplifier current as frequency dial is tuned, check shorting fingers in turret.</p> <p>If resistor R9 burns out, check for shorted tuning capacitor C9A, C9B, or A4C36; open or shorted CR1, A4CR3; or shorted S4. If this condition affects one band only, check the turret contact and coil for that one band. If this condition persists on all bands, see Table 5-7.</p>		
<b>G. AUDIO OSCILLATOR</b>		
<p><b>PREPARATION:</b> This procedure assumes that the power supplies are operating correctly. Set MODULATION SELECTOR switch to INT. 1000... Adjust MODULATION AMPLITUDE control for 100%. Measure voltage at:</p>		
Measure	Normal AC Indication	Normal DC Indication
1. A1V5 (12AT7)		
a. Pin 1	3.7 volts rms	+160 Vdc
b. Pin 2	6.6 volts rms	0 Vdc

Table 5-6. Troubleshooting Chart (Cont'd)

Measure	Normal AC Indication	Normal DC Indication
<b>G. AUDIO OSCILLATOR (CONT'D)</b>		
c. Pin 3.	6.2 volts rms	+2.7 Vdc
d. Pin 6	80 volts rms	+290 Vdc
e. Pin 7	3.8 volts rms	0 Vdc
f. Pin 8	1.88 volts rms	+4.3 Vdc
2. T1 leads		
a. Green	20 volts rms	0 Vdc
b. Yellow	3 volts rms	0 Vdc
c. Blue	80 volts rms	+292 Vdc
<b>H. MODULATION MONITOR</b>		
<p><b>PREPARATION:</b> This procedure assumes that the power supplies and Audio Oscillator are operating correctly. Set MODULATION SELECTOR switch to INT. 1000. Adjust MODULATION AMPLITUDE control for 100%. Measure voltage at:</p>		
1. A1V9A (1/2 12AT7)		
Pin 2	2.8 volts rms	0 Vdc (approximate voltages)
Test Point 9	2.8 volts rms	+4.8 Vdc
<b>NOTE</b>		
<p>Diode A1CR4 prevents a high negative voltage developing at the cathode of A1V9A during warmup. Such a high voltage of reversed polarity would damage electrolytic capacitor A1C56. The high negative voltage could also be developed if the heater of A1V9 burned out or if the instrument were turned on with A1V9 removed. Diode A1CR5 is the detector for the modulation meter.</p> <p>Both diodes, A1CR4 and A1CR5, can be measured only out of the circuit. Forward resistance should be approximately 500 ohms. Back resistance should be greater than 100K ohms.</p>		
<b>I. CRYSTAL CALIBRATOR</b>		
<p><b>PREPARATION:</b> This procedure assumes that the power supplies are operating correctly. Set CRYSTAL CALIBRATOR switch to 1 MC. Measure voltage at:</p>		
Measure	Normal Indication	Possible Cause of Malfunction
1. A2Q5 (base)	+16 Vdc	A2Y1, A2Q1, A2Q2 faulty
2. A2CR4 (cathode)	+15.5 Vdc	A2Q5, A2CR4, A2R17 faulty
Set CRYSTAL CALIBRATOR switch to 100 KC		
3. A2CR4 (cathode)	+13 Vdc	A2Q3, A2Q4, A2CR1, A2CR2, A2CR3, A2R10, A2R11, A2R12 faulty

Table 5-6. Troubleshooting Chart (Cont'd)

Measure	Normal Indication	Possible Cause of Malfunction
<b>I. CRYSTAL CALIBRATOR (CONT'D)</b>		
4. A2Q6 (base)	+10 Vdc	A2T1, A2C8, A2C9, A2C11, A3CR6, A2CR7, A2R23 faulty
5. A1V9B (1/212AT7)		
a. Pin 7	-0.7 Vdc	A2CR8, A2CR9, A2C12, A2C13, A2Q6 faulty
b. Test point 10	+111 Vdc	A1R45, A1V9 faulty

Table 5-7. Troubleshooting the Feedback Loop

<p><b>SYMPTOM.</b> No output on all ranges, or A4R9 (100 ohms) burns out on all ranges.</p> <p><b>PREPARATION.</b> This procedure assumes that:</p> <ol style="list-style-type: none"> <li>The +25.6 volt, -200 volt, and +300 volt supplies are functioning properly.</li> <li>All heater voltages in the RF chassis measure the correct value.</li> <li>All tubes and transistors have been checked.</li> <li>The Oscillator is working properly on all bands and gives approximate voltages listed in Table V-6, Part D.</li> </ol>	<p>e. The tuning capacitor or its leads are not short circuited.</p> <p><b>PROCEDURE.</b> Unless otherwise noted all measurements are made at 115 volts rms, 60-hertz line, with the Signal Generator on CW.</p> <p>Proceed from step to step. Rectify any troubles before proceeding to the next step. Measurements are made with an Hewlett Packard Model 410B VTVM and Model 428A Clip-On Milliammeter.</p> <p>E = dc voltages; e = ac voltages; I = current.</p>																																				
<b>Procedure</b>	<b>Observe or Measure</b>																																				
<ol style="list-style-type: none"> <li>Disable the feedback by connecting pin 2 of A4V9 to -200 volts by shorting A4R27 (215K).</li> <li>Connect a series combination of a fixed 5000-ohm, 5-watt and a variable 2000-ohm, 2-watt resistor from pin 9 of A4V9 (12B4A) to ground. Terminate output with 50-ohm load. Adjust variable resistor to obtain 1 volt at 1 MHz.</li> <li>Repeat Procedure 2 for bands 1, 2, 4, 5 and 6</li> </ol>	<p>This bias should cutoff V9. There should be no current through R9. Check with Hewlett-Packard Model 428B.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">A4V9 (12B4A)</td> <td style="width: 30%;">pin 1 to ground</td> <td style="width: 40%;">I<sub>k</sub> is approximately 19 mA</td> </tr> <tr> <td>A4R28</td> <td>bands 1 to 5</td> <td>I is approximately 5.6 mA</td> </tr> <tr> <td></td> <td>band 6</td> <td>I is approximately 0 mA</td> </tr> <tr> <td>A4V5 or A4V6 (12HG7)</td> <td>pin 1 to ground</td> <td>e is approximately 2.0 Vrms</td> </tr> <tr> <td></td> <td>pin 1 to 2</td> <td>E is approximately -14 Vdc</td> </tr> <tr> <td></td> <td>pin 8 to ground</td> <td>E is approximately +295 Vdc</td> </tr> <tr> <td></td> <td>pin 7 to ground</td> <td>E is approximately +295 Vdc</td> </tr> <tr> <td>Drop across A4R46 or A4R48</td> <td></td> <td>E is approximately 0.15 Vdc</td> </tr> <tr> <td>CR1 (anode)</td> <td></td> <td>e is approximately 5.7 Vrms</td> </tr> <tr> <td>A4CR3 (cathode)</td> <td></td> <td>E is approximately 7.1 Vdc</td> </tr> <tr> <td>A4V8 (6AW8)</td> <td>pin 7 to ground</td> <td>E is approximately 3.1 Vdc</td> </tr> <tr> <td></td> <td>pin 7 to ground</td> <td>e is approximately 0 Vrms</td> </tr> </table> <p>Check with data listed in Table 5-6.</p> <p>Data for CR1, CR2 and V8 for this test are same as listed in procedure 2.</p>	A4V9 (12B4A)	pin 1 to ground	I <sub>k</sub> is approximately 19 mA	A4R28	bands 1 to 5	I is approximately 5.6 mA		band 6	I is approximately 0 mA	A4V5 or A4V6 (12HG7)	pin 1 to ground	e is approximately 2.0 Vrms		pin 1 to 2	E is approximately -14 Vdc		pin 8 to ground	E is approximately +295 Vdc		pin 7 to ground	E is approximately +295 Vdc	Drop across A4R46 or A4R48		E is approximately 0.15 Vdc	CR1 (anode)		e is approximately 5.7 Vrms	A4CR3 (cathode)		E is approximately 7.1 Vdc	A4V8 (6AW8)	pin 7 to ground	E is approximately 3.1 Vdc		pin 7 to ground	e is approximately 0 Vrms
A4V9 (12B4A)	pin 1 to ground	I <sub>k</sub> is approximately 19 mA																																			
A4R28	bands 1 to 5	I is approximately 5.6 mA																																			
	band 6	I is approximately 0 mA																																			
A4V5 or A4V6 (12HG7)	pin 1 to ground	e is approximately 2.0 Vrms																																			
	pin 1 to 2	E is approximately -14 Vdc																																			
	pin 8 to ground	E is approximately +295 Vdc																																			
	pin 7 to ground	E is approximately +295 Vdc																																			
Drop across A4R46 or A4R48		E is approximately 0.15 Vdc																																			
CR1 (anode)		e is approximately 5.7 Vrms																																			
A4CR3 (cathode)		E is approximately 7.1 Vdc																																			
A4V8 (6AW8)	pin 7 to ground	E is approximately 3.1 Vdc																																			
	pin 7 to ground	e is approximately 0 Vrms																																			

Table 5-7. Troubleshooting the Feedback Loop (Cont'd)

Procedure	Observe or Measure		
<p>4. Adjust the variable resistor for 3.1 Vdc at pin 7 of A4V8. Set R5 (VERNIER) fully counterclockwise.</p>	<p>A4V8 (6AW8)</p>	<p>pins 1 and 6 pin 2 pin 3 pin 4 pin 5 pin 7 pin 8 pin 9</p>	<p>E is approximately +3.0 Vdc E is approximately 0 Vdc E is approximately +60 Vdc E is approximately 0 Vdc E is approximately +6.6 Vdc E is approximately +1.2 Vdc E is approximately +80 Vdc E is approximately +10 Vdc</p>
<p>5. Turn R5 (VERNIER) fully clockwise.</p>	<p>A4V7 (12AT7)</p>	<p>pins 1 and 6 pin 2 pin 3 pins 4 and 5 pin 7 pin 8 pin 9</p>	<p>E is approximately +295 Vdc E is approximately +50 Vdc E is approximately +54 Vdc E is approximately +19.5 Vdc E is approximately +135 Vdc E is approximately +143 Vdc E is approximately +13 Vdc</p>
<p>6. Disconnect jumper from pin 2 of 2A4V9 to -200 volts. Remove 5000- and 2900-ohm resistors.</p> <p>7. Realign the RF Oscillator and Amplifier Sections if any tubes or components have been replaced or altered.</p>	<p>A4V8 (6AW8)</p>	<p>pins 1 and 6 pin 2 pin 3 pin 6 pin 7 pin 8 pin 9</p>	<p>E is approximately +4.5 Vdc E is approximately +3.3 Vdc E is approximately +138 Vdc E is approximately +4.5 Vdc no voltage change as R5 is rotated E is approximately +54 Vdc E is approximately +42 Vdc</p> <p>The Signal Generator should be operating properly.</p> <p>See paragraphs on maximum carrier and modulation zero (5-44), carrier zero (5-42), modulation meter (5-46) and output meter (5-48) adjustments.</p>

Table 5-8. Etched Circuit Soldering Equipment

Item	Use	Specification	Item Recommended
Soldering Tool	Soldering Unsoldering	Wattage rating: 37.5 Tip Temp: 750-800°F Tip Size: 1/8" OD	Ungar #776 Handle with Ungar #1237 Heating Unit
Soldering Tip,	Soldering	Shape: chisel	Ungar #PL113
General Purpose	Unsoldering	Size: 1/8"	
De-soldering aid	Unsoldering multi-connection components (e.g., tube sockets)	Suction device to remove molten solder from connection	Soldapult by the Edsyn Company, Arleta, California
Resin (flux) solvent	Remove excess flux from soldered area before application of protective coating	Must not dissolve etched circuit base board material or conductor bonding agent	Freon Acetone Lacquer Thinner Isopropyl Alcohol (100% dry)
Solder	Component replacement Circuit board repair Wiring	Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred	
Protective Coating	Contamination, corrosion protection after soldering	Good electrical insulation, corrosion-prevention properties	Krylon R #1302*  Humiseal Protective Coating, Type 1B12 by Columbia Technical Corp. Woodside 77, New York
*Krylon, Inc., Norristown, Pennsylvania			

**5-70. COMPONENT REPLACEMENT.**

- a. Remove defective component from circuit board.
- b. Remove solder from mounting holes using a suction desoldering aid (Table 5-8) or wooden toothpick.
- c. Shape leads of replacement component to match mounting hole spacing.
- d. Insert component leads into mounting holes, and position component as original was positioned. **DO NOT FORCE LEADS OF REPLACEMENT COMPONENT INTO MOUNTING HOLES.** Sharp lead ends may damage plated-through conductor.

**Note**

Axial lead components, such as resistors and tubular capacitors, can be replaced without unsoldering. Clip leads near body of defective component, remove component and straighten leads left in board. Wrap leads of replacement component one turn around original leads. Solder wrapped connection, and clip off excess lead.

**5-71. TUBE SOCKET REPLACEMENT.** There are three ways to remove a tube socket from the etched circuit board:

- a. Cut terminals attaching socket to circuit board, remove socket, and unsolder remaining terminal pieces individually.

- b. Using long nose pliers, break insulating material of socket away from its metal connectors, then unsolder connectors from board individually.

- c. Use a special soldering iron tip designed to heat all socket connections simultaneously and remove socket as a unit; or use a suction device (Table 5-8) to desolder all connections and remove socket.

**5-72. ETCHED CONDUCTOR REPAIR.** A broken or burned section of conductor can be repaired by bridging the damaged section with a length of tinned copper wire. Allow adequate overlap and remove any varnish from etched conductor before soldering wire into place.

**5-73. TRANSISTOR REPLACEMENT.** Replace transistors as follows:

- a. Do not apply excessive heat. See Table 5-8 for soldering tool specifications.

- b. Use a heat sink such as pliers or hemostat between transistor body and hot soldering iron.

c. When installing a replacement transistor, ensure sufficient lead length to dissipate heat of soldering by maintaining about the same length of exposed lead as used for original transistor.

#### 5-74. DRIVE CABLE ASSEMBLY REPLACEMENT.

5-75. Replacement of the drive cable assembly (HP Stock Number 606B-18) requires only the removal of the old drive cable assembly and winding the replacement drive cable onto the idler shaft, tuner pulley, and drive pulley. An adjustment of the drive cable assembly is made to obtain proper rotation of the frequency dial and tuner plates. No special tools are required. Following is the installation procedure:

a. Disconnect power. Remove cabinet and RF generator shield.

b. Turn instrument upside down and remove the aluminum shielding plate between the RF Oscillator and RF Amplifier.

c. Refer to Figure 5-12. Loosen the two setscrews in spring load nut and the one setscrew in end of drive pulley.

d. Remove old drive cable assembly.

e. Push end of replacement drive cable nearest drive collar over tuner pulley. Press drive collar into notch in tuner pulley.

f. Wrap short end of drive cable around tuner pulley as shown in Figure 5-12. Attach end of cable to floating collar on spring-loaded idler shaft with 4-40 x 1/4 inch round-head machine screw.

g. Wind two full turns of drive cable onto floating collar. Be sure spring load nut is positioned so that one of the setscrews is accessible. Place a 9/16-inch open-end wrench over spring load nut to prevent its turning.

h. Wrap one and a half turns of drive cable around drive pulley as shown in Figure 5-12.

i. Rotate spring-loaded idler shaft so that No. 4-40 screw hole in spring-loading collar is accessible.

j. Attach long end of drive cable to spring loading collar using the 4-40 x 1/4 round-head machine screw.

k. Place screwdriver in slot at end of spring-loaded idler shaft and rotate shaft counterclockwise to remove slack in drive cable. Continue to hold spring-load nut with end wrench.

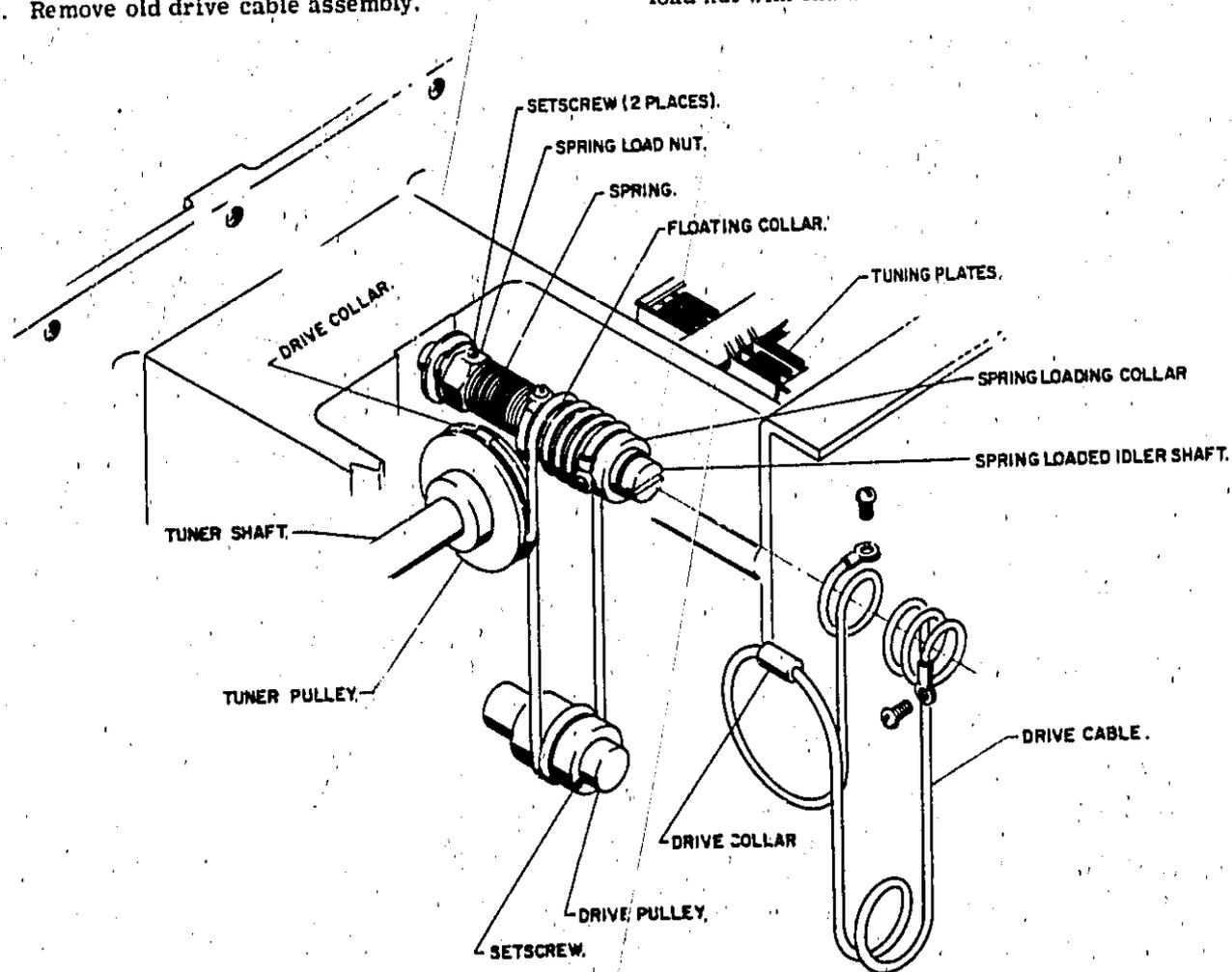


Figure 5-12. Installation of Drive Cable Assembly

m. Tighten one setscrew in spring-load nut and remove end wrench.

n. Turn frequency dial to approximately mid-range and seat cable in slot on drive pulley.

p. Holding spring-load nut with 9/16 inch open-end wrench, loosen the previously tightened setscrew in spring-load nut and turn spring-loaded idler shaft counterclockwise to a torque of approximately 7 inch-pounds. Retighten setscrew and remove wrench.

q. Hold frequency dial against its low frequency stop. Slip drive cable on drive pulley by turning spring-loaded idler shaft with screwdriver. Turn idler shaft until both tuning capacitors are fully meshed.

r. Tighten the 4-40 Allen setscrew in drive pulley.

s. Rotate frequency dial through its range and observe position of drive cable.

t. Check dial calibration as outlined in paragraph 5-12.

u. Replace aluminum shielding plate between RF Oscillator and RF Amplifier.

v. Turn instrument right-side up. Replace RF generator shield and cabinet.

#### 5-76. TURN-ON PROCEDURE AFTER REPAIR.

5-77. Be sure to check for shorts in tuning capacitors A4C3 and A4C9 with an ohmmeter after repair and before turning on the instrument. Solder splashes may occur which short these capacitors when repairing other parts of the instrument. If the instrument is turned on with these capacitors shorted, resistors A4R2 or A4R9 may be damaged.

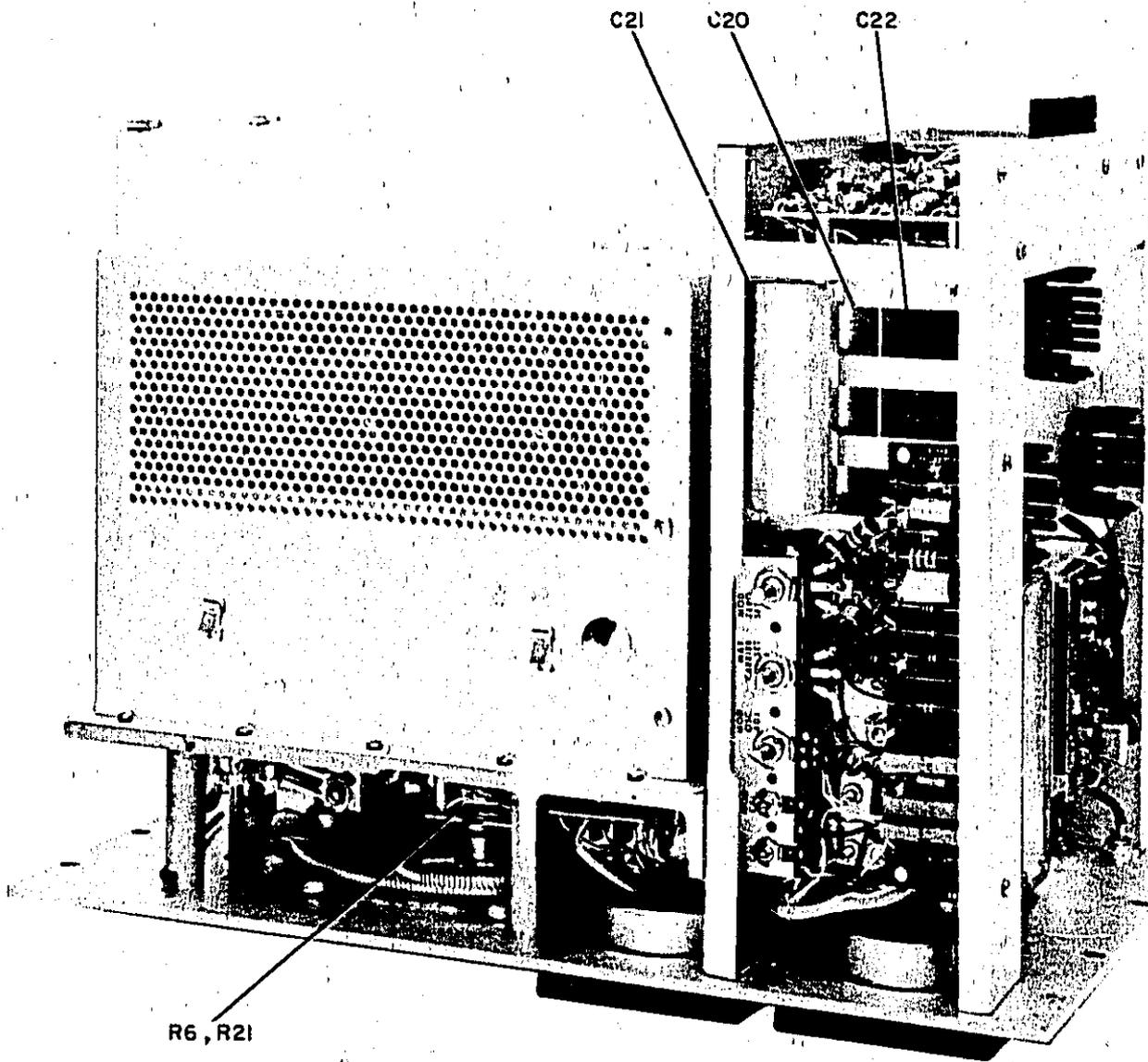


Figure 5-13. Interior View Showing Locations of Unlabeled Chassis Components

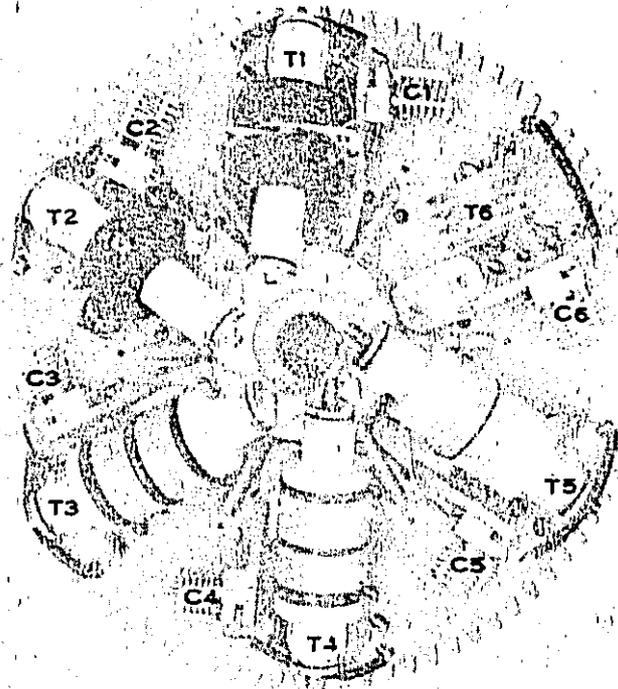


Figure 5-14. Oscillator Turret Assembly A7

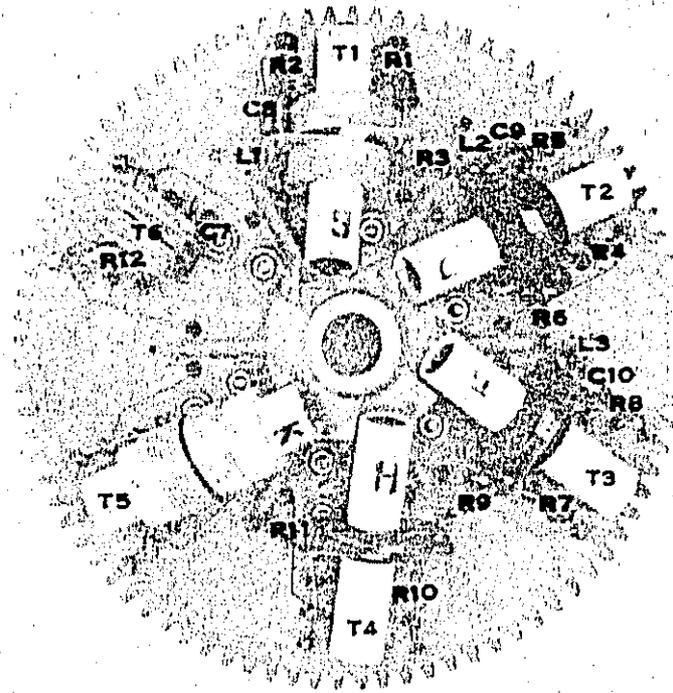


Figure 5-15. Amplifier Turret Assembly A8

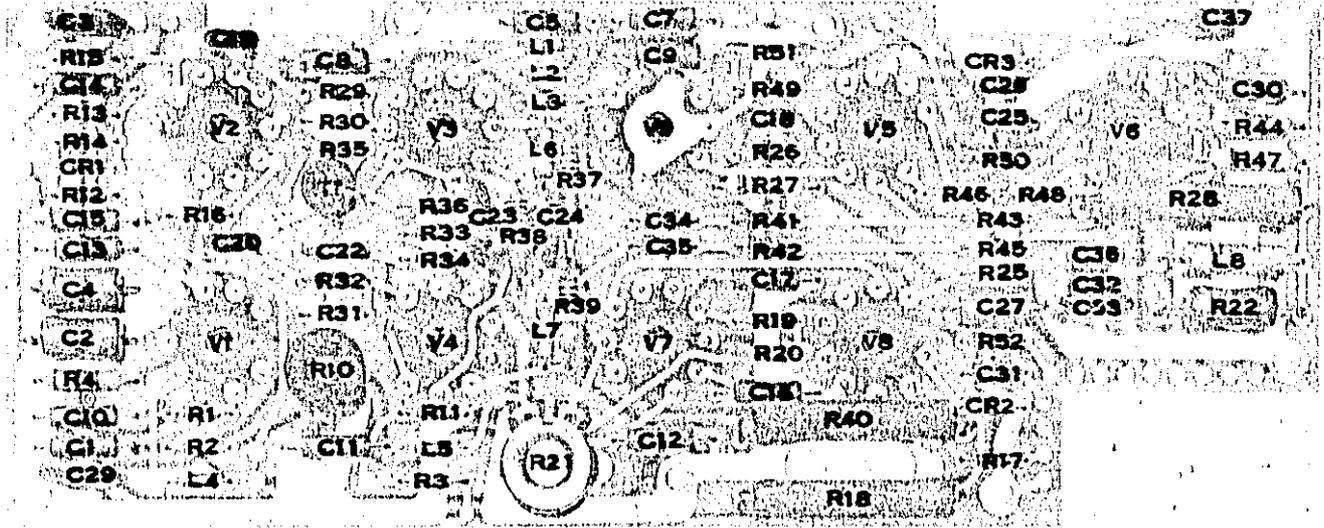


Figure 5-16. Etched Circuit A4 Oscillator Amplifier Assembly Component Locations

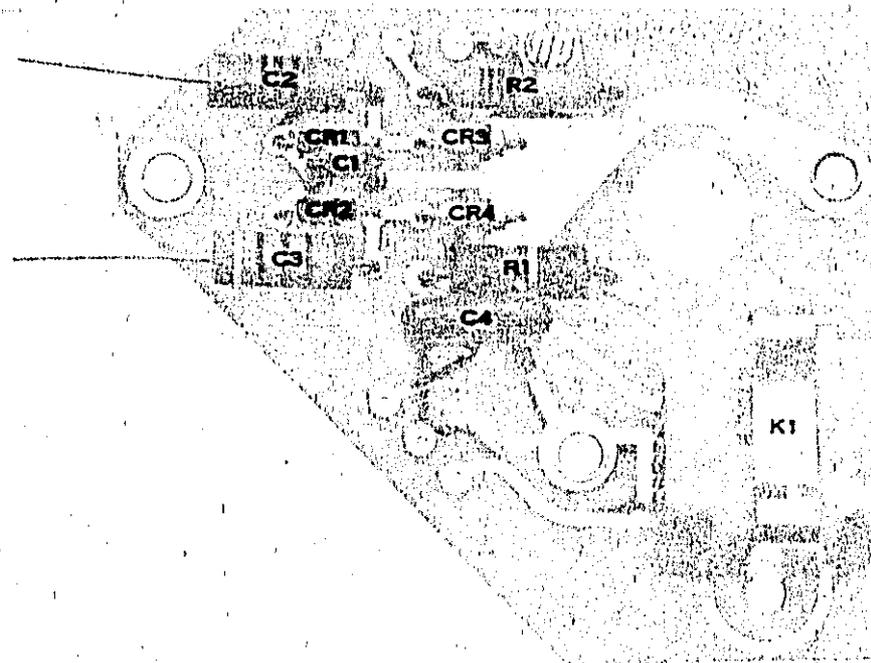


Figure 5-17. Etched Circuit A5 Varactor Control Assembly Component Locations

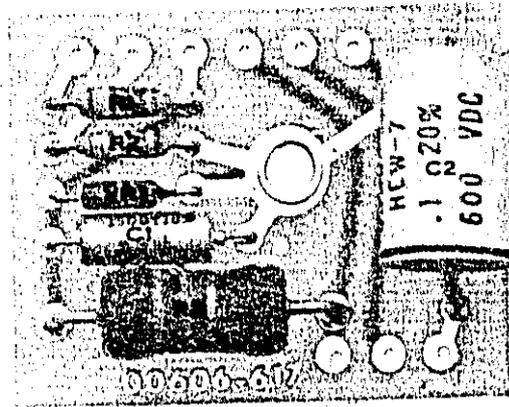


Figure 5-18. Etched Circuit A6 ΔF Assembly Component Locations

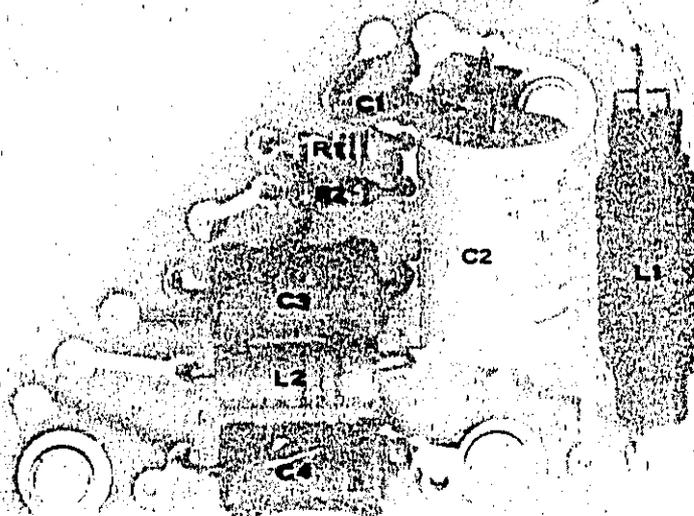


Figure 5-19. Etched Circuit A3 Control Input Assembly Component Locations

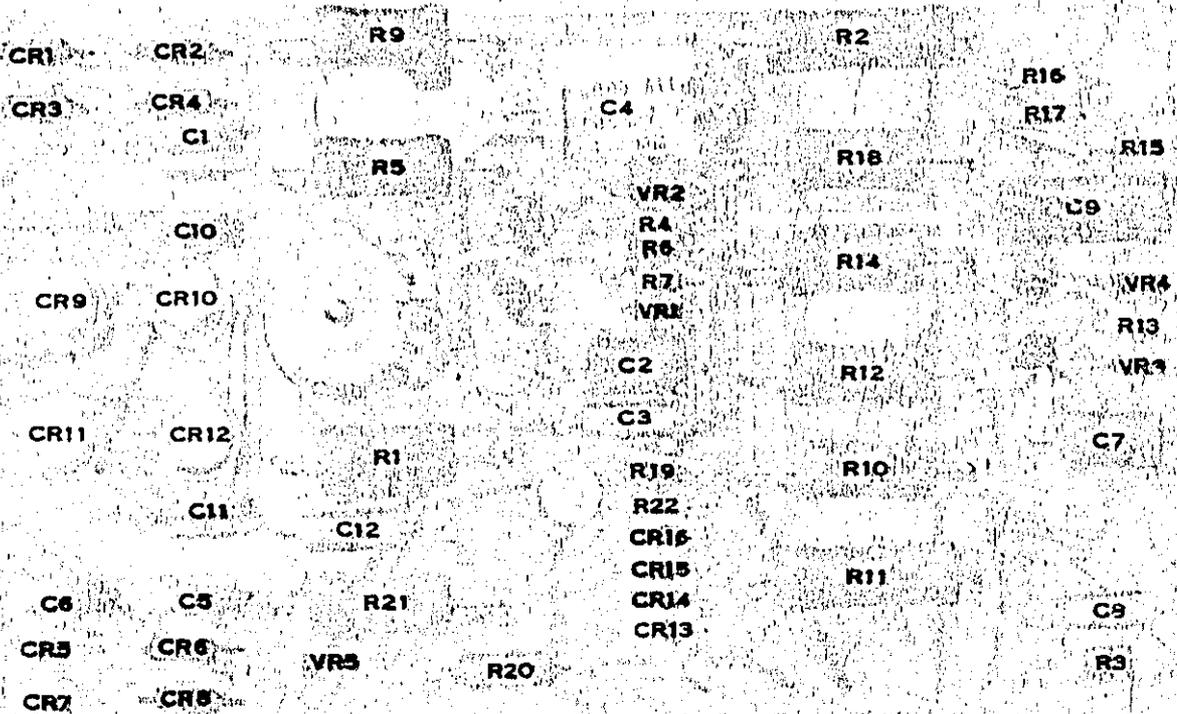
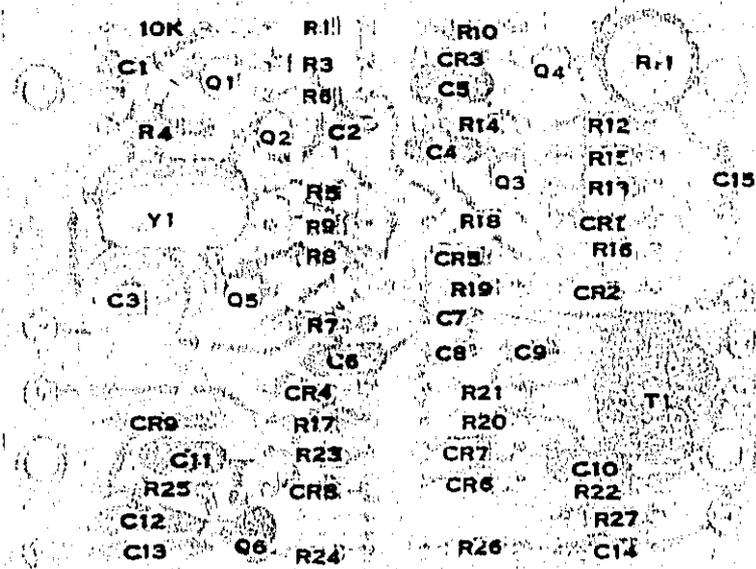
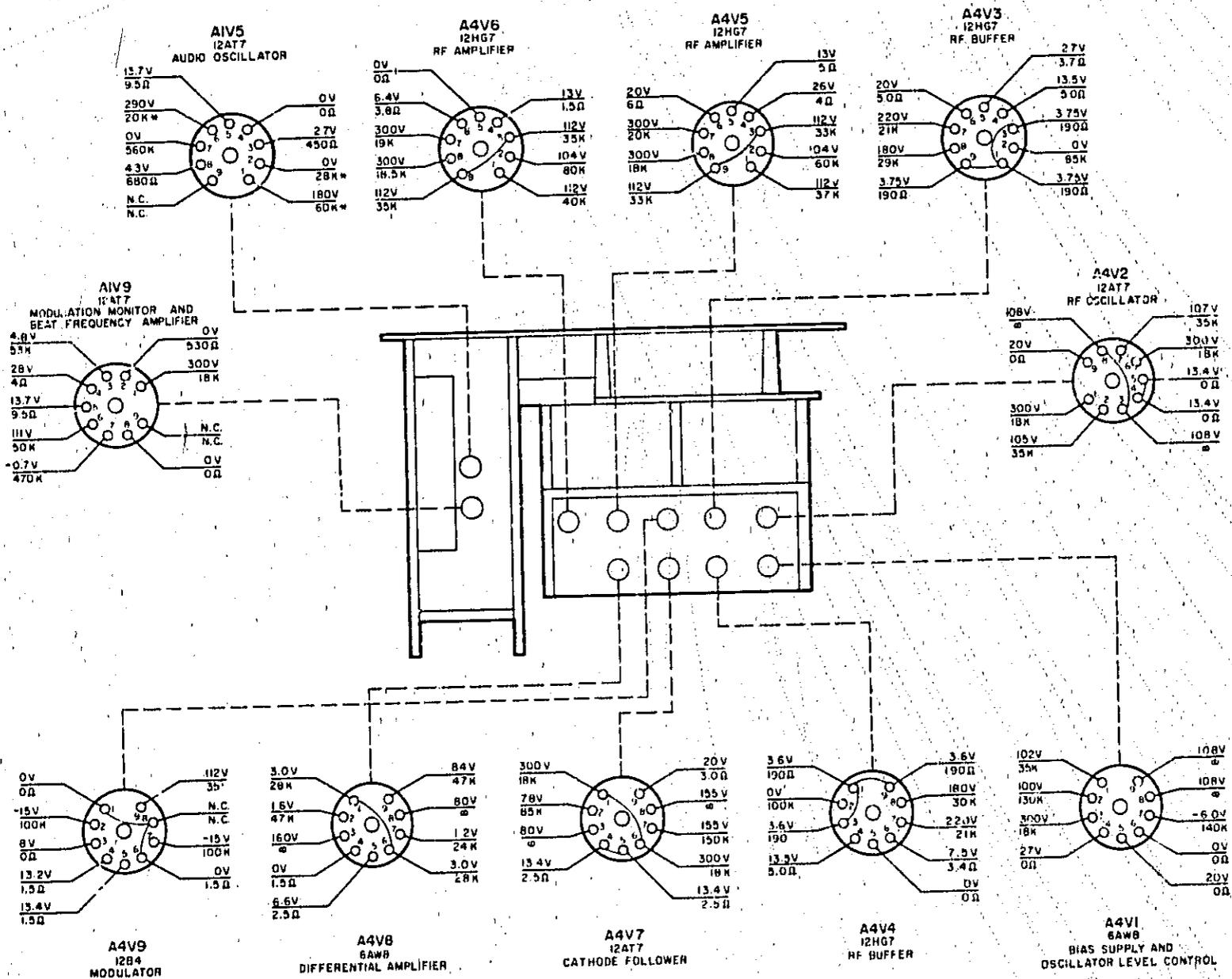


Figure 5-20. Etched Circuits A2 Calibrator Assembly (above) and A11 Power Supply Assembly (below) Component Locations



\* MODULATION SELECTOR SWITCH S1 SET TO INT.

Figure 5-21. Tube Socket Voltage and Resistance Measurements

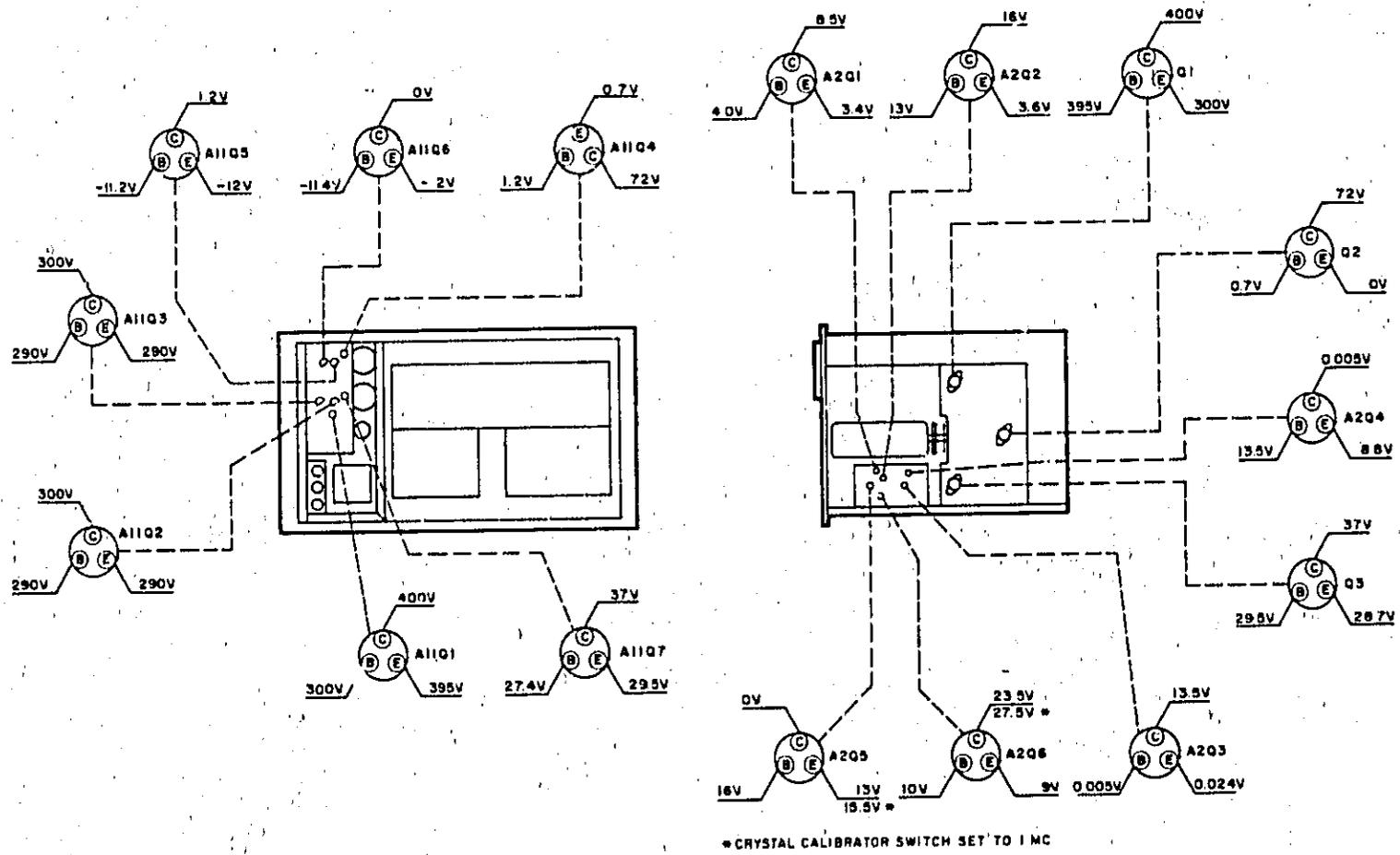


Figure 5-22. Transistor Voltage Measurements

1. Resistance in ohms, inductance in microhenry, capacitance in picofarads unless otherwise indicated
2.  screwdriver adjust  
 panel control
3.  front panel designation
4.  etched circuit borderline  
 signal path  feedback path
5.  CW indicates movable contact position at clockwise rotation limit of control shaft (shaft viewed from knob or slotted end)
6. \*denotes a factory-selected value. Typical value shown. Part may be omitted.
7.  = test point
8.  Voltage regulator (breakdown) diode
9. Relays shown in condition prevailing during normal instrument operation
10. Unless otherwise noted, voltage and resistance measurements taken with controls set as follows:

RANGE switch - Band 5

VERNIER (frequency) control - 0

MODULATION SELECTOR switch - 1000~

MODULATION AMPLITUDE control - 50%

ATTENUATOR switch - Any setting except 3.0 VOLTS

VERNIER (attenuator) control - Adjusted for 0 DBM

CRYSTAL CALIBRATOR switch - 100KC

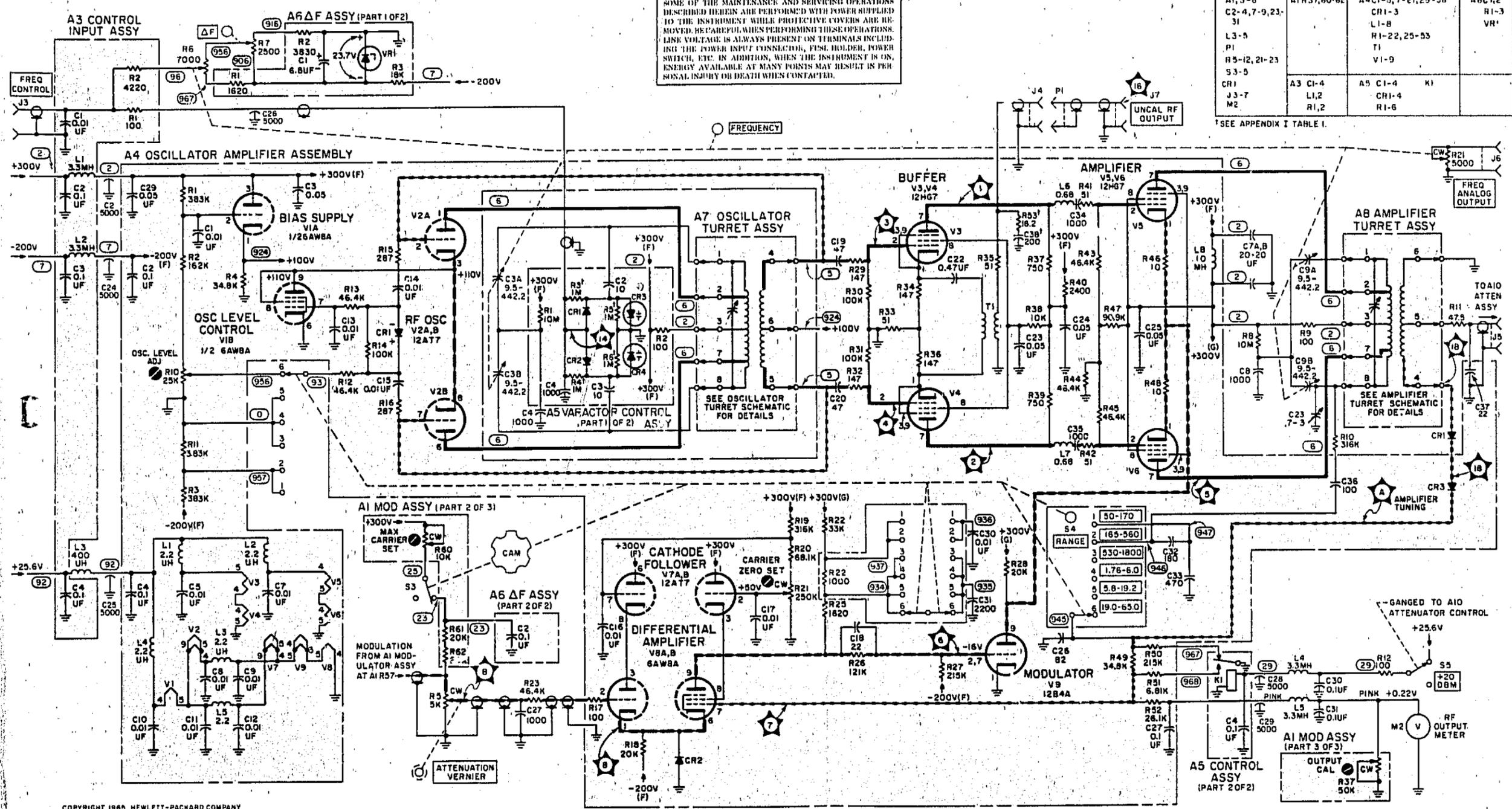
Figure 5-23. Schematic Diagram Notes

**WARNING**  
 SOME OF THE MAINTENANCE AND REPAIRING OPERATIONS DESCRIBED HEREIN ARE PERFORMED WITH POWER SUPPLIED TO THE INSTRUMENT WHILE PROTECTIVE COVERS ARE REMOVED. BE CAREFUL WHEN PERFORMING THESE OPERATIONS. LINE VOLTAGE IS ALWAYS PRESENT ON TERMINALS INCLUDING THE POWER INPUT CONNECTOR, FUSE HOLDER, POWER SWITCH, ETC. IN ADDITION, WHEN THE INSTRUMENT IS ON, ENERGY AVAILABLE AT MANY POINTS MAY RESULT IN PERSONAL INJURY OR DEATH WHEN CONTACTED.

REFERENCE DESIGNATIONS

A1, 3-8	A1R37, 60-62	A4C1-5, 7-27, 29-38	A6C1, 2
C2-4, 7-9, 23-31		CR1-3	RI-3
L3-5		L1-8	VR1
P1		RI-22, 25-53	
R5-12, 21-23		T1	
S3-5		VI-9	
CR1	A3 C1-4	A5 C1-4	K1
J3-7	L1, 2	CR1-4	
M2	RI, 2	RI-6	

SEE APPENDIX I TABLE I.



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 6049 246 GEN.

Figure 5-24. RF Generator and Modulator Circuits Schematic Diagram

**WARNING**  
 SOME OF THE MAINTENANCE AND SERVICING OPERATIONS DESCRIBED HEREIN ARE PERFORMED WITH POWER SUPPLIED TO THE INSTRUMENT WHILE PROTECTIVE COVERS ARE REMOVED. BE CAREFUL WHEN PERFORMING THESE OPERATIONS. LINK VOLTAGE IS ALWAYS PRESENT ON TERMINALS INCLUDING THE POWER INPUT CONNECTOR, FUSE HOLDER, POWER SWITCH, ETC. IN ADDITION, WHEN THE INSTRUMENT IS ON, ENERGY AVAILABLE AT MANY POINTS MAY RESULT IN PERSONAL INJURY OR DEATH WHEN CONTACTED.

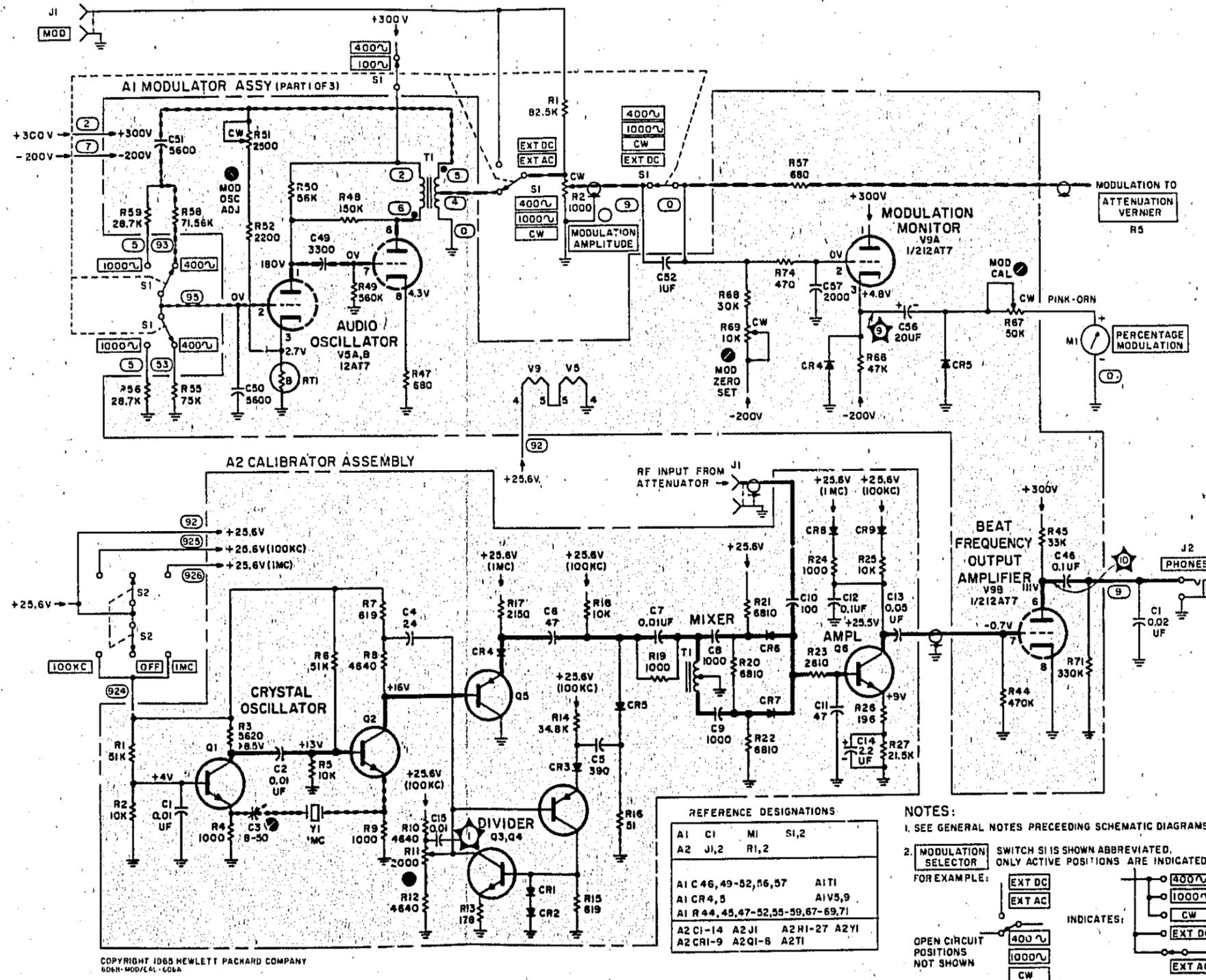
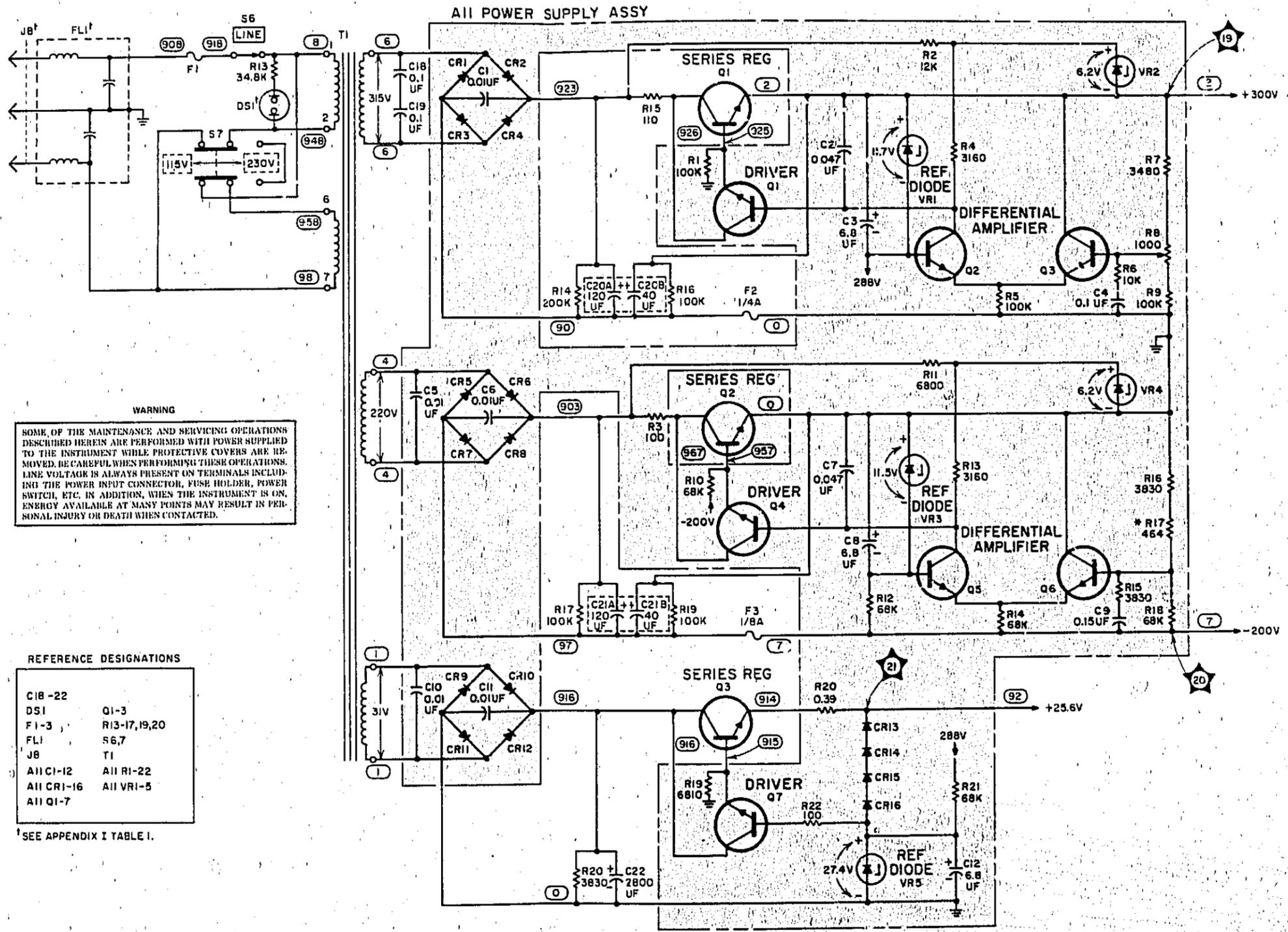


Figure 5-25. Modulator and Crystal Calibrator Circuits Schematic Diagram



**WARNING**

SOME OF THE MAINTENANCE AND SERVICING OPERATIONS DESCRIBED HEREIN ARE PERFORMED WITH POWER SUPPLIED TO THE INSTRUMENT WHILE PROTECTIVE COVERS ARE REMOVED. BE CAREFUL WHEN PERFORMING THESE OPERATIONS. LINE VOLTAGE IS ALWAYS PRESENT ON TERMINALS INCLUDING THE POWER INPUT CONNECTOR, FUSE HOLDER, POWER SWITCH, ETC. IN ADDITION, WHEN THE INSTRUMENT IS ON, ENERGY AVAILABLE AT MANY POINTS MAY RESULT IN PERSONAL INJURY OR DEATH WHEN CONTACTED.

**REFERENCE DESIGNATIONS**

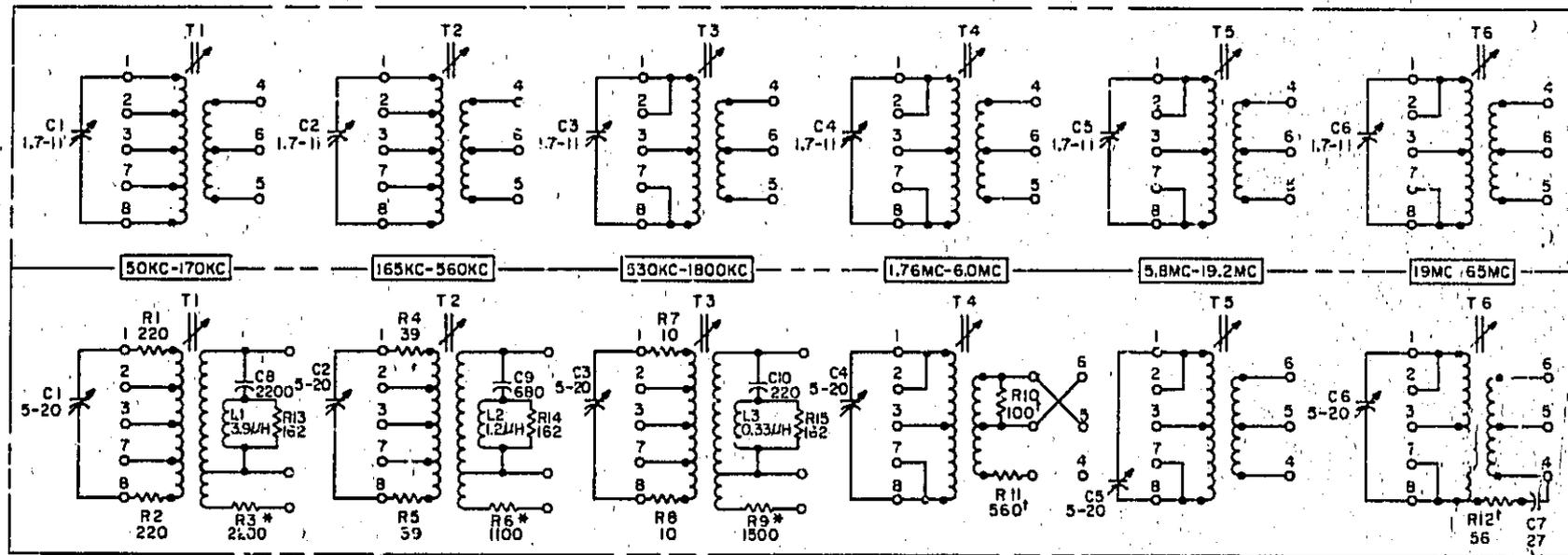
C18-22	Q1-3
DS1	R13-17, 19, 20
F1-3	S6, 7
FL1	T1
JB	All R1-22
All C1-12	All V1-5
All CR1-16	All Q1-7

†SEE APPENDIX I TABLE I.

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606B-PS-606A

Figure 5-26. Power Supply Schematic Diagram

A7 OSCILLATOR TURRET ASSEMBLY



A8 AMPLIFIER TURRET ASSEMBLY

REFERENCE DESIGNATIONS

A7	A8
A7C1-6	ABC1-10
A7T1-6	ABL1-3
	A3R1-12
	AJ T1-6

SEE APPENDIX I TABLE I.

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6069 TURRETS - 606A

Figure 5-27. Oscillator and Amplifier Turrets Schematic Diagram

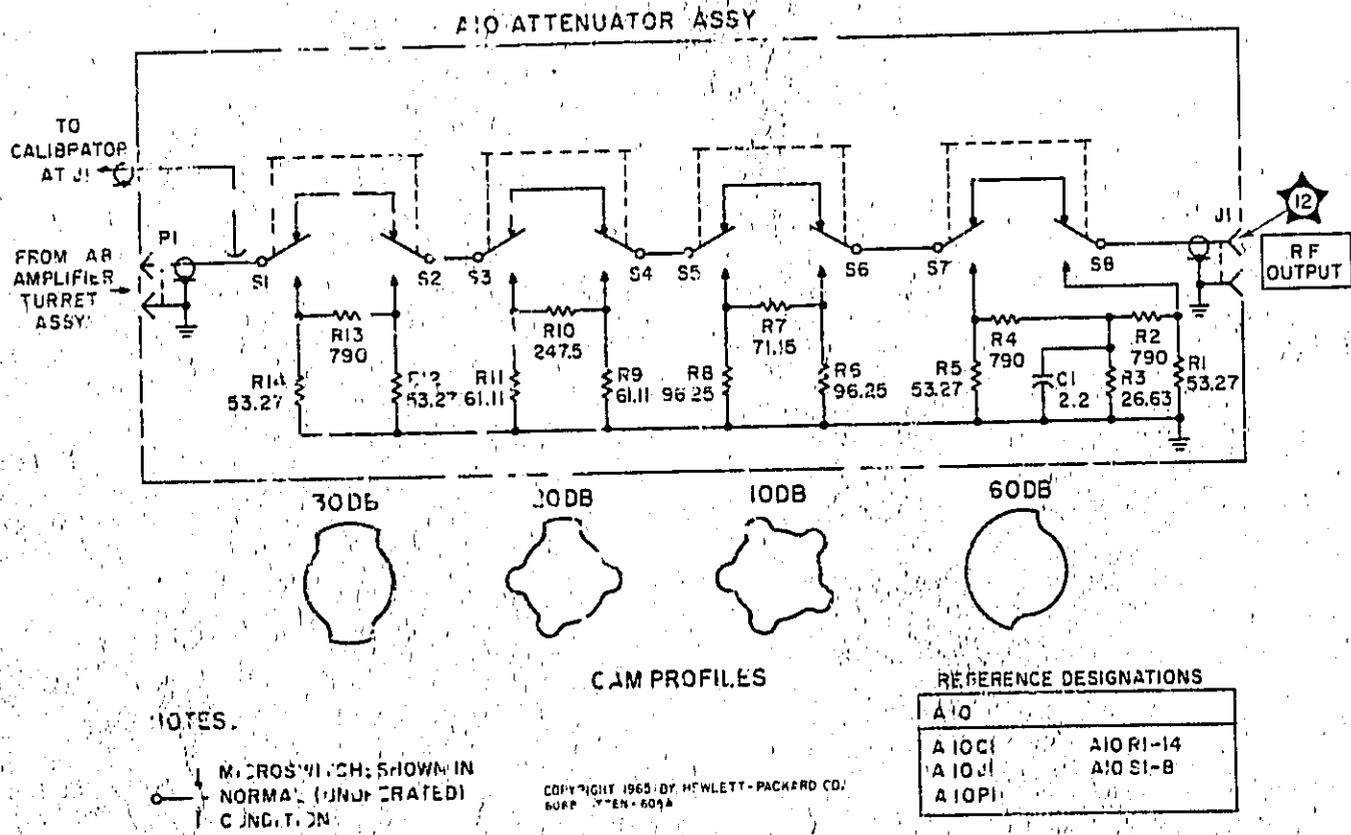
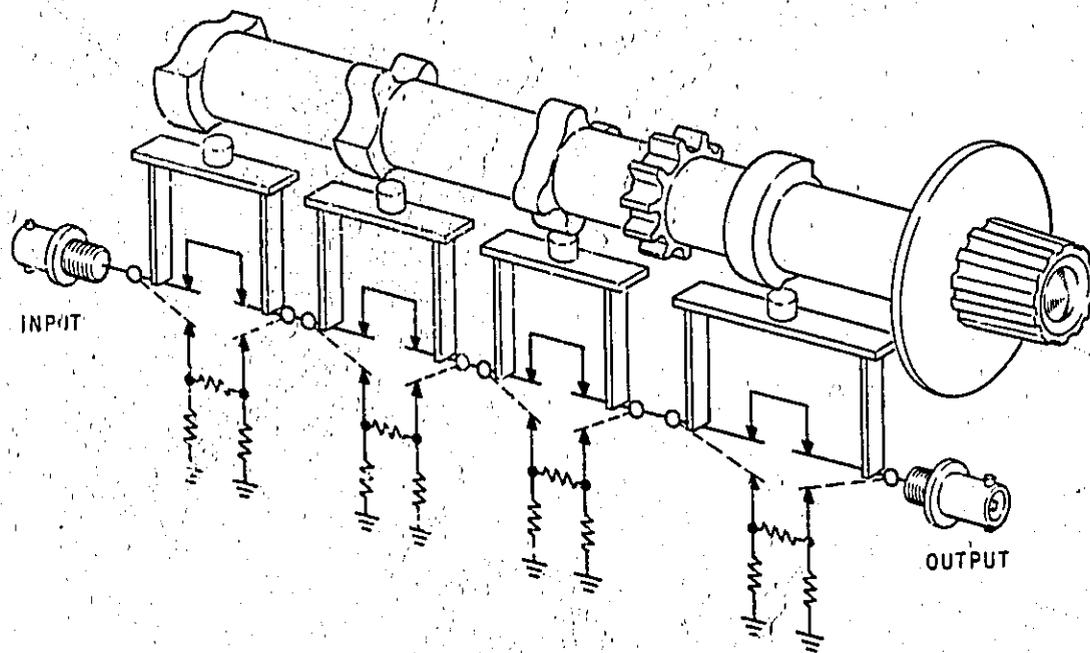


Figure 5-28 Output Attenuator Pictorial and Schematic Diagram

# **PARTS LIST**

## SECTION VI REPLACEABLE PARTS

### 6-1. INTRODUCTION

6-2. This section contains information for ordering parts. Table 6-1 lists abbreviations used in the parts list and throughout the manual. Table 6-2 lists all replaceable parts in reference designator order. Table 6-3 contains the names and addresses that correspond to the manufacturer's code number.

### 6-3. ABBREVIATIONS

6-4. Table 6-1 gives a list of abbreviations used in the parts list, schematics, and throughout the manual. In some cases, two forms of the abbreviation are given, one all capital letters and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

### 6-5. REPLACEABLE PARTS LIST

6-6. Table 6-2 is the list of replaceable parts and is organized as follows:

- a. Electrical assemblies and their components in alpha-numeric order by reference designation.
- b. Chassis-mounted parts in alpha-numeric order by reference designation.
- c. Miscellaneous parts.

- d. Illustrated parts breakdown.

The information given for each part consists of the following:

- a. The Hewlett-Packard part number.
- b. The total quantity (Qty) in the instrument.
- c. The description of the part.
- d. Typical manufacturer of the part in a five-digit code.
- e. Manufacturer code number for the part.

The total quantity for each part is given only once; at the first appearance of the part number in the list.

### 6-7. ORDERING INSTRUCTIONS

6-8. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate quantity required, and address the order to the nearest Hewlett-Packard office.

6-9. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATORS							
A	= assembly	F	= fuse	P	= plug	V	= vacuum tube, neon bulb, photocell, etc.
B	= motor	FL	= Filter	Q	= transistor	VR	= voltage regulator
BT	= battery	J	= jack	R	= resistor	W	= cable
C	= capacitor	K	= relay	RT	= thermistor	X	= socket
CP	= coupler	L	= inductor	S	= switch	Y	= crystal
CR	= diode	LS	= loud speaker	T	= transformer	Z	= tuned cavity, network
DL	= delay line	M	= meter	TB	= terminal board		
DS	= device signaling (lamp)	MK	= microphone	TP	= test point		
E	= misc electronic part	MP	= mechanical part	U	= integrated circuit		

ABBREVIATIONS							
A	= amperes	H	= henries	N/O	= normally open	RMO	= rack mount only
AFC	= automatic frequency control	HDW	= hardware	NOM	= nominal	RMS	= root-mean square
AMPL	= amplifier	HEX	= hexagonal	NPO	= negative positive zero (zero temperature coefficient)	RWV	= reverse working voltage
BFO	= beat frequency oscillator	HG	= mercury			S-B	= slow-blow
BE CU	= beryllium copper	HR	= hour(s)	NPN	= negative-positive-negative	SCR	= screw
BH	= binder head	Hz	= Hertz	NRFR	= not recommended for field replacement	SE	= selenium
BP	= bandpass	IF	= intermediate freq	NSR	= not separately replaceable	SECT	= section(s)
BRS	= brass	IMPG	= impregnated			SEMICON	= semiconductor
BWO	= backward wave oscillator	INCD	= incandescent	OBD	= order by description	SI	= silicon
		INCL	= include(s)	OH	= oval head	SIL	= silver
		INS	= insulation(ed)	OX	= oxide	SL	= slide
		INT	= internal	P	= peak	SPG	= spring
		K	= kilo = 1000	PC	= printed circuit	SPL	= special
CCW	= counterclockwise	LH	= left hand	PF	= picofarads = 10 <sup>-12</sup> farads	SST	= Stainless steel
CER	= ceramic	LIN	= linear taper	PH BRZ	= phosphor bronze	SR	= split ring
CMO	= cabinet mount only	LK WASH	= lock washer	PHL	= Phillips	STL	= steel
COEF	= coefficient	LOG	= logarithmic taper	PIV	= peak inverse voltage	TA	= tantalum
COM	= common	LPF	= low pass filter	PNP	= positive-negative-positive	TD	= time delay
COMP	= composition	M	= milli = 10 <sup>-3</sup>	P/O	= part of	TGL	= toggle
COMPL	= complete	MEG	= meg = 10 <sup>6</sup>	PORC	= polystyrene	THD	= thread
CONN	= connector	MET FLM	= metal film	POT	= potentiometer	TI	= titanium
CP	= cadmium plate	MET OX	= metallic oxide	PP	= peak-to-peak	TOL	= tolerance
CRT	= cathode-ray tube	MFR	= manufacturer	PT	= point	TRIM	= trimmer
CW	= clockwise	MHz	= mega Hertz	PWV	= peak working voltage	TWT	= traveling wave tube
DEPC	= deposited carbon	MINAT	= miniature			μ	= micro = 10 <sup>-6</sup>
DR	= drive	MOM	= momentary	RECT	= rectifier	VAR	= variable
ELECT	= electrolytic	MOS	= metalized substrate	RF	= radio frequency	VDCW	= dc working volts
ENCAP	= encapsulated	MTG	= mounting	RH	= round head or right hand	W/	= with
EXT	= external	MY	= "mylar"			W	= watts
F	= farads	N	= nano (10 <sup>-9</sup> )			WIV	= working inverse voltage
FH	= flat head	N/C	= normally closed			WW	= wirewound
FIL H	= Fililster head	NE	= neon			W/O	= without
FXD	= fixed	NI PL	= nickel plate				

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	00606-624	1	MODULATOR ASSY	28480	00606-624
A1	00606-603	1	WIRING HARNESS:MAIN	28480	00606-603
A1C1 - THRU A1C45 A1C46	0170-0022	4	NOT ASSIGNED CIFXO MY 0.1UF 20% 600VDCM	09134	TYPE 24
A1C47			NOT ASSIGNED		
A1C48			NOT ASSIGNED		
A1C49	0160-0003	1	CIFXO MY 0.0033 UF 10% 600VDCM	56289	106P3J296 PMO
A1C50	0140-0071	2	CIFXO MICA 5600PF 1% 500VDC	28480	0140-0071
A1C51	0140-0071		CIFXO MICA 5600PF 1% 500VDC	28480	
A1C52	0170-0018	1	CIFXO MY 1UF 5% 200VDCM	84411	TYPE 621M 10552
A1C53			NOT ASSIGNED		
A1C55			NOT ASSIGNED		
A1C56	0180-0063	1	CIFXO AL ELECT 20 UF +75-10% 25VDCM	56289	300206C025C02-05M
A1C57	0150-0023	1	CIFXO CER 2000 PF 20% 1000VDCM	56289	Z0C295A2-CDH
A1C81 - THRU A1C83 A1C84 A1C85	1410-0016	10	NOT ASSIGNED DIODE:GERMANIUM 100MA/0.85V 60PIV DIODE:GERMANIUM 100MA/0.85V 60PIV	93332 93332	02361 02361
A1C81 - THRU A1R36 A1R37 A1R38 - THRU A1R43 A1R44	2100-0141	2	NOT ASSIGNED REVAR COMP 50K OHM 20% LIN 1/4W	28480	2100-0141
A1R45	0687-4741	1	NOT ASSIGNED RIFXO COMP 470K OHM 10% 1/2W	01121	EB 4741
A1R45	0693-3331	1	RIFXO COMP 33K OHM 10% 2W	01121	HB 3331
A1R46			NOT ASSIGNED		
A1R47	0687-6811	1	RIFXO COMP 680 OHM 10% 1/2W	01121	EB 6811
A1R48	0687-1541	1	RIFXO COMP 150K OHM 10% 1/2W	01121	EB 1541
A1R49	0687-5641	1	RIFXO COMP 560K OHM 10% 1/2W	01121	EB 5641
A1R50	0690-5631	1	RIFXO COMP 56K OHM 10% 1W	01121	GB 5631
A1R51	2100-0067	1	REVAR COMP 2500 OHM 10% LIN 1/2W	28480	2100-0067
A1R52	0687-2221	2	RIFXO COMP 2200 OHM 10% 1/2W	01121	EB 2221
A1R53			NOT ASSIGNED		
A1R54			NOT ASSIGNED		
A1R55	0757-0856	1	RIFXO MET FLM 75-0K OHM 1% 1/2W	28480	0757-0856
A1R56	0698-3103	2	RIFXO MET FLM 28.7K OHM 1% 1/2W	28480	0698-3103
A1R57	0757-0816	1	RIFXO MET FLM 681 OHM 1% 1/2W	28480	0757-0816
A1R58	0757-0888	1	RIFXO MET FLM 71.5K OHM 1% 1/4W	28480	0757-0888
A1R59	0698-3103	1	RIFXO MET FLM 28.7K OHM 1% 1/2W	28480	0698-3103
A1R60	2100-0053	2	REVAR WM 10K OHM 20% LIN 2W	28480	2100-0053
A1R61	0771-0004	3	RIFXO MET FLM 20K OHM 10% 4W	28480	0771-0004
A1R62	0771-0005	1	RIFXO MET FLM 24K OHM 10% 4W	28480	0771-0005
A1R63			NOT ASSIGNED		
A1R64	0693-4731	1	RIFXO COMP 47K OHM 10% 2W	01121	HB 4731
A1R67	2100-0141		REVAR COMP 50K OHM 20% LIN 1/4W	28480	2100-0141
A1R68	0771-0007	1	RIFXO MET FLM 30K OHM 10% 4W	28480	0771-0007
A1R69	2100-0053		REVAR WM 10K OHM 20% LIN 2W	28480	2100-0053
A1R70			NOT ASSIGNED		
A1R71	0687-1341	1	RIFXO COMP 330K OHM 10% 1/2W	01121	EB 3341
A1R72 - THRU A1R73 A1R74 A1R75	0687-4711	1	NOT ASSIGNED RIFXO COMP 470 OHM 10% 1/2W	01121	EB 4711
A1R76	2140-0007	1	LAMP:INCANDESCENT 10W 250V	08806	0A/56-12V
A1T1	9120-0036	1	TRANSFORMER:AUDIO	28480	9120-0036
A1V1 - THRU A1V4 A1V5 A1V6 - THRU	1932-0027	3	NOT ASSIGNED ELECTRON TUBE:12AT7 DUAL TRIODE	33173	12AT7
A1V8			NOT ASSIGNED		
A1V9	1932-0027		ELECTRON TUBE:12AT7 DUAL TRIODE	33173	12AT7
A2	00606-603	2	HAND ASSY:CRYSTAL CALIBRATION	28480	00606-603
A2	0380-0059	1	SPACER:SLEEVE BRASS FOR #6 NDM	00866	080
A2C1	0160-2055	4	CIFXO CER 0.01 UF +80-20% 100VDCM	56289	C023F101F103ZS22-CDH
A2C2	0160-2055		CIFXO CER 0.01 UF +80-20% 100VDCM	56289	C023F101F103ZS22-CDH
A2C3	0130-0017	1	CIFXO CER 0-50 PF	28480	0130-0017
A2C4	0160-0196	1	CIFXO MICA 24PF 5% 300VDCM	04062	ADM156240J35
A2C5	0140-0200	1	CIFXO MICA 390 PF 5%	72136	ADM156391-J3C
A2C6	0140-0204	4	CIFXO MICA 47 PF 5% NPO 500VDCM	14655	ADM156470J9C
A2C7	0160-2055		CIFXO CER 0.01 UF +80-20% 100VDCM	56289	C023F101F103ZS22-CDH
A2C8	0150-0050	2	CIFXO CER 1000 PF +80-20% 100VDCM	56289	C0678102E102Z526-CDH
A2C9	0160-0050		CIFXO CER 1000 PF +80-20% 100VDCM	56289	C0678102E102Z526-CDH
A2C10	0140-0176	2	CIFXO MICA 100 PF 2%	28480	0140-0176
A2C11	0140-0204		CIFXO MICA 47 PF 5% NPO 500VDCM	14655	ADM156470J9C

See Introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2C12	0160-0121	1	CIFXD CER 0.1 UF +80-20% 50VDCW	56289	5C50815-CML
A2C13	0160-2917	1	CIFXD CER 0.05 UF +80-20% 100VDCW	84411	TYPE 1A
A2C14	0160-0155	1	CIFXD ELECT 2.2 UF 20% 20VDCW	56289	150N225X0020A2-0Y5
A2C15	0160-2055	1	CIFXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F1032522-COM
A2CH1	1901-0621	1	DIODE:SI ALLOY 100V 200MA	28480	1901-0621
A2CR2	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
A2CR3	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
A2CR4	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
A2CR5	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
A2CR6	1901-0040	2	DIODE:SILICON 30MA 30V	07263	FDG100H
A2CH7	1901-0040		DIODE:SILICON 30MA 30V	07263	FDG100H
A2CH8	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
A2CH9	1910-0016		DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	02361
A2Q1	1894-0005	3	TSTRISI NPN	80131	2N700
A2Q2	1894-0005		TSTRISI NPN	80131	2N700
A2Q3	1894-0005		TSTRISI NPN	80131	2N700
A2Q4	1894-0009	2	TSTRISI PNP	28480	1894-0009
A2Q5	1894-0009		TSTRISI PNP	28480	1894-0009
A2Q6	1894-0071	5	TSTRISI NPN(SELECTED FROM 2N3704)	28480	1894-0071
A2R1	0757-0458	2	RIFXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A2R2	0757-0442	5	RIFXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R3	0757-0200	1	RIFXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A2R4	0757-0280	5	RIFXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R5	0757-0442	1	RIFXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R6	0757-0458	1	RIFXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A2R7	0757-0418	2	RIFXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A2R8	0698-3155	1	RIFXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A2R9	0757-0280	1	RIFXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R10	0698-3155	1	RIFXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A2R11	2100-1774	1	RIFXD MET FLM 2K OHM 5% TYPE H 1W	28480	2100-1774
A2R12	0698-3155	1	RIFXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A2R13	0698-3439	1	RIFXD MET FLM 178 OHM 1% 1/8W	28480	0698-3439
A2R14	0757-0123	3	RIFXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
A2R15	0757-0418	1	RIFXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A2R16	0757-0394	5	RIFXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2R17	0698-0084	1	RIFXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A2R18	0757-0442	1	RIFXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R19	0757-0280	1	RIFXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R20	0757-0439	5	RIFXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A2R21	0757-0439	1	RIFXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A2R22	0757-0439	1	RIFXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A2R23	0698-0085	1	RIFXD MET FLM 2.51K OHM 1% 1/8W	28480	0698-0085
A2R24	0757-0280	1	RIFXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R25	0757-0442	1	RIFXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R26	0698-3440	1	RIFXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A2R27	0757-0199	1	RIFXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A2T1	9100-0399	1	TRANSFORMER	28480	9100-0399
A2Y1	0610-0013	1	CRYSTAL:QUARTZ 1MHZ	28480	0610-0013
A3	00806-615	2	BOARD ASSY:POWER SUPPLY FILTER	28480	00806-615
A3	00806-614	3	CAPACITOR ASSY:BRIDGE RECTIFIER	28480	00806-614
A3C1	0160-0093	2	CIFXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A3C2	0170-0022		CIFXD MY 0.1UF 20% 600VDCW	09134	TYPE 24
A3C3	0160-0168	7	CIFXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
A3C4	0160-0168		CIFXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
A3L1	9140-0052	1	C01L:CFXD RF 3.3 MHY	28480	9140-0052
A3R2	9100-1665	3	C01L/CNCF 3300 OHM 5%	28480	9100-1665
A3R1	0757-0401	4	RIFXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A3R2	0698-3154	1	RIFXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A4	00806-601	1	BOARD ASSY:RF	28480	00806-601
A4C1	0160-0161	14	CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C2	0160-0168		CIFXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
A4C3	0150-0052	5	CIFXD CER 0.05 UF 20% 600VDCW	56289	33C17A
A4C4	0160-0168		CIFXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
A4C5	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C6			NOT ASSIGNED		
A4C7	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C8	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C9	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C10	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C11	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C12	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C13	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C14	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C15	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A4C16	0160-0161		CIFXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4C17	0160-0161	2	CIFXD MY 0.01 UF 10% 200VDCM	56289	192P10392-PT
A4C18	0160-0145		CIFXD NICA 22 PF 5%	20480	0140-0145
A4C19	0140-0204		CIFXD NICA 47 PF 5% NPO 500VDCM	14655	ADM15E470J5C
A4C20	0140-0204		CIFXD NICA 47 PF 5% NPO 500VDCM	14655	ADM15E470J5C
A4C21			NOT ASSIGNED		
A4C22	0160-0174	1	CIFXD CER 0.47 UF 50-20% 25VDCM	56289	5C11875-CML
A4C23	0150-0052		CIFXD CER 0.05 UF 20% 400VDCM	56289	33C17A
A4C24	0150-0052		CIFXD CER 0.05 UF 20% 400VDCM	56289	33C17A
A4C25	0150-0052		CIFXD CER 0.05 UF 20% 400VDCM	56289	33C17A
A4C26	0140-0193		CIFXD NICA 82 PF 5%	20480	0140-0193
A4C27	0160-0168	2	CIFXD MY 0.1 UF 10% 200VDCM	56289	192P10492-PTS
A4C28			NOT ASSIGNED		
A4C29	0150-0052		CIFXD CER 0.05 UF 20% 400VDCM	56289	33C17A
A4C30	0160-0161		CIFXD MY 0.01 UF 10% 200VDCM	56289	192P10392-PTS
A4C31	0160-0154		CIFXD NICA MY 0.0022 UF 10% 200VDCM	56289	192P22292-PTS
A4C32	0140-0197	1	CIFXD NICA 180 PF 5% 300VCCM	14655	ADM15E181J3C
A4C33	0160-2210		CIFXD NICA 470 PF 5%	20480	0160-2210
A4C33	0380-0336		STANDOFF	20480	0370-0336
A4C34	0160-0153		CIFXD MY 0.001 UF 10% 200VDCM	56289	192P10292-PTS
A4C35	0160-0153		CIFXD MY 0.001 UF 10% 200VCCM	56289	192P10292-PT
A4C36	0140-0176	3	CIFXD NICA 100 PF 2%	20480	0140-0176
A4C37	0140-0145		CIFXD NICA 22 PF 5%	20480	0140-0145
A4C38	0140-0220		CIFXD NICA 200 PF 1% 300VCCM	20480	0140-0220
A4CR1	1910-0042		DIOD:GE 5MA AT 1.0V	78480	1910-0042
A4CR2	1910-0016		DIODE:GERMANIUM 100MA/0.65V 60PIV	93332	D2361
A4CR3	1910-0042	DIOD:GE 5MA AT 1.0V	78480	1910-0042	
A4L1	9140-0142	2	COIL:FXD RF 2.20 OHM 10%	99800	09-4436-4K
A4L2	9140-0142		COIL:FXD RF 2.20 OHM 10%	82142	09-4436-4K
A4L3	9140-0142		COIL:FXD RF 2.20 OHM 10%	82142	09-4436-4K
A4L4	9140-0142		COIL:FXD RF 2.20 OHM 10%	82142	09-4436-4K
A4L5	9140-0142		COIL:FXD RF 2.20 OHM 10%	82142	09-4436-4K
A4L6	9140-0094	1	COIL:FXD RF 0.68UH	99800	1537-08
A4L7	9140-0094		COIL:FXD RF 0.68UH	99800	1537-08
A4L8	9140-0131		COIL:FXD RF 10 MH	20480	9140-0131
A4R1	0698-3459		REFXD MET FLM 383K OHM 1% 1/8W	20480	0698-3459
A4R2	0757-0470		REFXD MET FLM 162K OHM 1% 1/8W	20480	0757-0470
A4R1	0698-3459	1	REFXD MET FLM 383K OHM 1% 1/8W	20480	0698-3459
A4R4	0698-3420		REFXD MET FLM 34.8K OHM 1% 1/2W	20480	0698-3420
A4R5 THRU			NOT ASSIGNED		
A4R9					
A4R10	2100-2452		REVAR COMP 25K OHM 20% LIN 1/4W	20480	2100-2452
A4R11	0698-3153	4	REFXD MET FLM 3.83K OHM 1% 1/8W	20480	0698-3153
A4R12	0698-3162		REFXD MET FLM 46.4K OHM 1% 1/8W	20480	0698-3162
A4R13	0698-3162		REFXD MET FLM 46.4K OHM 1% 1/8W	20480	0698-3162
A4R14	0757-0465		REFXD MET FLM 100K OHM 1% 1/8W	20480	0757-0465
A4R15	0698-3443		REFXD MET FLM 17 OHM 1% 1/8W	20480	0698-3443
A4R16	0698-3443	1	REFXD MET FLM 287 OHM 1% 1/8W	20480	0698-3443
A4R17	0757-0461		REFXD MET FLM 100 OHM 1% 1/8W	20480	0757-0461
A4R18	0771-0004		REFXD MET FLM 20K OHM 10% 4W	20480	0771-0004
A4R19	0698-3457		REFXD MET FLM 316K OHM 1% 1/8W	20480	0698-3457
A4R20	0757-0461		REFXD MET FLM 68.1K OHM 1% 1/8W	20480	0757-0461
A4R21	2100-0144	1	REVAR COMP 250K OHM 30% LIN 1/5W	20480	2100-0144
A4R22	0764-0046		REFXD MET OH 33K OHM 5% 2W	20480	0764-0046
A4R23 THRU			NOT ASSIGNED		
A4R24					
A4R25	0757-0428		REFXD MET FLM 1.62K OHM 1% 1/8W	20480	0757-0428
A4R26	0757-0467	1	REFXD MET FLM 121K OHM 1% 1/8W	20480	0757-0467
A4R27	0757-0127		REFXD MET FLM 215K OHM 2% 1/2W	3480	0757-0127
A4R28	0771-0004		REFXD MET FLM 20K OHM 10% 4W	20480	0771-0004
A4R29	0698-3438		REFXD MET FLM 147 OHM 1% 1/8W	20480	0698-3438
A4R30	0757-0465		REFXD MET FLM 100K OHM 1% 1/8W	20480	0757-0465
A4R31	0757-0465	1	REFXD MET FLM 100K OHM 1% 1/8W	20480	0757-0465
A4R32	0698-3438		REFXD MET FLM 147 OHM 1% 1/8W	20480	0698-3438
A4R33	0757-0394		REFXD MET FLM 51.1 OHM 1% 1/8W	20480	0757-0394
A4R34	0698-3438		REFXD MET FLM 147 OHM 1% 1/8W	20480	0698-3438
A4R35	0757-0394		REFXD MET FLM 51.1 OHM 1% 1/8W	20480	0757-0394
A4R36	0698-3438	2	REFXD MET FLM 147 OHM 1% 1/8W	20480	0698-3438
A4R37	0757-0817		REFXD MET FLM 750 OHM 1% 1/2W	20480	0757-0817
A4R38	0757-0839		REFXD MET FLM 10K OHM 1% 1/2W	20480	0757-0839
A4R39	0757-0817		REFXD MET FLM 750 OHM 1% 1/2W	20480	0757-0817
A4R40	0770-0002		REFXD MET OH 2400 OHM 5% 4W	24460	0770-0002
A4R41	0757-0394	1	REFXD MET FLM 51.1 OHM 1% 1/8W	20480	0757-0394
A4R42	0757-0394		REFXD MET FLM 51.1 OHM 1% 1/8W	20480	0757-0394
A4R43	0698-3162		REFXD MET FLM 46.4K OHM 1% 1/8W	20480	0698-3162
A4R44	0698-3423		REFXD MET FLM 46.4K OHM 1% 1/2W	20480	0698-3423
A4R45	0698-3162		REFXD MET FLM 46.4K OHM 1% 1/8W	20480	0698-3162

See Introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4K6	0757-0346	2	RIFXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A4K7	0757-0439	1	RIFXD MET FLM 90.7K OHM 1% 1/2W	28480	0757-0439
A4K8	0757-0346	1	RIFXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A4K9	0757-0123	1	FACTORY SELECTED PART RIFXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
A4N0	0698-3454	1	RIFXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A4N1	0757-0439	1	RIFXD MET FLM 6.01K OHM 1% 1/8W	28480	0757-0439
A4N2	0698-3159	1	RIFXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A4N3	0757-0302	1	RIFXD MET FLM 16.2 OHM 1% 1/8W	28480	0757-0302
A4T1	9100-0396	1	TRANSFORMER	28480	9100-0398
A4V1	1933-0011	2	ELECTRON TUBE:6AW8A	33173	6AW8A
A4V2	1200-0190	9	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V3	1932-0027	1	ELECTRON TUBE:12AT7 DUAL TRIODE	33173	12AT7
A4V4	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V5	1923-0071	4	ELECTRON TUBE:12HG7	02735	12HG7
A4V6	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V7	1923-0071	1	ELECTRON TUBE:12HG7	02735	12HG7
A4V8	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V9	1923-0071	1	ELECTRON TUBE:12HG7	02735	12HG7
A4V0	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V1	1923-0071	1	ELECTRON TUBE:12HG7	02735	12HG7
A4V2	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V3	1932-0027	1	ELECTRON TUBE:12AT7	03508	12AT7
A4V4	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V5	1933-0011	1	ELECTRON TUBE:6AW8A	33173	6AW8A
A4V6	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V7	1923-0071	1	ELECTRON TUBE:12HG7	02735	12HG7
A4V8	1200-0190	1	SOCKET:TUBE 9 PIN MINIATURE	71785	121-51-11-141
A4V9	1923-0071	1	ELECTRON TUBE:12HG7	02735	12HG7
A5	00606-602	1	BOARD ASSY:VARICAP	28480	00606-602
A5	7100-0101	1	SHIELD:PMU-METAL	02675	HU0920-11/16-MU-H10
A5C1	0150-0093	1	CIFXD CER 0.01 UF +80-20% 100VDCM	72982	801-K800011
A5C2	0160-2319	1	CIFXD CER 10 PF/0.5 PF 500VDCM	72982	315-N1500-10/0.5 PF
A5C3	0150-0092	1	CIFXD CER 10 1 PF 500VDCM	72982	315-000-0200-100F
A5C4	0170-0085	1	CIFXD MY 0.1UF 20% 300VDCM	84411	601PE STYLE 3
A5C81	1901-0025	5	DIODE:SILICON 100MA/1V	07263	FD 2387
A5C82	1901-0025	1	DIODE:SILICON 100MA/1V	07263	FD 2387
A5C83	0122-0017	2	CAPVOLTAGE VAR 12 PF 20% 100VDCM	01281	1N4804
A5C84	0122-0017	1	CAPVOLTAGE VAR 12 PF 20% 100VDCM	01281	1N4804
A5K1	0490-0018	1	RELAY:ARMATURE SPDT	77342	RS-1124 5000 OHM
A5K1	0698-1061	2	RIFXD COMP 10 MEGOHM 1% 1W	01121	GB 1061
A5K2	0757-0198	1	RIFXD MET FLM 100 OHM 1% 1/2W	28480	0757-0198
A5K3	0683-1055	4	RIFXD COMP 1 MEGOHM 5% 1/4W	01121	CB 1055
A5K4	0683-1055	1	RIFXD COMP 1 MEGOHM 5% 1/4W	01121	CB 1055
A5K5	0683-1055	1	RIFXD COMP 1 MEGOHM 5% 1/4W	01121	CB 1055
A5K6	0683-1055	1	RIFXD COMP 1 MEGOHM 5% 1/4W	01121	CB 1055
A6	00606-617	2	BOARD ASSY:DELTA "F"	28480	00606-617
A6C1	0180-0116	4	CIFXD ELECT 6.0 UF 10% 30VCCM	56289	1500685A903582-0Y5
A6C2	0170-0022	1	CIFXD MY 0.1UF 20% 600VDCM	09134	TYPE 24
A6N1	0757-0428	1	RIFXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A6N2	0698-3159	1	RIFXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3159
A6R1	0764-0006	1	RIFXD MET OR 10K OHM 5% 2W	28480	0764-0006
A6VH1	1902-3256	1	DIODE:REAR:DOWN SILICON 20.7V 5% 1W	28480	1902-3256
A7	00606-612	3	TURRET ASSY:OSCILLATOR	28480	00606-612
A7C1	0121-0031	6	CIVAR AIR 1.85-10.38 PF	28480	0121-0031
A7C2	0121-0031	1	CIVAR AIR 1.85-10.38 PF	28480	0121-0031
A7C3	0121-0031	1	CIVAR AIR 1.85-10.38 PF	28480	0121-0031
A7C4	0121-0031	1	CIVAR AIR 1.85-10.38 PF	28480	0121-0031
A7C5	0121-0031	1	CIVAR AIR 1.85-10.38 PF	28480	0121-0031
A7C6	0121-0031	1	CIVAR AIR 1.85-10.38 PF	28480	0121-0031
A7T1	00606-612	1	TURRET ASSY:OSCILLATOR	28480	00606-612
A7T2			N.S.R. PART OF A7		
A7T3			N.S.R. PART OF A7		
A7T4			N.S.R. PART OF A7		
A7T5			N.S.R. PART OF A7		
A7T6			N.S.R. PART OF A7		
A8	00606-622	2	TURRET ASSY:AMPLIFIER	28480	00606-622
A8C1	0130-0006	6	CIVAR CER 5-20 PF N300	28480	0130-0006
A8C2	0130-0006	1	CIVAR CER 5-20 PF N300	28480	0130-0006
A8C3	0130-0006	1	CIVAR CER 5-20 PF N300	28480	0130-0006
A8C4	0130-0006	1	CIVAR CER 5-20 PF N300	28480	0130-0006
A8C5	0130-0006	1	CIVAR CER 5-20 PF N300	28480	0130-0006
A8C6	0130-0006	1	CIVAR CER 5-20 PF N300	28480	0130-0006
A8C7	0160-0042	1	CIFXD MICA 27PF 5% 500VDCM	28480	0160-0042
A8C8	0160-0154	1	CIFXD MICA NY 0.0022 UF 10% 200VDCM	56289	192P22292-PTS
A8C9	0160-2141	1	CIFXD CER 680 PF 80/20% 100VDCM	9141J	TYPE B

See Introduction to this section for ordering information

Table 6-2. Replacable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
AHC10	0160-2139	1	REFXD CER 220 PF ±20% 1000VDCW	91418	TYPE D
AHL1	9100-1617	1	C01L/C01KE3.90 OH 10%	20480	9100-1617
AHL2	9100-1615	1	C01L/C01KE FXD 1.20 OH 10%	20480	9100-1615
AHL3	9100-1612	1	C01L/FXD HF 0.33 OH 20%	20480	9100-1612
AHR1	0690-2211	2	REFXD COMP 220 OHM 10% 1W	01121	GB 2211
AHR2	0690-2211		REFXD COMP 220 OHM 10% 1W	01121	GB 2211
AHR3	0687-2221		REFXD COMP 2200 OHM 10% 1/2W	01121	EB 2221
AHR4	0687-3901	2	FACTORY SELECTED PART		
AHR5	0687-3901		REFXD COMP 39 OHM 10% 1/2W	01121	EB 3901
AHR6	0687-3901		REFXD COMP 39 OHM 10% 1/2W	01121	EB 3901
AHR6	0686-1125	1	REFXD COMP 1100 OHM 5% 1/2W	01121	EB 1125
AHR6			FACTORY SELECTED PART		
AHR7	0687-1001	2	REFXD COMP 10 OHM 10% 1/2W	01121	EB 1001
AHR8	0687-1001		REFXD COMP 10 OHM 10% 1/2W	01121	EB 1001
AHR9	0687-1521	1	REFXD COMP 1500 OHM 10% 1/2W	01121	EB 1521
AHR9			FACTORY SELECTED PART		
AHR10	0687-1011	1	REFXD COMP 100 OHM 10% 1/2W	01121	EB 1011
AHR11	0687-5611	1	REFXD COMP 560 OHM 10% 1/2W	01121	EB 5611
AHR12	0687-5601	1	REFXD COMP 56 OHM 10% 1/2W	01121	EB 5601
AHR13	0757-0405	3	REFXD MET FLN 162 OHM 1% 1/8W	20480	0757-0405
AHR14	0757-0405		REFXD MET FLN 162 OHM 1% 1/8W	20480	0757-0405
AHR15	0757-0405		REFXD MET FLN 162 OHM 1% 1/8W	20480	0757-0405
AHT1			N.S.N. PART OF AB ASSY		
AHT2			N.S.N. PART OF AB ASSY		
ABT3			N.S.N. PART OF AB ASSY		
AHT4			N.S.N. PART OF AB ASSY		
AHT5			N.S.N. PART OF AB ASSY		
ABT6			N.S.N. PART OF AB ASSY		
AV			NIT ASSIGNED		

See Introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
AP1			NOT ASSIGNED		
AP1	00606-600	2	BOARD ASSY:POWER SUPPLY	28480,	00606-600
AP1C1	0150-0012	5	CIFXD CER 0.01 UF 20% 1000VDCM	56289	29C214A3
AP1C2	0170-0040	2	CIFXD MY 0.047 UF 10% 200VDCM	56289	192P47392-PTS
AP1C3	0180-0116		CIFXD ELECT 6.8 UF 10% 35VDCM	56287	1500685X9035B2-UYS
AP1C4	0170-0022		CIFXD MY 0.1UF 20% 600VDCM	09134	TYPE 24
AP1C5	0150-0012		CIFXD CER 0.01 UF 20% 1000VDCM	56289	29C214A3
AP1C6	0150-0012		CIFXD CER 0.01 UF 20% 1000VDCM	56289	29C214A3
AP1C7	0170-0040		CIFXD MY 0.047 UF 10% 200VDCM	56289	192P47392-PTS
AP1C8	0180-0116		CIFXD ELECT 6.8 UF 10% 35VDCM	56289	1500685X9035B2-UYS
AP1C9	0160-0303	1	CIFXD MYLAR .15 UF 10% 200VDCM	28480	0160-0303
AP1C10	0150-0012		CIFXD CER 0.01 UF 20% 1000VDCM	56289	29C214A3
AP1C11	0150-0012		CIFXD CER 0.01 UF 20% 1000VDCM	56289	29C214A3
AP1C12	0180-0116		CIFXD ELECT 6.8 UF 10% 35VDCM	56289	1500685X9035B2-DYS
AP1C13	1901-0029	8	DIODE: SILICON 600 PIV	28480	1901-0029
AP1C14	1901-0029		DIODE: SILICON 600 PIV	28480	1901-0029
AP1C15	1901-0029		DIODE: SILICON 600 PIV	28480	1901-0029
AP1C16	1901-0029		DIODE: SILICON 600 PIV	28480	1901-0029
AP1C17	1901-0029		DIODE: SILICON 600 PIV	28480	1901-0029
AP1C18	1901-0029		DIODE: SILICON 600 PIV	28480	1901-0029
AP1C19	1901-0200	4	DIODE: SI 3 A 100 PRRV	28480	1901-0200
AP1C20	1901-0200		DIODE: SI 3 A 100 PRRV	28480	1901-0200
AP1C21	1901-0200		DIODE: SI 3 A 100 PRRV	28480	1901-0200
AP1C22	1901-0200		DIODE: SI 3 A 100 PRRV	28480	1901-0200
AP1C23	1901-0016		DIODE: GERMANIUM 100MA/0.85V CUPIV	93332	02361
AP1C24	1901-0025		DIODE: SILICON 100MA/1V	07263	FU 2307
AP1C25	1901-0025		DIODE: SILICON 100MA/1V	07263	FU 2307
AP1C26	1901-0025		DIODE: SILICON 100MA/1V	07263	FU 2307
AP1D1	1854-0079	2	TSTR:SI NPN	80131	2N3704
AP1D2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
AP1D3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
AP1D4	1854-0079		TSTR:SI NPN	80131	2N3704
AP1D5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
AP1D6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
AP1D7	1854-0019	1	TSTR:SI NPN	80131	2N7051
AP1E1	0764-0028	6	RIFXD MET UX 100K OHM 5% 2W	28480	0764-0028
AP1E2	0767-0009	1	RIFXD MET FLM 12K OHM 3W	28480	0767-0009
AP1E3	0757-0198		RIFXD MET FLM 100 OHM 1% 1/8W	28480	0757-0198
AP1E4	0757-0279	2	RIFXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
AP1E5	0764-0028		RIFXD MET UX 100K OHM 5% 2W	28480	0764-0028
AP1E6	0757-0442		RIFXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
AP1E7	0698-3152	1	RIFXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
AP1E8	2100-0154	1	RIFXD CHMP 1K OHM 30% LIN 0.15W	28480	2100-0154
AP1E9	0764-0028		RIFXD MET UX 100K OHM 5% 2W	28480	0764-0028
AP1E10	0698-5059	5	RIFXD MET UX 68K OHM 2% 2W	28480	0698-5059
AP1E11	0767-0013	1	RIFXD MET FLM 6800 OHM 5% 3W	28480	0767-0013
AP1E12	0698-5059		RIFXD MET UX 68K OHM 2% 2W	28480	0698-5059
AP1E13	0757-0279		RIFXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
AP1E14	0698-5059		RIFXD MET UX 68K OHM 2% 2W	28480	0698-5059
AP1E15	0698-3153		RIFXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
AP1E16	0698-3153		RIFXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
AP1E17	0698-0082	1	RIFXD MET FLM 464 OHM 1% 1/8W FACTORY SELECTED PART	28480	0698-0082
AP1E18	0698-5059		RIFXD MET UX 68K OHM 2% 2W	28480	0698-5059
AP1E19	0757-0439		RIFXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
AP1E20	0812-0020	1	RIFXD MW 0.39 OHM 5% 3W	28480	0812-0020
AP1E21	0698-5059		RIFXD MET UX 68K OHM 2% 2W	28480	0698-5059
AP1E22	0757-0401		RIFXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
AP1V1	1902-0018	1	DIODE BREAKDOWN: 11.7V 5% DIODE BREAKDOWN: 16.1V 10%	04713	1N941
AP1V2	1902-0036	2	DIODE BREAKDOWN: 11.7V 5% DIODE BREAKDOWN: 16.1V 10%	28480	1902-0036
AP1V3	1902-0069	1	DIODE BREAKDOWN: 11.7V 5% DIODE BREAKDOWN: 16.1V 10%	04713	5Z 11489
AP1V4	1902-0036		DIODE BREAKDOWN: 11.7V 5% DIODE BREAKDOWN: 16.1V 10%	28480	1902-0036
AP1V5	1902-0185	1	DIODE BREAKDOWN: 27.4V 5% 400MW	28480	1902-0185
CP	0150-0024	1	CIFXD CER 0.02 UF +80-20% 600VDCM	71590	TYPE DD 203
CP	0160-2049	6	CIFXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
CP	0121-0144	1	CIVAR AIR 442.2 PF	28480	0121-0144
CP	0150-0019	2	CIFXD CER 1000 PF 20% 500VDCM	72982	327005X500102M
CP - THRU			NOT ASSIGNED		
CP	0180-0017	1	CIFXD ELECT 2X20 UF 450VDCM	56289	032440
CP	0150-0019		CIFXD CER 1000 PF 20% 500VDCM	72982	327005X500102M
CP	0121-0144	1	CIVAR AIR 442.2 PF	28480	0121-0144
CP - THRU			NOT ASSIGNED		
CP			NOT ASSIGNED		

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
C13	0160-0001	1	CIFXD MY 0-1 UF 10% 600VDCW	56289	106P10496 PND
C14-THRU			NOT ASSIGNED		
C17	00606-614		CAPACITOR ASSY:BRIDGE RECTIFIER	28480	00606-614
C18	00606-614		CAPACITOR ASSY:BRIDGE RECTIFIER	28480	00606-614
C19	00606-614		CAPACITOR ASSY:BRIDGE RECTIFIER	28480	00606-614
C20	0180-1812	2	CIFXD ELECT 2 SECTION 120/40 UF 475VDCW	56289	042340-DFP
C21	0180-1812	2	CIFXD ELECT 2 SECTION 120/40 UF 475VDCW	56289	042340-DFP
C22	0180-0169	1	CIFXD ELECT 2800 UF +75-10% 60VDCW	56289	039023
C23	0132-0003	1	CIFVAR POLY 0.7-3.0 PF	28480	0132-0003
C24	0160-2049	1	CIFXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
C25	0160-2049		CIFXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
C26	0160-2049		CIFXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
C27	0160-2357	1	CIFXD CER FEED-THRU 1000 PF +80-20%	28480	0160-2357
C28	0160-2049		CIFXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
C29	0160-2049		CIFXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
C30	0160-0168		CIFXD MY 0-1 UF 10% 200VDCW	56289	192P10492-PTS
C31	0160-0168		CIFXD MY 0-1 UF 20% 200VDCW	56289	192P10492-PTS
CS1	1910-0042		DIODI GE 5MA AT 1.0V	28480	1910-0042
CS1	1450-0419	1	LIGHT INDICATOR SELECTED NF-2H	28480	1450-0419
F1	2110-0305	2	FUSE:1.25 AMP SLOW BLOW	71400	MDX-1-1/4A
F1			FOR 230V OPERATION		
F1	2110-0015	1	FUSE:CARTRIDGE 2.5 AMP 125V MAX 5/16" BL	75915	31302-5
F1			FOR 115V OPERATION		
F1	1400-0084	3	FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014
F2	2110-0004	1	FUSE:CARTRIDGE 1/4 AMP 250V	75915	JAG/CAT. 312-250
F2	1400-0084		FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014
F3	2110-0027	1	FUSE:1.25A 250V	75915	312-125
F3	1400-0084		FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014
FL1	4170-2887	1	FILTEMLINE 50/400 HZ	05245	F1221A
J1	1250-0118	3	CONNECTOR:RNC	24931	20JR 120-1
J2	1251-0066	1	JACK:TELEPHONE 2 CONDUCTOR	82389	23-1339
J3	1250-0118		CONNECTOR:RNC	24931	20JR 120-1
J4			N.S.R. PART OF W1		
J5			N.S.R. PART OF W3		
J6	1250-0118		CONNECTOR:RNC	24931	20JR 120-1
J7	1250-0053	1	CONNECTOR:RFP RNC CAP AND CHAIN	28480	1250-0053
J8			N.S.R. PART OF W2		
LE-THRU	1251-2357	1	SOCKET:3-PIN MALE POWER RECEPTACLE	82389	FAC-301
L1			NOT ASSIGNED		
L1	9140-0051	1	COIL:IFXD 600 OHM	28480	9140-0051
L4	9100-1665		COIL/CHOK 3300 OHM 5%	28480	9100-1665
L5	9100-1665		COIL/CHOK 3300 OHM 5%	28480	9100-1665
M1	1120-0075	1	METER 0-200 MA SPEC SCALE 0-100%	28480	1120-0075
M2	1120-0074	1	METER:0-100 MA SPEC SCALE 0-3V	28480	1120-0074
P1			N.S.R. PART OF W2		
P1	0120-1348	1	CABLE ASSY:POWER, DETACHABLE	70903	KHS-7041
C1	1854-0080	2	TSTRISI RPN	28480	1854-0080
C1	1200-0147	3	SLEEVE:INSULATOR NYLON	26365	974-302
C1	1200-0043	3	INSULATOR:155R MOUNTING(U-3)	71785	293011
C2	1854-0080		TSTRISI RPN	28480	1854-0080
C2	1200-0147		SLEEVE:INSULATOR NYLON	26365	974-302
C2	1200-0043		INSULATOR:155R MOUNTING(U-3)	71785	293011
C3	1854-0063	1	TSTRISI RPN	80131	283055
C3	1200-0147		SLEEVE:INSULATOR NYLON	26365	974-302
C3	1200-0043		INSULATOR:155R MOUNTING(U-3)	71785	293011
R1	0757-0857	1	RIFXD MET FLM 42.5K OHM 1% 1/2W	28480	0757-0857
R2			N.S.R. PART OF S1		
R3-THRU			NOT ASSIGNED		
R4			NOT ASSIGNED		
R5	2100-0225	1	RIFVAR 5W 5000 OHM 10% LIN 2W	28480	2100-0225
R6	2100-1695	2	RIFVAR COMP 7K-5K OHM 10% LIM 10CC 30	28480	2100-1695
R7	2100-0207	1	RIFVAR COMP 250J OHM 20% LIN 2W	28480	2100-0207
R8	0690-1061		RIFXD COMP 10 MEGOHM 10% 1W	01121	GB 1061
R9	0757-0198		RIFXD MET FLM 100 OHM 1% 1/2W	28480	0757-0198
S10	0690-1425	1	RIFXD MET FLM 11K OHM 1% 1/2W	28480	0690-1425
R11	0757-0909	1	RIFXD MET FLM 47.5 OHM 1.0% 1/2W	28480	0757-0909
R12	0757-0401		RIFXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
R13	0757-0123		RIFXD MET FLM 34.0K OHM 1% 1/8W	28480	0757-0123
R14	0690-3664	1	RIFXD MET FLM 770K OHM 5% 2W	28480	0690-3664
R15	0816-0020	1	RIFXD 5W 110 OHM 10% 10W	28480	0816-0020
R16	0764-0028		RIFXD MET 0X 100K OHM 5% 2W	28480	0764-0028
R17	0764-0028		RIFXD MET 0X 100K OHM 5% 2W	28480	0764-0028

See Introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
R18			NOT ASSIGNED		
R19	0764-0020		RIFXD MET DX 100K OHM 5% 2W	20480	0764-0020
R20	0698-3412	1	RIFXD MET FLM 3.03K OHM 1% 1/2W	20480	0698-3412
R21	2100-1695		RIVAR COMP 7K-5K OHM 10% LIN LOCC LOG	20480	2100-1695
R22	0757-0200		RIFXD MET FLM 1K OHM 1% 1/8W	20480	0757-0200
R23	0698-3162		RIFXD MET FLM 46.4K OHM 1% 1/8W	20480	0698-3162
S1	3100-0190	1	SWITCH:ROTARY: 1 SECT 5 POS	20480	3100-0190
S2	3101-0012	1	SWITCH:TOGGLE DPDT ON-OFF-CN	27191	0926A319
S3	3102-0010	1	SWITCH: SENSITIVE SPDT 125 VAC 10 AMP	91929	02 2H0022
S4	3100-1854	1	SWITCH:ROTARY	20480	3100-1854
S5	3130-0105	1	SECTION:ROTARY SWITCH	20480	3130-0105
S6	3101-0030	1	SWITCH:TOGGLE SPST ON-NONE-OFF	27191	0406A360
S7	3101-1234	1	SWITCH:SLIDE DPDT	02309	11A-1242
T1	9100-0375	1	TRANSFORMER	20480	9100-0375
W1	00606-607	2	CABLE ASSY:UNCAL OUTPUT	20480	00606-607
W2	00606-608	1	CABLE ASSY:UNCAL RF	20480	00606-608
W3	606A-160	1	CABLE:AMPLIFIER OUTPUT INCLUDES JS	20480	606A-160
			MISCELLANECUS		
	00606-600		WARD ASSY:POWER SUPPLY	20480	00606-600
	00606-001	1	PANEL:FRONTLIGHT GRAY	20480	00606-001
	00606-00020	1	PANEL:FRONTMINT GRAY)	20480	00606-00020
	00606-603	1	WARD ASSY:CRYSTAL CALIBRATION	20480	00606-603
	00606-615	1	WARD ASSY:POWER SUPPLY FILTER	20480	00606-615
	00606-616	1	WARD ASSY:MODULATOR FILTER	20480	00606-616
	00606-617	1	WARD ASSY:DELTA REF	20480	00606-617
	00606-00024	1	BRACKET:INLET	20480	00606-00024
	606A-55A	1	BOX SHIELD	20480	606A-55A
	00606-010	1	BRACKET:POTENTIOMETER	20480	00606-010
	00606-013	1	BRACKET:AMPLIFIER SWITCH	20480	00606-013
	606A-36H	1	BRACKET:DETENT MOUNT	20480	606A-36H
	606A-44B-2	1	CABINET BODY ASSY:BLUE-GRAY	20480	606A-44B-2
	00606-60034	1	CABINET BODY ASSY:OLIVE GRAY	20480	00606-60034
	00606-607	1	CABLE ASSY:UNCAL OUTPUT	20480	00606-607
	606A-108A	1	CAM ASSY:DIAL POINTER	20480	606A-108A
	606A-83E	1	CAM:DETENT	20480	606A-83E
	00606-620	1	CABLE:RADIO SECONDARY	20480	00606-620
	1251-0156	1	CONNECTOR:RECEPTACLE	01009	C5402 ACG
	00606-00021	2	COVER:REAR CABINET ONLY:BLUE-GRAY	20480	00606-00021
	00606-00031	1	COVER:REAR CABINET ONLY:OLIVE GRAY	20480	00606-00031
	606A-36E	1	ASSY:DETENT LIFT	20480	606A-36E
	00606-003	1	DIAL ASSY:FREQUENCY VERNIER	20480	00606-003
	00606-625	1	DIAL:FREQUENCY	20480	00606-625
	00606-206	1	DIAL:HUB, INNER	20480	00606-206
	606A-83C	1	DRUM:CABLE	20480	606A-83C
	606A-100F	1	DRUM:DIAL DRIVE	20480	606A-100F
	00606-00025	1	DUST COVER:HACK	20480	00606-00025
	00606-00033	1	DUST COVER ASSY:OLIVE GRAY(606BK)	20480	00606-00033
	00606-00026	1	DUST COVER ASSY:BLUE-GRAY(606BK)	20480	00606-00026
	00606-209	1	FORM:GUIL	20480	00606-209
	606A-36C	1	GEAR:TURRET DRIVE	20480	606A-36C
	606A-48T	1	GROUNDING STRAP	20480	606A-48T
	00606-014	1	HEAT SINK:SIKRET	20480	00606-014
	606A-105B	1	HUB:OUTER DIAL	20480	606A-105B
	0370-0026	1	KNUR:BLACK W/ANOD 3/4" OD 1/8" SHAFT	20480	0370-0026
	0370-0036	1	KNUR:SKINNED BAR BLK 1.0" DIA	20480	0370-0036
	0370-0037	1	KNUR:SKINNED BAR 1" DIA, BLACK	20480	0370-0037
	0370-0063	1	KNUR:RED 3/4" DIA	20480	0370-0063
	0370-0066	1	KNUR:ROUND BLACK 0.375" DIA SHAFT	20480	0370-0066
	0370-0083	1	KNUR:ROUND, BLACK 0.500" DIA	20480	0370-0083
	606A-76A	1	KNUR ASSY:WINDOW DIAL	20480	606A-76A
	606A-99A	1	POINTER ASSY	20480	606A-99A
	606A-77C	1	RESISTOR WARD ASSY:AUDIO OSCILLATOR	20480	606A-77C
	00606-610	1	RF GENERATOR ASSY	20480	00606-610
	606A-102	1	ROLLER:DETENT	20480	606A-102
	606A-37A	1	SHAFT:TURRET DRIVE	20480	606A-37A
	606A-37B	1	SHAFT:POINTER	20480	606A-37B
	606A-37C	1	SHAFT:IDLER	20480	606A-37C
	606A-37D	1	SHAFT:TUNER	20480	606A-37D
	606A-37E	1	SHAFT:TURRET AMPLIFIER	20480	606A-37E
	606A-37F	1	SHAFT:TURRET OSCILLATOR	20480	606A-37F
	606A-47A	1	SPACER:CHASSIS MOUNTING (HOLLOW)	20480	606A-47A
	606A-47B	1	SPACER:CHASSIS MOUNTING (SOLID)	20480	606A-47B
	00606-205	1	SPACER:DOT BRACKET	20480	00606-205

See Introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	606A-918	1	SPRING LEAF	28480	606A-918
	606A-838	1	TERMINAL BOARD	28480	606A-838
	00606-622		TUNNET ASSY:AMPLIFIER	28480	00606-622
	00606-612		TUNNET ASSY:OSCILLATOR	28480	00606-612
	00606-621	1	WIRING HARNESS:CRYSTAL CAL CONTROL	28480	00606-621
	00606-606	1	WIRING HARNESS:REGULAR	28480	00606-606
	00606-618	1	WIRING HARNESS:RF DECK	28480	00606-618
	606A-830	1	WINDUP: FREQUENCY	28480	606A-830
	1470-0010	1	WRENCH: KEY FOR RF COVER	28480	1470-0010
	1205-0059	1	HEAT SHIELD FOR 9 PIN PL TUBE SOCKET	28480	1205-0059

See introduction to this section for ordering information

**TABLE 6-3.  
CODE LIST OF MANUFACTURERS**

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U. S. A. Common	Any supplier of U. S.	05745	Components Corp.	Chicago, Ill.	09145	Tech. Ind. Inc. Alphon Elect.	Burbank, Calif.
00136	McCoy Electronics	Mount Holly Springs, Pa.	05777	Westinghouse Electric Corp.		09250	Electro-Assemblies, Inc.	Chicago, Ill.
00213	Sage Electronics Corp.	Rochester, N. Y.		Semiconductor Dept.	Youngwood, Pa.	09353	C & H Components Inc.	Newton, Mass.
00287	Genco Inc.	Danielson, Conn.	05347	Ultima, Inc.	San Mateo, Calif.	09369	Mallory Battery Co. of Canada, Ltd.	Toronto, Ontario, Canada
00334	Humidist	Colton, Calif.	05397	Union Carbide Corp., Elect. Div.	New York, N. Y.	09927	Bundy Corp.	Noiwalk, Conn.
00348	Microlite Co., Inc.	Valley Stream, N. Y.	05574	Viking Ind. Inc.	Canoga Park, Calif.	10214	General Transistor Western Corp.	Los Angeles, Calif.
00373	Garlock Inc.	Chester Hill, N. J.	05593	Icore Electro-Plastics Inc.	Sunnyvale, Calif.	10411	Ti-Tal, Inc.	Belkeley, Calif.
00656	Aerover Corp.	New Bedford, Mass.	05616	Corning Plastic (Radio Electrical Spec. Co.)	Cleveland, Ohio	10646	Tristandum Co.	Niagara Falls, N. Y.
00719	Amp. Inc.	Harrisburg, Pa.	05624	Haider Colman Co.	Rockford, Ill.	11236	CTS of Beine, Inc.	Beine, Ind.
00781	Aircraft Radio Corp.	Boonton, N. J.	05728	Tiffen Optical Co.	Roalyn Heights, Long Island, N. Y.	11251	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
00809	Cisco Ltd.	Whitby, Ontario, Canada	05729	Mello-Tel Corp.	Westbury, N. Y.	11247	Bay State Electronics Corp.	Waltham, Mass.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.	05783	Stewart Engineering Co.	Santa Cruz, Calif.	11312	Teledyne Inc., Microwave Div.	Palo Alto, Calif.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S. C.	05820	Wakelief Engineering Inc.	Wakelief, Mass.	11314	National Seal	Downey, Calif.
00866	Ror Engineering Co.	City of Industry, Cal.	06005	Hassick Co., Div. of Stewart Wainer Corp.	Bridgeport, Conn.	11453	Precision Connector Corp.	Jupiter, N. Y.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.	06090	Hayshem Corp.	Redwood City, Calif.	11534	Duncan Electronics Inc.	Costa Mesa, Calif.
00924	Microlab Inc.	Luxington, N. J.	06175	Hausch and Lomb Optical Co.	Rochester, N. Y.	11711	General Instrument Corp., Semiconductor Div., Products Group	Newark, N. J.
01007	General Electric Co., Capacitor Dept.	Hudson Falls, N. Y.	06402	E. T. A. Products Co. of America	Chicago, Ill.	11717	Imperial Electronics, Inc.	Bueno Park, Calif.
01009	Alden Products Co.	Brooklyn, Mass.	06540	Alum Electronic Hardware Co., Inc.	New Rochelle, N. Y.	11870	Merab, Inc.	Palo Alto, Calif.
01121	Allen Bradley Co.	Milwaukee, Wis.	06555	Heede Electrical Instrument Co., Inc.	Penacook, N. H.	12040	National Semiconductor	Danbury, Conn.
01255	Lifton Industries, Inc.	Beverly Hills, Calif.	06666	General Devices Co., Inc.	Indianapolis, Ind.	12136	Philadelphia Handle Co.	Camden, N. J.
01281	TRW Semiconductors, Inc.	Lawdale, Calif.	06751	Components Inc., Ariz. Div.	Phoenix, Ariz.	12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
01295	Teak Instruments, Inc., Transistor Products Div.	Dallas, Texas	06812	Leitinger Mfg. Co., West Div.	Van Nuys, Calif.	12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N. M.
01349	The Alliance Mfg. Co., Small Parts Inc.	Alliance, Ohio	06850	Nation Assoc. Linac Div.	San Carlos, Calif.	12697	Chlorostat Mfg. Co.	Dover, N. H.
01538	Pacific Relays, Inc.	Van Nuys, Calif.	07066	Valvol Electric Co.	Van Nuys, Calif.	12728	Elmal Filter Corp.	W Haven, Conn.
01670	Godfridd Bros. Silk Co.	New York, N. Y.	07126	Uginton	Pasadena, Calif.	12859	Nippon Electric Co., Ltd.	Tokyo, Japan
01930	Aerovick Corp.	Rockford, Ill.	07137	Transistor Electronics Corp.	Minneapolis, Minn.	12861	Metric Electronics Corp.	Clark, N. J.
01961	Pac Engineering Co.	Santa Clara, Calif.	07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N. Y.	12910	Delta Semiconductor Inc.	Newport Beach, Calif.
02114	Feracube Corp. of America	Saugerties, N. Y.	07149	Falshom Corp.	New York, N. Y.	12954	Dickson Electronics Corp.	Scottsdale, Arizona
02116	Whetlock Signals, Inc.	Long Branch, N. J.	07233	Conra-Graphix Co.	City of Industry, Calif.	13019	Auro Supply Co., Inc.	Atchison, Kansas
02266	Cole Rubber and Plastics Inc.	Sonnyvale, Calif.	07254	Silicon Transistor Corp.	Corte Madera, N. Y.	13103	Thermolloy	Ballas, Texas
02560	Amphenol-Bug Electronics Corp.	Broadview, Ill.	07261	Avnet Corp.	Culver City, Calif.	13396	Telefunken (Gebli)	Hannover, Germany
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N. J.	07263	Laschold Camera & Inst. Corp. Semiconductor Div.	Mountain View, Calif.	13835	Midland-Night Div. of Plastic Industries, Inc.	Kansas City, Kansas
02771	Vedatone Co. of America, Inc.	Old Saybrook, Conn.	07372	Monrovia Rubber Co.	Minneapolis, Minn.	14099	Sem-Tech	Newbury Park, Calif.
02777	Hopkins Engineering Co.	San Fernando, Calif.	07387	Bretcher Corp., The	Monterey Park, Calif.	14193	Calif. Resistor Corp.	Santa Monica, Calif.
02875	Hudson Tool & Die Co.	Hawaik, N. J.	07397	Sylvania Elect. Prod. Inc., Ul. View Operations	Mountain View, Calif.	14298	American Components, Int.	Conshohocken, Pa.
03008	G. L. Semiconductor Prod. Dept.	Hoffman, N. Y.	07700	Technical Wire Products Inc.	Granfield, N. J.	14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
03705	Apex Machine & Tool Co.	Dayton, Ohio	07829	Udine Elect. Co.	Chicago, Ill.	14493	Hewlett-Packard Company	Lawland, Colo.
03797	Udema Corp.	Compton, Cal. V.	07910	Continental Device Corp.	Hawthorne, Calif.	14655	Cornell Rubber Electric Corp.	Newark, N. J.
03816	Parker Seal Co.	Los Angeles, Calif.	07935	Hayshem Mfg. Co. Semiconductor Div.	Mountain View, Calif.	14674	Corning Glass Works	Corning, N. Y.
03877	Transillon Electric Corp.	Wakelief, Mass.	07960	Hewlett-Packard Co., Boonton Radio Div.	Rockaway, N. J.	14752	Electric Cube Inc.	San Gabriel, Calif.
03888	Pyralim Resistor Co., Inc.	Cedar Knolls, N. J.	08145	U. S. Engineering Co.	Los Angeles, Calif.	14960	Williams Mfg. Co.	San Jose, Calif.
03954	Singer Co., Night Div. Finder Plant	Somerville, N. J.	08289	Blinn, Delbert Co.	Pomona, Calif.	15106	The Sphero Co., Inc.	Little Falls, N. Y.
04009	View, Hart and Hergenrodt, Elect. Co.	Hartford, Conn.	08358	Reigras Battery Co.	Niagara Falls, Ontario, Canada	15203	Webster Electronics Co.	New York, N. Y.
04013	Tauor Corp.	Lambertville, N. J.	08354	Deutsch Fastener Corp.	Los Angeles, Calif.	15287	Seacnic Corp.	Northridge, Calif.
04062	Acco Electronic Inc.	Great Neck, N. Y.	08664	Walter Co., The	Waterbury, Conn.	15291	Adjustable Bushing Co.	N Hollywood, Calif.
04127	Essex Bulb	Los Angeles, Calif.	08717	Stee Company	Sun Valley, Calif.	15558	Micron Electronics	Garden City, Long Island, N. Y.
04222	H-Q Division of Aetovox	Myrtle Beach, S. C.	08718	ITT Cannon Electric Inc.	Phoenix, Arizona	15566	Anprobe Inst. Corp.	Lyndbrook, N. Y.
04354	Precision Paper Tube Co.	Wheeling, Ill.	08792	National Radio Lab. Inc.	Patnamus, N. J.	15631	Cabletronics	Costa Mesa, Calif.
04404	Dynac Division of Hewlett-Packard Co.	Palo Alto, Calif.	08806	General Electric Co. Mineral Long Dept.	Cleveland, Ohio	15772	Twentieth Century Coal Spring Co.	Santa Clara, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.	08954	Mel-Ron	Indianapolis, Ind.	15801	Ferret Elec. Inc.	Framingham, Mass.
04673	Dakota Eng. Inc.	Culver City, Calif.	08926	Walckey Relays Div.	Costa Mesa, Calif.	15818	Aerlec Inc.	MI. View, Calif.
04713	Motofoto, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	09134	Texas Capacitor Co.	Houston, Texas	16037	Space Fine Wire Co.	Space Park, N. C.
04732	Filton Co., Inc. Western Div.	Culver City, Calif.	09506	General Electric Co. Minial Long Dept.	Cleveland, Ohio	16179	Omni-Spectra Inc.	Farmington, Mich.
04773	Automatic Electric Co.	Northlake, Ill.	09584	Mel-Ron	Indianapolis, Ind.	16352	Computer Drive Corp.	Costa, N. J.
04796	Sequira Wire Co.	Redwood City, Calif.	09926	Walckey Relays Div.	Costa Mesa, Calif.	16585	Boots Aircraft Nut Corp.	Pasadena, Calif.
04811	Precision Coal Spring Co.	El Monte, Calif.	09134	Texas Capacitor Co.	Houston, Texas	16668	Ideal Prec. Meter Co., Inc. De Jul Meter Div.	Brooklyn, N. Y.
04811	P. M. Motor Company	Westchester, Ill.				16758	Delta Radio Div. of G. M. Corp.	Acronia, Ind.
04919	Component Mfg. Service Co.	W. Bridgewater, Mass.				17109	Thermometrics Inc.	Corona Park, Calif.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.				17474	Triplex Company	Mountain View, Calif.
						17554	Components Inc.	Billerica, Mass.
						17675	Hanlin Metal Products Corp.	Akron, Ohio
						17745	Angstrom Prec. Inc.	N. Hollywood, Calif.
						17854	Selco Inc.	San Jose, Calif.

TABLE 6-3.

CODE LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
17870	McGraw-Edison Co.	Manhasset, N. H.	62119	Universal Electric Co.	Swosso, Mich.	73699	J. O. Electronics Corp.	Brooklyn, N. Y.
18042	Power Design Parallel Inc.	Palo Alto, Calif.	63743	Ward-Leonard Electric Co.	Mt. Vernon, N. Y.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
18063	Cresite Corp., Semiconductor Div.	Palo Alto, Calif.	64959	Western Electric Co., Inc.	New York, N. Y.	73957	Gloos-Pin Corp.	Rockfield, N. J.
18324	Signetics Corp.	Sunnyvale, Calif.	65092	Weston Inst. Inc. Weston-Newark	Newark, N. J.	74276	Signalite Inc.	Neptune, N. J.
18476	Ty-Cat Mfg. Co., Inc.	Hulliston, Mass.	66295	Wittek Mfg. Co.	Chicago, Ill.	74455	J. H. Wynn, and Sons	Winchester, Mass.
18466	TRW Elect. Comp. Div.	Des Plaines, Ill.	66346	Minnesota Mining & Mfg. Co.	Revere-Mincon Div. St. Paul, Minn.	74861	Industrial Condenser Corp.	Chicago, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N. Y.	70776	Allen Mfg. Co.	Hartford, Conn.	74868	R. F. Products Division of Amphelco-Bolg Electronics Corp.	Danbury, Conn.
18612	Vishay Instruments Inc.	Malvern, Pa.	70309	Allied Control	New York, N. Y.	74970	E. F. Johnson Co.	Wassera, Minn.
18673	L. I. DuPont and Co., Inc.	Wilmington, Del.	70319	Allmetal Screw Product Co., Inc.	Garden City, N. Y.	75042	International Resistance Co.	Philadelph. Pa.
15911	Durham Mfg. Co.	Milwaukee, Wis.	70412	Amplex, Div. of Chrysler Corp.	Detroit, Mich.	75263	Keystone Carbon Co., Inc.	St. Marys, Pa.
19325	The Bendix Corp., Navigation & Control Div.	Teletoto, N. J.	70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.	75379	GTS Knights Inc.	Sandwich, Ill.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N. J.	70563	Amgen Co., Inc.	Union City, N. J.	75382	Hulka Electric Corporation	Mt. Vernon, N. Y.
19589	Concoa	Baldwin Park, Calif.	70574	ADC Products Inc.	Minneapolis, Minn.	75388	Lenz Electric Mfg. Co.	Chicago, Ill.
19644	LRC Electronics	Horseheads, N. Y.	70903	Belden Mfg. Co.	Chicago, Ill.	75915	Littelfuse, Inc.	Des Plaines, Ill.
19701	Electra Mfg. Co.	Independence, Kansas	70998	Bird Electronic Corp.	Cleveland, Ohio	76005	Lord Mfg. Co.	Erie, Pa.
20183	General Abrasives Corp.	Philadelphia, Pa.	71002	Birnbach Radio Co.	New York, N. Y.	76210	O. W. Harwood	San Francisco, Calif.
21276	Laserlume, Inc.	Long Island City, N. Y.	71034	Bliley Electric Co., Inc.	Erie, Pa.	76433	General Instrument Corp., Miramonte Division	Newark, N. J.
21335	Falmit Heating Co., The	New Britain, Conn.	71041	Boston Gear Works Div. of Murray C. of Texas	Quincy, Mass.	76467	James Miller Mfg. Co., Inc.	Wilton, Mass.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.	71218	Bud Radio, Inc.	Wilmington, Ohio	76493	J. W. Willes Co.	Los Angeles, Calif.
23042	Teascan Corp.	Indianapolis, Ind.	71279	Cambridge Thermionics Corp.	Cambridge, Mass.	76530	Cinch-Monadnock, Div. of United Carb Fastener Corp.	San Leandro, Calif.
23253	British Radio Electronics Ltd.	Washington, D. C.	71284	Camloc Fastener Corp.	Paramus, N. J.	76545	Marler Electric Co.	Cleveland, Ohio
24155	G. L. Lamp Division	Neia Park, Cleveland, Ohio	71313	Caldwell Condenser Corp.	Lindenhurst L. I., N. Y.	76703	National Union	Newark, N. J.
24655	General Radio Co.	West Concord, Mass.	71400	Dussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.	76834	Oak Manufacturing Co.	Crystal Lake, Ill.
24661	Memrot Inc., Comp. Div.	Huntington, Ind.	71436	Chicago Condenser Corp.	Chicago, Ill.	77066	The Regola Corp., Electrodynamics Div.	N. Hollywood, Calif.
24796	Paritec Inc.	San Juan Capistrano, Calif.	71442	Carl. Spring Co., Inc.	Pico-Rivera, Calif.	77075	Pacific Metals Co.	San Francisco, Calif.
26365	Gi-As Reproducer Corp.	New Rochelle, N. Y.	71450	CIS Corp.	Elyria, Ind.	77271	Phonostan Instrument and Electronic Co.	South Pasadena, Calif.
26462	Globet File Co. of America, Inc.	Carlstadt, N. J.	71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
26651	Compac Hollister Co.	Hollister, Calif.	71471	C. nema, Div. Aet-vox Corp.	Buena, Calif.	77342	American Machine & Foundry Co. Potter & Blumfield Div.	Princeton, Ind.
26992	Hamilton Watch Co.	Lancaster, Pa.	71482	C. P. Starr & Co.	Chicago, Ill.	77630	TRW Electronics Components Div.	Hamden, N. J.
27291	Specialties Mfg. Co., Inc.	Stifford, Conn.	71520	Centiplab Div. of Globe Union Inc.	Milwaukee, Wis.	77638	General Instrument Corp., Rectifier Div.	Brooklyn, N. Y.
28480	Hewlett-Packard Co.	Palo Alto, Calif.	71616	Commercial Plastics Co.	Chicago, Ill.	77764	Resistance Products Co.	Harrisburg, Pa.
28520	Heyman Mfg. Co.	Northwell, N. J.	71700	Coinish Wire Co., The	New York, N. Y.	77909	Rubbercraft Corp. of Calif.	Torrance, Calif.
30817	Instrument Specialties Co., Inc.	Little Falls, N. J.	71707	Colo Card Co., Inc.	Providence, R. I.	78189	Shackelford Division of Illinois Tool Works	Elgin, Ill.
33173	G. E. Receiving Tube Dept.	Dunstable, Ms.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	78277	Sigma	So. Braintree, Mass.
35434	Lycitech Int.	Chicago, Ill.	71765	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.	78283	Signal Indicator Corp.	New York, N. Y.
36196	Stanlyck Cell Products Ltd.	Hawkesbury, Ontario, Canada	71766	Electric Motive Mfg. Co., Inc.	Wilmington, Conn.	78290	Struthers-Dunn Inc.	Pittman, N. J.
36267	Cunningham, W. H. & Hill, Ltd.	Toronto Ontario, Canada	72619	Bright Corp.	Brooklyn, N. Y.	78424	Specialty Leather Prod. Co.	Newark, N. J.
37942	P. H. Malloy & Co. Inc.	Indianapolis, Ind.	72656	Indiana General Corp., Electronics Div.	Keasby, N. J.	78452	Thompson-Wheel & Co.	Chicago, Ill.
39543	Mechanical Industries Prod. Co.	Akron, Ohio	72689	General Instrument Corp., Cap. Div. Newark	N. J.	78471	Tilly Mfg. Co.	San Francisco, Calif.
40920	Miniature Precision Bearings, Inc.	Keene, N. H.	72765	Blake Mfg. Co.	Harwood Heights, Ill.	78485	Stackpole Carbon Co.	St. Marys, Pa.
42190	Mater, Co.	Chicago, Ill.	72825	Hugh H. Uly Inc	Philadelphia, Pa.	78543	Standard Thomson Corp.	Waltham, Mass.
43990	C. A. Morgan Co.	Englewood, Colo.	72928	Gudeman Co.	Chicago, Ill.	78593	Tenneman Products, Inc.	Cleveland, Ohio
44655	Ohmite Mfg. Co.	Skokie, Ill.	72962	Easton Sico Nut Corp.	Union, N. J.	78790	Transformer Engineers	San Gabriel, Calif.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.	72964	Robert M. Hadley Co.	Los Angeles, Calif.	78947	Utricle Co.	Newtownville, Mass.
47904	Polaroid Corp.	Cambridge, Mass.	72962	Eire Technological Products, Inc.	Eire, Pa.	79136	Waldes Robinson Inc.	Long Island City, N. Y.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.	73061	Hansen Mfg. Co., Inc.	Princeton, Ind.	79142	Veeder Root, Inc.	Hartford, Conn.
49956	Radiovac & Power Tube Div.	Waltham, Mass.	73076	H. W. Harper Co.	Chicago, Ill.	79231	Wence Mfg. Co.	Chicago, Ill.
57090	Rowan Controller Co.	Wesminster, Md.	73138	Harpot Div. of Beckman Inst., Inc.	Bulleton, Calif.	79277	Continental-Wal Electric Corp.	Philadelphia, Pa.
57953	Jacobson Company	Waltham, Mass.	73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.	79663	Zenick Mfg. Corp.	New Rochelle, N. Y.
58254	Shallcross Mfg. Co.	Selma, N. C.	73445	Amplex Lint Co.	Hicksville, L. I., N. Y.	80051	Megon Division of Sessions Clock Co.	Westtown, N. J.
58276	Simpson Electric Co.	Chicago, Ill.	73506	Diachet Semiconductor Corp.	New Haven, Conn.	80035	Fresstel Corp.	Franklin, Pa.
58933	Sonotone Corp.	Elizabethtown, N. Y.	73559	Carling Electric, Inc.	Hartford, Conn.	80120	Schuster Alloy Products Co.	Elizabeth, N. J.
58936	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.	73581	Circle P Mfg. Co.	Trenton, N. J.	80131	Electronic Industries Association	Any brand
58137	Spotting Tube Co., Inc.	Tonawanda, N. Y.	73682	George N. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.	80207	Unimac Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
58789	Sorgue Electric Co.	North Adams, Mass.	73734	Federal Screw Products Inc.	Chicago, Ill.	80275	United Transistor Corp.	New York, N. Y.
59446	Telco Corp.	Tulsa, Okla.	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio	80748	Dalord Electric Corp.	Chicago, Ill.
59730	Thomas & Betts Co.	Elizabeth, N. J.	73793	General Industries Co., The	Flint, Ohio	80794	Deurns Inc.	Riverside, Calif.
60741	Tampair Electrical Inst. Co.	Wafflon, Ohio	73846	Goshen Shaving & Tool Co.	Goshen, Ind.	80811	Acio Div. of Robertshaw Controls Co.	Columbus, Ohio
61775	Unico Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.						

**TABLE 6-3.**  
**CODE LIST OF MANUFACTURERS (Continued)**

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
80495	All Star Products Inc.	Delliance, Ohio	8664	Radio Corp. of America, Electronic	Harrison, N. J.	95566	Arnold Engineering Co.	Marengo, Ill.
80509	Avery Label Co.	Montevia, Calif.		Cons. & Devices Div.	Glendale, Calif.	95712	Dodge Electric Co., Inc.	Franklin, Ind.
80563	Hammerhead Co., Inc.	Wasa Hill, N. C.	86928	Sealtop Mfg. Co.	Anaheim, Calif.	95964	Simon Mfg. Co.	Wayne, Ill.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.	87034	Marco Industries	Lansdale, Pa.	95967	Wrencher Co.	Chicago, Ill.
80933	Dimec Gray Co.	Dayton, Ohio	87216	Phico Corporation (Lansdale Division)	Lansdale, Pa.	96067	Microwave Assoc., West Inc.	Sunnyvale, Calif.
81030	International Instruments Inc.	Dayton, Ohio	87473	Weston Fibrous Glass Products Co.	San Francisco, Calif.	96095	Hi-Q Div. of Aerovox Corp.	Olean, N. Y.
81073	Grayhill Co.	LaGrange, Ill.			San Francisco, Calif.	96256	Thordalson-Meissner Inc.	Mt. Carmel, Ill.
81095	Triad Transformer Corp.	Yonkers, Calif.			San Francisco, Calif.	96256	Solar Manufacturing Co.	Los Angeles, Calif.
81317	Winchester Elect. Div., Lytco Ind., Inc.	Uakville, Conn.			Pasadena, Calif.	96306	Mingoswitch, Div. of Minn.-Honeywell	Freeport, Ill.
81349	Military Specification		87664	Van Waters & Rogers Inc.	Pasadena, Calif.			Chicago, Ill.
81483	International Rectifier Corp.	El Segundo, Calif.	87930	Tower Mfg. Corp.	Lincoln, Ill.	96330	Carlton Screw Co.	Burlington, Mass.
81511	Airpax Electronics, Inc.	Cambridge, Maryland	88140	Guller-Hammer, Inc.	St. Paul, Minn.	96341	Microwave Associates, Inc.	Oakland, Calif.
81660	Baird Controls Div. Baird Wright Corp.	Watertown, Mass.	88220	Gould-National Batteries, Inc.	Buffalo, N. Y.	96501	Excel Transformer Co.	Richmond Park, N. Y.
82042	Carter Precision Electric Co.	Stokie, Ill.	89231	Graybar Electric Co.	Oakland, Calif.	96508	Xcelite Inc.	
82047	Sperts Faraday, Inc., Copper Hewlett Electric Div.	Holoken, N. J.	89473	G. E. Distributing Corp.	Schenectady, N. Y.	96733	San Fernando Elect. Mfg. Co.	San Fernando, Calif.
82116	Electric Regulator Co.	Northwich, Conn.	89665	United Transformer Co.	Chicago, Ill.			
82142	Jeffris Electronics Division of Sperts	Carlton Co.	90030	United Shoe Machinery Corp.	Beverly, Mass.	96881	Thomson Ind. Inc.	Long Is., N. Y.
82170	Faithful Camera & Inst. Corp. Space & Defense System Div.	Du Bois, Pa.	90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N. J.	97404	Industrial Retaining Ring Co.	Ivington, N. J.
82709	Maguire Industries, Inc.	Greenwich, Conn.	90763	United Carb Fastener Corp.	Chicago, Ill.	97539	Alubatic & Precision Mfg.	Englewood, N. J.
82719	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.	90979	Heating Engineering Co.	San Francisco, Calif.	97979	Neon-Resistor Corp.	Yonkers, N. Y.
82736	Ashton Corp.	East Newark, N. J.	91146	ITT Cannon Elec. Inc., Salem Div.	Salem, Mass.	97983	Lifton System Inc., Adler-Westlex Common. Div.	New Rochelle, N. Y.
82747	Smith, J. L. Inc.	Chicago, Ill.	91260	Connor Spring Mfg. Co.	San Francisco, Calif.	98141	R-Tronics, Inc.	Jamaica, N. Y.
82763	Murray & Co. Inc. Spencer Products	Attitash, N. H.	91345	Miller Dial & Nameplate Co.	El Monte, Calif.	98159	Rubber Tech, Inc.	Gardena, Calif.
82768	Phillips Advance Control Co.	Jersey City, N. J.	91418	Radio Materials	Chicago, Ill.	98270	Hewlett-Packard Co., Mosley Div.	Pasadena, Calif.
82866	Raychem Products Corp.	Madison, Wis.	91506	Augal Inc.	Attleboro, Mass.	98278	Microdof, Inc.	Pasadena, Calif.
82877	Holton Mfg. Co., Inc.	Woodstock, N. Y.	91537	Dale Electronics, Inc.	Columbus, Neb.	98291	Sealectro Corp.	Marlton, N. Y.
82893	Vector Electronic Co.	Glendale, Calif.	91662	Elco Corp.	Willow Grove, Pa.	98296	Zero-Mfg. Co.	Burbank, Calif.
83014	Harwell Corp.	Los Angeles, Calif.	91737	Gen. Mfg. Co., Inc.	Waltham, Mass.	98410	Gen. Mfg. Co., Inc.	Cleveland, Ohio
83058	Core Transformer Co.	Cambridge, Mass.	91827	H.P. Development Co.	Redwood City, Calif.	98731	General Mfg. Inc., Electronics Div.	Minneapolis, Minn.
83084	New Hampshire Valve Repair, Inc.	Peterborough, N. H.	91886	Malco Mfg. Co., Inc.	Chicago, Ill.	98734	Patco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
83123	General Instrument Corp. Conquest Div.	Concord, N. H.	91939	Honeywell Inc., Micro Switch Div.	Freeport, Ill.	98871	North Hills Electronics, Inc.	Glen Cove, N. Y.
83148	Tel. Wire and Cable Div.	Douglas, S. C.	91961	Nahn-Bios, Spring Co.	Oakland, Calif.	98978	International Electronic Research Corp.	Burbank, Calif.
83284	Victory E. Corp.	Los Angeles, Calif.	92746	Tau Conductor Corp.	Peabody, Mass.	99109	Columbia Technical Corp.	New York, N. Y.
83299	Bridges Corp., Red Bank Div.	Red Bank, N. J.	92767	Elget Optical Co., Inc.	Rochester, N. Y.	99313	Varian Associates	Palo Alto, Calif.
83315	Hobart Mfg.	Mundelein, Ill.	92867	Tenobite Insulated Wire Co., Inc.	Tarrytown, N. Y.	99378	Altec Corp.	Winchester, Mass.
83324	Hosco Inc.	Newport Beach, Calif.	92959	Roblink & Myers Inc.	Palladium Park, N. J.	99515	Marshall Ind., Capacitor Div.	Montevia, Calif.
83330	Smith, Herman H., Inc.	Babbling, N. Y.	93140	Ameco Controls, Div. of Essex Wire Corp.	Mar. Field, Ohio	99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
83337	Tech Labs.	Patterson, Calif.	93637	Patco Mfg. Co.	Culver City, Calif.	99800	Delevan Electronics Corp.	East Aurora, N. Y.
83385	Carlton Screw Co.	Chicago, Ill.	93927	G. V. Controls	Livingston, N. J.	99800	Wilco Corporation	Indianapolis, Ind.
83501	David Wire and Cable Co. Div. of American Corp.	Brookfield, Mass.	94037	General Cable Corp.	Bayonne, N. J.	99928	Burton Corp.	Whisper, N. J.
83504	Bairnough Div. of Electronic Sub. Div.	Plainfield, N. J.	94141	Phyco Dodge	Yonkers, N. Y.	99934	Henzlind, Inc.	Boston, Mass.
83740	Union Carbide Corp., Consumer Prod. Div.	New York, N. Y.	94144	Raytheon Co., Comp. Div., Inc. Comp. Operations	Quincy, Mass.	99942	Hoffman Electronics Corp. Semiconductor Div.	Elmhurst, Calif.
83777	Model Eng. and Mfg. Inc.	Hopkinton, Ind.	94146	Scientific Electronics Products, Inc.	Lowland, Colo.	99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.
83821	Loyd Springs Co.	Pestus, Mo.	94151	Agner Elect. Corp., Tung-Sol Div.	Newark, N. J.			
83924	Aeronautical Instruments Radio Co.	Lodi, N. J.	94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N. J.			
84374	Arco Electronics, Inc.	Great Neck, N. Y.	94722	South Chester Corp.	Chester, Pa.			
84395	A. J. Giesey Co., Inc.	San Francisco, Calif.	94830	Wire Cloth Products, Inc.	Bellwood, Ill.			
84431	TSP Corporation Div.	Ogden, Neb.	94875	Automatic Metal Products Co.	Brooklyn, N. Y.			
84970	James Division, Inc.	Bloomington, Ind.	94667	Worcester Pressed Aluminum Corp.	Worcester, Mass.			
85454	Boston Audio Com. any	Boston, N. J.	94695	Magnecraft Electric Co.	Chicago, Ill.	0000F	Wilco Tool and Die	Los Angeles, Calif.
85471	AvB. Boyd Co.	San Francisco, Calif.	95023	George A. Philbrick Researchers, Inc.	Boston, Mass.	0000Z	Willow Leather Products Corp.	Newark, N. J.
85474	W. J. Bracamonte & Co.	San Francisco, Calif.			Boca, Fla.	000AB	ETA	England
85566	Knitted Knobs, Inc.	Hampden, Conn.	95236	Allies Products Corp.	Boca, Fla.	000BB	Precision Instrument Components Co.	Van Nuys, Calif.
85571	Seamless Rubber Co.	Chicago, Ill.	95238	Continental Connector Corp.	Longside, N. Y.	000CS	Hewlett-Packard Co.,	Colorado Springs
86174	Palmit Springs Co.	Los Angeles, Calif.	95263	Leetvall Mfg. Co., Inc.	Long Island, N. Y.	000HM	Rubber Eng. & Development	Hoyward, Calif.
86197	Carlton Division Products Co., Inc.	Carlton Heights, Pa.	95265	National Coil Co.	Sneadon, Wyo.	000HN	A "M" Mfg. Co.	San Jose, Calif.
86579	Precision Rubber Products Corp.	Dayton, Ohio	95275	Vitramon, Inc.	Bridgeport, Conn.	000Q	Coeltron	Oakland, Calif.
			95348	Gordas Corp.	Bloomfield, N. J.	000QM	California Eastern Lab.	Burlington, Calif.
			95354	Method Mfg. Co.	Rolling Meadows, Ill.	000YY	S. K. Smith Co.	Los Angeles, Calif.

THE FOLLOWING HP VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.

0000F	Wilco Tool and Die	Los Angeles, Calif.
0000Z	Willow Leather Products Corp.	Newark, N. J.
000AB	ETA	England
000BB	Precision Instrument Components Co.	Van Nuys, Calif.
000CS	Hewlett-Packard Co.,	Colorado Springs
000HM	Rubber Eng. & Development	Hoyward, Calif.
000HN	A "M" Mfg. Co.	San Jose, Calif.
000Q	Coeltron	Oakland, Calif.
000QM	California Eastern Lab.	Burlington, Calif.
000YY	S. K. Smith Co.	Los Angeles, Calif.

From FSC Handbook Supplements

**BACK DATING  
MANUAL  
CHANGES**

**APPENDIX I**  
**BACKDATING**  
**MANUAL CHANGES**  
**Model 606B**  
**HF Signal Generator**

Table I-1, *Parts/Components Change Index*, (which follows the backdating), is a cross-reference of the change, the assembly on which the change was made, and the reference designation of the changed component.

Make all backdating corrections in this manual according to changes below:

Serial Prefix or Number	Make Manual Changes	Serial Prefix or Number	Make Manual Changes
608-00101 to 00750	A thru F	811-01851 to 02400	D, E, F
608-00751 to 724-01100	B thru F	959-02401 to 02600	E, F
724-01101 to 811-01850	C thru F	0959A02601 to 03200	F

**CHANGE A**

Page 6-4, Table 6-2:

Change A4R10 to 2100-0914,1, R:Var. Comp. 25 K ohm 20% LIN 1/5W, 28480, 2100-0914.  
 Delete A4C38.

Page 6-5, Table 6-2:

Delete A4R53.

Page 5-31, Figure 5-24:

Delete A4C38 and A4R53.

**CHANGE B**

Page 5-31, Figure 5-24 and Page 6-5, Table 6-2:

Delete A5R3, A5R4, A5R5, and A5R6.

**CHANGE C**

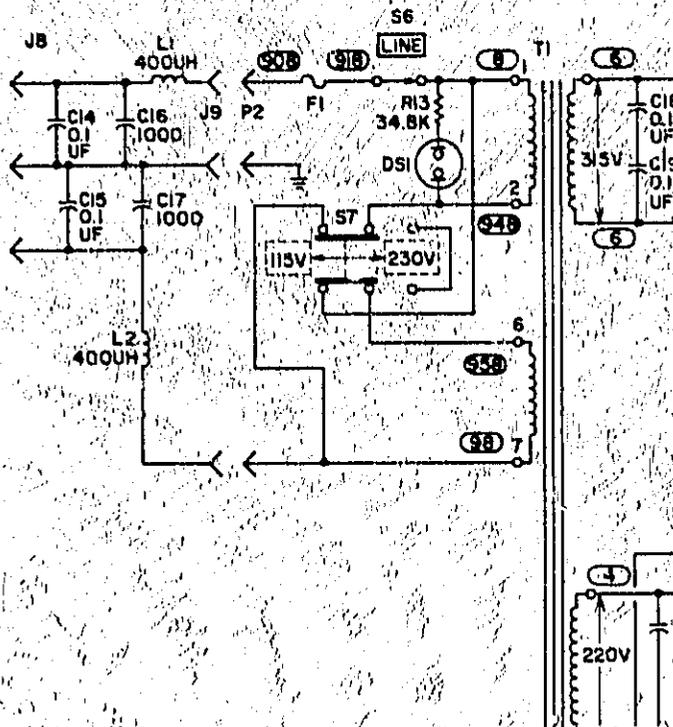
Page 5-37, Figure 5-27 and Page 6-6, Table 6-2:

Add an asterisk immediately following the reference designations A8R10, A8R11, and A8R12. (This indicates a factory selected part).

**CHANGE D**

Page 5-35, Figure 5-26

Change the power supply schematic as shown in the partial schematic below.

*Power Supply Partial Schematic (Part of Change D)*

Page 6-7, Table 6-2:  
Change C4 Qty to 4.

Page 6-8, Table 6-2:  
Add

- C14, 0132-0003, 2, C: VAR POLY 0.7-3.0 pF, 28480, 0132-0003;
- C15, 0160-0002, C: FXD MYLAR 0.1  $\mu$ F 10% 600 VDCW, 56289, 106P10496 PMD;
- C17, 0150-0019, C: FXD CER 1000 pF 20% 509 VDCW, 72982, 327005x560102M;
- J9, 1251-0095, 1 Connector: Power 2 female contacts, 75382, 221;
- L1, 9140-0051, 3, Coil: FXD 400  $\mu$ H, 28480, 9100-1665
- L2, 9140-0051, Coil: FXD 400  $\mu$ H, 18480, 9100-1665.

## Change

- C13 Qty to 2
- C23 Qty to 0
- J8 to 1251-0148, 1, Connector: Power 3 Pin male, 60 27, H-1061-2;
- L3 Qty to 0
- P2 to 8120-0078, 1, Cable: Power 7.5 ft. 70903, KH 4147;
- Delete FL1

Page 6-9, Table 6-2

- Add W4, 8120-0045, 1, Cable Assembly: Power, 70903, KH 4077
- Change HP Part No. 00606-00026 to 00606-623 and 00606-00025 to 606A-4-tR
- Delete 00606-00024.

**CHANGE E**

Page 6-8, Table 6-2:

Change DS1 to 1450-0048, 1, Lamp:Indicator Red 115V, 72765, 599-124.

**CHANGE F**

Page 6-9, Table 6-2

Delete 00606-00028, 00606-00031, 00696-00033, and 00606-60034.

Table I-1. Component/Part Change Index

Component Locations	Chassis	A4	A5	A8
CHANGE A		C38 <sup>1</sup> R53 <sup>1</sup> R10 <sup>2</sup>		
B			R3 <sup>1</sup> R4 <sup>1</sup> R5 <sup>1</sup> R6 <sup>1</sup>	
C				R10 <sup>3</sup> K11 <sup>3</sup> R12 <sup>3</sup>
D	C14 <sup>4</sup> , C15 <sup>4</sup> , C16 <sup>4</sup> , C17 <sup>4</sup> , J9 <sup>4</sup> , L1 <sup>4</sup> , L2 <sup>4</sup> , W4 <sup>4</sup> , JS <sup>2</sup> , P2 <sup>2</sup> , FL1 <sup>1</sup>			
E	DS1 <sup>2</sup>			
F	00606-00028 <sup>1</sup> 00606-00031 <sup>1</sup> 00606-00033 <sup>1</sup> 00606-60034 <sup>1</sup>			

- <sup>1</sup>Delete Component(s)/Parts
- <sup>2</sup>Change Part Number/Description
- <sup>3</sup>Changed to Factory Selected Component
- <sup>4</sup>Add component
- <sup>5</sup>Change HP Part Number

# MANUAL CHANGES

## HF Signal Generator

### MANUAL IDENTIFICATION

Description: HF Sig. Gen.  
 Model Number: #56B  
 Date Printed: Sept. 1972  
 Part Number: 00606-90017

This supplement contains important information for correcting manual errors and for adapting the manual to instruments containing improvements made after the printing of the manual.

To use this supplement:

Make all ERRATA corrections

Make all appropriate serial number related changes indicated in the tables below.

Serial Prefix or Number	Make Manual Changes	Serial Prefix or Number	Make Manual Changes
1401A, 1432A, 1439A, 1515A	1	1728A 1748A	1-5 1-6
1518A 1543A	1, 2 1-3	1822A 1826A	1-7 1-8
1604A04636 to 04970 1604A04971 to 05010	1-4 1-5	2036A	1-9

► NEW ITEM

### ERRATA

Pages 1-1 and 1-2, Table 1-1:

Add the following note.

**NOTE:** Unless otherwise noted, specifications for **OUTPUT CHARACTERISTICS** and **MODULATION CHARACTERISTICS** apply over the top 10 dB of the output level Vernier range. RF output terminated with  $\pm 50$  ohm resistive load.

Under **MODULATION CHARACTERISTICS**, change the Modulation Meter Accuracy specification to the following wording.

"Accuracy:  $\pm$  (5% of full scale +5% of reading), 0 to 90% modulation, for modulation frequencies to 10 kHz;  $\pm 10\%$  of full scale for frequencies from 10 kHz to 20 kHz."

In the Modulation Level Constancy specification add the following wording to the last sentence.

"... for modulation levels up to 70%."

Page 5-1, paragraph 5-9:

Change step h to read as follows:

### CAUTION

*A power level of +20 dBm will damage the thermistor mount.*

- h. Remove the 20 dB attenuator. Set ATTENUATOR control to -10 DBM. Power meter should indicate  $-10 \pm 1$  dB.

### NOTE

Continued . . .

Manual change supplements are revised as often as necessary to keep manual as current and accurate as possible. Hewlett-Packard recommends that you periodically request the latest edition of this supplement. Free copies are available from all HP offices. When requesting copies quote the manual identification information from your supplement, or the model number and print date from the title page of the manual.

12 September 1980  
7 Pages

HEWLETT  PACKARD

Printed in U.S.A.

**ERRATA (Cont'd)****Page 5-1, paragraph 5-9: (Cont.)**

Add the following sentence to step i:

"Be sure to reconnect the 20 dB attenuator."

**Page 5-8, paragraph 5-37:**

Add the following sentence between step e and step f: "Remove the electronic counter from test point A2R11 and connect it to the junction of A2CR5 and A2R16."

Change the beginning of step g to read: "With the counter still connected, set potentiometer A2R11 . . ."

**Page 5-10, paragraph 5-49:**

Add the following steps:

- i. Repeat step d. The output voltage should be between 0.8V and 1V ( $\pm 1$  dB) throughout the entire frequency range of the Signal Generator.
- j. Bands 1, 2, and 3 can be corrected if necessary by changing resistor values for A8R3, R6, and R9 respectively (increasing resistance increases output level across the band). The normal range of values for these resistors are as follows: R3, 1.5k $\Omega$  to 3.3k $\Omega$ ; R6, 500 $\Omega$  to 2.2k $\Omega$ ; R9, 1k $\Omega$  to 2.2k $\Omega$ .

**Page 5-31, Figure 5-24:**

In the part 1 of 2 A5 schematic, change C4 1000 to C1 5000 pF.

**Page 5-33, Figure 5-25:**

Add an asterisk (\*) to C5 (it is a factory selected part). To select a value for C5, set the CRYSTAL CALIBRATOR switch on the front panel to 100 KC. Then, connect an electronic counter to the junction of CR5 and R16.

The counter should read 100 kHz when R11 is at approximately mid-range. Increase the capacitance if the frequency is greater than 100 kHz; decrease the capacitance if the frequency is less than 100 kHz. The allowable values for C5 range from 390 pF to 620 pF.

**Page 5-35, Figure 5-26:**

Change the nominal value of \*R17 to 261 $\Omega$ .

**Page 5-37, Figure 5-27:**

On the amplifier turret schematic, change R3\* to 3300 $\Omega$  and R6\* to 1600 $\Omega$ .

**Page 6-3, Table 6-2:**

Add an asterisk (\*) to A2C5 and change the part number to 0160-3534 CAPACITOR-FXD 510 pF (nominal value).

**Page 6-4, Table 6-2:**

A2CR1 can be replaced by 1901-0621 or 1901-0025, depending on availability. Changing from one part number to the other may require changing A2C5.

Change A2Q1, A2Q2 and A2Q3 to 1854-0809.

Change A3C3 and A4C2 to 0170-0022 C: FXD MY 0.1 UF 20% 600 WVDC.

**Page 6-5, Table 6-2:**

Change A4CR1 and A4CR3 to 1910-0016.

Change HP Part Number for A4R10 to 2100-3573.

**Page 6-6, Table 6-2:**

Change A5C1 to 0160-2145 C: FXD CER 5000 pF +80-20% 100VDCW.

Change A5C4 part number to 0160-0168.

**Page 6-7, Table 6-2:**

Change A8R3 to 0687-3321 RESISTOR 3.3K 10% 0.5W CC T-0+647.

Change A8R6 to 0686-1625 RESISTOR 1.6K 5% 0.5W CC TC-0+647.

**ERRATA (Cont'd)****Page 6-8, Table 6-2:**

Change A10 to 606A-34C ATTENUATOR (EXCEPT FOR A10J1, NOT RECOMMENDED FOR FIELD REPAIR).

Add A10J1 with the following information.

A10J1 1250-0102 CONNECTOR-RF, BNC FEM SGL-HOLE-FR 50-OHM.  
1250-7051 CONTACT-RF CONN; SER BNC; FEMALE; BE-CU.

Change A11R17 to 0698-3132 R: FXD 261Ω 1% .125W TC-0±100.

**Page 6-9, Table 6-2:**

Change CR1 to 1910-0016.

Delete 1400-0084.

Add 1400-0090 NEOPRENE WASHER

Add 2110-0470 FUSEHOLDER

Add 2110-0465 FUSEHOLDER CAP

Add 2110-0467 NUT

**NOTE**

*If any part of the old fuseholder (1400-0084) needs replacing, all four parts of the new fuseholder must be ordered. The old fuseholder is identified by a straight solder lug with the white-black-gray wire attached. On the new fuseholder the solder lug is at a right angle to the body.*

Change FL1 to 9100-3142.

Change Q2 1854-0080 to Q2 1854-0658.

Change HP Part Number for P2 to 8120-1378.

Change DS1 part number to 1450-0566.

**Page 6-10, Table 6-2:**

Delete 00606-001.

Delete 00606-616.

Delete 606A-44B-2.

Delete 00606-00021.

Delete 606A-71A.

Change 606A-75C to 00606-60037.

Add the following parts:

606A-37G SHAFT

0370-0083 KNOB

1480-0061 PIN

**Page 6-11, Table 6-2:**

Change 606A-83B to 606A-95A.

Add 00606-60036 Terminal Board: Audio Oscillator.

Add the following parts:

7120-4162 LABEL, WARNING "HAZARDOUS VOLTAGE" LARGE.

7120-4163 LABEL, WARNING "HAZARDOUS VOLTAGE" SMALL (2 each).

7120-4295 LABEL, WARNING "HAZARDOUS VOLTAGE ALWAYS PRESENT . . ."

7120-5087 LABEL, WARNING "TO PREVENT ELECTRICAL SHOCK . . ." (2 each).

Change 1470-0010 to 00606-20013.

**CHANGE 1**

Page 1-1, Table 1-1:

Change HARMONIC OUTPUT specification to read as follows:

Harmonics (Output Volts meter set between -7 and +3 dB):

>25 dB below fundamental of 50 kHz to 65 MHz.

Page 5-31, Figure 5-25 (schematic):

Delete C23.

Page 6-9, Table 6-2:

Delete C23.

**CHANGE 2**

Page 5-31/5-32, Figure 5-24 (schematic):

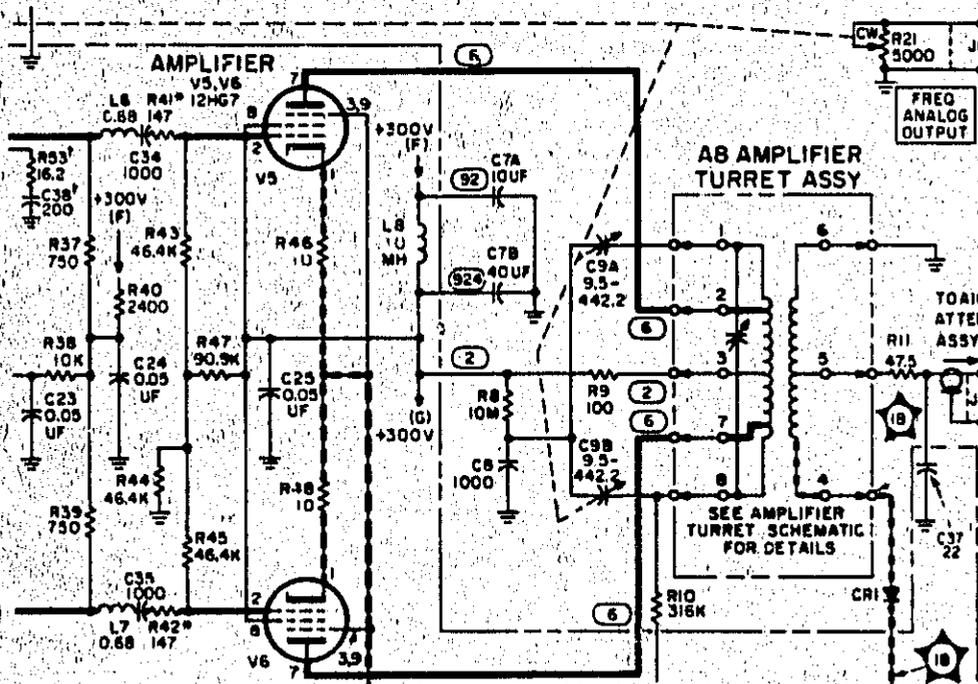
Replace appropriate portion of schematic with attached partial schematic.

Page 6-5, Table 6-2:

Change A4R41 and A4R42 to 0698-3438 R:FXD MET FLM 147 OHM 1% 1/8 W.

Page 6-8, Table 6-2:

Change C7 to 0180-0135 C:FXD ELECT 40/10  $\mu$ F 450V.



P/O Figure 5-24. RF Generator and Modulator Circuits  
Schematic Diagram (P/O Change 2)

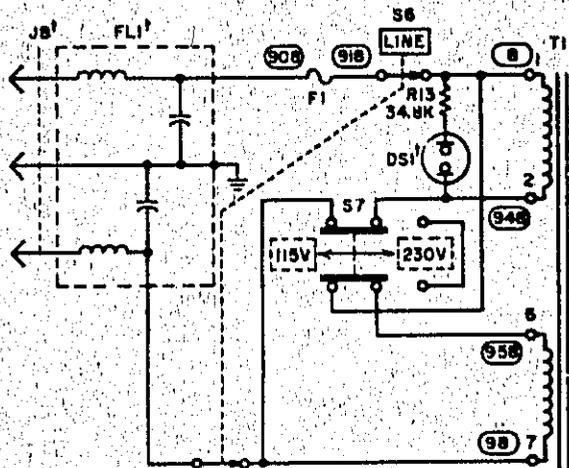
**CHANGE 2 (cont'd)****NOTE**

In band 6 and on the 3.0V Attenuator range, resistors A4R41 and A4R42 affect incidental FM and maximum percent AM. Increasing resistance decreases incidental FM and also decreases maximum percent AM. If necessary, resistors should be selected to maximize performance for both characteristics. Both resistors should be the same value, between  $51.1\Omega$  and  $287\Omega$  (typically,  $147\Omega$ ).

**CHANGE 3**

Page 5-35/5-36, Figure 5-26 (schematic):

Replace appropriate portion of schematic with attached partial schematic.



P/O Figure 5-26. Power Supply Schematic Diagram (P/O Change 3)

Page 6-10, Table 6-2:

Change S6 to 3101-0003 SWITCH-TCL BASIC DPST NS 3A 250 VAC/DC.

**CHANGE 4**

Page 5-31/5-32, Figure 5-24 (schematic, see Change 2):

Add a capacitor C32\* to ground parallel to R8 and C8. Typical value of C32 is 1000 pF; may be omitted (see note).

Add a capacitor C33\* to ground parallel to C8 only. Typical value of C33 is 1000 pF; may be omitted.

**NOTE**

C32 and C33 are added to circuit to decrease third harmonic at signal frequencies about 62 MHz, and fourth and fifth harmonics at signal frequencies above 40 MHz. However, adding either capacitor will slightly increase the second harmonic at signal frequencies between 60 and 65 MHz.

Change A4R53 to 26.1  $\Omega$ .

Page 6-6, Table 6-2:

Change A4R53 to 0698-3432 R: FXD 26.1 OHM 1% 1/8 W.

Page 6-9, Table 6-2:

Add C32 and C33 0150-0050 C: FXD, 1000 pF +80-20% 1000 WVDC.

Page 6-11, Table 6-2:

Add 0360-0001 LUG, SOLDER NO. 6 (FOR C33).

Add 0360-0269 LUG, SOLDER NO. 8 (FOR C32).

Add 1400-0749 (Qty, 2) CLIP, RETAINER.

**CHANGE 5**

Page 5-35/5-36, Figure 5-26:

On the A11 assembly, change C9 to 0.1  $\mu$ F.

Page 6-8, Table 6-2:

Change A11C9 to 0170-0022 C: FXD MY 0.1  $\mu$ F 20% 600 WVDC.

**CHANGE 6**

Page 5-22:

Add the following paragraph:

**5-78. FACTORY SELECTED COMPONENTS**

5-79. The following paragraphs explain how to choose the values of selected components. These components are designated by an asterisk (\*) on the schematic and parts list.

**5-80. SELECTING A4C39 AND A4C40**

5-81. If incidental FM exceeds the specified level, vary C39 and C40 from zero (no capacitors) to 22 pf for a minimum level.

Page 5-31/5-32, Figure 5-24:

Draw in C39\* from the plate of V3 to ground.

Draw in C40\* from the plate of V4 to ground.

Write the following note on the bottom of the page:

\*Selected value. See paragraph 5-78 for selection procedure.

Page 6-5, Table 6-2:

Add A4C39\* and C40\* 0160-2216 C:FXD 15 pF (nominal value).

**CHANGE 7**

Page 6-10, Table 6-2:

Change S6 part number to 3101-2329.

**CHANGE 8**

Page 6-9, Table 6-2:

Delete 1400-0090 NEOPRENE WASHER.

Delete 2110-0470 FUSEHOLDER

Delete 2110-0465 FUSEHOLDER CAP

Delete 2110-0467 NUT.

Add 2110-0564 FUSEHOLDER BODY 12A MAX; 250V MAX 28480 2110-0564

Add 2110-0565 FUSEHOLDER CAP BAYONET; 12A, 250V MAX 28480 2110-0565

Add 2110-0569 NUT-HEX, PLASTIC 28480 2110-0569

Add 1400-0090 WASHER; RUBBER 5/8" OD 00000 OBD.

**► CHANGE 9**

Page 6-6:

Change A4R52 to 0698-3158, CD4, Qty 1, R:FXD MET FLM 27.3K OHM 1% 1/8W.

**CHANGE 9 (Cont'd)**

**Page 6-9:**

Change M1 to 1120-1578, CD6, Qty 1, METER MODULATION.  
Change M2 to 1120-1577, CD5, Qty 1, METER OUTPUT.

**Page 6-10:**

Change TB1 to 0360-0055, CD9, Qty 1, TERMINAL LUG.

# HP MANUAL CHANGES

Make all corrections in your manual according to errata.  
Check the following table for your instrument serial prefix  
and make indicated changes in the manual:

MANUAL TITLE: 606B  
MANUAL PRINTED: September, 1972  
MANUAL PART NO: 00606-90017  
CHANGE DATE: 14th January, 1975

SERIAL PREFIX	MAKE CHANGE	SERIAL PREFIX	MAKE CHANGE	SERIAL PREFIX	MAKE CHANGE
ALL	ERRATA				
1251U	1				
1446U	1,2				
1446U-00986	1 - 3				

## ERRATA

Table 6-1

Change : A2Y1 to Part No 0410-0407 Xtal:Quartz 1000KHz  
A2CR6,7 to part no 1901-0518 Di. Hot Carrier  
P2 to part no 8120-1351 Cbl Assy Power

All 10% carbon composition resistors are replaced with 5%  
Number sequence is changed :

0684-XXX1 to 0683-XXX5  
0687-XXX1 to 0696-XXX5

## CHANGE 1

Table 1-1 Specification

Change : Harmonic output to read:-  
(RF output meter set between -10dB and +3dB for each attenuator setting).  
>25dB below fundamental from 50kHz to 65mHz.  
: Table 6-2  
Delete : C23 part no 0132-0003 C.Var .7-3pF.

## CHANGE 2

Table 6-1 page 6-10

Change : Part no 606A-75B and 606A-75C to part no 00606-60036  
and 00037. (These are pc boards instead of the Kingman  
boards and are interchangeable).

## CHANGE 3

Table 6-1, Page 6-11

Change : Q2 to Part No 1854-0658 XSTRSi.