

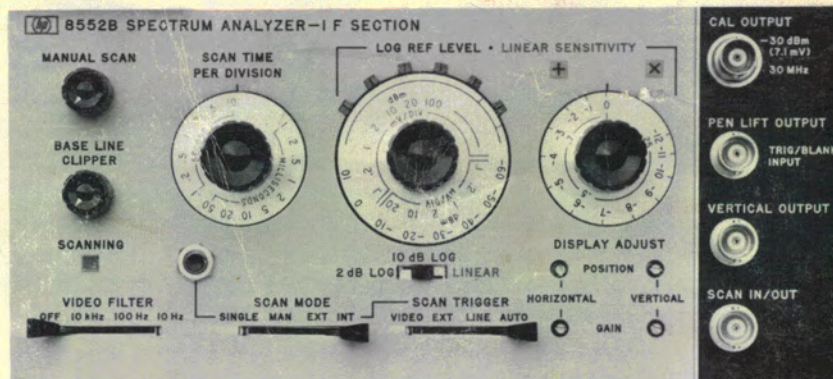
# SPECTRUM ANALYZER IF SECTION

**8552B**

H01-8552B

**H02-8552B**

**H04-8552B**



HEWLETT  PACKARD

## **SAFETY**

*This instrument has been designed and tested according to IEC Publication 348, "Safety Requirements for Electronic Measuring apparatus," and has been supplied in safe condition. This is a Safety Class I instrument. To ensure safe operation and to keep the instrument safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section I for general safety considerations applicable to this instrument.*

## **CERTIFICATION**

*The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facilities, or to the calibration facilities of other International Standards Organization members.*

## **WARRANTY AND ASSISTANCE**

*This Hewlett-Packard product is warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery. Hewlett-Packard will repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. No other warranty is expressed or implied. We are not liable for consequential damages.*

*Service contracts or customer assistance agreements are available for Hewlett-Packard products that require maintenance and repair on-site.*

*For any assistance, contact your nearest Hewlett-Packard Sales and Service Office.*



OPERATING AND SERVICE MANUAL

**SPECTRUM ANALYZER**  
**IF SECTION**  
**8552B**

**SERIAL NUMBERS**

This manual applies directly to instruments with serial numbers prefixed 1410A.

With changes described in Section VII, this manual also applies to instruments with serial numbers prefixed 971-, 974-, 977-, 1050A, 1107A, 1121A, 1131A, 1137A, 1144A, 1209A, 1210A, 1217A, 1234A, 1250A, 1311A, 1335A, and 1345A.

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

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MANUAL PART NO. 08552-90088  
Microfiche Part No. 08552-90089  
Operating Supplement Part No. 08552-90091

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Figure 1-1. Model 8552B Spectrum Analyzer IF Section

## SECTION I

### GENERAL INFORMATION

#### 1-1. INTRODUCTION

1-2. This manual contains pertinent information required to install, operate, test, adjust and service the Hewlett-Packard Model 8552B Spectrum Analyzer IF Section. This section covers instrument identification, description, accessories, specifications and other basic information. A more complete discussion of overall operation of the Spectrum Analyzer system is given in RF Section manuals.

1-3. Figure 1-1 shows the Hewlett-Packard Model 8552B Spectrum Analyzer IF Section.

1-4. The various sections in this manual provide information as follows:

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

SECTION III, OPERATION, provides information relative to operating the equipment.

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

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

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

SECTION VII, MANUAL CHANGES, provides back-dating information.

SECTION VIII, SERVICE, provides information required to service the instrument.

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

1-6. Instrument specifications are listed in Table 1-1. These specifications are the performance standards, or limits against which the instrument

may be tested. Table 1-1 also lists supplemental characteristics. Supplemental characteristics are not specifications but are typical characteristics included as additional information for the user.

#### 1-7. INSTRUMENTS COVERED BY MANUAL

1-8. This instrument has a two-part serial number. The first four digits and the letter or the first three digits and the hyphen comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The contents of this manual apply directly to instruments having the same serial number prefix(es) as listed under SERIAL NUMBERS on the title page.

1-9. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. This unlisted serial prefix indicates that the instrument is different from those documented in this manual. The manual for this instrument is supplied with a yellow Manual Changes supplement that contains "change information" that documents the differences.

1-10. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the *latest Manual Changes supplement*. The supplement for this manual is keyed to this manual's print date and part number, both of which appear on the title page. Complimentary copies of the supplement are available from Hewlett-Packard.

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

#### 1-12. DESCRIPTION

1-13. The HP Model 8552B Spectrum Analyzer IF Section was designed to be used in conjunction with an RF Section and a Display Section.

1-14. The complete analyzer is a highly sensitive superheterodyne receiver with spectrum scanning capabilities determined by the RF Section. Output video from the receiver circuits is applied to the CRT in the display section; thus, a signal or group of signals can be analyzed in the frequency

domain. Input signals are plotted on the CRT as a function of amplitude versus frequency. The amplitude (Y-axis) of the CRT is calibrated in absolute units of power (dBm) or voltage ( $\mu\text{V}/\text{mV}$ ); accordingly, absolute and relative measurements of both amplitude and frequency can be made.

1-15. The instrument controls are arranged for easy operation. For wide spectrum analysis, the operator can use the preset scan of the RF Section used, or for a more detailed study, the spectrum width can be progressively narrowed. The frequency scan can be stopped to allow use of the instrument as a fixed frequency receiver. The RF Section's widest bandwidth is automatically selected for preset scan operation; for variable scan and fixed frequency operation, narrower bandwidths can be selected by the operator.

**1-16. OPTIONS**

1-17. The standard 8552B provides  $-30 \pm 0.3$  dBm calibrator output (7.07 mV into 50 ohms) at  $30 \pm 0.003$  MHz. A standard BNC connector is used.

1-18. Option H01. The calibrator output impedance is 75 ohms with an output of 8.66 mV ( $-30$  dBm). The CAL OUTPUT Connector is equivalent to the Western Electric WE-560A.

1-19. Option H02. The calibrator output impedance is 75 ohms with an output of 8.66 mV ( $-30$  dBm). The CAL OUTPUT connector is a BNC.

1-20. Option H04. The Log Amplitude reference is calibrated in dB  $\mu\text{V}$  (0 dB  $\mu\text{V}$  is 1  $\mu\text{V}$  across 50 ohms).

**1-21. EQUIPMENT REQUIRED BUT NOT SUPPLIED**

1-22. The Model 8552B must be mated with a standard 8550 series RF Section and a 140 series Display Section before it can function as a spectrum analysis system.

**1-23. RF Sections**

1-24. The available 8552B Options must be mated with the following RF Sections:

- 1) 8552B-H01 . . . . . 8553B-H01
- 2) 8553B-H02 . . . . . 8553B-H02
- 3) 8552B-H04 . . 8553, 8554, 8555 (standard)  
8556A-H11 (special)

**1-25. Display Sections**

1-26. The 140 Display Sections are equipped with a fixed-persistence, non-storage CRT. 141T Display Sections are equipped with a variable persistence, storage CRT. The 143 Display Sections have a large screen (8 x 10 inch) fixed-persistence, non-storage CRT.

Table 1-1. 8552B Specifications

## SPECIFICATIONS

## FREQUENCY

**Resolution:**

**Bandwidth:** IF bandwidths of 10 Hz to 300 kHz provided in a 1, 3 sequence.

**Bandwidth Accuracy:** Individual IF bandwidths' 3 dB points calibrated to  $\pm 20\%$  (10 kHz bandwidth  $\pm 5\%$ ).

**Bandwidth Selectivity:** 60 dB/3 dB IF bandwidth ratio  $< 11:1$  for IF bandwidths from 10 Hz to 3 kHz and  $< 20:1$  for IF bandwidths from 10 kHz to 300 kHz, 60 dB points separated by  $< 100$  Hz for 10 Hz bandwidth.

## AMPLITUDE

**Absolute Amplitude Calibration Range:**

**Log:** From  $-130$  to  $+10$  dBm, 10 dB/div on a 70 dB display or 2 dB/div expand below LOG reference.

**H04:** From  $-23$  to  $+117$  dBV, 10 dB/div on a 70 dB display or 2 dB/div expand below LOG reference.

**Calibrator Output:**

**Amplitude:**  $-30$  dBm  $\pm 0.3$  dB;  $+77$  dB $\mu$ V (H04)

**Standard/H04-8552B:** 7.07 mV into 50 ohms

**H01/H02-8552B:** 8.66 mV into 75 ohms

**Amplitude Accuracy:**

Switching between bandwidths (at  $20^\circ\text{C}$ ):

|                   | Log                                                          | Linear                    |
|-------------------|--------------------------------------------------------------|---------------------------|
| 0.1 - 300 kHz     | $\pm 0.5$ dB                                                 | $\pm 5.8\%$               |
| 0.03 - 300 kHz    | $\pm 1.0$ dB                                                 | $\pm 12.0\%$              |
| 0.01 - 300 kHz    | $\pm 1.5$ dB                                                 | $\pm 19.0\%$              |
| Amplitude Display | $\pm 0.25$ dB/dB                                             | $\pm 2.8\%$               |
|                   | but not more than $\pm 1.5$ dB over full 70 dB display range | of full 8 div. deflection |

## GENERAL

**Scan Time:** 16 internal scan rates from 0.1 ms/div to 10 sec/div in a 1, 2, 5 sequence, or Manual Scan.

**Scan Time Accuracy:**

0.1 ms/div to 20 ms/div:  $\pm 10\%$

50 ms/div to 10 sec/div:  $\pm 20\%$

**Power Requirements:** 115 or 230 volts  $\pm 10\%$ , 50 to 60 Hz, normally less than 225 watts for complete analyzer (varies with plug-in units used).

**Weight:** Model 8552B IF Section: Net 9 lb., 11 oz., (4.4 kg.)

## Scan Characteristics

**Scan Mode:**

**Internal:** Analyzer repetitively scanned by internally generated ramp; synchronization selected by Scan Trigger.

**Single:** Single scan actuated by front panel push-button.

**External:** Scan determined by 0 to +8 volt external signal; scan input impedance  $> 10$  k $\Omega$ .

Blanking:  $-1.5$  V external blanking signal required.

**Manual:** Scan controlled by position of Manual Scan knob.

**Scan Trigger:** For Internal scan mode, select between:

**Auto:** Scan free runs.

**Line:** Scan synchronized with power line frequency.

**External:** Scan synchronized with  $> 2$  volt (20V max) trigger signal. Polarity selected by internal switch (on assembly A6) of 8552B IF Section. Scan triggers with negative impulse when switch in NORMAL position.

**Video:** Scan internally synchronized to envelope of RF input signal (signal amplitude of 1.5 major divisions peak-to-peak required on display section CRT).

## Penlift Characteristics

**Penlift output:** 0 to +14 volts (0V pen down). Available in Internal and Single Scan modes and Auto, Line and Video Scan Trigger.

**1-27. EQUIPMENT AVAILABLE**

1-28. The following equipment is recommended for maintenance purposes:

- a. HP 11592A Service Kit (shown in Figure 1-2).
- b. Six-pin extender board (not included in HP 11592A Service Kit) HP Part Number 5060-5914.

**1-29. RECOMMENDED TEST EQUIPMENT**

1-30. Table 1-2 lists the test equipment and accessories required to check, adjust and repair the 8552B Spectrum Analyzer IF Section. If substitute equipment is used, it must meet the Minimum Specifications listed in Table 1-2.

*Table 1-2. Test Equipment and Accessories*

| Item                                                                     | Minimum Specifications or Required Features                                                                                                                                                                                                         | Suggested Model                                                                                                       | Note*   |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------|
| Amplifier                                                                | Frequency Range: 3 to 30 MHz<br>Gain: 20 dB<br>Input and Output Impedance: 50 ohms<br>Flatness: $\pm 1$ dB                                                                                                                                          | HP 8447A                                                                                                              | P, A    |
| Attenuator                                                               | Frequency Range: 0 – 30 MHz<br>Flatness: $\pm 0.5$ dB<br>Steps: 1 dB from 0 to 12 dB                                                                                                                                                                | HP 355C                                                                                                               | A       |
| Attenuator                                                               | Frequency Range: 0 – 30 MHz<br>Flatness: $\pm 0.5$ dB<br>Steps: 10 dB – 0 to 110 dB                                                                                                                                                                 | HP 355D                                                                                                               | A       |
| Audio Oscillator                                                         | Frequency Range: 10 kHz<br>Output Amplitude: 2V rms<br>Frequency Accuracy: $\pm 2\%$<br>Output Impedance: 600 ohms                                                                                                                                  | HP 200CD                                                                                                              | P, A    |
| Digital Voltmeter                                                        | Voltage Accuracy: $\pm 0.2\%$<br>Range Selection: Manual or Automatic<br>Voltage Range: 1 – 1000 Vdc full scale<br>Input Impedance: 10 megohms<br>Polarity: Automatic Indication                                                                    | HP 3440A Digital Voltmeter with<br>HP 3443A Plug-in                                                                   | P, A, T |
| Crystal Detector                                                         | Frequency: 1 – 50 MHz<br>Sensitivity: $> 0.04$ mV/ $\mu$ W<br>Frequency Response: $\pm 0.2$ dB<br>Polarity: Negative                                                                                                                                | HP 423A Crystal Detector                                                                                              | A       |
| Frequency Counter                                                        | Frequency Range: 100 kHz – 50 MHz<br>Accuracy: $\pm 0.001\%$<br>Sensitivity: 30 mV rms<br>Readout Digits: 7                                                                                                                                         | HP 5245L Frequency Counter with<br>HP 5261A Plug-in                                                                   | P, A    |
| Oscilloscope                                                             | Frequency Range: Dc to 50 MHz<br>Time Base: 1 $\mu$ s/div to 10 ms/div<br>Time Base Accuracy: $\pm 3\%$<br>Dual Channel, Alternate Operation<br>Ac or dc Coupling<br>External Sweep Mode<br>Voltage Accuracy: $\pm 3\%$<br>Sensitivity: 0.005 V/div | HP 180A with<br>HP 1801A Vertical Amplifier and<br>HP 1821A Horizontal Amplifier<br>HP 10004A 10:1 Divider Probes (2) | A, T    |
| <p>Note*</p> <p>Performance = P; Adjustment = A; Troubleshooting = T</p> |                                                                                                                                                                                                                                                     |                                                                                                                       |         |



Table 1-2. Test Equipment and Accessories (cont'd)

| Item                                                                     | Minimum Specifications or Required Features                                                                                                                                                                                                                                                                                                                                                     | Suggested Model              | Note*   |
|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------|
| Ohmmeter                                                                 | Resistance Range: 1 ohm to 100 megohms<br>Accuracy: $\pm 10\%$ of Reading                                                                                                                                                                                                                                                                                                                       | HP 412A                      | T       |
| Power Supply                                                             | Output Voltage: Variable, 0 – 30 Vdc<br>Output Current: 0 – 400 mA<br>Meter Resolution: $< 5$ mV                                                                                                                                                                                                                                                                                                | HP 6217A Power Supply        | A       |
| Signal Generator                                                         | Frequency Range: 1 – 30 MHz<br>Output Amplitude: $> 0$ dBm<br>Amplitude Accuracy: $\pm 1\%$<br>Frequency Accuracy: $\pm 1\%$<br>Output Impedance: 50 ohms<br>Modulation: External to 100%                                                                                                                                                                                                       | HP 606B HF Signal Generator  | A       |
| Signal Generator                                                         | Frequency Range: 30 to 50 MHz<br>Output Amplitude: $> -20$ dBm<br>Amplitude Accuracy: $\pm 1\%$<br>Output Impedance: 50 ohms<br>Modulation: External Pulse or CW to 100%                                                                                                                                                                                                                        | HP 608F VHF Signal Generator | P, A, T |
| Oscillator Synchronizer                                                  | Frequency Range: 50 kHz – 310 MHz<br>Input Signal Level: 50 kHz – 20 MHz; 0.1 – 2V rms into 50 ohms, 10 – 310 MHz; 180 – 500 mV rms into 50 ohms.<br>Frequency Reference Stability: Short term, $5 \times 10^{-8}$ /minute<br>Frequency Control Output: Frequency control voltage directly compatible with HP 606B and HP 608F signal generators; output voltage range, -2 to -32 Vdc (maximum) | HP 8708A Synchronizer        | A       |
| Sweep Oscillator                                                         | Frequency Range: 1 – 60 MHz<br>Output Flatness: $\pm 0.25$ dB over full band<br>Output Impedance: 50 ohms<br>Sweep Width: Up to 10 MHz<br>Output Amplitude: At least 0 dBm.                                                                                                                                                                                                                     | HP 8601A Generator/Sweeper   | A       |
| Pulse Generator                                                          | Rep Rate: 10 kHz to 100 kHz<br>Pulse Width: 0.5 to 5 msec<br>Pulse Amplitude: 2V                                                                                                                                                                                                                                                                                                                | HP 222A                      | A       |
| RF Voltmeter                                                             | Frequency Range: 3 MHz to 50 MHz<br>Amplitude Range: 0 to -40 dBm<br>Accuracy: $\pm 5\%$                                                                                                                                                                                                                                                                                                        | HP 3406A                     | T       |
| Tunable RF Voltmeter                                                     | Bandwidth: 1 kHz<br>Frequency Range: 1 – 50 MHz<br>Sensitivity: 10 mV – 1V rms<br>Input Impedance: $\geq 0.1$ megohms                                                                                                                                                                                                                                                                           | HP 8405A Vector Voltmeter    | P, A, T |
| Extender Board                                                           | 6-Pin                                                                                                                                                                                                                                                                                                                                                                                           | HP 5060-5914                 | A, T    |
| 50-ohm Tee                                                               | Type N female connectors on two ports, with the third port able to accept HP 8405A probe tips.                                                                                                                                                                                                                                                                                                  | HP 11536A 50-ohm Tee         | P, A    |
| <p>Note*</p> <p>Performance = P; Adjustment = A; Troubleshooting = T</p> |                                                                                                                                                                                                                                                                                                                                                                                                 |                              |         |

Table 1-2. Test Equipment and Accessories (cont'd)

| Item                                                                    | Minimum Specifications or Required Features                                                    | Suggested Model                                | Note*   |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------|---------|
| 50-ohm Termination                                                      | Frequency Range: Dc — 310 MHz<br>VSWR: 1.1<br>Power Rating: 0.5 Watt<br>Connector: Type N Male | HP 908A Coaxial Termination                    | P, A    |
| Variable Voltage Transformer                                            | Range: 102 — 127 Vac<br>Voltmeter Range: 103 — 127 Vac $\pm 1$ volt                            | General Radio W5MT3A or Superior Electric UC1M | A       |
| BNC Tee (2)                                                             | Two BNC Female Connectors; one Male BNC Connector                                              | UG-274B/U<br>HP 1250-0781                      | P, A, T |
| Adapter                                                                 | BNC Male to Type N Female                                                                      | UG-349A/U<br>HP 1250-0077                      | A       |
| Adapter                                                                 | BNC Male to Binding Post                                                                       | HP 10110A                                      | A       |
| Adapter (3)                                                             | BNC Female to Type N Male                                                                      | UG-201A/U<br>HP 1250-0780                      | P, A    |
| Voltage Probe                                                           | Dual Banana Plug-to-Probe Tip and Clip (Ground) Lead                                           | HP 10025A<br>Straight-thru Voltage Probe       | A, T    |
| Cable Assy (6)                                                          | Male BNC Connectors, 48 inches long                                                            | HP 10503A                                      | P, A, T |
| Cable Assy                                                              | BNC Male to Dual Banana Plug, 45 inches long                                                   | HP 11001A                                      | P, A, T |
| Cable Assy                                                              | Dual Banana Plug to Clip Leads, 45 inches long                                                 | HP 11002A                                      | A, T    |
| Cable Assy                                                              | Dual Banana Plug to Dual Banana Plug, 44 inches long                                           | HP 11000A                                      | A, T    |
| Cable Assy                                                              | BNC Male to one end only; 44 inches. (Attach Test Clips to Shield and Center Conductor.)       | HP 10501A                                      | A, T    |
| Tuning Tool, Slot                                                       | Nonmetallic, 6-inch shaft                                                                      | Gowanda PC9668                                 | A, T    |
| Screwdrivers                                                            | Pozidrive No. 1 (small)<br>Stanley No. 5531                                                    | HP 8710-0899                                   | A, T    |
| Tuning Tool, Slot                                                       | Nonmetallic, 2.5-inch shaft                                                                    | HP 8710-0095                                   | A, T    |
| Capacitor                                                               | 8200 pF (approx.), See paragraph 5-38                                                          | HP 0140-0184                                   | A, T    |
| Adapter                                                                 | Type N Female Connector to Type N Female Connector                                             | UG-29B/U<br>HP 1250-0777                       | A, T    |
| Adapter                                                                 | Type N Female to BNC Female Adapter                                                            | FXR 21850                                      | A, T    |
| Adapter                                                                 | Type NBC Plug-to-Plug Adapter                                                                  | UG-491B/U<br>HP 1250-0216                      | A, T    |
| Tuning Tool                                                             | Fluted Tip, Siemens Halske B63399-B004-X000                                                    | HP 8710-0957                                   | A       |
| <p>Note</p> <p>Performance = P; Adjustment = A; Troubleshooting = T</p> |                                                                                                |                                                |         |





Figure 2-1. Model 8552B Spectrum Analyzer IF Section with 8553B RF Section and 141T Display Section

## SECTION II

### INSTALLATION

#### 2-1. SHIPPING INFORMATION

2-2. Because of individual customer requirements, shipping configurations are flexible. Initial inspection is based on the premise that the RF and IF Sections are installed in the Display Section; thus the instrument is physically and functionally complete for test. Since the RF and IF Sections are received separately, the plug-ins must be mechanically fitted together, electrically connected, and inserted in a Display Section.

#### 2-3. INITIAL INSPECTION

##### 2-4. Mechanical Check

2-5. If shipping carton is damaged, ask that agent of carrier be present when instrument is unpacked. Inspect instrument for mechanical damage such as scratches, dents, broken knobs, or other defects. Also, check cushioning material for signs of severe stress.

##### 2-6. Performance Check

2-7. As soon as possible after receipt, the instrument should be checked in accordance with the Performance Tests in Section IV.

#### 2-8. CLAIMS FOR DAMAGE

2-9. If the Spectrum Analyzer IF Section is mechanically damaged or fails to meet the specified performance tests, immediately notify the carrier and the nearest Hewlett-Packard Sales and Service office. (A current list of sales and service offices appears at the back of this manual.) Retain shipping carton and padding material for inspection by the carrier. Any Hewlett-Packard Sales and Service office will arrange for instrument repair or replacement without waiting for a claim settlement with the carrier.

#### 2-10. POWER REQUIREMENTS

2-11. The IF Section receives its power from the Display Section. Before connecting the analyzer to a line power source, perform the installation procedures given in the Display Section manual.

#### 2-12. CONNECTIONS

2-13. Since the RF and IF Sections are shipped separately, the plug-ins must be mechanically fitted

together, electrically connected, and then inserted into the Display Section mainframe. To make these connections refer to the RF Section Manual.

#### 2-14. INSTALLATION CHECK

2-15. After installing the IF/RF Sections in the Display Section, the installation procedures given in Section II of the RF Section manual should be performed.

#### 2-16. STORAGE AND SHIPMENT

##### 2-17. Original Packaging

2-18. The same containers and materials used in factory packaging can be obtained through the Hewlett-Packard Sales and Service offices listed at the rear of this manual.

2-19. If the instrument is being returned to Hewlett-Packard for servicing attach a tag indicating the type of service required, return address, model number and full serial number. Also mark the container FRAGILE to assure careful handling.

2-20. In any correspondence refer to the instrument by model number and full serial number.

##### 2-21. Other Packaging Materials

2-22. The following general instructions should be used for repackaging with commercially available materials.

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

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

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

d. Seal the shipping container securely.

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

## SECTION III OPERATION

### 3-1. INTRODUCTION

3-2. This section provides operating instructions for the HP 8552B IF Section. The panel features are described in Figure 3-1, Operator's Checks are outlined in Figure 3-2, and Operating Instructions are provided in the appropriate RF Section manual. Operator's Maintenance provides instructions for maintenance that can be done by the operator.

### 3-3. PANEL FEATURES

3-4. The panel features of the 8552B are shown and explained in Figure 3-1, 8552B Spectrum Analyzer IF Section Controls, Connectors and Indicators.

### 3-5. OPERATOR'S CHECKS

3-6. The Operator's Checks are designed to familiarize the operator with the 8552B and give him an understanding of the instrument capabilities.

3-7. The FRONT PANEL CHECK PROCEDURE and Table 4-1, (in Section 4), provide the Operator's Checks for the 8552B.

#### NOTE

When the 8552B-H04 is being used, the adjustments of paragraph 3-14 should be substituted for those in Section IV.

### 3-8. OPERATIONAL ADJUSTMENTS

3-9. During checkout at the factory, the IF Section is adjusted for proper operation. Upon receipt of the instrument the operator must perform the front panel adjustments as shown in the RF Section manual.

### 3-10. H01/H02 Instruments

3-11. For H01/H02 instruments it should be recalled that at  $-30$  dBm, the equivalent voltage is  $8.66$  mV (75 ohms). Perform the tests and adjustments as shown in the RF Section Manual.

### 3-12. H04 Instruments

3-13. The  $-30$  dBm CAL OUTPUT signal is used to calibrate the analyzer. However, since  $0$  dB $\mu$ V (across 50 ohms) =  $-107$  dBm, the  $-30$  dBm signal corresponds to  $+77$  dB $\mu$ V. To achieve correct log calibration, LOG REF LEVEL is set to  $80$  dB $\mu$ V

and AMPL CAL is set so that the signal peaks 3 dB below the LOG REF graticule line. And since  $-30$  dBm =  $7.07$  mV (across 50 ohms), AMPL CAL is fine-adjusted for  $7.1$  mV ( $\approx 7.07$  mV) on the CRT display.

Use the following procedure as a supplement to the procedures specified in Section IV and the RF Section manuals for AMPL CAL adjustment.

#### NOTE

When the 8556A RF Section is used, the correct adjustment procedure is located in the RF Section manual.

1. Make VERTICAL GAIN and POSITION adjustments as specified in the manuals.
2. Set LOG REF LEVEL to  $80$  dB $\mu$ V (check that LOG/LINEAR is set to  $10$  dB LOG, LOG REF LEVEL Vernier is set to  $0$ , and CAL OUTPUT is connected to RF INPUT).
3. Adjust AMPL CAL to set the  $30$  MHz calibrator signal 3 dB below the top ( $0$  dB) graticule line on the CRT.
4. Step INPUT ATTENUATION and LOG REF LEVEL through their ranges. The signal should increase or decrease  $10$  dB per step.
5. Set LOG/LINEAR to LINEAR and LINEAR SENSITIVITY to  $1$  mV/div. Adjust AMPL CAL to set the  $30$  MHz calibrator signal for  $7.1$  divisions on the CRT.

### 3-14. OPERATING INSTRUCTIONS

3-15. Refer to the RF Section manuals for specific operating instructions.

### 3-16. OPERATING TIPS

3-17. When using the  $10$  Hz Bandwidth, use a scan time of  $1$  second or slower. Special provision is made in the 8552B IF Section to increase the stability of the  $50$  MHz Converter during the slow scans.

3-18. When using MANUAL SCAN or EXTERNAL SCAN, the DISPLAY UNCAL lamp warns if the combination of control settings being used degrades the calibration. Do not sweep the analyzer any faster than it would be swept by an internal scan with the control settings selected.

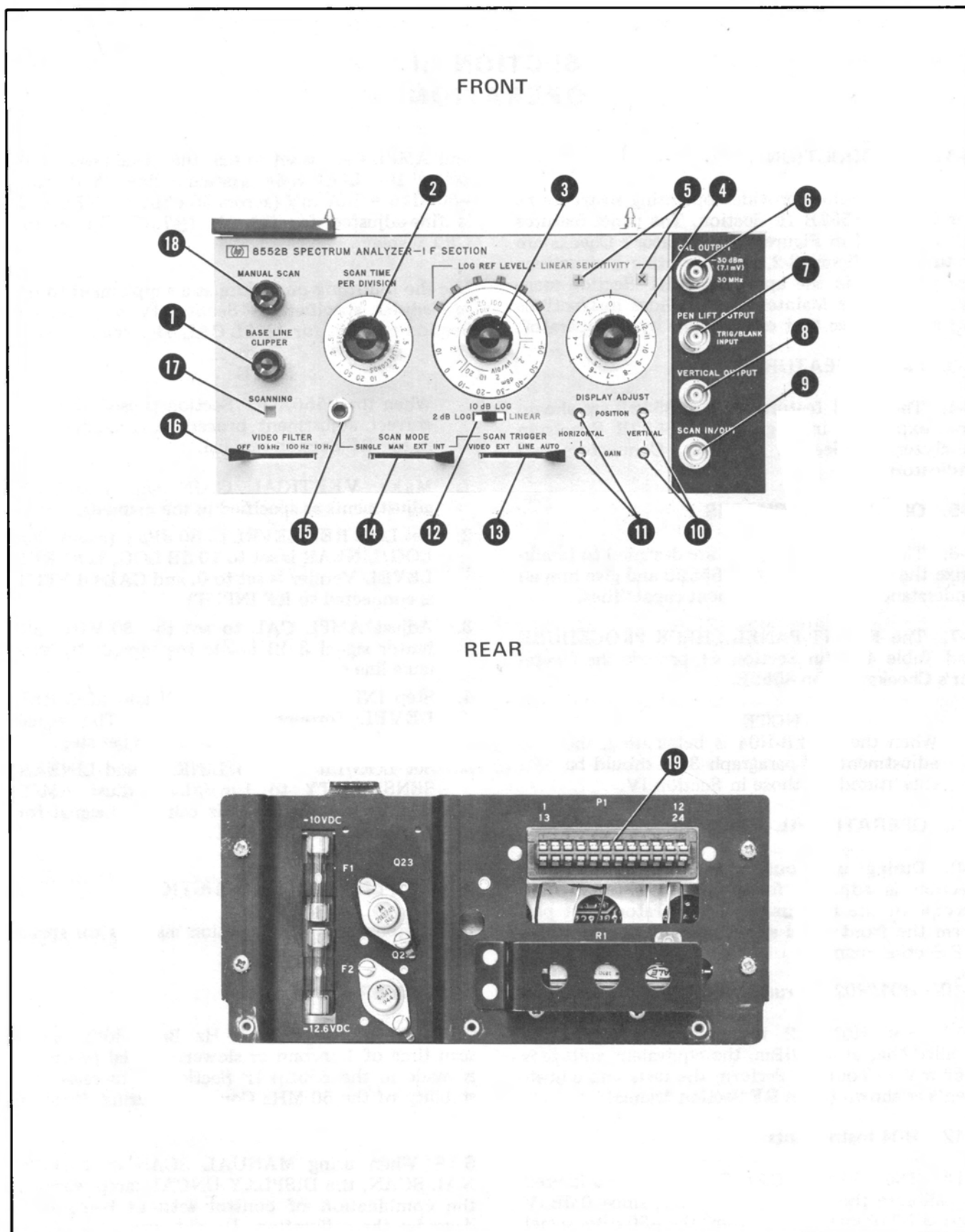


Figure 3-1. 8552B Spectrum Analyzer IF Section Controls and Connectors Indicators



## FRONT AND REAR PANEL CONTROLS AND CONNECTORS

- 1 **BASE LINE CLIPPER.** Blanks lower part of trace to blank baseline noise. Blanking function also prevents blooming with a variable-persistence storage display section.
- 2 **SCAN TIME PER DIVISION.** Controls scan time.
- 3 **LOG REF LEVEL · LINEAR SENSITIVITY Ranges.** When the Log-Linear Mode Switch is in either of the Log positions and the vernier dial to the right is set at *black* zero, the *black* number under any illuminated index lamp indicates the power level at the display's LOG REF LEVEL. With the Log-Linear Mode Switch in the LINEAR position, the *blue* number under any illuminated index lamp indicates the per division multiplier for calibrated voltage amplitude, provided the vernier is set to *blue* 1. If the LOG REF LEVEL switch carries a third red scale, these numbers apply only when an 8556 RF Section is used.
- 4 **LOG REF LEVEL · LINEAR SENSITIVITY Vernier.** Indicates 1-dB increments for logarithmic amplification; indicates multiplication factors up to unity for linear amplification.
- 5 **LOG REF LEVEL LINEAR SENSITIVITY Mode Indicators.**  
 "+" indicates the amplitude is to be read in dB-Log mode (the Range, Vernier and Display levels are to be added algebraically).  
 "x" indicates the amplitude is to be read in volts-linear mode (the Range, Vernier and Display levels are to be multiplied together).
- 6 **CAL OUTPUT.** Provides a 30-MHz signal at -30 dBm for amplitude calibration of spectrum analyzer.
- 7 Provides penlift output 0 to 14 Vdc (0 Vdc while scanning) to compatible TTL HP recorders (HP 7005, 7035, 7004 and 7034). Blanking input when SCAN MODE is set to EXT (-15 Vdc required). Trigger Input of > 2 Vpk maximum when SCAN MODE is set to INT and SCAN TRIG is set to EXT. (Polarity depends on position of internal switch A6S1, NORM-negative and REV-positive; factory set in the NORM (normal) position).
- 8 **VERTICAL OUTPUT.** Detected video output proportional to vertical deflection on CRT.
- 9 **SCAN IN/OUT.** Scan Output of -5 to +5 Vdc for 10-divisions of horizontal deflection on CRT (1k ohm output impedance). Scan Input 0 to +8 Vdc for 10-divisions of horizontal deflection on CRT (10k ohm input impedance).
- 10 **VERTICAL.** Adjusts vertical position and gain of deflection amplifier.
- 11 **HORIZONTAL.** Adjusts horizontal position and gain of deflection amplifier.
- 12 **Log-Linear Mode Switch.** Selects log (2 or 10 dB) or linear display modes.
- 13 **SCAN TRIGGER.** Selects scan trigger mode. Operable only when SCAN MODE is in the INT position.
- 14 **SCAN MODE.** Selects an internally generated ramp scan voltage in SINGLE or INT. The manual scan voltage is set by the MANUAL SCAN control. The EXT. scan voltage must be provided by an external generator.
- 15 **SINGLE.** Press to initiate or stop scan with SCAN MODE switch set to SINGLE.
- 16 **VIDEO FILTER.** May select 10 Hz, 100 Hz, 10 kHz or OFF sections of low-pass filter for detected video.
- 17 **SCANNING.** Lights for duration of each scan.
- 18 **MANUAL SCAN.** Controls scan in MAN position of SCAN MODE (14).
- 19 **P1.** Connects to display section.

## NOTE

Do NOT make any VERTICAL GAIN or POSITION adjustments in the 2 dB LOG mode as the front panel calibration will become invalid.

Figure 3-1. 8552B Spectrum Analyzer IF Section Controls, Connectors and Indicators (cont'd)

**3-19. OPERATOR'S MAINTENANCE**

3-20. Operator's maintenance involves changing the -12.6 and -10 Vdc fuses, which are located on the rear panel of the 8552B.

3-21. Both fuses (F1 and F2), may be ordered under HP part number 2110-0001.

3-22. If the fuse is replaced and it immediately burns out again, a competent technician should be called to troubleshoot the instrument, or it should be returned to Hewlett-Packard for servicing. Refer to Section II under STORAGE AND SHIPMENT.

## SECTION IV

### PERFORMANCE TESTS

#### 4-1. INTRODUCTION

4-2. Perform tests in procedural order with the test equipment called for, or with its equivalent. Specifications of test equipment and accessories required to performance-test the analyzer are given in Table 1-2.

4-3. Front panel checks for routine inspection are given in Table 4-1. Procedures for verifying that the instrument meets specifications are given in Paragraphs 4-23 through 4-28, and a test card in Table 4-5 contains data spaces for recording test results.

4-4. During any performance test, all shields and attaching hardware must be in place and the RF and IF Section plug-ins must be installed in the display section. The analyzer must be allowed to warm up at least one-half hour before being tested or adjusted.

#### 4-5. FRONT PANEL CHECKS

4-6. Before proceeding to the front panel checks, the instrument must be adjusted and all the controls set as specified in the preset adjustment instructions in paragraph 4-13. After the instrument is set up, proceed with the checks. The instrument should perform as called out in the procedure (paragraphs 4-12 through 4-21) before going on to the performance tests.

#### 4-7. PERFORMANCE TESTS

4-8. The performance tests given in this manual are suitable for incoming inspection, troubleshooting or preventive maintenance. The tests are designed to verify published instrument specifications. Perform the tests in the order given, and record data on the test card (Table 4-5) at the end of this section. These tests assume the use of an 8553B RF Section and a 141T Display Section unless otherwise noted. If another RF Section is used the procedure must be adjusted accordingly: the frequencies used may change and some bandwidths will not be available for checking. If another Display Section is used, the tests that require variable persistence can be performed using an X-Y Recorder.

4-9. The tests are arranged in the following order:

| Para. | Test Description                      |
|-------|---------------------------------------|
| 4-23  | Calibrator Output                     |
| 4-24  | Bandwidth Accuracy                    |
| 4-25  | Bandwidth Selectivity                 |
| 4-26  | Switching between Bandwidths Accuracy |
| 4-27  | Amplitude Display Accuracy            |
| 4-28  | Scan Time Accuracy                    |

4-10. Each test is arranged so that the specification is written out as it appears in the Table of Specifications. Next, a description of the test and any special instructions or problem areas is included. Each test that requires test equipment has a test setup drawing and a list of required equipment. Each procedure gives control settings required for that particular test. Data spaces are included in each test procedure, and the spaces are repeated in the Performance Test Card at the end of this section.

4-11. Required specifications for test equipment are detailed in Table 1-2 in Section I. If substitute test equipment is to be used, it must meet the specifications listed in order to check the analyzer.

#### 4-12. FRONT PANEL CHECK PROCEDURE

##### 4-13. Preset Adjustments

4-14. Turn analyzer ON and preset the INTENSITY & FOCUS to approximately 1 o'clock. While the analyzer is warming up make the following control settings:

RANGE MHz ..... 0–110  
 FREQUENCY ..... 40 MHz  
 FINE TUNE ..... Centered  
 BANDWIDTH ..... 300 kHz  
 SCAN WIDTH ..... 0–100 MHz  
 SCAN WIDTH PER DIVISION ..... 10 MHz  
 INPUT ATTENUATION ..... 10 dB  
 TUNING STABILIZER ..... On  
 BASELINE CLIPPER ..... ccw  
 SCAN TIME PER DIVISION 5 MILLISECONDS  
 LOG REF LEVEL ..... -10 dBm  
 LOG REF LEVEL Vernier ..... 0  
 LOG-LINEAR ..... 10 dB LOG  
 VIDEO FILTER ..... 10 kHz  
 SCAN MODE ..... INT  
 SCAN TRIGGER ..... AUTO

4-15. Connect CAL OUTPUT to RF INPUT using a BNC-to-BNC cable. The display on your analyzer should be similar to Figure 4-1.

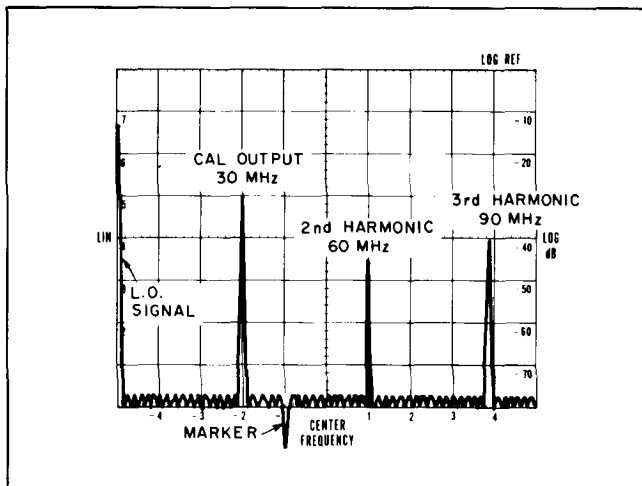


Figure 4-1. 30 MHz Calibrator Signal & Harmonics

#### 4-16. Display Section Adjustments

- a. Set LOG REF LEVEL max ccw.
- b. Set SCAN TIME PER DIVISION to 10 SECONDS and adjust FOCUS and ASTIGMATISM for the smallest round spot possible.
- c. Reset SCAN TIME PER DIVISION to 5 MILLISECONDS. Adjust TRACE ALIGN so that horizontal base line of the CRT trace is exactly parallel to the horizontal graticule lines.

#### 4-17. IF Section Display Adjustments

- a. Adjust VERTICAL POSITION so that the horizontal base line of the CRT trace is exactly on the bottom horizontal graticule line of the CRT. Set LOG REF LEVEL to 0 dBm.
- b. Adjust HORIZONTAL POSITION so display is centered on CRT. Then adjust HORIZONTAL GAIN until the displayed scan width is exactly 10 divisions. Some interaction between HORIZONTAL POSITION and GAIN may occur, requiring slight readjustment of the controls.

The display on your CRT should now match Figure 4-1 almost exactly. (The amplitudes of the individual signals may be slightly different.)

- c. Note the inverted marker below the bottom graticule line. This marker indicates the display center frequency of the ZERO and SCAN WIDTH PER DIVISION tuning modes. Adjust the FREQUENCY control to place this marker exactly under the signal three divisions from the left.

This signal is the 30 MHz calibrator signal. Tune the marker carefully to null the signal.

#### NOTE

The other signals on the display are the "zero frequency" First LO feedthrough and the 60 MHz and 90 MHz harmonics of the calibrator signal.

- d. Set the SCAN WIDTH PER DIVISION control to .05 MHz and the BANDWIDTH to 10 kHz.

- e. Switch the red SCAN WIDTH control to the PER DIVISION position. The BANDWIDTH, SCAN WIDTH PER DIVISION, and Center Frequency are now those selected in steps c and d. (The marker makes it easy to select any signal in 0–100 MHz scan and expand the display about that signal.)

- f. Adjust FREQUENCY tuning to center 30 MHz calibrator signal, if necessary. Then reduce SCAN WIDTH PER DIVISION to 10 kHz. Use FINE TUNE to center the signal on the display. (The analyzer's First LO is automatically phase-locked to a crystal oscillator reference for the blue color-coded SCAN WIDTH positions since the TUNING STABILIZER was set on. Therefore, the FREQUENCY control — which tunes the First LO — should not be used to tune the analyzer; frequency would tune in 100 kHz steps.)

- g. Adjust the LOG REF LEVEL controls so the maximum signal amplitude is exactly on the -70 dB graticule line. Rotate LOG REF LEVEL control seven steps in the clockwise direction. The amplitude of the signal should increase in increments of one division per 10-dB step (see Figure 4-2).

- h. Adjust VERTICAL GAIN to place maximum signal amplitude exactly on LOG REF (top) graticule line (Figure 4-2). Repeat steps g and h to obtain optimum adjustment of VERTICAL GAIN (increments as close to one division per 10 dB step as possible).

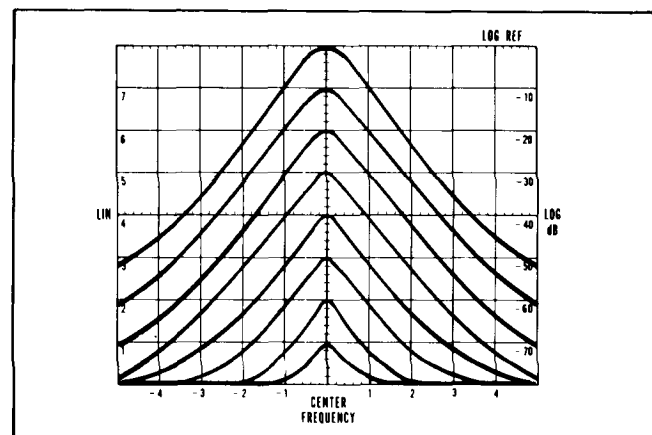


Figure 4-2. Vertical Gain Adjustment

4-18. Ampl. Cal Adjustment RF Section

- a. Set the LOG REF LEVEL controls to -30 dBm (-30 +0).
- b. Adjust AMPL CAL so that the signal amplitude (-30 dBm) is exactly on the LOG REF (top) graticule line of the CRT.

The analyzer is now calibrated in the LOG display mode.

4-19. Ampl Cal Check for Linear Sensitivity Accuracy

4-20. In the LINEAR display mode the vertical display is calibrated in absolute voltage. For LINEAR measurements the LIN scale factors on the left side of the CRT and the blue color-coded scales of the LINEAR SENSITIVITY controls are used. The signal voltage is the product (note lighted "x" lamp) of the CRT deflection and LINEAR SENSITIVITY control settings. It is usually most convenient to normalize the LINEAR SENSITIVITY vernier by setting it to "1" (blue scale).

- a. Set the LOG-LINEAR switch to LINEAR. Set LINEAR SENSITIVITY to 1 mV/div (1 mV x 1).

Since the -30 dBm calibrator output is  $\cong 7.1$  mV (across 50 ohms), the CRT deflection should be  $\cong 7.1$  divisions.

NOTE

For standard options H01/H02 the CRT deflection should be  $\approx 8.7$  mV across 75 ohms.

- b. Adjust AMPL CAL on RF Section for a  $\cong 7.1$  div CRT deflection, if necessary. (LINEAR display is more expanded than the compressed LOG display, so adjustment of the AMPL CAL control can be made with more resolution in LINEAR without noticeable effect on the LOG calibration.)

The analyzer is now calibrated for both the LOG and LIN display modes.

- 4-21. Set controls as follows:
- |                         |           |
|-------------------------|-----------|
| SCAN WIDTH              | 0-100 MHz |
| SCAN WIDTH PER DIVISION | 10 MHz    |
| BANDWIDTH               | 10 kHz    |
| LOG·LINEAR              | 10 dB LOG |
| LOG REF LEVEL           | -10 dBm   |
| TUNING STABILIZER       | On        |

Perform tests in Table 4-1, Front Panel Checks.

NOTE

Make NO Front Panel adjustments with LOG·LINEAR set to 2 dB LOG.

Table 4-1. Front Panel Checks

| Function                          | Procedure                                                                                                                                                                                                                            | Result                                                                                                                                                                                                                                          |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Base Line Clipper                 | 1. Turn BASE LINE CLIPPER cw.<br>2. Return clipper to ccw.                                                                                                                                                                           | 1. At least the bottom 2 divisions should blank.                                                                                                                                                                                                |
| Scan                              | 3. Tune SCAN TIME across its range.<br>4. Return to 5 ms/div.                                                                                                                                                                        | 3. Scan should occur in all positions.                                                                                                                                                                                                          |
| Scan Width                        | 5. Turn SCAN WIDTH to PER DIVISION.<br>6. Center CAL OUTPUT signal on display.<br>7. Reduce SCAN WIDTH PER DIVISION to 20 kHz; use FINE TUNE to center display.                                                                      | 5. 30 MHz signal and harmonics visible. DISPLAY UNCAL light comes on.<br>7. Signal remains on-screen, centered.                                                                                                                                 |
| Phase Lock                        | 8. With TUNING STABILIZER on, slowly turn the FREQUENCY control.<br><br>9. Turn TUNING STABILIZER to OFF; use FREQUENCY to center display.<br><br>10. Turn TUNING STABILIZER on, use FINE TUNE to center display.                    | 8. Signal jumps to left or right hand edges of CRT ( $\pm 100$ kHz). This corresponds to the 100 kHz reference oscillator in the automatic phase control circuit.<br>9. Signal should tune continuously.<br>10. Signal should not jump 100 kHz. |
| Bandwidth and Display Uncal Light | 11. Reduce BANDWIDTH, SCAN TIME PER DIVISION, and SCAN WIDTH PER DIVISION, using FINE TUNE to center display.<br><br>12. Return BANDWIDTH to 10 kHz, SCAN WIDTH PER DIVISION to 20 kHz and SCAN TIME PER DIVISION to 5 MILLISECONDS. | 11. Display should be stable, and viewable as long as DISPLAY UNCAL is unlit.                                                                                                                                                                   |
| Calibration                       | 13. Lit index light on LOG REF LEVEL. LINEAR SENSITIVITY corresponds to top line of graticule; with input attenuation at 20 dB and LOG REF LEVEL at -10 dBm, signal level is -30 dBm.                                                | 13. Calibrator signal is -30 dBm level (2 divisions down from top of graticule).                                                                                                                                                                |
| Gain Vernier                      | 14. Turn LOG REF LEVEL·LINEAR SENSITIVITY vernier cw.                                                                                                                                                                                | 14. Signal level increases by amount marked on vernier dial.                                                                                                                                                                                    |
| Attenuators                       | 15. Turn INPUT ATTENUATION and LOG REF LEVEL·LINEAR SENSITIVITY in 10 dB steps.                                                                                                                                                      | 15. Signal increases or decreases one vertical division per 10 dB step.                                                                                                                                                                         |

PERFORMANCE TESTS

4-23. Calibrator Output

SPECIFICATION:

Amplitude: -30 dBm  $\pm$ 0.3 dB  
Frequency: 30 MHz  $\pm$ 3 kHz

DESCRIPTION: The Calibrator's amplitude accuracy is checked by comparing the 30 MHz fundamental signal with a source of known accuracy. The frequency is checked by amplifying the signal and measuring it with a frequency counter.

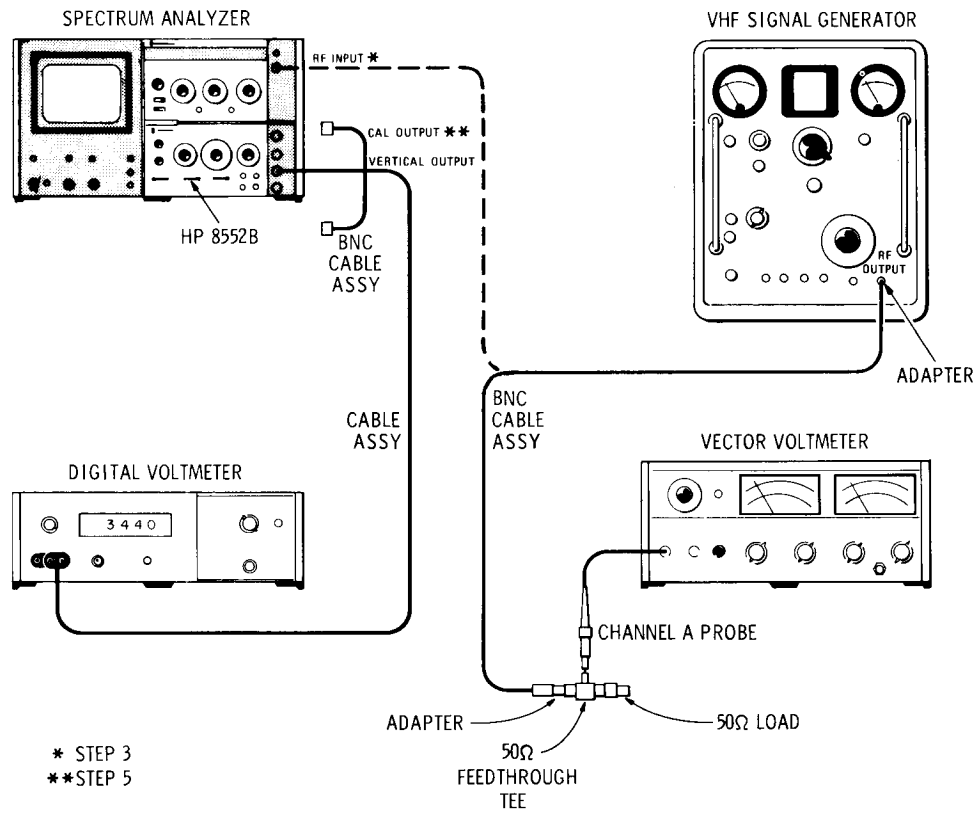


Figure 4-3. Calibrator Amplitude Test Setup

EQUIPMENT:

|                    |                |
|--------------------|----------------|
| SIGNAL GENERATOR   | HP 608F        |
| CABLE ASSEMBLY (2) | HP 10503A      |
| CABLE ASSEMBLY     | HP 11001A      |
| 50-OHM TEE         | HP 11536A      |
| ADAPTER (2)        | UG-201A/U      |
| 50-OHM TERMINATION | HP 908A        |
| AMPLIFIER          | HP 8447A       |
| FREQUENCY COUNTER  | HP 5245L       |
| VECTOR VOLTMETER   | HP 8405A       |
| DIGITAL VOLTMETER  | HP 3440A/3443A |

## PERFORMANCE TESTS

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### 4-23. Calibrator Output (cont'd)

1. Connect the equipment as shown in Figure 4-3 and make the following settings:

#### ANALYZER:

|                         |                |
|-------------------------|----------------|
| RANGE MHz               | 0—110          |
| FREQUENCY               | 30 MHz         |
| BANDWIDTH               | 300 kHz        |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | 1 MHz          |
| INPUT ATTENUATION       | 10 dB          |
| SCAN TIME PER DIVISION  | 5 MILLISECONDS |
| LOG-LINEAR              | LINEAR         |
| LINEAR SENSITIVITY      | 1 mV/DIV       |
| VIDEO FILTER            | OFF            |
| SCAN MODE               | INT            |
| SCAN TRIGGER            | AUTO           |

#### 8405A:

|                      |       |
|----------------------|-------|
| FREQ. RANGE — MC     | 20—40 |
| CHANNEL              | A     |
| AMPLITUDE RANGE — dB | -30   |

#### 608F:

|                 |         |
|-----------------|---------|
| FREQUENCY RANGE | B       |
| MEGACYCLES      | 30      |
| MODULATION      | CW      |
| ATTENUATION     | -30 dBm |

#### 3440A:

|       |      |
|-------|------|
| RANGE | AUTO |
|-------|------|

2. Use signal generator ATTENUATOR VERNIER to set generator amplitude to exactly -30 dBm (7.22 mV for Options H01/H02) as read on vector voltmeter.
3. Disconnect the signal generator from the vector voltmeter; connect signal generator to analyzer RF INPUT. Center the signal on the CRT display with analyzer FREQUENCY control.
4. Set SCAN WIDTH to ZERO and peak the trace with analyzer FREQUENCY control. Use analyzer LINEAR SENSITIVITY vernier to set signal level (as read on digital voltmeter) to  $700 \pm 0.4$  mV. Do not change LINEAR SENSITIVITY vernier during remainder of check.
5. Disconnect the signal generator from RF INPUT and connect CAL OUTPUT to RF INPUT. Peak trace with FREQUENCY control. Signal level (as read on digital voltmeter) should be between 670 and 731 mV ( $\pm 0.3$  dB):

670 \_\_\_\_\_ 731 mV



PERFORMANCE TESTS

4-23. Calibrator Output (cont'd)

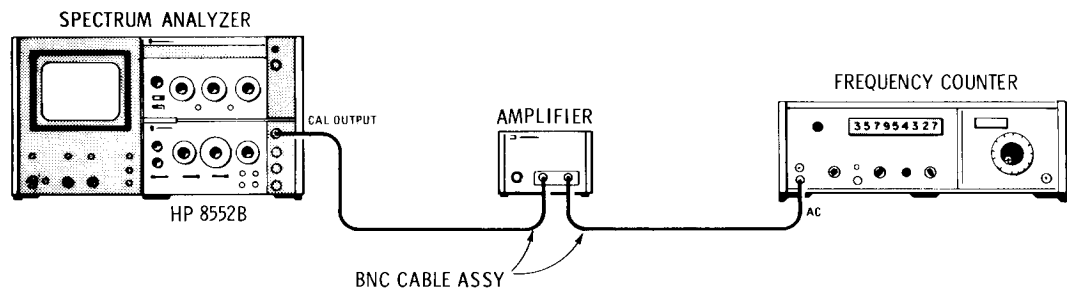


Figure 4-4. Calibrator Frequency Check Test Setup

6. Connect the equipment as shown in Figure 4-4 and make the following settings:

|             |           |
|-------------|-----------|
| HP 5245L:   |           |
| SAMPLE RATE | 9 o'clock |
| TIME BASE   | 1s        |
| FUNCTION    | FREQUENCY |

7. Read CAL OUTPUT on the frequency counter, 30 MHz  $\pm$  3 kHz.

29.997 \_\_\_\_\_ 30.003 MHz

4-24. Bandwidth Accuracy

SPECIFICATION: Individual IF bandwidth 3 dB points calibrated to  $\pm$ 20% (10 kHz bandwidth  $\pm$ 5%).

DESCRIPTION: While observing a signal on the CRT display, all bandwidths except 10 kHz are verified by measuring the half-power points of the signal. The 10 kHz bandwidth is measured by using a frequency counter to monitor the input signal generator frequency as it is tuned between the IF filter half-power points.

EQUIPMENT:

|                    |           |
|--------------------|-----------|
| SIGNAL GENERATOR   | HP 608F   |
| FREQUENCY COUNTER  | HP 5245L  |
| CABLE ASSEMBLY (2) | HP 10503A |
| ADAPTER            | UG-201A/U |

1. Make the following analyzer control settings:

|                         |                |
|-------------------------|----------------|
| RANGE — MHz             | 0–110          |
| FREQUENCY               | 30 MHz         |
| BANDWIDTH               | 300 kHz        |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | .05 MHz        |
| INPUT ATTENUATION       | 10 dB          |
| SCAN TIME PER DIVISION  | 5 MILLISECONDS |
| TUNING STABILIZER       | On             |
| BASE LINE CLIPPER       | Max ccw        |
| LOG-LINEAR              | LINEAR         |

# PERFORMANCE TESTS

## 4-24. Bandwidth Accuracy (cont'd)

Analyzer control settings (cont'd)

|                    |          |
|--------------------|----------|
| LINEAR SENSITIVITY | 2 mV/Div |
| VIDEO FILTER       | 10 kHz   |
| SCAN MODE          | INT      |
| SCAN TRIGGER       | AUTO     |

2. Connect CAL OUTPUT to RF INPUT.
3. Use LINEAR SENSITIVITY vernier control to adjust for 5.7 divisions signal amplitude.
4. Measure the bandwidth at the half-power points at the 4.0 division line. Bandwidth should be  $300 \pm 60$  kHz (4.8 to 7.2 divisions).

### NOTE

4.8 \_\_\_\_\_ 7.2 div

The bandwidth checks (Table 4-2), assume the use of the 8553B RF Section and 141T Display Section. With other RF Sections, some bandwidths aren't used; on bandwidths that are used it may be impossible to achieve the resolution needed to take the reading.

5. Repeat steps 3 and 4 to measure the bandwidths listed in Table 4-2, and set the controls as indicated in the table. (When checking .03 and .01 kHz bandwidths: set SCAN MODE to SINGLE, PERSISTENCE to MAX and push single scan button. When finished, set SCAN MODE to INT, PERSISTENCE to MIN.)

Table 4-2. Bandwidth Checks

| BANDWIDTH | SCAN WIDTH PER DIVISION | SCAN TIME PER DIVISION | 3 dB Bandwidth    |
|-----------|-------------------------|------------------------|-------------------|
| 100 kHz   | 20 kHz                  | 5 MILLISECONDS         | 4.0 _____ 6.0 div |
| 30 kHz    | 5 kHz                   | 5 MILLISECONDS         | 4.8 _____ 7.2 div |
| 3 kHz     | 0.5 kHz                 | 10 MILLISECONDS        | 4.8 _____ 7.2 div |
| 1 kHz     | 0.2 kHz                 | 10 MILLISECONDS        | 4.0 _____ 6.0 div |
| 0.3 kHz   | .05 kHz                 | 10 MILLISECONDS        | 4.8 _____ 7.2 div |
| 0.1 kHz   | .02 kHz                 | 0.2 SECONDS            | 4.0 _____ 6.0 div |
| .03 kHz   | .02 kHz                 | 1 SECONDS              | 1.2 _____ 1.8 div |
| .01 kHz   | .02 kHz                 | 1 SECONDS              | 0.4 _____ 0.6 div |

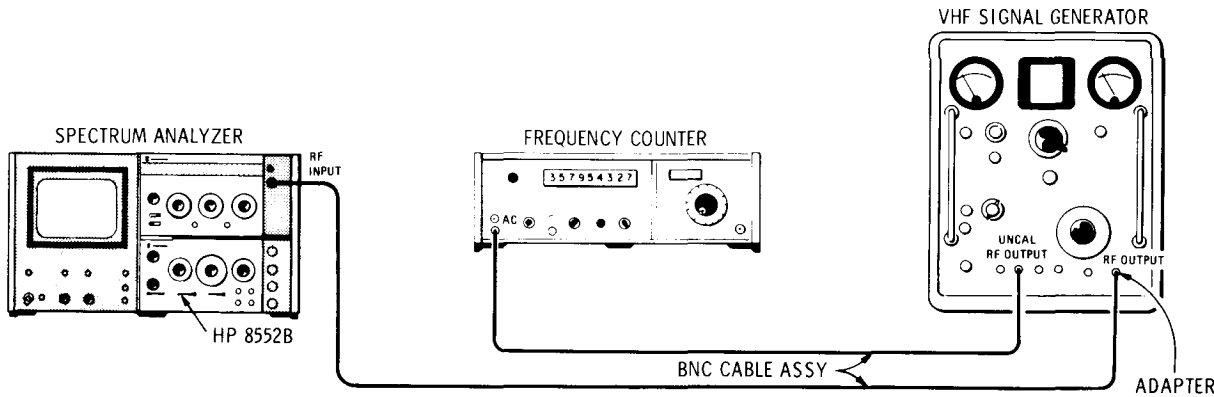


Figure 4-5. 10 kHz Bandwidth Accuracy Test Setup

PERFORMANCE TESTS

4-24. Bandwidth Accuracy (cont'd)

6. To check the 10 kHz bandwidth, connect the test setup shown in Figure 4-5 and make the following control settings.

ANALYZER:

BANDWIDTH . . . . . 10 kHz  
SCAN WIDTH PER DIVISION . . . . . 0.05 MHz  
SCAN TIME PER DIVISION . . . . . 5 MILLISECONDS  
TUNING STABILIZER . . . . . On

608F:

MEGACYCLES . . . . . 30  
ATTENUATION . . . . . -30 dBm  
MODULATION . . . . . CW  
FREQUENCY RANGE . . . . . B  
RF OUTPUT . . . . . +7 (on meter)

5245L:

SENSITIVITY (VOLTS RMS) . . . . . 0.1  
FUNCTION . . . . . FREQUENCY

7. Fine adjust the signal generator frequency to center the 30 MHz signal on the CRT display.
8. Using FINE TUNE to keep the display centered, reduce SCAN WIDTH PER DIVISION to 20 kHz. Set SCAN WIDTH to ZERO scan. Set VIDEO FILTER to 10 Hz.
9. Peak the signal using FINE TUNE and adjust LINEAR SENSITIVITY Vernier control for a 7.1 division display.

NOTE

Steps 10 and 11 check upper and lower 3 dB points.

10. Decrease HP 608F frequency until the base line drops to the 5.0 division line. Record the signal generator frequency as read from the HP 5245L Frequency Counter. \_\_\_\_\_ MHz
11. Increase HP 608F frequency until the base line peaks and then drops to the 5.0 division line. Record the signal generator frequency. \_\_\_\_\_ MHz
12. The difference in the readings of steps 10 and 11 equals the half-power bandwidth. The bandwidth should be 10 ±0.5 kHz. 9.5 \_\_\_\_\_ 10.5 kHz

4-25. Bandwidth Selectivity

SPECIFICATION:

- 60 dB/3 dB IF bandwidth ratio <20:1 for IF bandwidths from 10 kHz to 300 kHz.  
60 dB/3 dB IF bandwidth ratio <11:1 for IF bandwidths from 10 Hz to 3 kHz.  
60 dB points separated by <100 Hz for 10 Hz bandwidth.

DESCRIPTION: Bandwidth selectivity is verified by observing the CAL OUTPUT signal in the LOG mode on the CRT and measuring the bandwidth at the -60 dB points using the analyzer's calibrated scan widths. The ratio of this bandwidth to the 3 dB bandwidths defines the analyzer selectivity.

## PERFORMANCE TESTS

### 4-25. Bandwidth Selectivity (cont'd)

1. Connect CAL OUTPUT to RF INPUT and make the following control settings:

## ANALYZER:

|                         |                 |
|-------------------------|-----------------|
| RANGE - MHz             | 0--110          |
| FREQUENCY               | 30 MHz          |
| BANDWIDTH               | 300 kHz         |
| INPUT ATTENUATION       | 0 dB            |
| SCAN WIDTH              | PER DIVISION    |
| SCAN WIDTH PER DIVISION | 1 MHz           |
| SCAN TIME PER DIVISION  | 50 MILLISECONDS |
| LOG LINEAR              | 10 dB LOG       |
| LOG REF LEVEL           | 20 dBm          |
| BASE LINE CLIPPER       | Max ccw         |
| TUNING STABILIZER       | On              |
| VIDEO FILTER            | 100 Hz          |
| SCAN MODE               | INT             |
| SCAN TRIGGER            | AUTO            |

2. Tune FREQUENCY to center the CAL OUTPUT signal on the CRT display; adjust LOG REF LEVEL Vernier to peak the signal on the top graticule line.
3. Compute the bandwidth at the -60 dB graticule line (SCAN WIDTH PER DIVISION setting times the number of divisions separating the signal's slopes). Compute the 60 dB/3 dB IF bandwidth ratio using the 3 dB bandwidth found in Paragraph 4-24.

$$\frac{60 \text{ dB bandwidth}}{3 \text{ dB bandwidth}} < \frac{20}{1} \quad \text{_____} \quad 20:1$$

#### NOTE

If the DISPLAY UNCAL lamp is illuminated in any of the steps shown in table 4-3, it may be disregarded.

4. To check the remaining BANDWIDTH settings, refer to Table 4-3 for control settings and test limits. Compute the 60 dB/3 dB IF bandwidth ratios using the 3 dB bandwidths found in Table 4-2. (When checking 0.03 and 0.01 bandwidths, set SCAN MODE to INT, PERSISTENCE to MIN.)

*Table 4-3. Bandwidth Selectivity Checks*

| BANDWIDTH | SCAN WIDTH<br>PER DIVISION | SCAN TIME<br>PER DIVISION | 60 dB BANDWIDTH<br>DIVISIONS | RATIO FREQUENCY<br>60 dB/3 dB BANDWIDTHS |
|-----------|----------------------------|---------------------------|------------------------------|------------------------------------------|
| 100 kHz   | 0.5 MHz                    | 50 MILLISECONDS           | _____                        | _____                                    |
| 30 kHz    | 0.1 MHz                    | 50 MILLISECONDS           | _____                        | _____                                    |
| 10 kHz    | 0.05 MHz                   | 50 MILLISECONDS           | _____                        | _____                                    |
| 3 kHz     | 5 kHz                      | 50 MILLISECONDS           | _____                        | _____                                    |
| 1 kHz     | 2 kHz                      | 0.1 SECONDS               | _____                        | _____                                    |
| 0.3 kHz   | 0.5 kHz                    | 0.2 SECONDS               | _____                        | _____                                    |
| 0.1 kHz   | 0.2 kHz                    | 0.2 SECONDS               | _____                        | _____                                    |
| .03 kHz   | 0.05 kHz                   | 0.2 SECONDS               | _____                        | _____                                    |
| .01 kHz*  | 0.02 kHz                   | 0.5 SECONDS               | _____                        | _____                                    |

\*10 Hz 60 dB bandwidth must be less than the 11:1 ratio and the 60 dB points separated by less than 100 Hz.

## PERFORMANCE TESTS

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### 4-26. Switching Between Bandwidths Accuracy

| SPECIFICATION: At 20°C, | <u>Log</u> | <u>Linear</u> |
|-------------------------|------------|---------------|
| 0.1 – 300 kHz           | ±0.5 dB    | ±5.8%         |
| 0.03 – 300 kHz          | ±1.0 dB    | ±12.0%        |
| 0.01 – 300 kHz          | ±1.5 dB    | ±19.0%        |

DESCRIPTION: Relative bandwidth amplitude accuracy is verified by observing the amplitude of the CAL OUTPUT signal while switching IF bandwidths. The display is observed in the LINEAR mode for best amplitude resolution.

- Connect CAL OUTPUT to RF INPUT and set analyzer controls as follows:
 

|                         |                |
|-------------------------|----------------|
| RANGE — MHz             | 0—110          |
| FREQUENCY               | 30 MHz         |
| FINE TUNE               | Centered       |
| BANDWIDTH               | 300 kHz        |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | 0.5 MHz        |
| INPUT ATTENUATION       | 10 dB          |
| SCAN TIME PER DIVISION  | 5 MILLISECONDS |
| BASE LINE CLIPPER       | Max ccw        |
| LOG-LINEAR              | LINEAR         |
| LINEAR SENSITIVITY      | 2 mV/DIV       |
| TUNING STABILIZER       | On             |
| VIDEO FILTER            | 10 kHz         |
| SCAN MODE               | INT            |
| SCAN TRIGGER            | AUTO           |
- Adjust FREQUENCY to center CAL OUTPUT signal on CRT.
- Set LINEAR SENSITIVITY controls for a 7.0 division display; set SCAN TIME PER DIVISION to 0.2 SECONDS, SCAN WIDTH PER DIVISION to .05 MHz.
- Progressively switch BANDWIDTH from 300 kHz through 1 kHz. Note the signal amplitude at each BANDWIDTH setting.

#### NOTE

Steps 5 and 6 require use of a 141 type variable persistence Display Section.

- Set SCAN WIDTH to .05 kHz; set SCAN TIME PER DIVISION to 1 SECOND.
- Progressively switch BANDWIDTH from 0.3 kHz to 0.01 kHz. Again note the signal amplitude at each BANDWIDTH setting. The maximum deviation between any two bandwidths (100 Hz to 300 kHz) should be less than 0.8 division. The maximum deviation between any two bandwidths (30 Hz to 300 kHz) should be less than 1.6 division. The maximum deviation between any two bandwidths (10 Hz to 300 kHz) should be less than 2.6 division.

|                    |               |
|--------------------|---------------|
| 100 Hz to 300 kHz: | _____ 0.8 div |
| 30 Hz to 300 kHz:  | _____ 1.6 div |
| 10 Hz to 300 kHz:  | _____ 2.6 div |

## PERFORMANCE TESTS

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### 4-27. Amplitude Display Accuracy

#### SPECIFICATION:

$\pm 0.25$  dB/dB but not more than  $\pm 1.5$  dB over the full 70 dB display range.

DESCRIPTION: A full eight division signal is displayed on the CRT in the LOG mode. The LOG REF LEVEL is then changed 70 dB in 10 dB steps. The error of the CRT display is measured at each step. It is assumed that the IF Section Display Adjustments in Paragraph 4-17 have been performed.

1. Connect CAL OUTPUT to RF INPUT.

2. Set Analyzer controls as follows:

|                         |                |
|-------------------------|----------------|
| RANGE — MHz             | 0—110          |
| FREQUENCY               | 30 MHz         |
| FINE TUNE               | Centered       |
| BANDWIDTH               | 100 kHz        |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | 0.5 MHz        |
| INPUT ATTENUATION       | 20 dB          |
| SCAN TIME PER DIVISION  | 5 MILLISECONDS |
| BASE LINE CLIPPER       | Max ccw        |
| LOG-LINEAR              | 10 dB LOG      |
| LOG REF LEVEL           | -20 dBm        |
| VIDEO FILTER            | OFF            |
| SCAN MODE               | INT            |
| SCAN TRIGGER            | AUTO           |

3. Adjust FREQUENCY to center the 30 MHz CAL signal on the CRT display and adjust LOG REF LEVEL Vernier for a full eight division vertical display.

4. Change the LOG REF LEVEL to reduce the displayed signal amplitude 10 dB. Signal amplitude should be seven divisions  $\pm 0.15$  division.

6.85\_\_\_\_\_7.15 div

5. Change the LOG REF LEVEL to reduce the signal amplitude in 10 dB steps to verify the entire 70 dB display range.

|           |                   |           |                   |
|-----------|-------------------|-----------|-------------------|
| a. -20 dB | 5.85_____6.15 div | d. -50 dB | 2.85_____3.15 div |
| b. -30 dB | 4.85_____5.15 div | e. -60 dB | 1.85_____2.15 div |
| c. -40 dB | 3.85_____4.15 div | f. -70 dB | 0.85_____1.15 div |

## PERFORMANCE TESTS

### 4-28. Scan Time Accuracy

#### SPECIFICATION:

0.1 ms/div up to 20 ms/div  $\pm 10\%$ .

50 ms/div to 10s/div  $\pm 20\%$ .

**DESCRIPTION:** A sine wave modulated RF signal is connected to the RF INPUT. The demodulated signal is displayed on the analyzer CRT and its peaks aligned with the CRT graticule by adjusting the modulation frequency. Scan time is verified by measuring the period average of the modulation signal using a frequency counter.

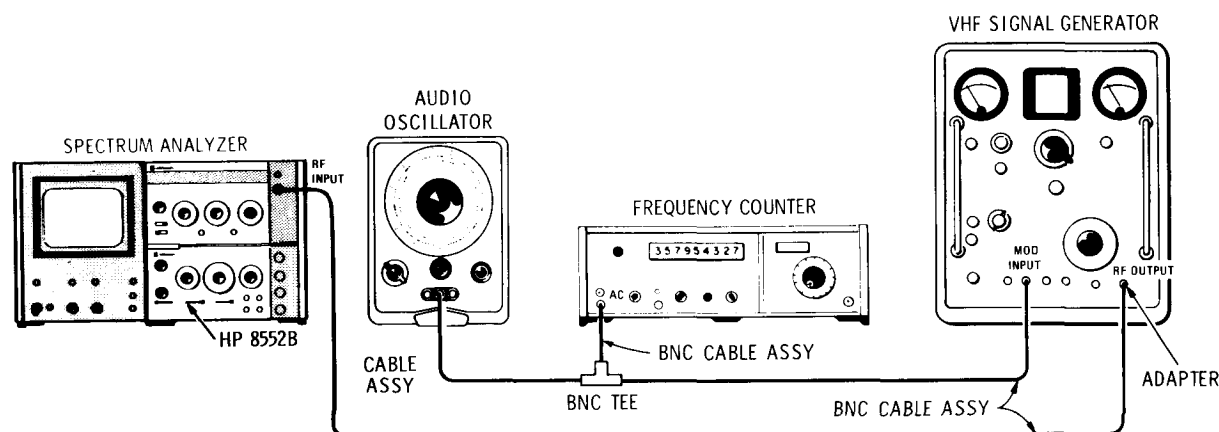


Figure 4-6. Scan Time Accuracy Test Setup

#### EQUIPMENT:

|                    |           |
|--------------------|-----------|
| FREQUENCY COUNTER  | HP 5245L  |
| AUDIO OSCILLATOR   | HP 200CD  |
| SIGNAL GENERATOR   | HP 608F   |
| CABLE ASSEMBLY (3) | HP 10503A |
| CABLE ASSEMBLY     | HP 11001A |
| BNC Tee            | UG-274B/U |
| ADAPTER            | UG-201A/U |

1. Connect the test setup in Figure 4-6 and make the following control settings:

#### ANALYZER:

|                        |                |
|------------------------|----------------|
| RANGE — MHz            | 0—110          |
| FREQUENCY              | 30 MHz         |
| FINE TUNE              | Centered       |
| BANDWIDTH              | 300 kHz        |
| SCAN WIDTH             | ZERO           |
| INPUT ATTENUATION      | 10 dB          |
| SCAN TIME PER DIVISION | 2 MILLISECONDS |
| BASE LINE CLIPPER      | Max ccw        |
| LOG-LINEAR             | LINEAR         |
| LINEAR SENSITIVITY     | 1 mV/DIV       |
| VIDEO FILTER           | 10 kHz         |
| SCAN MODE              | INT            |
| SCAN TRIGGER           | VIDEO          |

#### 4-28. Scan Time Accuracy (cont'd)

608F:

|                 |         |
|-----------------|---------|
| MEGACYCLES      | 30      |
| ATTENUATION     | -40 dBm |
| MODULATION      | EXT AM  |
| FREQUENCY RANGE | B       |

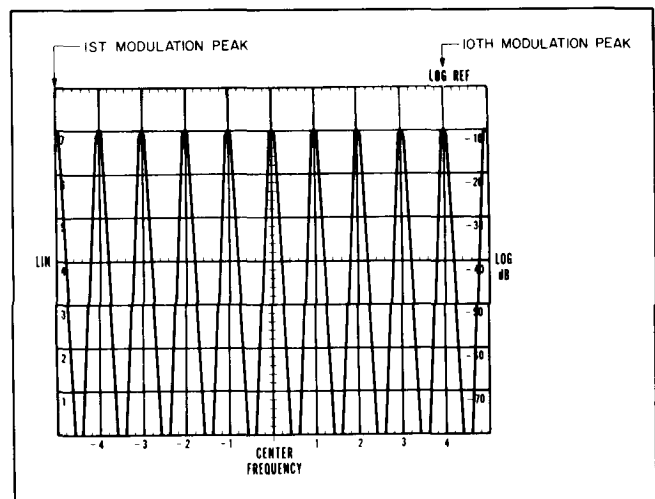
5245L:

|                         |                |
|-------------------------|----------------|
| SENSITIVITY (VOLTS RMS) | 0.1            |
| FUNCTION                | PERIOD AVERAGE |
| TIME BASE               | 10 $\mu$ s     |

200CD:

|                          |      |
|--------------------------|------|
| RANGE . . . . .          | X100 |
| Frequency Dial . . . . . | 5    |

2. Adjust the HP 200CD AMPLITUDE for 90% modulation as indicated on the HP 608F panel meter.
3. Fine tune the HP 608F Signal Generator for maximum signal indication of the analyzer CRT. Adjust LINEAR SENSITIVITY Vernier control for a convenient display height.
4. Position the first modulation peak directly on the -5 graticule line by adjusting the HORIZONTAL POSITION control.
5. Adjust the audio oscillator modulation frequency to align the tenth modulation peak with the +4 graticule line (see Figure 4-7). Total scan time is read on the HP 5245L and should be  $2.0 \pm 0.2$  ms.  
1.8 \_\_\_\_\_ 2.2 ms
6. Repeat steps 4 and 5 to verify the SCAN TIME PER DIVISION positions as listed in Table 4-4. The approximate HP 200CD frequency settings and HP 5245L PERIOD AVERAGE tolerances are also contained in Table 4-4.



*Figure 4-7. Scan Time Modulation Peaks*

*Table 4-4. Modulation Frequencies for Checking Scan Time*

| SCAN TIME PER DIVISION | HP 200CD Frequency | Scan Time             |
|------------------------|--------------------|-----------------------|
| 0.1 MILLISECONDS       | 10 kHz             | 90 _____ 110 $\mu$ s  |
| 0.2 MILLISECONDS       | 5 kHz              | 180 _____ 220 $\mu$ s |
| 0.5 MILLISECONDS       | 2 kHz              | 450 _____ 550 $\mu$ s |
| 1 MILLISECOND          | 1 kHz              | 0.9 _____ 1.1 ms      |
| 2 MILLISECONDS         | 500 Hz             | 1.8 _____ 2.2 ms      |
| 5 MILLISECONDS         | 200 Hz             | 4.5 _____ 5.5 ms      |
| 10 MILLISECONDS        | 100 Hz             | 9.0 _____ 11.0 ms     |
| 20 MILLISECONDS        | 50 Hz              | 18.0 _____ 22.0 ms    |
| 50 MILLISECONDS        | 20 Hz              | 40.0 _____ 60.0 ms    |
| 0.1 SECONDS            | 10 Hz              | 80.0 _____ 120.0 ms   |
| 0.2 SECONDS            | 5 Hz               | 160 _____ 240.0 ms    |



Table 4-5. Performance Check Test Record

| Hewlett-Packard Model 8552B  |                                                                                                                                                                                                                                                                                           | Test Performed by: _____                                                                                                 |                                                      |                                                                                                 |                                                                                     |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Spectrum Analyzer IF Section |                                                                                                                                                                                                                                                                                           | Date: _____                                                                                                              |                                                      |                                                                                                 |                                                                                     |
| Serial No. _____ - _____     |                                                                                                                                                                                                                                                                                           |                                                                                                                          |                                                      |                                                                                                 |                                                                                     |
| Para. No.                    | Test Description                                                                                                                                                                                                                                                                          | Measurement Unit                                                                                                         | Min                                                  | Actual                                                                                          | Max                                                                                 |
| 4-23                         | <b>Calibrator Output</b><br>Amplitude: -30 dBm $\pm 0.3$ dB<br>Frequency: 30 MHz, $\pm 3$ kHz                                                                                                                                                                                             | millivolts<br>MHz                                                                                                        | 676<br>29.997                                        | _____<br>_____                                                                                  | 724<br>30.003                                                                       |
| 4-24                         | <b>Bandwidth Accuracy</b><br>Bandwidths: $\pm 20\%$ 10 kHz Bandwidth: $\pm 5\%$<br>300 kHz Bandwidth<br>100 kHz Bandwidth<br>30 kHz Bandwidth<br>10 kHz Bandwidth<br>3 kHz Bandwidth<br>1 kHz Bandwidth<br>.3 kHz Bandwidth<br>.1 kHz Bandwidth<br>.03 kHz Bandwidth<br>.01 kHz Bandwidth | divisions<br>divisions<br>divisions<br>kHz<br>divisions<br>divisions<br>divisions<br>divisions<br>divisions<br>divisions |                                                      | _____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____ | 7.2<br>6.0<br>7.2<br>10.5<br>7.2<br>6.0<br>7.2<br>6.0<br>1.8<br>0.6                 |
| 4-25                         | <b>Bandwidth Selectivity</b><br>Bandwidths<br>300 kHz<br>100 kHz<br>30 kHz<br>10 kHz<br>1 kHz<br>0.3 kHz<br>0.1 kHz<br>0.03 kHz<br>0.01 kHz<br>0.01 kHz                                                                                                                                   | ratio<br>ratio<br>ratio<br>ratio<br>ratio<br>ratio<br>ratio<br>ratio<br>ratio<br>ratio<br>Hz                             |                                                      | _____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____ | 20:1<br>20:1<br>20:1<br>20:1<br>20:1<br>11:1<br>11:1<br>11:1<br>11:1<br>11:1<br>100 |
| 4-26                         | <b>Switching Between Bandwidths</b><br>$\pm 0.5$ dB 100 Hz to 300 kHz<br>$\pm 1.0$ dB 30 Hz to 300 kHz<br>$\pm 1.5$ dB 10 Hz to 300 kHz                                                                                                                                                   | divisions<br>divisions<br>divisions                                                                                      |                                                      | _____<br>_____<br>_____                                                                         | 0.8<br>1.6<br>2.6                                                                   |
| 4-27                         | <b>Amplitude Display</b><br>Accuracy at<br>-10 dB: $\pm .15$ dB<br>-20 dB: $\pm .15$ dB<br>-30 dB: $\pm .15$ dB<br>-40 dB: $\pm .15$ dB<br>-50 dB: $\pm .15$ dB<br>-60 dB: $\pm .15$ dB<br>-70 dB: $\pm .15$ dB                                                                           | divisions<br>divisions<br>divisions<br>divisions<br>divisions<br>divisions<br>divisions                                  | 6.85<br>5.85<br>4.85<br>3.85<br>2.85<br>1.85<br>0.85 | _____<br>_____<br>_____<br>_____<br>_____<br>_____<br>_____                                     | 7.15<br>6.15<br>5.15<br>4.15<br>3.15<br>2.15<br>1.15                                |

Table 4-5. Performance Check Test Record (cont'd)

| Para.<br>No. | Test Description             | Measurement<br>Unit | Min  | Actual | Max  |
|--------------|------------------------------|---------------------|------|--------|------|
| 4-28         | <b>Scan Time</b>             |                     |      |        |      |
|              | Accuracy at 0.1 MILLISECONDS | $\mu$ s             | 90   | _____  | 110  |
|              | 0.2 MILLISECONDS             | $\mu$ s             | 180  | _____  | 220  |
|              | 0.5 MILLISECONDS             | $\mu$ s             | 450  | _____  | 550  |
|              | 1 MILLISECONDS               | ms                  | 0.9  | _____  | 1.1  |
|              | 2 MILLISECONDS               | ms                  | 1.8  | _____  | 2.2  |
|              | 5 MILLISECONDS               | ms                  | 4.5  | _____  | 5.5  |
|              | 10 MILLISECONDS              | ms                  | 9.0  | _____  | 11.0 |
|              | 20 MILLISECONDS              | ms                  | 18.0 | _____  | 22.0 |
|              | 50 MILLISECONDS              | ms                  | 40.0 | _____  | 60.0 |
|              | 0.1 SECONDS                  | ms                  | 80   | _____  | 120  |
|              | 0.2 SECONDS                  | ms                  | 160  | _____  | 240  |

## SECTION V ADJUSTMENTS

### 5-1. INTRODUCTION

5-2. This section describes adjustments and checks required to return the analyzer IF section to peak operating condition when repairs are required. Included in this section are test setups, procedures, and tips about tools and test equipment. Adjustment location photographs are located on fold-outs at the back of the manual. A test record for recording data taken during adjustment procedures is included at the end of this section. The analyzer must warm up one hour before any adjustments are attempted.

### 5-3. EQUIPMENT REQUIRED

5-4. A complete list of test equipment and a list of accessories are contained in Table 1-2. In addition, each test procedure contains a list of test equipment and identifies all test equipment and accessories by call-outs. Any equipment substituted for the instruments or accessories listed must meet the minimum specifications in order to calibrate the analyzer.

### 5-5. Posidriv Screwdrivers

5-6. Many screws in the instrument appear to be Phillips, but are not. The table of accessories gives the name and number of the Posidriv screwdrivers designed to fit these screws. To avoid damage to the screw slots, the Posidriv screwdrivers should be used.

### 5-7. Slug Tuning Tools

5-8. Use HP 8710-1010 and HP 8710-0957 tuning tools for tuning the slugs in the ferrite inductors in the IF Section. No other tools should be used for this purpose.

### 5-9. Blade Tuning Tools

5-10. For adjustments requiring a nonmetallic metal-blade tuning tool, use the General Cement Model No. 5003 (HP 8730-0013). It may be necessary to cut away part of the plastic on the tuning blade end to use the tool on all the adjustments. In situations not requiring nonmetallic tuning tools, an ordinary small screwdriver or other suitable tool is sufficient. No matter what tool is used, never try to force any adjustment control in the analyzer. This is especially critical when tuning variable slug-tuned inductors and variable capacitors.

### 5-11. HP 11592A Service Kit

5-12. The HP 11592A Service Kit is an accessory item available from Hewlett-Packard for use in maintaining the spectrum analyzer. No attempt to adjust the analyzer should be made unless the user has the service kit. The kit can be obtained by contacting your nearest Hewlett-Packard Sales and Service office. A list of HP field offices is included at the back of this manual.

5-13. Table 1-2 contains a detailed description of the contents of the service kit. Any item in the kit may be ordered separately if desired. The wiring in the 11592-60015 Extender Assembly is especially critical and fabrication should not be attempted. Other items in the kit may be built if desired.

### 5-14. Extender Cable Installation

**5-15. Plug-in Removal.** Push the front panel latch in the direction indicated by the arrow until the latch disengages and pops out from the panel. Pull the plug-ins out of the instrument. Locate the black press-to-release button on the left side of the RF Section. Press the button and firmly pull the two sections apart.

5-16. When the two sections separate at the front panel, raise the upper section until it is above the lower section by two or three inches at the front panel. Disengage the metal tab-slot connection at the rear of the plug-ins and separate the two sections.

### 5-17. Plug-In Cover Removal

5-18. Remove the bottom cover from the IF Section. Do not remove the shield covers from the A1/A12, A13 and A8 assemblies in the IF Section until those assemblies are to be adjusted.

**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 in-

strument is on, energy available at many points may result in personal injury or death when contacted.”

### 5-19. Extender Connections

5-20. Place the plate end of the HP 11592-60015 Extender Assembly in the display section and press firmly into place so that both plugs make contact. The plate and plugs cannot be installed upside down as the plate has two holes corresponding to two guide rods in the mainframe.

5-21. Connect the upper cable plug to the RF Section and the lower cable plug to the IF Section. The plugs are keyed so that they will go on correctly and will not make contact upside down. Connect the HP 11592-60016 Interconnection Cable Assembly between the RF and IF Sections. The connectors are keyed by the shape of the plug and the arrangement of the pins. Press the connectors firmly together and extend the instrument sections as far apart as the cables will allow without putting stress on the connectors.

### 5-22. FACTORY SELECTED COMPONENTS

5-23. Table 5-4 contains a list of factory selected components by reference designation, basis of selection, and schematic diagram location on which the component is illustrated. Factory selected components are designated by an asterisk (\*) on the schematic diagrams in Section VIII of this manual.

### 5-24. RELATED ADJUSTMENTS

5-25. The adjustment procedures are arranged in numerical order. Many adjustments are directly re-

lated to preceding or following ones. The following sets of adjustments are related, and if one adjustment in the set is made, the other procedures in that set should be checked or adjusted.

### Power Supply Checks and Adjustments (para. 5-27).

#### Scan Circuits

1. Horizontal Scan Checks and Adjustments (para. 5-28).
2. Final Scan Checks (para. 5-29).

#### Log/Linear Amplifier Circuits

1. Vertical Deflection Amplifier Checks (para. 5-30).
2. Log/Linear Amplifier Checks and Adjustments (para. 5-31).

#### 3 MHz IF Circuits

1. 300 kHz Bandpass Filter Adjustment (para. 5-32).
2. LC Filter Adjustments (para. 5-33).
3. Crystal Filter Fine Adjustment (para. 5-34).
4. 3 MHz IF Gain Adjustment (para. 5-36).

#### Converter Circuits

1. 47 MHz Local Oscillator Automatic Phase Lock Check and Adjustment (para. 5-37).
2. 50 MHz IF Bandpass Check and Adjustment (para. 5-38).
3. 44 MHz Rejection Adjustment (para. 5-39).

#### 30 MHz Calibration Oscillator Check and Adjustment (para. 5-40).

#### Analogic Check and Adjustment (para. 5-41).

ADJUSTMENTS

5-26. CHECKS AND ADJUSTMENTS

5-27. Power Supply Check and Adjustment

REFERENCE: Schematic 19.

DESCRIPTION: The spectrum analyzer IF Section regulates power fed from the display section. These checks verify and validate the display section power supply voltages and the regulated voltages in the spectrum analyzer plug-ins.

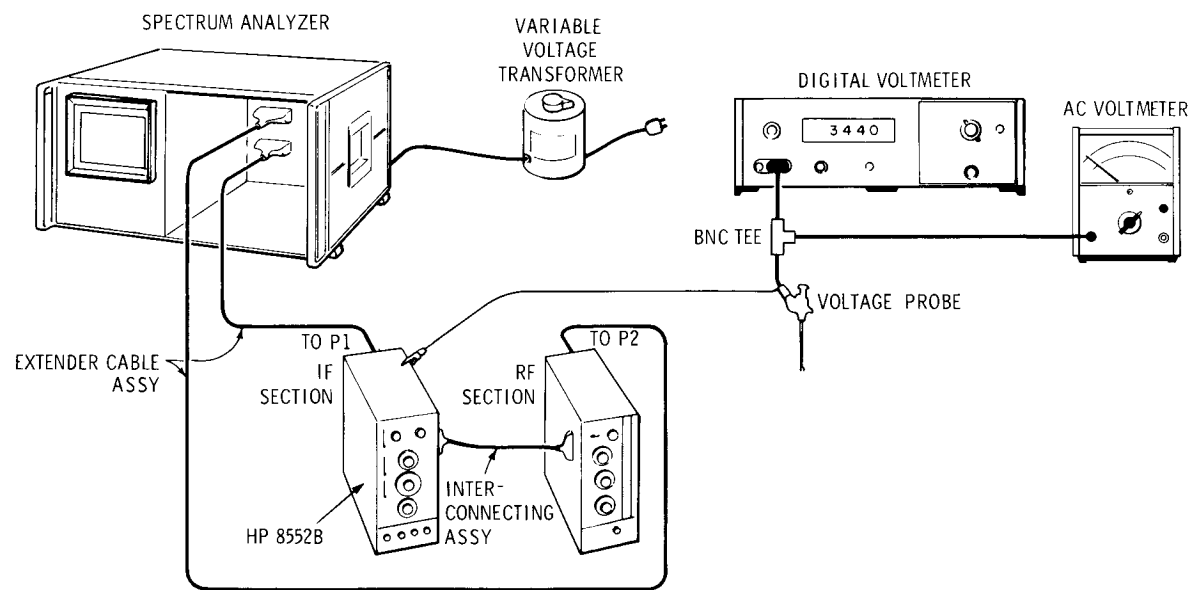


Figure 5-1. Power Supply Check and Adjustment Test Setup

EQUIPMENT:

|                                |                |
|--------------------------------|----------------|
| EXTENDER ASSEMBLY              | HP 11592-60015 |
| DIGITAL VOLTMETER              | HP 3440A/3443A |
| INTERCONNECTION ASSEMBLY       | HP 11592-60016 |
| STRAIGHT-THROUGH VOLTAGE PROBE | HP 10025A      |
| VARIABLE VOLTAGE TRANSFORMER   | W5MT3A         |
| AC VOLTMETER                   | HP 400E        |
| BNC TEE                        | UG-274 B/U     |

1. Connect the test setup shown in Figure 5-1. Measure the dc display voltages with the HP 3440A/3443A Digital Voltmeter while the analyzer plug-ins are installed on extender cables.

| Test Point (to Chassis) | Wire Color | Voltage           |
|-------------------------|------------|-------------------|
| P1-9                    | red        | +250 $\pm$ 3 Vdc  |
| P1-4, P2-2              | wht/red    | +100 $\pm$ 1 Vdc  |
| P1-6, P2-6              | vio        | -100 $\pm$ 1 Vdc  |
| F1, F2                  | wht/vio    | -12.6 $\pm$ 1 Vdc |

2. If the display section supplies need adjustment, refer to the manual provided with the display section for instructions.

## ADJUSTMENTS

### 5-27. Power Supply Check and Adjustment (cont'd)

3. Connect the digital voltmeter to the IF Section XA5-11 (wht/blk/red lead, Figure 8-8) and measure  $+20 \pm 0.10$  Vdc. Ripple should be  $< 0.5$  mV rms. These tolerances should be maintained as the line voltage is varied between 103.5 Vac and 126.5 Vac using the variable voltage transformer.  
 $+19.90$  \_\_\_\_\_  $+20.10$  Vdc
4. If the  $+20$  Vdc supply is out of tolerance, adjust A5R16  $+20V$  ADJ on the power supply assembly for  $+20V \pm 0.1$  Vdc.
5. Connect the digital and ac voltmeters to the IF Section XA5-8 (wht/blk/vio) and measure  $-10 \pm 0.01$  Vdc. Ripple should be  $< 0.5$  mV rms. These tolerances should be maintained as the line voltage is varied between 103.5 Vac and 126.5 Vac using the variable voltage transformer.  
 $-9.99$  \_\_\_\_\_  $-10.01$  Vdc
6. If the  $-10$  Vdc supply is out of tolerance, adjust A5R32  $-10V$  ADJ on the power supply assembly for  $-10V \pm 0.01$  Vdc.

### 5-28. Horizontal Scan Check and Adjustment

REFERENCE: Schematic 15, 16.

DESCRIPTION: The SCAN OUT voltage is measured and pre-set in this procedure. The Final Scan Check (paragraph 5-29) is then performed. The SCAN OUT voltage waveform is observed and adjustments made, if necessary, to obtain the proper waveform.

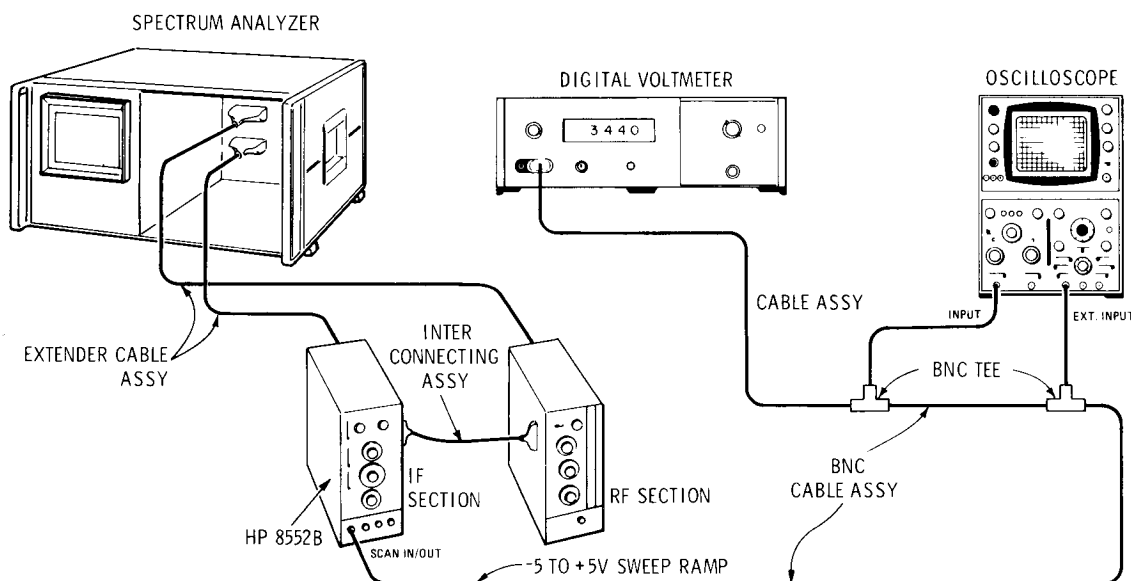


Figure 5-2. Scan Generator Check and Adjustment Test Setup

## ADJUSTMENTS

## 5-28. Horizontal Scan Check and Adjustment (cont'd)

## EQUIPMENT:

|                                    |                     |
|------------------------------------|---------------------|
| OSCILLOSCOPE . . . . .             | HP 180A/1801A/1821A |
| DIGITAL VOLTMETER . . . . .        | HP 3440/3443A       |
| EXTENDER ASSEMBLY . . . . .        | HP 11592-60015      |
| INTERCONNECTION ASSEMBLY . . . . . | HP 11592-60016      |
| BNC Tee (2) . . . . .              | UG-274B/U           |
| CABLE ASSEMBLY (4) . . . . .       | HP 10503A           |
| CABLE ASSEMBLY . . . . .           | HP 11001A           |

1. Connect the test setup shown in Figure 5-2 and make the following control settings:

## ANALYZER:

|                                  |                |
|----------------------------------|----------------|
| BASE LINE CLIPPER . . . . .      | Max ccw        |
| SCAN TIME PER DIVISION . . . . . | 5 MILLISECONDS |
| SCAN MODE . . . . .              | INT            |
| SCAN TRIGGER . . . . .           | AUTO           |

## 180A/1801A/1821A:

|                                |                               |
|--------------------------------|-------------------------------|
| HORIZONTAL SCALE . . . . .     | 10 milliseconds/division      |
| VERTICAL SENSITIVITY . . . . . | 2 volts/division              |
| EXTERNAL TRIGGER . . . . .     | trigger on external dc signal |

## 3440A/3443A:

|                       |           |
|-----------------------|-----------|
| SAMPLE RATE . . . . . | 9 o'clock |
| RANGE . . . . .       | AUTO      |

2. Synchronize the oscilloscope horizontal scan with the signal from the analyzer SCAN IN/OUT jack.

3. Observe and measure the SCAN IN/OUT waveform and compare it against the waveform shown in Figure 5-3. Rise time should be  $54 \pm 4$  milliseconds.

50 \_\_\_\_\_ 58 ms

4. If rise time of the scan voltage is out of tolerance, adjust A6R12 SCAN TIME control. Then proceed with the remainder of the scan generator adjustments given below.

5. Set the analyzer SCAN TRIGGER to EXT. Use the digital voltmeter to measure the dc voltage level at the SCAN IN/OUT jack. Voltage should be  $-5.0 \pm 0.02$  Vdc.

-4.98 \_\_\_\_\_ -5.02 Vdc

6. If the voltage is out of tolerance, adjust A6R50 -5V ADJ control on the scan generator assembly.

7. Turn the SCAN TIME PER DIVISION control to 10 SECONDS, SCAN MODE to SINGLE; push the SINGLE button. (Note: This requires 100 seconds to reach peak.)

8. Observe the SCAN IN/OUT voltage as the scan reaches the right-hand edge of the graticule. The highest reading should be  $+5.0 \pm 0.1$  Vdc. Repeat this operation several times to make sure the voltage reading is correct.

+4.9 \_\_\_\_\_ +5.1 Vdc

9. If the voltage is out of tolerance, adjust A6R46 SCAN AMPL control on the scan generator assembly and repeat steps 5 through 8 until both readings are correct.

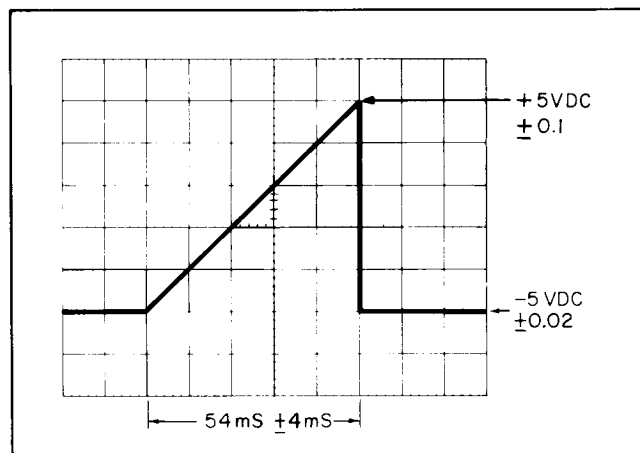


Figure 5-3. Scan Voltage Waveform Measurement

ADJUSTMENTS

5-29. Final Scan Check

REFERENCE: Schematics 15, 16.

DESCRIPTION: A modulated RF signal is connected to the RF INPUT. The demodulated signal on the analyzer display is used to fine-adjust scan time circuits. Then, the operation of remaining scan circuits is checked. The analyzer's front panel calibration procedure (see paragraph 4-12) must be performed before these checks and adjustments are made.

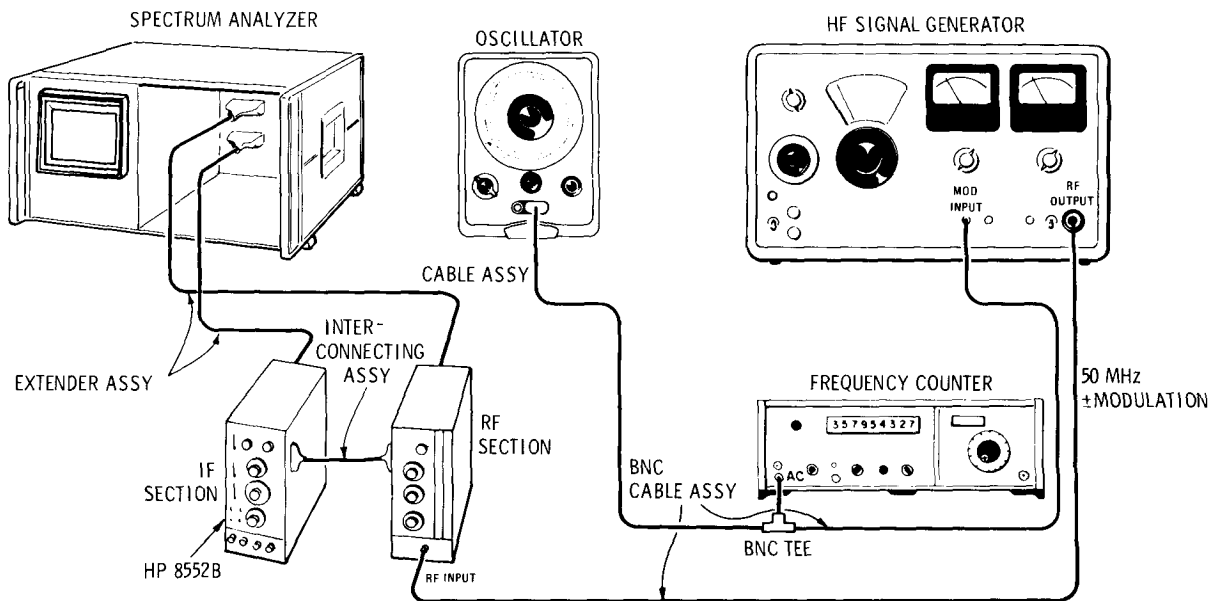


Figure 5-4. Final Scan Time Adjustment Test Setup

EQUIPMENT:

|                          |                |
|--------------------------|----------------|
| FREQUENCY COUNTER        | HP 5245L       |
| OSCILLATOR               | HP 200CD       |
| SIGNAL GENERATOR         | HP 606B        |
| CABLE ASSEMBLY (2)       | HP 10503A      |
| CABLE ASSEMBLY           | HP 11001A      |
| INTERCONNECTING ASSEMBLY | HP 11592-60016 |
| EXTENDER ASSEMBLY        | HP 11592-60015 |
| BNC Tee                  | UG-274B/U      |

1. Connect the test setup shown in Figure 5-4 and make the following control settings:

ANALYZER:

|                        |               |
|------------------------|---------------|
| FREQUENCY              | 50 MHz        |
| FINE TUNE              | Centered      |
| BANDWIDTH              | 300 kHz       |
| SCAN WIDTH             | ZERO          |
| INPUT ATTENUATION      | 0 dB          |
| BASE LINE CLIPPER      | Max ccw       |
| SCAN TIME PER DIVISION | 1 MILLISECOND |
| LINEAR SENSITIVITY     | 1 mV/DIV      |
| LOG·LINEAR             | LINEAR        |



## ADJUSTMENTS

### 5-29. Final Scan Check (cont'd)

#### ANALYZER Control settings (cont'd)

VIDEO FILTER . . . . . 10 kHz  
 SCAN MODE . . . . . INT  
 SCAN TRIGGER . . . . . VIDEO

#### 606B:

FREQUENCY . . . . . 30 MHz  
 ATTENUATOR (dBm) . . . . . -40  
 MODULATION SELECTOR . . . . . EXT DC  
 RANGE . . . . . 6

#### 5245L:

SENSITIVITY . . . . . 0.1  
 FUNCTION . . . . . PERIOD AVERAGE - (10)  
 TIME BASE . . . . . 10  $\mu$ s

2. Adjust the HP 200CD Audio Oscillator AMPLITUDE for 90 percent modulation as indicated on the HP 606B Signal Generator.
3. Fine tune the signal generator for maximum signal indication on the analyzer. Adjust LINEAR SENSITIVITY controls for a convenient display height.
4. Adjust the audio oscillator modulation frequency to give a 1.0 ms HP 5245L Period Average reading.

*Table 5-1. Modulation Frequencies for Checking Scan Time*

| SCAN TIME PER DIVISION | HP 200CD Frequency | HP 5245L Period Average |
|------------------------|--------------------|-------------------------|
| 1 MILLISECOND          | $\approx$ 1 kHz    | 1.0 $\pm$ 1 ms          |
| 5 MILLISECONDS         | $\approx$ 200 Hz   | 5.0 $\pm$ 0.5 ms        |
| 10 MILLISECONDS        | $\approx$ 100 Hz   | 10.0 $\pm$ 1 ms         |
| 50 MILLISECONDS        | $\approx$ 20 Hz    | 50.0 $\pm$ 10 ms        |
| 0.1 SECOND             | $\approx$ 10 Hz    | 100.0 $\pm$ 20 ms       |

5. Position the first modulation peak directly on the -5 graticule line by adjusting the HORIZONTAL POSITION control.
6. If the tenth modulation peak does not align with the +4 graticule line, adjust the SCAN TIME control A6R12 on the Scan Generator Assembly (see Figure 4-7).
7. Check the scan time limits of the SCAN TIME PER DIVISION positions as listed in Table 5-1 by setting the first modulation peak in alignment with the -5 graticule line. Then align the tenth modulation peak with +4 graticule line by slightly changing, if necessary, the modulation frequency from the audio oscillator (one peak per division). The HP 5245L Period Average readings should be within the tolerances as listed in Table 5-1. If they are not, readjust A6R12 SCAN TIME for the best compromise at all SCAN TIME PER DIVISION settings.
8. To check scan time linearity, set the controls as follows:  
 SCAN TIME PER DIVISION . . . . . 2 MILLISECONDS  
 Modulation Frequency (HP 200CD) . . . . .  $\approx$  500 Hz

## ADJUSTMENTS

### 5-29. Final Scan Check (cont'd)

9. Use the HORIZONTAL POSITION control to set the first modulation peak on the -5 graticule line. Adjust, if necessary, the audio oscillator modulation frequency to position the tenth modulation peak on the +4 graticule line. The peaks should align with each graticule line  $\pm 0.1$  division.

| Graticule | Min  | Actual | Max  | Graticule        | Min  | Actual | Max  |
|-----------|------|--------|------|------------------|------|--------|------|
| -5        | -0.1 | _____  | +0.1 | CENTER FREQUENCY | -0.1 | _____  | +0.1 |
| -4        | -0.1 | _____  | +0.1 | +1               | -0.1 | _____  | +0.1 |
| -3        | -0.1 | _____  | +0.1 | +2               | -0.1 | _____  | +0.1 |
| -2        | -0.1 | _____  | +0.1 | +3               | -0.1 | _____  | +0.1 |
| -1        | -0.1 | _____  | +0.1 | +4               | -0.1 | _____  | +0.1 |

10. Switch to each position of the SCAN TRIGGER switch and make sure that the scan triggers. To verify the EXT position, place an ac signal (5 Hz to 50 kHz) at the TRIGGER/BLANK INPUT.

EXT Trigger: 2 \_\_\_\_\_ 20 V p-p

11. To check VIDEO trigger operation, reduce the modulated signal input slowly to 1.5 divisions of vertical deflection. The scan should continue to trigger down to this level.

VIDEO TRIGGER: 1.5 divisions \_\_\_\_\_

12. To check the EXT position of the SCAN MODE switch, connect an 8-volt peak-to-peak, 1 kHz sine-wave signal from the HP 200CD Oscillator to the SCAN IN/OUT jack. A horizontal trace should appear on the CRT display.

EXT SCAN MODE: 8 V p-p \_\_\_\_\_

13. To check MAN position of the SCAN MODE switch, rotate MANUAL SCAN from full ccw to full cw. The trace should sweep across the CRT display from left to right (at least 10 full divisions).

MANUAL SCAN: 10 divisions \_\_\_\_\_

### 5-30. Vertical Deflection Amplifier Check

REFERENCE: Schematic 14.

DESCRIPTION: The A4 Crystal Filter Assembly is removed from the IF Section. A 3 MHz signal of known amplitude is applied at the input (XA4-14) of the LOG REF LEVEL LINEAR SENSITIVITY attenuator. The VERTICAL POSITION and VERTICAL GAIN controls and 2 dB LOG mode are then checked. A time domain waveform is then placed on the analyzer by an AM modulated 3 MHz signal at XA4-14. Operation of the BASE LINE CLIPPER is checked visually on the display.

## ADJUSTMENTS

## 5-30. Vertical Deflection Amplifier Check (cont'd)

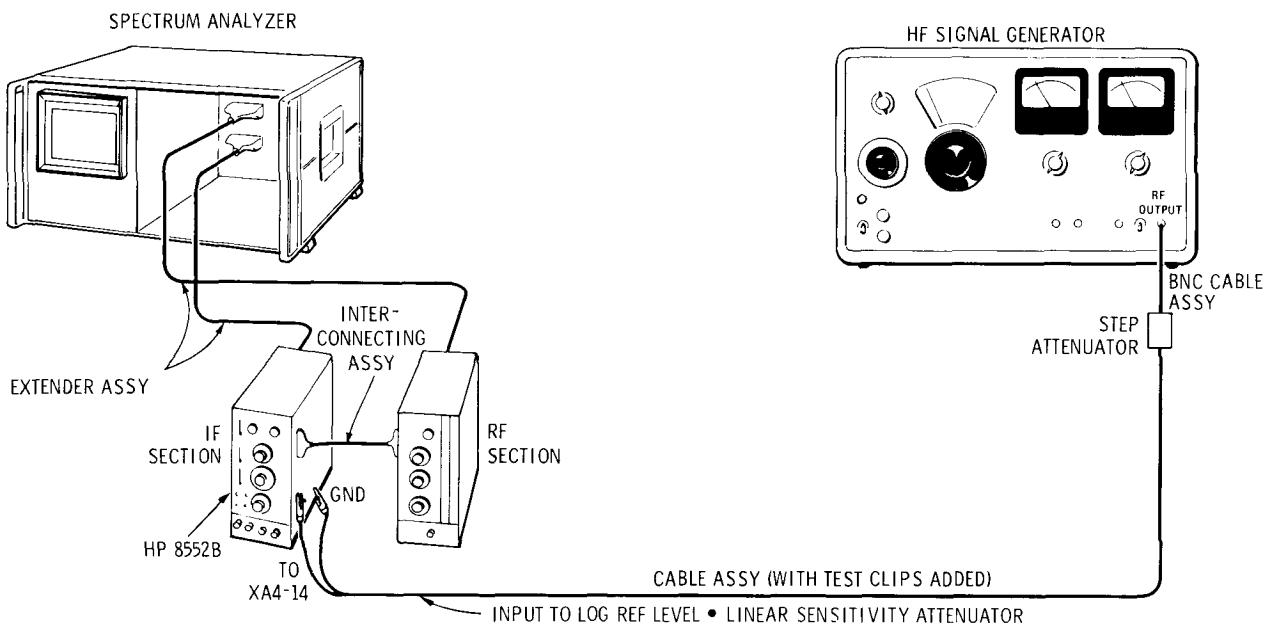


Figure 5-5. Vertical Deflection Amplifier Test Setup

## EQUIPMENT:

|                                            |                |
|--------------------------------------------|----------------|
| SIGNAL GENERATOR                           | HP 606B        |
| CABLE ASSEMBLY (with test clips installed) | HP 10501A      |
| INTERCONNECTION ASSEMBLY                   | HP 11592-60016 |
| EXTENDER ASSEMBLY                          | HP 11592-60015 |
| ATTENUATOR                                 | HP 355D        |
| CABLE ASSEMBLY                             | HP 10503A      |

1. With the analyzer power off, remove the A4 Crystal Filter board from the 8552B.
2. Connect the test setup shown in Figure 5-5, turn analyzer power ON, and set controls as follows:

## ANALYZER:

|                        |                |
|------------------------|----------------|
| INPUT ATTENUATION      | 0 dB           |
| SCAN TIME PER DIVISION | 2 MILLISECONDS |
| LOG REF LEVEL          | -20 dBm        |
| LOG-LINEAR             | 10 dB LOG      |
| BASE LINE CLIPPER      | Max ccw        |
| VIDEO FILTER           | 10 Hz          |
| SCAN MODE              | INT            |
| SCAN TRIGGER           | AUTO           |

## 606B:

|                     |       |
|---------------------|-------|
| FREQUENCY           | 3 MHz |
| ATTENUATOR (dBm)    | 0     |
| MODULATION SELECTOR | CW    |
| RANGE               | 4     |

## ADJUSTMENTS

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### 5-30. Vertical Deflection Amplifier Check (cont'd)

355D:

ATTENUATION . . . . . 100 dB

3. With an input signal at  $-100$  dBm, adjust the front-panel VERTICAL POSITION control. The trace should move  $\pm 2$  vertical divisions as the control is moved through its range. -2 \_\_\_\_\_ +2 div
4. Reset the trace to the bottom vertical graticule line. Then increase the signal level to  $-50$  dBm at XA4-14.
5. Switch LOG·LINEAR to LINEAR. Observe the display as the VERTICAL GAIN control is turned through its full range. The trace should move at least two vertical divisions. 2 div \_\_\_\_\_
6. Set LOG-LINEAR to 10 dB LOG; set 606B to  $-100$  dB. Set trace to bottom graticule line with VERTICAL POSITION.
7. Set 355D to 70 dB; using 606B VERNIER and ATTENUATOR, adjust trace to  $-70$  dB graticule on CRT.
8. Set 355D to 0 dB. Set trace to LOG REF graticule with VERTICAL GAIN. Check trace alignment and adjust if necessary.
9. Repeat steps 6 through 8 until trace is split by graticule in each step.
10. Set 355 D to 0 dB. Switch LOG-LINEAR to 2 dB LOG and adjust A7R35 2 dB OFFSET (see Figure 8-8) to set trace to LOG REF graticule.
11. Set 355D to 10 dB. Note the difference between the trace and the  $-50$  dB graticule; adjust A7R35 2 dB GAIN to move the trace to the  $-50$  dB graticule.
12. Repeat steps 10 and 11 until the trace is at LOG REF graticule at 0 dB and a  $-50$  dB graticule at  $-10$  dB.
 

LOG REF at 0 dB: \_\_\_\_\_ (✓)  
 $-50$  dB at  $-10$  dB: \_\_\_\_\_ (✓)
13. Make the following control settings:  
 ANALYZER:  
     LOG·LINEAR . . . . . 10 dB LOG  
     VIDEO FILTER . . . . . OFF  
 606B:  
     MODULATION SELECTOR . . . . . INT 100 Hz  
     MODULATION AMPLITUDE . . . . . 90%  
 355D:  
     ATTENUATION . . . . . 110
14. Turn the BASE LINE CLIPPER until the signal is blanked. The control arrow should indicate between 8 and 12 o'clock.
15. Increase the 355D to 50 dB. Set the SCAN TRIGGER to VIDEO.
16. The scan should trigger on the video signal. Turn the BASE LINE CLIPPER fully clockwise and check signal clipping.
17. The clipping circuit should function so that two to eight divisions of signal above the base line are blanked when the BASE LINE CLIPPER is fully clockwise. \_\_\_\_\_ 8 div

## ADJUSTMENTS

### 5-31. Log-Linear Amplifier Check and Adjustment

REFERENCE: Schematics 12, 13.

DESCRIPTION: A 3 MHz signal is applied at the input to the LOG REF LEVEL LINEAR SENSITIVITY attenuator (XA4-14). The log and linear amplifier circuits are calibrated by varying the signal amplitude by known increments.

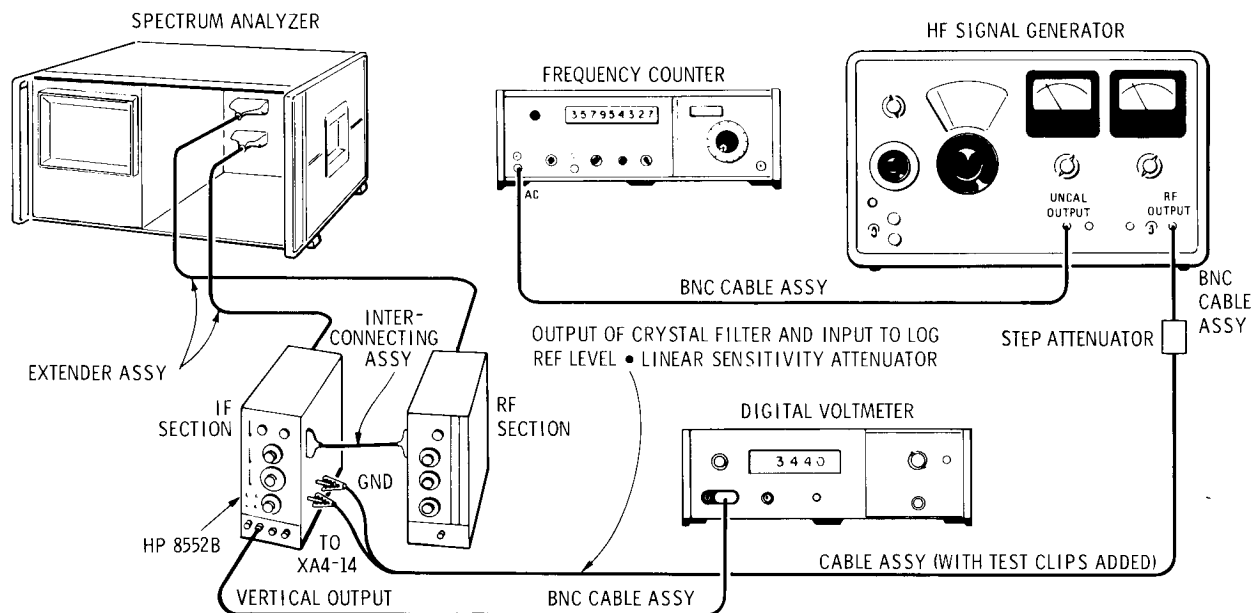


Figure 5-6. Log-Linear Amplifier Check and Adjustment Test Setup

#### EQUIPMENT:

|                                                         |                 |
|---------------------------------------------------------|-----------------|
| SIGNAL GENERATOR                                        | HP 606B         |
| FREQUENCY COUNTER                                       | HP 5245L        |
| CABLE ASSEMBLY (install test clips on unterminated end) | HP 10501A       |
| TUNING TOOL, SLOT                                       | Gowanda PC-9668 |
| STRAIGHT-THROUGH VOLTAGE PROBE                          | HP 10025A       |
| DIGITAL VOLTMETER                                       | HP 3440A/3443A  |
| INTERCONNECTING ASSEMBLY                                | HP 11592-60016  |
| EXTENDER ASSEMBLY                                       | HP 11592-60015  |
| CABLE ASSEMBLY                                          | HP 11001A       |
| ATTENUATOR                                              | HP 355C         |
| CABLE ASSEMBLY (3)                                      | HP 10503A       |

1. With the analyzer power off, remove A4 Crystal Filter board.
2. Make the following control settings and then connect the test setup shown in Figure 5-6.

#### ANALYZER:

|                   |           |
|-------------------|-----------|
| LOG-LINEAR        | 10 dB LOG |
| LOG REF LEVEL     | -20 dBm   |
| INPUT ATTENUATION | 0 dB      |

## ADJUSTMENTS

### 5-31. Log-Linear Amplifier Check and Adjustment (cont'd)

ANALYZER control settings (cont'd)

|                                  |                |
|----------------------------------|----------------|
| SCAN TIME PER DIVISION . . . . . | 2 MILLISECONDS |
| BASE LINE CLIPPER . . . . .      | Max ccw        |
| VIDEO FILTER . . . . .           | 10 kHz         |
| SCAN MODE . . . . .              | INT            |
| SCAN TRIGGER . . . . .           | AUTO           |

3440A/3443A:

|                       |           |
|-----------------------|-----------|
| SAMPLE RATE . . . . . | 9 o'clock |
| RANGE . . . . .       | AUTO      |

606B:

|                               |                             |
|-------------------------------|-----------------------------|
| RANGE . . . . .               | 4                           |
| FREQUENCY . . . . .           | 3 MHz ( $\pm 1$ kHz)        |
| MODULATION SELECTOR . . . . . | CW                          |
| ATTENUATOR —dBm . . . . .     | -110                        |
| VERNIER . . . . .             | Set for 0 on meter dB scale |

5245L:

|                       |               |
|-----------------------|---------------|
| SAMPLE RATE . . . . . | 9 o'clock     |
| SENSITIVITY . . . . . | 1 (volts rms) |
| TIME BASE . . . . .   | 1 s           |
| FUNCTION . . . . .    | FREQUENCY     |

355C:

|                       |      |
|-----------------------|------|
| ATTENUATION . . . . . | 0 dB |
|-----------------------|------|

3. Turn the analyzer power on and connect a 3 MHz  $\pm 1$  kHz CW signal from the 606B to pin XA4-14. With an input signal of -110 dBm adjust the VERTICAL POSITION control to set the base line on the bottom graticule line.
4. Increase the signal generator level to -40 dBm and adjust A8L12 detector tuning on Service Sheet 13 for maximum vertical deflection on the trace. Repeat -110 dBm adjustment if necessary.

#### NOTE

Steps 5 and 6 may require iteration.

5. Increase the signal level to +10 dBm. Adjust the VERTICAL GAIN control for eight divisions of vertical deflection.
6. Decrease the signal generator level to -60 dBm and set ATTEN VERNIER on 606B for 1.0 division deflection of the vertical display. Retain this ATTEN VERNIER setting through step 14.
7. Repeat steps 5 and 6, then increase the signal level 20 dB (do not move 606B ATTEN VERNIER) and set LOG-LINEAR to LINEAR.
8. Adjust A8R52, LINEAR GAIN (sets basedrive to Linear Scale Factor Amplifier) for 7.07 divisions of vertical deflection. Measure the dc voltage present at the VERTICAL OUTPUT jack with a digital voltmeter. Record the voltage.  

VERTICAL OUTPUT Voltage: \_\_\_\_\_
9. Set the HP 355C attenuation to 4 dB and turn LINEAR SENSITIVITY to 20  $\mu$ V/DIV. Adjust 4 dB ADJ A8R63 to the reference voltage in step 8,  $\pm 6$  mVdc. Repeat step 8 if necessary.
10. With the analyzer power off, remove the A7 Deflection Amplifier Assembly.

## ADJUSTMENTS

### 5-31. Log-Linear Amplifier Check and Adjustment (cont'd)

11. Set the HP 355C to 0 dB; set the HP 606B Signal Generator 3 MHz level to -110 dBm, and set LOG-LINEAR to 10 dB LOG (LOG REF LEVEL at -20 dBm).
12. Turn the analyzer on and measure the dc voltage with the HP 3440A/3443A Digital Voltmeter and straight-through voltage probe (HP 10025A) connected to XA8-14. The dc level should measure more negative than -6 mVdc.  
\_\_\_\_\_ -6 mVdc
13. Increase the signal generator level to +10 dBm. The signal level at XA8-14 should be -800  $\pm$  40 mVdc.  
-840 \_\_\_\_\_ -760 mV
14. Decrease the signal generator level in 10 dB steps (to -60 dBm). For each 10 dB reduction, the dc level at XA8-14 should change by 100  $\pm$  40 mVdc.

| Signal Generator Level at XA4-14 | DC Level at XA8-14  | Signal Generator Level at XA4-14 | DC Level at XA8-14  |
|----------------------------------|---------------------|----------------------------------|---------------------|
| 0 dBm                            | -740 mVdc ____ -660 | -40 dBm                          | -340 mVdc ____ -260 |
| -10 dBm                          | -640 mVdc ____ -560 | -50 dBm                          | -240 mVdc ____ -160 |
| -20 dBm                          | -540 mVdc ____ -460 | -60 dBm                          | -140 mVdc ____ - 60 |
| -30 dBm                          | -440 mVdc ____ -360 |                                  |                     |

15. Turn the analyzer power off and re-install the A7 Deflection Amplifier assembly.
16. Turn the analyzer power on. Check vertical position, Step 3. Set the LOG-LINEAR switch to LINEAR. Set the signal generator output to -30 dBm.
17. Adjust the generator output level vernier for a full eight division display on the analyzer.
18. Carefully reduce the signal input to the analyzer at XA4-14 by the amounts shown in the table below using the HP 355C and HP 606B output attenuators. Deflection should be  $\pm 0.2$  division for the levels indicated.

| Input at XA14-14             | CRT Display: Deflection in Divisions |
|------------------------------|--------------------------------------|
| Reference: -30 dBm (approx.) | 8.0                                  |
| Add: 6 dB attenuation        | 4.0 $\pm 0.2$                        |
| Add: 6 dB attenuation        | 2.0 $\pm 0.2$                        |
| Add: 8 dB attenuation        | 0.8 $\pm 0.2$                        |
| Add: 10 dB attenuation       | 0.25 $\pm 0.2$                       |
| Add: 40 dB attenuation       | 0 $\pm 0.2$                          |

19. Reinstall A4 Crystal Filter Assembly.

## ADJUSTMENTS

---

### 5-32. 300 kHz Bandpass Filter Adjustment

REFERENCE: Schematics 6, 7.

DESCRIPTION: The 300 kHz bandpass filter is adjusted for symmetry and center frequency. Then the 300 kHz bandwidth is checked.

EQUIPMENT:

|                                    |                |
|------------------------------------|----------------|
| CABLE ASSEMBLY . . . . .           | HP 10503A      |
| INTERCONNECTING ASSEMBLY . . . . . | HP 11592-60016 |
| EXTENDER ASSEMBLY . . . . .        | HP 11592-60015 |
| TUNING TOOL . . . . .              | HP 8710-0095   |

1. Install the analyzer plug-ins on the two extender cable assemblies, connect CAL OUTPUT to RF INPUT and make the following control settings:

ANALYZER:

|                                   |                 |
|-----------------------------------|-----------------|
| INPUT ATTENUATION . . . . .       | 20 dB           |
| BANDWIDTH . . . . .               | 3 kHz           |
| SCAN WIDTH . . . . .              | PER DIVISION    |
| SCAN WIDTH PER DIVISION . . . . . | 5 kHz           |
| FREQUENCY . . . . .               | 30 MHz          |
| FINE TUNE . . . . .               | Centered        |
| SCAN TIME PER DIVISION . . . . .  | 10 MILLISECONDS |
| VIDEO FILTER . . . . .            | 10 kHz          |
| TUNING STABILIZER . . . . .       | On              |
| SCAN MODE . . . . .               | INT             |
| SCAN TRIGGER . . . . .            | LINE            |
| LOG LINEAR . . . . .              | LINEAR          |
| LINEAR SENSITIVITY . . . . .      | 1 mV/DIV        |
| BASE LINE CLIPPER . . . . .       | Max ccw         |

2. Place the A2 3 MHz Amplifier assembly on an extender and install it in the analyzer. Center the signal on the CRT display with the FINE TUNE control.
3. Set BANDWIDTH to 300 kHz and SCAN WIDTH PER DIVISION to .05 MHz.
4. Adjust A2A1L2, A2A1L4 and A2R1 for a smooth, symmetrical wave shape *centered* on the CRT display.
5. Set SCAN WIDTH PER DIVISION to 5 kHz and BANDWIDTH to 3 kHz. The display should remain centered. Return these controls to .05 MHz and 300 kHz, respectively.
6. Install the circuit board without the extender. Readjust A2R1 IMP if necessary.
7. Check 300 kHz bandwidth, paragraph 4-24: 300 kHz  $\pm$ 60 kHz

240\_\_\_\_\_360 kHz
8. If necessary, repeat adjustment procedure.
9. Switch BANDWIDTH to 10 kHz. The peak amplitude should remain the same  $\pm$ 0.4 division. If not, perform the LC Filter Adjustment, paragraph 5-33.



## ADJUSTMENTS

---

### 5-33. LC Filter Adjustment

REFERENCE: Schematic 8.

DESCRIPTION: The LC Filter circuits (100, 30 and 10 kHz bandwidths) are peaked and centered. The 10 kHz gain control is set so that the 10 kHz bandwidth has the same gain as the 300 kHz bandwidth. Then the gain and bandwidth of the filters are checked.

EQUIPMENT:

|                                    |                |
|------------------------------------|----------------|
| CABLE ASSEMBLY . . . . .           | HP 10503A      |
| TUNING TOOL . . . . .              | HP 8710-0095   |
| INTERCONNECTING ASSEMBLY . . . . . | HP 11592-60016 |
| EXTENDER ASSEMBLY . . . . .        | HP 11592-60015 |

1. Install the analyzer plug-ins on the two extender cable assemblies; connect CAL OUTPUT to RF INPUT, and make the following control settings:

ANALYZER:

|                                   |                 |
|-----------------------------------|-----------------|
| FREQUENCY . . . . .               | 30 MHz          |
| BANDWIDTH . . . . .               | 3 kHz           |
| SCAN WIDTH . . . . .              | PER DIVISION    |
| SCAN WIDTH PER DIVISION . . . . . | 5 kHz           |
| INPUT ATTENUATION . . . . .       | 20 dB           |
| TUNING STABILIZER . . . . .       | On              |
| SCAN TIME PER DIVISION . . . . .  | 10 MILLISECONDS |
| LOG-LINEAR . . . . .              | LINEAR          |
| LINEAR SENSITIVITY . . . . .      | 2 mV/DIV        |
| VIDEO FILTER . . . . .            | 10 kHz          |
| SCAN MODE . . . . .               | INT             |
| SCAN TRIGGER . . . . .            | AUTO            |

2. Center the signal as carefully as possible on the CRT display with the FINE TUNE control.
3. Set BANDWIDTH to 10 kHz and SCAN WIDTH to ZERO. Peak A1C4, A1C10, A1C16 and A1C22 for maximum trace deflection on the display.
4.
  - a. If one of the PEAK capacitors is at the end of its range (or if an inductor has been replaced) remove the circuit board from the analyzer.
  - b. Free the related inductor core with acetone and center the capacitor.
  - c. Install the circuit board on the extender. Perform steps 1 through 3 except tune the inductor, rather than the capacitors.
  - d. Re-glue the inductor, using Duco cement, and re-install the circuit board without the extender.
  - e. Again perform steps 1 through 3.
5. Set SCAN WIDTH to PER DIVISION and BANDWIDTH to 300 kHz. Use LINEAR SENSITIVITY to set signal for a 7.0 division display.
6. Set BANDWIDTH to 10 kHz and adjust A1R35 10 kHz ADJ for a 7.0 division display.
7. Install the shield cover and check the change in signal amplitude on the display as BANDWIDTH is switched from 300 kHz to 10 kHz. Deflection at these bandwidths should be within  $\pm 0.4$  division of 300 kHz.

## ADJUSTMENTS

---

### 5-33. LC Filter Adjustment (cont'd)

300 kHz: Reference  
 100 kHz: -0.4\_\_\_\_\_+0.4 div  
 30 kHz: -0.4\_\_\_\_\_+0.4 div  
 10 kHz: -0.4\_\_\_\_\_+0.4 div

8. Set BANDWIDTH to 3 kHz. Again the signal amplitude should not change more than  $\pm 0.4$  divisions; if it does, perform the crystal filter adjustment, paragraph 5-34.

300 kHz: Reference  
 3 kHz: -0.4\_\_\_\_\_+0.4 div

9. Check 100, 30 and 10 kHz bandwidths, paragraph 4-24.

100 kHz Bandwidth: 80\_\_\_\_\_120 kHz

30 kHz Bandwidth: 24\_\_\_\_\_36 kHz

10 kHz Bandwidth: 9.5\_\_\_\_\_10.5 kHz

10. If necessary, repeat adjustment procedure.

---

### 5-34. Crystal Filter Fine Adjustment

REFERENCE: Schematics 10 and 11.

DESCRIPTION: This procedure fine adjusts the crystal filters for bandwidth and amplitude. If component changes are made, Coarse Adjustment (paragraph 5-35) may be necessary. The center frequency of the last four stages is referenced to the first stage, then all five stages are nulled. Next, the bandwidth amplitudes are set. Finally, the filters are checked for bandwidth and amplitude.

#### EQUIPMENT:

|                                    |                     |
|------------------------------------|---------------------|
| SIGNAL GENERATOR . . . . .         | HP 606B             |
| OSCILLATOR SYNCHRONIZER . . . . .  | HP 8708A            |
| FREQUENCY COUNTER . . . . .        | HP 5245L            |
| CABLE ASSEMBLY (6) . . . . .       | HP 10503A           |
| INTERCONNECTING ASSEMBLY . . . . . | HP 11592-60016      |
| EXTENDER ASSEMBLY . . . . .        | HP 11592-60015      |
| OSCILLOSCOPE . . . . .             | HP 180A/1801A/1821A |
| CABLE ASSEMBLY . . . . .           | HP 10501A           |

1. Remove A2 3 MHz Amplifier Assembly, connect the test setup in Figure 5-7 and make the following control settings:

#### ANALYZER:

|                                   |                |
|-----------------------------------|----------------|
| FREQUENCY . . . . .               | 30 MHz         |
| TUNING STABILIZER . . . . .       | On             |
| BANDWIDTH . . . . .               | .01 kHz        |
| SCAN WIDTH . . . . .              | PER DIVISION   |
| SCAN WIDTH PER DIVISION . . . . . | 1 MHz          |
| INPUT ATTENUATION . . . . .       | 20 dB          |
| BASE LINE CLIPPER . . . . .       | Max ccw        |
| SCAN TIME PER DIVISION . . . . .  | 2 MILLISECONDS |

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ADJUSTMENTS

5-34. Crystal Filter Fine Adjustment (cont'd)

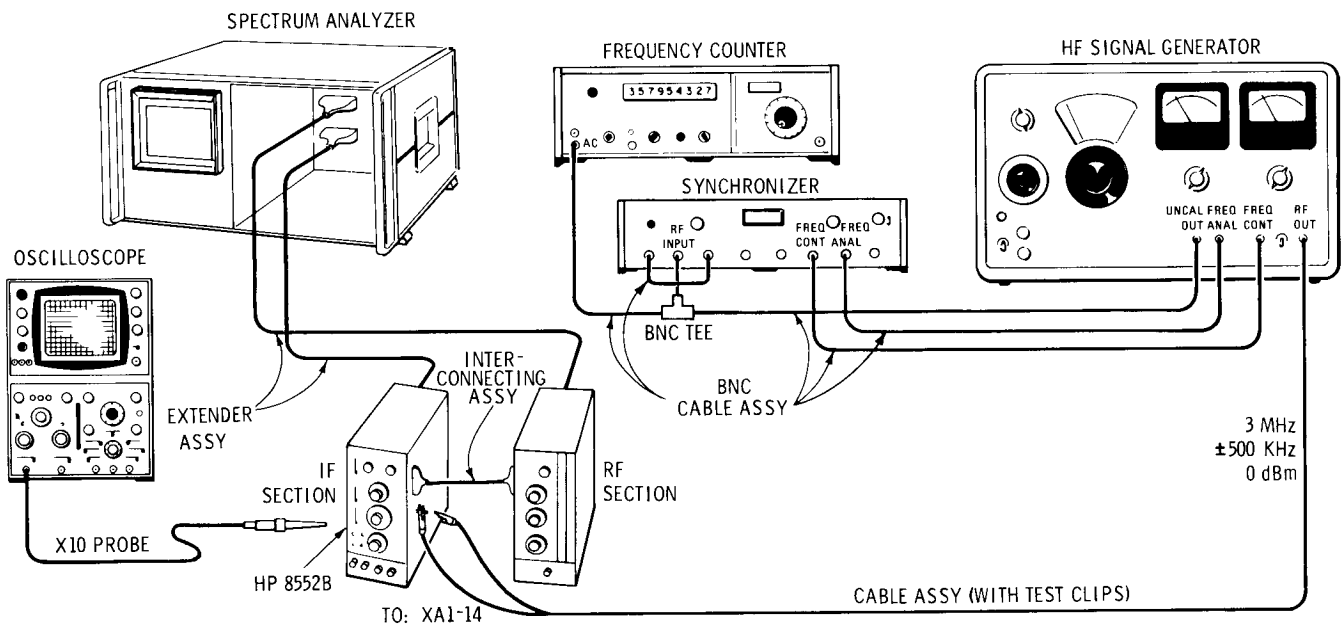


Figure 5-7. Crystal Filter Fine Adjustment Test Setup

|                                    |                       |
|------------------------------------|-----------------------|
| ANALYZER control settings (cont'd) |                       |
| LINEAR SENSITIVITY                 | 20 $\mu$ V/DIV        |
| VIDEO FILTER                       | 10 Hz                 |
| LOG-LINEAR                         | LINEAR                |
| SCAN MODE                          | INT                   |
| SCAN TRIGGER                       | AUTO                  |
| 606B:                              |                       |
| RANGE                              | 4                     |
| FREQUENCY                          | 3 MHz                 |
| MODULATION SELECTOR                | CW                    |
| ATTENUATOR (dBm)                   | -30                   |
| VERNIER                            | Set for 0 on dB meter |
| 8708A:                             |                       |
| FREQUENCY RANGE                    | 4                     |
| RF INPUT                           | Under lit lamp        |
| MODULATION                         | CW                    |
| FREQUENCY TUNING                   | Centered              |
| AC-DC                              | AC                    |
| 5245L:                             |                       |
| SAMPLE RATE                        | 9 o'clock             |
| TIME BASE                          | 1 s                   |

## ADJUSTMENTS

---

### 5-34. Crystal Filter Fine Adjustment (cont'd)

5245L settings (cont'd)

|                       |                 |
|-----------------------|-----------------|
| FUNCTION . . . . .    | FREQUENCY       |
| SENSITIVITY . . . . . | 0.1 (volts rms) |

180A:

|                     |        |
|---------------------|--------|
| VOLTS/DIV . . . . . | .01    |
| TIME/DIV . . . . .  | 1 MSEC |

2. Tune the synchronizer for 3 MHz  $\pm 10$  Hz, connect oscilloscope probe to A4TP6, then tune the synchronizer for a peak on the oscilloscope.
3. Remove the probe from TP6 and reduce LINEAR SENSITIVITY until trace appears on analyzer's CRT display. Adjust A4C30, 43, 57 and 70 for maximum trace deflection.
4. Repeat steps 2 and 3. Then remove the clip leads at XA1-14 and install A2 3 MHz Amplifier Assembly.
5. Connect CAL OUTPUT to RF INPUT and make the following control settings:

ANALYZER:

|                                  |                 |
|----------------------------------|-----------------|
| BANDWIDTH . . . . .              | 3 kHz           |
| SCAN TIME PER DIVISION . . . . . | 10 MILLISECONDS |
| LINEAR SENSITIVITY . . . . .     | 1 mV/DIV        |
| VIDEO FILTER . . . . .           | 10 kHz          |

6. Center signal on display with FREQUENCY control and reduce SCAN WIDTH PER DIVISION to 1 kHz.
7. Adjust A4C19, 34, 47, 61 and 74 to null the signal. Set the signal to the 7 graticule line with LINEAR SENSITIVITY vernier.
8. Set BANDWIDTH to 1 kHz; signal level should not change more than  $\pm 0.3$  division.
9. If signal is out of limits, repeat steps 6 and 7.
10. Set SCAN WIDTH to ZERO and make the BANDWIDTH changes and adjustments indicated below. Re-peak the signal with FINE TUNE every time BANDWIDTH is changed.

| BANDWIDTH | Adjust for 7.0 Divisions |        |
|-----------|--------------------------|--------|
| 0.3 kHz   | A4R129                   | 300 Hz |
| 0.1 kHz   | A4R126                   | 100 Hz |
| .03 kHz   | A4R122                   | 30 Hz  |
| .01 kHz   | A4R115                   | 10 Hz  |

ADJUSTMENTS

5-34. Crystal Filter Fine Adjustment (cont'd)

11. Repeat steps 8 through 10 until the bandwidth amplitude variations from 3 kHz through 0.1 kHz are as shown below:

|           |               |         |
|-----------|---------------|---------|
| 3 kHz:    | Set for 7 div |         |
| 1 kHz:    | 6.7           | 7.3 div |
| 0.3 kHz:  | 6.7           | 7.3 div |
| 0.1 kHz:  | 6.7           | 7.3 div |
| 0.03 kHz: | 6.5           | 7.5 div |
| 0.01 kHz: | 6.0           | 7.0 div |

12. Place the A4 Crystal Filter Assembly on an extender. Set BANDWIDTH to 3 kHz, peak the trace with FINE TUNE and set the trace to the 7 graticule with LINEAR SENSITIVITY vernier.

13. Set BANDWIDTH to 300 kHz and adjust A4R133 to set the trace to the 7 graticule line.

14. Install the A4 Crystal Filter Assembly without the extender. Repeat steps 12 through 14 until the bandwidth amplitude variation between 3 kHz to 300 kHz is less than  $\pm 0.3$  divisions.

6.7 7.3 div

15. Perform the bandwidth checks for the 3 kHz through .01 kHz bandwidths, paragraphs 4-24, 4-25:

| BANDWIDTH | 3 dB Bandwidth | 60 dB/3 dB Bandwidth Ratio |
|-----------|----------------|----------------------------|
| 3 kHz     | 4.8 7.2 div    | 11:1 div                   |
| 1 kHz     | 4.0 6.0 div    | 11:1 div                   |
| 0.3 kHz   | 4.8 7.2 div    | 11:1 div                   |
| 0.1 kHz   | 4.0 6.0 div    | 11:1 div                   |
| .03 kHz   | 1.2 1.8 div    | 11:1 div                   |
| .01 kHz   | 0.4 0.6 div    | 11:1 div                   |

16. If necessary, repeat adjustment procedure.

ADJUSTMENTS

5-35. Crystal Filter Coarse Adjustment

REFERENCE: Schematics 10 and 11.

DESCRIPTION: This procedure adjusts A4C18, 32, 45, 59 and 73; it coarse adjusts A4C19, 34, 47, 61 and 74. It should be performed only if component changes that would affect the crystal alignment are made. The crystal filter circuits are adjusted, in turn, by bypassing all but the stage being adjusted; they are adjusted for center frequency, symmetry and null.

NOTE

This procedure can be difficult and time consuming and should not be attempted unless the Fine Adjustment procedure will not align the filters.

EQUIPMENT:

|                                   |                |
|-----------------------------------|----------------|
| CRYSTAL FILTER BYPASS NETWORK (4) | (See Step 9)   |
| CABLE ASSEMBLY                    | HP 10503A      |
| INTERCONNECTING ASSEMBLY          | HP 11592-60016 |
| EXTENDER ASSEMBLY                 | HP 11592-60015 |

1. Install the analyzer plug-ins on the two extender cable assemblies, connect CAL OUTPUT to RF INPUT, and make the following control settings:

ANALYZER:

|                         |                |
|-------------------------|----------------|
| FREQUENCY               | 30 MHz         |
| BANDWIDTH               | 3 kHz          |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | .05 MHz        |
| INPUT ATTENUATION       | 10 dB          |
| TUNING STABILIZER       | On             |
| SCAN TIME PER DIVISION  | 5 MILLISECONDS |
| LOG LINEAR              | 10 dB LOG      |
| LOG REF LEVEL           | -20 dBm        |
| VIDEO FILTER            | 10 kHz         |
| SCAN MODE               | INT            |
| SCAN TRIGGER            | AUTO           |

2. Place the A4 Crystal Filter Assembly on an extender board and install it in the analyzer. Place the four Crystal Filter Bypass Networks across: TP2 to TP7, TP3 to TP8, TP4 to TP9 and TP5 to TP10.
3. Center the signal on the CRT display with the FREQUENCY control. Use the LOG REF LEVEL controls to set signal peak at LOG REF graticule.
4. Tune A4C19 and A4C18 respectively for signal null and symmetrical skirts (60 dB down).

NOTE

Oscillations sometimes occur when the Crystal Filter board is on the Extender board and the Crystal Filter Bypass Networks are being used. Place your fingers across the last Crystal Filter Bandpass Network. This will dampen the oscillations while the adjustments are being made.

5. Perform Step 4 for each of the Filter stages in turn, as indicated:

ADJUSTMENTS

5-35. Crystal Filter Coarse Adjustment (cont'd)

| Place Bypass Networks<br>Across Test Points | Tune for null and symmetrical<br>skirts (60 dB down) |
|---------------------------------------------|------------------------------------------------------|
| 1 and 6, 3 and 8<br>4 and 9, 5 and 10       | A4C34 and A4C32                                      |
| 1 and 6, 2 and 7<br>4 and 9, 5 and 10       | A4C47 and A4C45                                      |
| 1 and 6, 2 and 7<br>3 and 8, 5 and 10       | A4C61 and A4C59                                      |
| 1 and 6, 2 and 7<br>3 and 8, 4 and 9        | A4C74 and A4C73                                      |

- 6. Repeat steps 4 and 5.
- 7. Remove the Bypass Networks and install A4 assembly without an extender.
- 8. Perform Crystal Filter Fine Adjustment, paragraph 5-34.
- 9. Assemble four Crystal Filter bypass networks from parts listed below:
  - a. 4 capacitors — .047 microfarad 10% HP 0170-0040
  - b. 4 resistors — 3.3 ohm 5% HP 0683-0335
  - c. 8 receptacles — for .040 inch pin HP 1200-0063

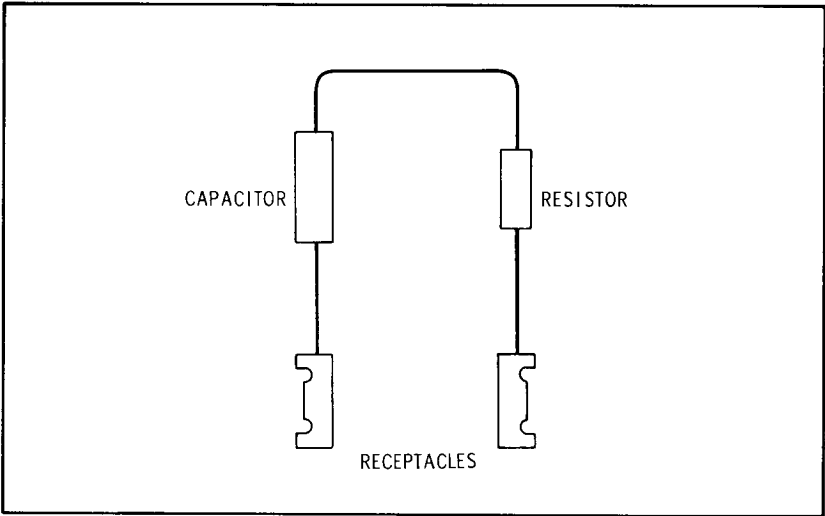


Figure 5-8. Crystal Filter Bypass Network

ADJUSTMENTS

5-36. 3 MHz IF Gain Adjustment

REFERENCE: Schematics 6, 7, 8.

DESCRIPTION: The amplifier gain controls are adjusted for various positions of the LOG REF LEVEL attenuator and then the remaining positions of the LINEAR SENSITIVITY dial are checked. The VERTICAL OUTPUT circuit adjustment is set for output voltage with full-scale display deflection.

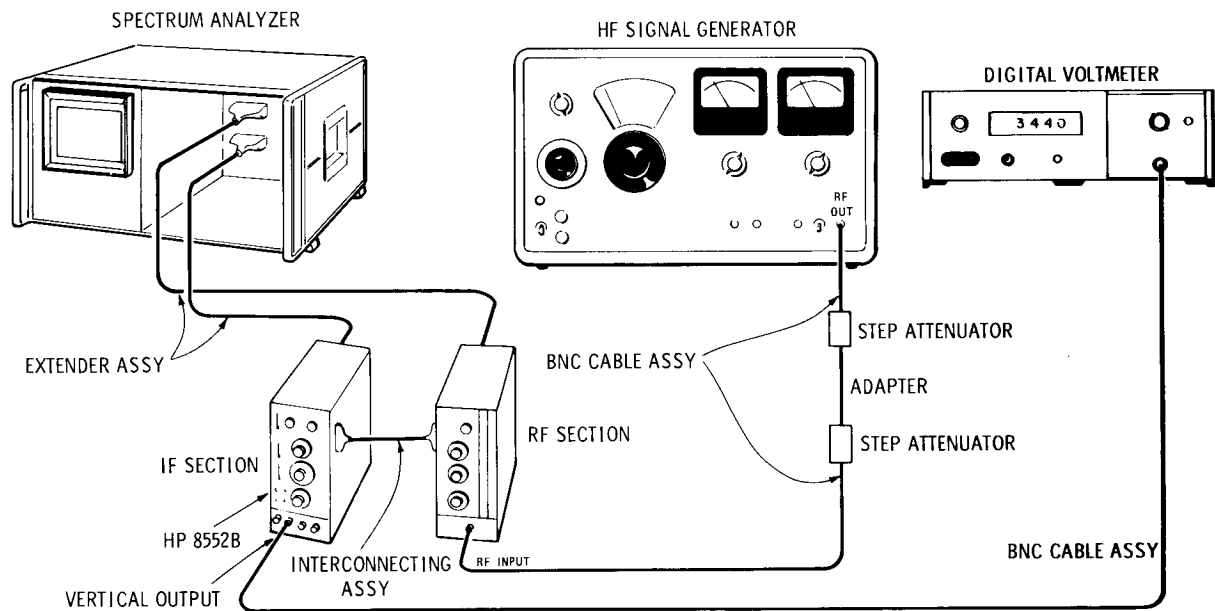


Figure 5-9. 3 MHz IF Gain Adjustment Test Setup

|                          |                |  |
|--------------------------|----------------|--|
| EQUIPMENT:               |                |  |
| SIGNAL GENERATOR         | HP 606B        |  |
| DIGITAL VOLTMETER        | HP 3440A/3443A |  |
| ATTENUATOR               | HP 355C        |  |
| ADAPTER                  | HP 1258-0216   |  |
| INTERCONNECTING ASSEMBLY | HP 11592-60016 |  |
| EXTENDER ASSEMBLY        | HP 11592-60015 |  |
| ATTENUATOR               | HP 355D        |  |
| CABLE ASSEMBLY (3)       | HP 10503A      |  |

1. Remove the cover shield from the Al LC Filter Assembly, connect the test setup shown in Figure 5-9 and make the following control settings:

|                        |                |  |
|------------------------|----------------|--|
| ANALYZER:              |                |  |
| FREQUENCY              | 30 MHz         |  |
| TUNING STABILIZER      | On             |  |
| BANDWIDTH              | 100 kHz        |  |
| SCAN WIDTH             | ZERO           |  |
| INPUT ATTENUATION      | 0 dB           |  |
| SCAN TIME PER DIVISION | 2 MILLISECONDS |  |
| LINEAR SENSITIVITY     | 1 mV/DIV       |  |
| LOG-LINEAR             | LINEAR         |  |
| BASE LINE CLIPPER      | Max ccw        |  |



ADJUSTMENTS

5-36. 3 MHz IF Gain Adjustment (cont'd)

ANALYZER control settings (cont'd)

|              |      |
|--------------|------|
| SCAN MODE    | INT  |
| SCAN TRIGGER | AUTO |
| VIDEO FILTER | OFF  |

606B:

|                     |                       |
|---------------------|-----------------------|
| FREQUENCY           | 30 MHz                |
| ATTENUATOR (dBm)    | -20                   |
| RANGE               | 5                     |
| MODULATION SELECTOR | CW                    |
| VERNIER             | Set for 0 dB on meter |

3440A/3443A:

|             |           |
|-------------|-----------|
| SAMPLE RATE | 9 o'clock |
| RANGE       | AUTO      |

355C and 355D:

|             |      |
|-------------|------|
| ATTENUATION | 0 dB |
|-------------|------|

2. Adjust FREQUENCY control for maximum trace deflection.
3. Adjust signal generator output so that VERTICAL OUTPUT voltage is  $-1.000 \pm 0.005$  Vdc.
4. Increase test attenuators by 12 dB.
5. Turn LOG REF LEVEL vernier to -12 dB.
6. Adjust A2R44 12 dB ADJ for  $-1.000 \pm 0.005$  Vdc.
7. Decrease test attenuators by 12 dB.
8. Turn LOG REF LEVEL vernier to 0 dB.
9. Adjust A2R51 0 dB ADJ for  $-1.000 \pm 0.005$  Vdc.
10. Repeat adjustments in steps 4 through 9 to minimize interaction between controls.
11. Set test attenuator to 6 dB.
12. Turn LOG REF LEVEL vernier to -6. Note error from 1.000 Vdc and adjust HP 606B output for -1.000 Vdc minus error.
13. Set test attenuator to 12 dB and repeat steps 5 through 10.

ADJUSTMENTS

5-36. 3 MHz IF Gain Adjustment (cont'd)

14. Measure the LOG REF LEVEL vernier accuracy at each dB mark by the substitution method employed in steps 4 through 9. The VERTICAL OUTPUT voltage at each step should be -1.000 ± 0.04 Vdc.

|       |                      |        |                      |
|-------|----------------------|--------|----------------------|
| -1 dB | -0.96_____1.04 Vdc   | -7 dB  | -0.96_____ -1.04 Vdc |
| -2 dB | -0.96_____ -1.04 Vdc | -8 dB  | -0.96_____ -1.04 Vdc |
| -3 dB | -0.96_____ -1.04 Vdc | -9 dB  | -0.96_____ -1.04 Vdc |
| -4 dB | -0.96_____ -1.04 Vdc | -10 dB | -0.96_____ -1.04 Vdc |
| -5 dB | -0.96_____ -1.04 Vdc | -11 dB | -0.96_____ -1.04 Vdc |
| -6 dB | -0.96_____ -1.04 Vdc | -12 dB | -0.96_____ -1.04 Vdc |

15. Change the control settings as follows:

ANALYZER:  
INPUT ATTENUATION . . . . . 10 dB  
LOG REF LEVEL . . . . . 0 dBm  
LOG LINEAR . . . . . 10 dB LOG

606B:  
ATTENUATOR (dBm) . . . . . 0

355D and 355C:  
ATTENUATION . . . . . 10 dB

16. Tune FREQUENCY control for maximum trace deflection.

17. Note reference voltage at VERTICAL OUTPUT.

Reference Voltage <- 600 mV (more negative) :\_\_\_\_\_

18. Adjust 3 MHz IF Gain positions as follows:

| Test Attenuator | LOG REF LEVEL | Adjust | Error Limit: ±2 mVdc (from Reference Voltage) |
|-----------------|---------------|--------|-----------------------------------------------|
| 10 dB           | -10 dBm       | A1R59  | -2_____+2                                     |
| 20 dB           | -20 dBm       | A1R58  | -2_____+2                                     |
| 30 dB           | -30 dBm       | A2R21  | -2_____+2                                     |
| 40 dB           | -40 dBm       | A2R24  | -2_____+2                                     |
| 50 dB           | -50 dBm       | A2R27  | -2_____+2                                     |

ADJUSTMENTS

5-36. 3 MHz IF Gain Adjustment (cont'd)

19. Check the remaining attenuator steps as follows:
- a. Connect a shorting strap between the green and blue wires on the LOG REF LEVEL switch A10S1-2R.
  - b. Set LOG·LINEAR control to LINEAR and test attenuators to 43 dB.
  - c. Set LINEAR SENSITIVITY to 0.1 mV/DIV with INPUT ATTENUATION at 10 dB.
  - d. Measure the voltage at the VERTICAL OUTPUT jack.

Reference Voltage:\_\_\_\_\_

- e. Check the remaining LINEAR SENSITIVITY positions according to the table below:

| Test Attenuator | LINEAR SENSITIVITY | Error Limit: ±15 mVdc |
|-----------------|--------------------|-----------------------|
| 43 dB           | 0.1 mV/DIV         | -15_____+15           |
| 33 dB           | 0.2 mV/DIV         | -15_____+15           |
| 23 dB           | 1.0 mV/DIV         | -15_____+15           |
| 13 dB           | 2.0 mV/DIV         | -15_____+15           |
| 3 dB            | 10.0 mV/DIV        | -15_____+15           |

- f. Remove the shorting strap installed in step a on page 5-24.

5-37. 47 MHz LO Automatic Phase Lock Check and Adjustment

REFERENCE: Schematics 3, 4, 5.

DESCRIPTION: The oscillator levels are set and checked and the phase lock loop is checked. The summing and shaping circuits are then adjusted by applying dc offsets and adjusting for a linear 47 MHz LO sweep.

## ADJUSTMENTS

## 5-37. 47 MHz LO Automatic Phase Lock Check and Adjustment (cont'd)

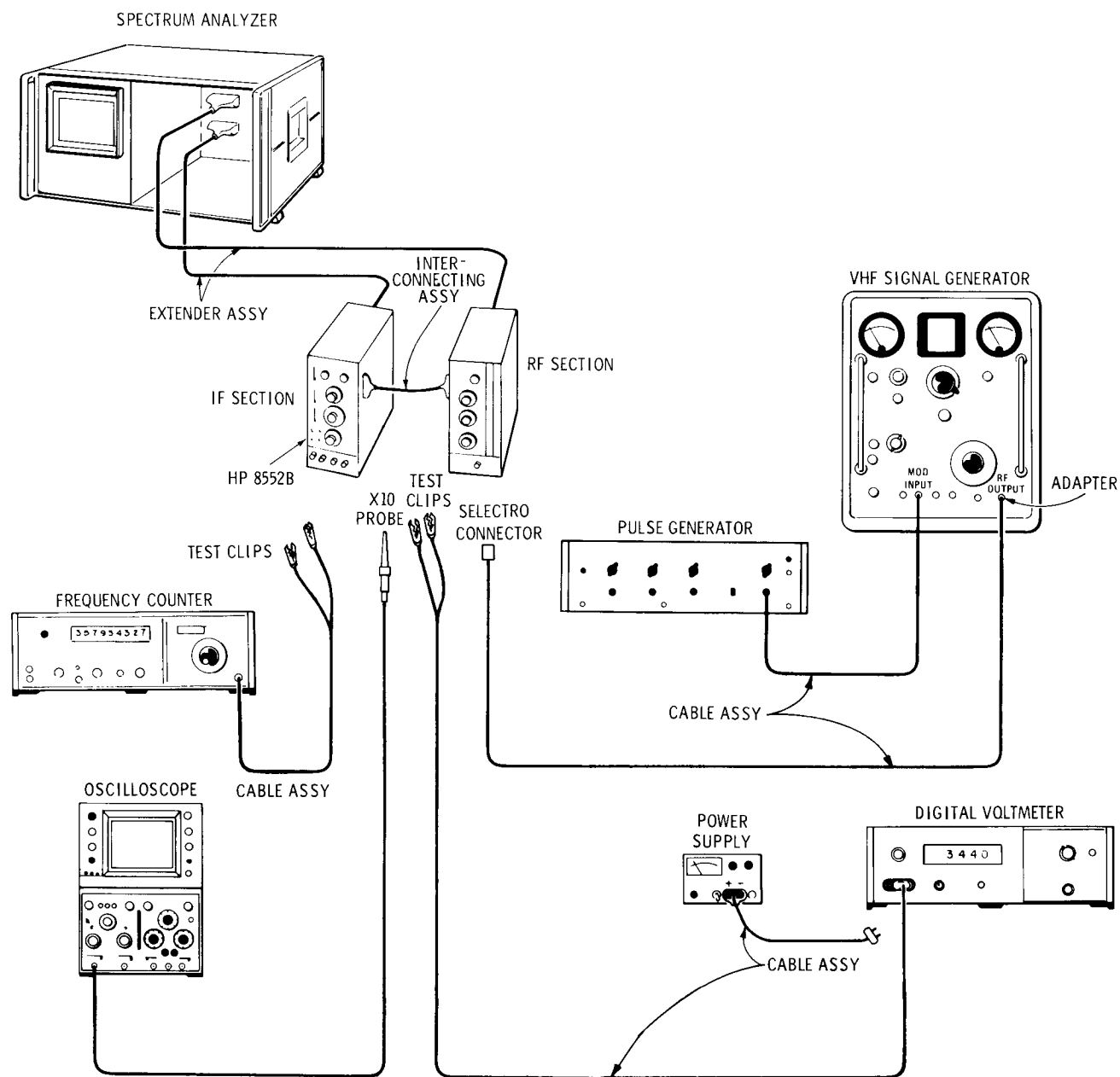


Figure 5-10. 47 MHz LO Automatic Phase Lock Test Setup

## EQUIPMENT:

|                      |                     |
|----------------------|---------------------|
| FREQUENCY COUNTER    | HP 5245L/5261A      |
| OSCILLOSCOPE         | HP 180A/1801A/1820A |
| SIGNAL GENERATOR     | HP 608F             |
| PULSE GENERATOR      | HP 222A             |
| POWER SUPPLY         | HP 6217A            |
| 6-PIN EXTENDER BOARD | HP 5060-5914        |

## ADJUSTMENTS

### 5-37. 47 MHz LO Automatic Phase Lock Check and Adjustment (cont'd)

#### EQUIPMENT (cont'd)

|                                         |                |
|-----------------------------------------|----------------|
| EXTENDER ASSEMBLY . . . . .             | HP 11592-60015 |
| INTERCONNECTING ASSEMBLY . . . . .      | HP 11592-60016 |
| CABLE ASSEMBLY . . . . .                | HP 11592-60001 |
| CABLE ASSEMBLY . . . . .                | HP 10503A      |
| CABLE ASSEMBLY (w/test clips) . . . . . | HP 10501A      |
| DIGITAL VOLTMETER . . . . .             | HP 3440A/3443A |
| ADAPTER . . . . .                       | UG-201A/U      |
| CABLE ASSEMBLY . . . . .                | HP 11000A      |
| CABLE ASSEMBLY (w/test clips) . . . . . | HP 11002A      |
| ALIGNMENT TOOL . . . . .                | HP 8710-0957   |

1. Connect the test setup in Figure 5-10. Remove the A1/A12 Assemblies cover shield and the A13 2 MHz VTO Assembly, and make the following control settings:

#### ANALYZER:

|                                   |                 |
|-----------------------------------|-----------------|
| FINE TUNE . . . . .               | Centered        |
| SCAN TIME PER DIVISION . . . . .  | 50 MILLISECONDS |
| BANDWIDTH . . . . .               | 1 kHz           |
| TUNING STABILIZER . . . . .       | OFF             |
| SCAN WIDTH . . . . .              | PER DIVISION    |
| SCAN WIDTH PER DIVISION . . . . . | 20 kHz          |
| VIDEO FILTER . . . . .            | OFF             |
| SCAN MODE . . . . .               | INT             |
| SCAN TRIGGER . . . . .            | AUTO            |
| LOG LINEAR . . . . .              | 10 dB LOG       |
| LOG REF LEVEL . . . . .           | -40 dBm         |

#### 180A/1801/1820:

|                     |          |
|---------------------|----------|
| VOLTS/DIV . . . . . | .02      |
| TIME/DIV . . . . .  | 0.5 MSEC |
| Probe . . . . .     | X10      |

#### 5245L/5261A:

|                                 |           |
|---------------------------------|-----------|
| SENSITIVITY . . . . .           | PLUG IN   |
| SAMPLE RATE . . . . .           | ccw       |
| TIME BASE . . . . .             | 1 s       |
| FUNCTION . . . . .              | FREQUENCY |
| SENSITIVITY (PLUG-IN) . . . . . | 30 mV RMS |

#### 608F:

|                       |           |
|-----------------------|-----------|
| MODULATION . . . . .  | EXT PULSE |
| ATTENUATION . . . . . | -20 dBm   |
| MEGACYCLES . . . . .  | 50        |

#### 222A:

|                           |                       |
|---------------------------|-----------------------|
| REF RATE . . . . .        | 10K — 100K            |
| PULSE WIDTH . . . . .     | 0.5 — 5 (vernier ccw) |
| PULSE AMPLITUDE . . . . . | 2V                    |
| PULSE POLARITY . . . . .  | +                     |

2. Attach oscilloscope probe to A12TP2. Adjust A12T1 for maximum; signal level should be  $650 \pm 200$  mV p-p.

450\_\_\_\_\_850 mV p-p

## ADJUSTMENTS

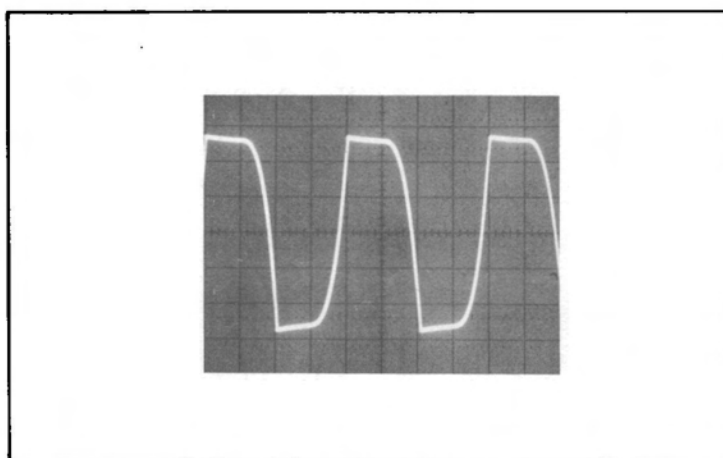
### 5-37. 47 MHz LO Automatic Phase Lock Check and Adjustment (cont'd)

3. Remove oscilloscope probe and attach frequency counter to A12TP2. 45 MHz Crystal Oscillator frequency should be  $45 \text{ MHz} \pm 10 \text{ kHz}$ .

44.990 \_\_\_\_\_ 45.010 MHz

4. Attach oscilloscope probe to feedthrough capacitor C8 (see Figure 8-8) and set oscilloscope VOLTS/DIV to 0.2 and TIME/DIV to 5 msec. Search waveform should be as shown in Figure 5-11 with amplitude from 8.5 to 11.5 V p-p.

8.5 \_\_\_\_\_ 11.5 V p-p



*Figure 5-11. Search Waveform*

5. Remove oscilloscope probe from C8 and attach to J8 (see Figure 8-8); set oscilloscope VOLTS/DIV to .05 and TIME/DIV to 5 msec. The 47 MHz LO level should be  $2.0 \text{ V} \pm 0.5$ .

1.5V \_\_\_\_\_ 2.5 V p-p

6. Remove oscilloscope probe from J8 and re-attach to feedthrough C8. Insert A13 2 MHz VTO Assembly into 8552B on 6-pin extender board. 47 MHz LO phase lock will be indicated by the 50 Hz square wave becoming steady dc.

#### NOTE

If square wave does not become steady dc, adjust 47 MHz LO (A3A2L1) as specified in step 16. Then repeat steps 4 through 6.

7. Remove oscilloscope probe from C8 and attach to A13TP1. Set oscilloscope VOLTS/DIV to .02 and TIME/DIV to 5 msec. Adjust A13R5 VTO LEVEL ADJ for  $900 \pm 250 \text{ mV p-p}$ .

650 \_\_\_\_\_ 1150 mV p-p

8. Disconnect oscilloscope probe and attach frequency counter to A13TP1. Switch analyzer SCAN WIDTH to ZERO. With alignment tool, adjust A13T1 for  $2 \text{ MHz} \pm 2 \text{ kHz}$ . (FINE TUNE must be centered and TUNING STABILIZER must be off.)

1998 \_\_\_\_\_ 2002 kHz

## ADJUSTMENTS

---

### 5-37. 47 MHz LO Automatic Phase Lock Check and Adjustment (cont'd)

9. Remove A13 2 MHz VTO and re-install in 8552B without extender.

#### NOTE

The following steps of this paragraph should be omitted if the RF Section being used is an 8554 or 8555.

Turn analyzer POWER off. Unsolder yellow wire at 8552B XA5 pin 3 and connect power supply positive lead to XA5 pin 3 (connect negative lead to chassis ground.) Adjust power supply for +7.50 V with digital voltmeter.

10. Connect pulse generator to frequency counter. Adjust REP RATE VERNIER for 20.000 kHz, then connect pulse generator to signal generator. Disconnect W7-50 MHz, white coax at J6 (see Figure 8-8). Connect the signal generator output to J6. Set analyzer SCAN WIDTH to PER DIVISION (SCAN WIDTH PER DIVISION should be 20 kHz).
11. Turn analyzer POWER on and observe signal on Display Section CRT.
12. Adjust A5R45 SHAPING ADJ for optimum linearity, aligning the pulses of the modulated signal on the vertical graticule lines. Adjust frequency of signal generator to keep pulses aligned on graticule lines as adjustment is made. Pulses should not deviate more than  $\pm 0.75$  minor divisions from graticule lines across entire display.

Max. deviation: 0.75 \_\_\_\_\_ 0.75 minor div

13. Change power supply to put -7.50V at XA5 pin 3. Adjust A5R71 OFFSET ADJ for optimum linearity, aligning pulses on vertical graticule lines and adjusting signal generator frequency as necessary to keep pulses on graticule lines. Pulses should not deviate more than  $\pm 0.75$  minor divisions from graticule lines across entire display.

Max. deviation 0.75 \_\_\_\_\_ 0.75 minor div

14. Set the power supply to 0V and check to see that the pulses do not deviate more than  $\pm 0.75$  minor divisions from vertical graticule lines across entire display.

Max. deviation 0.75 \_\_\_\_\_ 0.75 minor div

15. Repeat steps 8 through 14 until no further adjustments are necessary to meet the specifications in each step. (Yellow wire at XA5 pin 3 can remain unsoldered until adjustments are completed.)

16. Set analyzer SCAN WIDTH to ZERO and attach DVM to feedthrough C8. Phase lock error signal should be  $+4 \pm 0.4$ V. If not, adjust A3A2L1 (accessible through hole in A3A2 cover).

+3.6 \_\_\_\_\_ +4.4V

17. Turn the analyzer POWER off, reconnect W6 to J6 and re-solder yellow wire to XA5 pin 3. Remove test equipment connections from analyzer and re-install the cover shields to the A13 and A1/A12 Assemblies.

---

### 5-38. 50 MHz IF Bandpass Check and Adjustment

REFERENCE: Schematic 3.

DESCRIPTION: The 50 MHz IF bandpass is checked by manually sweeping the 47 MHz Local Oscillator over a 200 kHz range and viewing the analyzer display for flatness. For adjustment, the 50 MHz IF is swept using a flat external source. The output is detected, filtered and displayed on an oscilloscope. The bandpass filter is adjusted for frequency, amplitude, width and flatness.

---

## ADJUSTMENTS

### 5-38. 50 MHz IF Bandpass Check and Adjustment (cont'd)

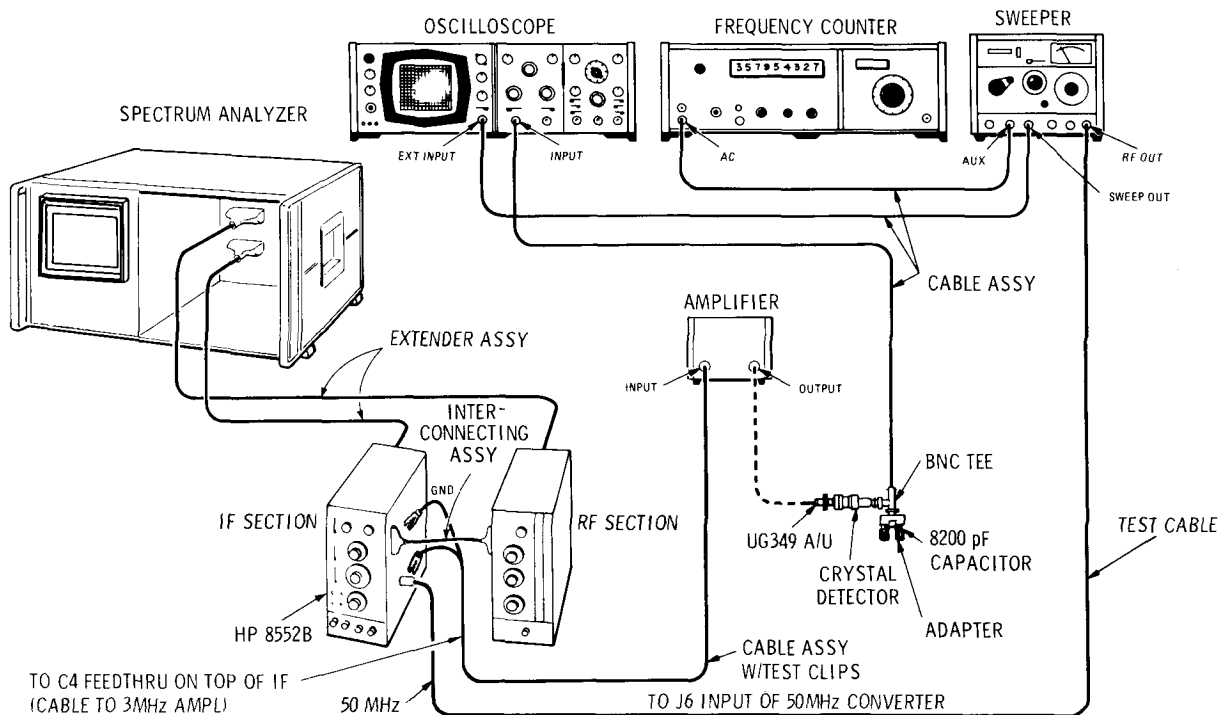


Figure 5-12. 50 MHz IF Bandpass Adjustment Test Setup

## EQUIPMENT:

|                                        |                   |
|----------------------------------------|-------------------|
| GENERATOR/SWEEPER                      | HP 8601A          |
| OSCILLOSCOPE with 1801A/1821A PLUG-INS | HP 180A           |
| FREQUENCY COUNTER                      | HP 5245L          |
| AMPLIFIER                              | HP 8447A          |
| CRYSTAL DETECTOR                       | HP 423A           |
| CABLE ASSEMBLY                         | HP 10501A         |
| CABLE ASSEMBLY (3)                     | HP 10503A         |
| TEST CABLE                             | HP 11592-60001    |
| EXTENDER ASSEMBLY                      | HP 11592-60015    |
| INTERCONNECTING ASSEMBLY               | HP 11592-60016    |
| ADAPTER                                | HP 10110A         |
| ADAPTER                                | UG-201A/U         |
| BNC Tee                                | UG-274B/U         |
| ADAPTER                                | UG-349A/U         |
| CAPACITOR                              | 8200 PF (approx.) |

1. Connect the test setup as shown in Figure 5-12. Make the following control settings:

## ANALYZER:

3 MHz Amplifier Assembly A2 removed.

8601A:

```

FREQUENCY . . . . . 50 MHz
RANGE . . . . . 110
SWEEP . . . . . SYM
OUTPUT LEVEL . . . . . -10 dBm
SWEEP MODE . . . . . LINE-FAST
1 kHz MODE . . . . . OFF

```



ADJUSTMENTS

5-38. 50 MHz IF Bandpass Check and Adjustment (cont'd)

180A/1801A:  
MAGNIFIER . . . . . X5  
POSITION . . . . . (see Figure 5-13)  
VOLTS/DIV (Channel A) . . . . . .05  
POLARITY . . . . . UP  
INPUT . . . . . DC  
DISPLAY . . . . . A

5245L:  
SAMPLE RATE . . . . . 9 o'clock  
SENSITIVITY (volts rms) . . . . . 0.1  
TIME BASE . . . . . 10 ms  
FUNCTION . . . . . FREQUENCY

- 2. Adjust Generator/Sweeper and oscilloscope to display a 10 MHz swept signal centered on 50 MHz. (See Figure 5-13.)
- 3. If the bandpass is not flat ( $\pm 2$  mV) at least 0.3 MHz on either side of 50 MHz, adjust A3A1C5, 6, 9 and 10 for maximum amplitude and flatness.
- 4. Select 3 MHz sweep width on the HP 8601A and observe oscilloscope display for a bandpass as shown in Figure 5-13. Repeat Step 3 as required to obtain desired bandpass.
- 5. Remove power from display section and install 3 MHz Amplifier Assembly A2.
- 6. Remove cable assembly from Generator/Sweeper.
- 7. Perform 44 MHz Rejection Check, paragraph 5-39. If capacitors A3C11, 14 or 19 are adjusted, repeat steps 1 through 4 above.

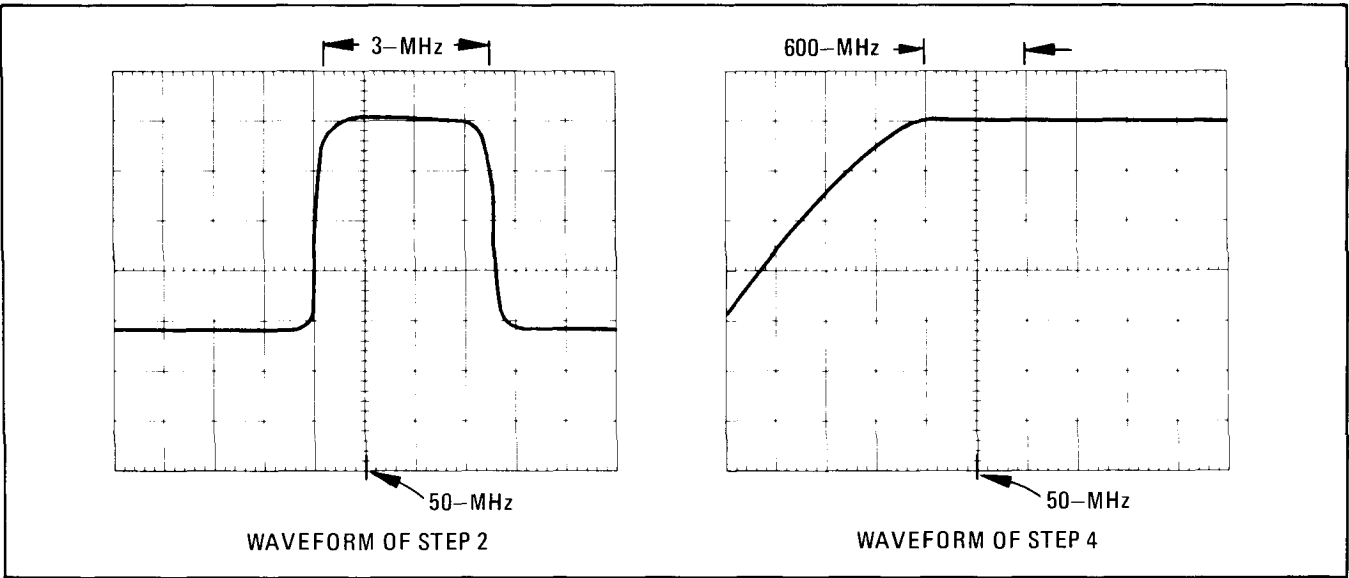


Figure 5-13. 50 MHz Bandpass Display for 10 MHz and 3 MHz Sweeps

## ADJUSTMENTS

### 5-38. 50 MHz IF Bandpass Check and Adjustment (cont'd)

8. Connect a test cable from CAL OUTPUT to RF INPUT and make the following control settings:

**ANALYZER:**

|                         |                            |
|-------------------------|----------------------------|
| FREQUENCY               | 30 MHz                     |
| FINE TUNE               | Full cw                    |
| INPUT ATTENUATION       | 0 dB                       |
| TUNING STABILIZER       | OFF                        |
| BANDWIDTH               | 10 kHz                     |
| SCAN WIDTH              | PER DIVISION               |
| SCAN WIDTH PER DIVISION |                            |
|                         | 100 kHz                    |
| BASE LINE CLIPPER       | Max ccw                    |
| SCAN TIME PER DIVISION  |                            |
|                         | 2 MILLISECONDS             |
| LINEAR SENSITIVITY      |                            |
|                         | Set for full scale display |
| VIDEO FILTER            | OFF                        |
| SCAN MODE               | INT                        |
| SCAN TRIGGER            | LINE                       |
| LOG·LINEAR              | LINEAR                     |

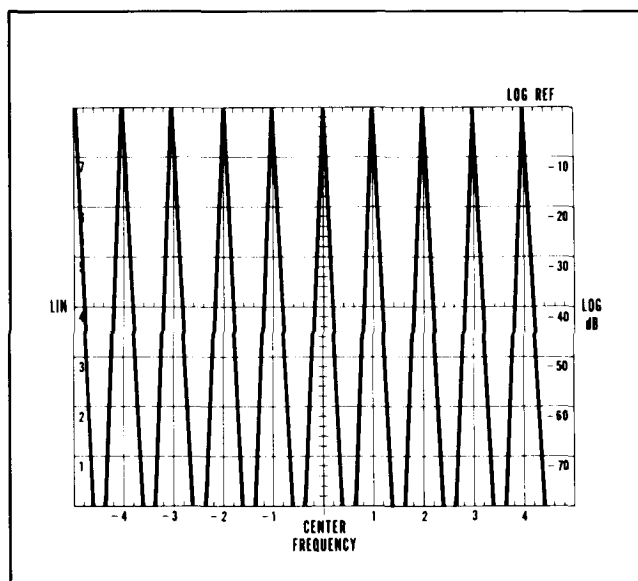


Figure 5-14. 50 MHz Bandpass Flatness Display

9. Tune FREQUENCY for display indicated in Figure 5-14 when FINE TUNE is rotated in 100 kHz steps.
10. Reduce LINEAR SENSITIVITY Vernier to a seven division vertical deflection. Rotate FINE TUNE through its range while observing display for flatness. Display should be flat  $\pm 0.2$  division across the 1.0 MHz FINE TUNE range.

-0.2 \_\_\_\_\_ +0.2 div

### 5-39. 44 MHz Rejection Adjustment

REFERENCE: Schematic 3.

DESCRIPTION: A 50 MHz reference is established, then 44 MHz is fed into the 47 MHz converter and nulled 70 dB below the reference level. The 50 MHz IF Bandpass Check and Adjustment must be repeated after the 44 MHz rejected controls are adjusted.

ADJUSTMENTS

5-39. 44 MHz Rejection Adjustment (cont'd)

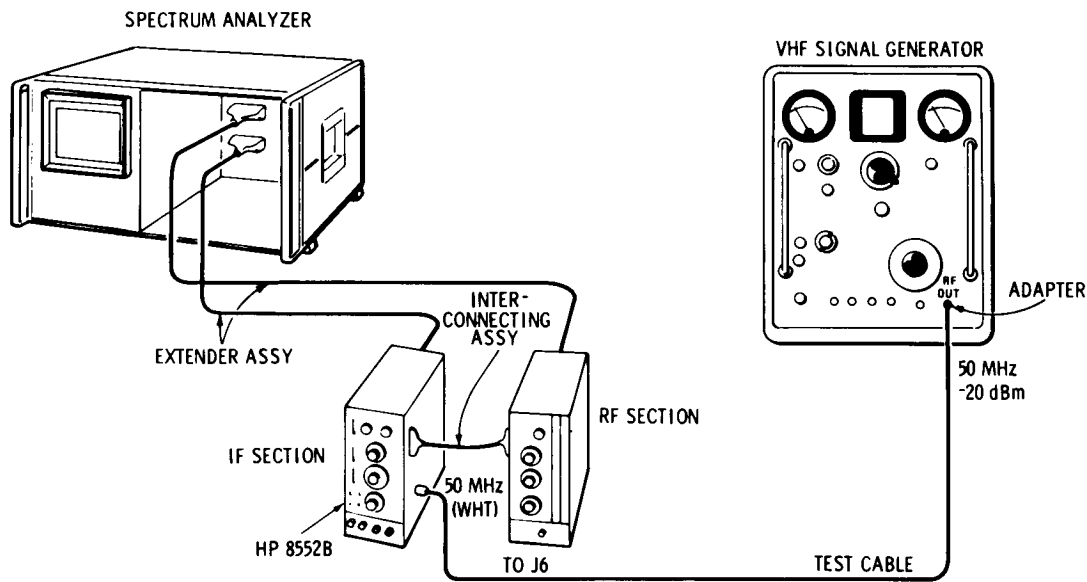


Figure 5-15. 44 MHz Rejection Adjustment Test Setup

|                          |                |
|--------------------------|----------------|
| EQUIPMENT:               |                |
| SIGNAL GENERATOR         | HP 608F        |
| TEST CABLE               | HP 11592-60001 |
| INTERCONNECTING ASSEMBLY | HP 11592-60016 |
| EXTENDER ASSEMBLY        | HP 11592-60015 |
| ADAPTER                  | UG-201A/U      |

1. Connect the test setup shown in Figure 5-15 and make the following control settings:

|                         |                |
|-------------------------|----------------|
| ANALYZER:               |                |
| INPUT ATTENUATION       | 0 dB           |
| FINE TUNE               | Centered       |
| TUNING STABILIZER       | OFF            |
| BANDWIDTH               | 10 kHz         |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | 20 kHz         |
| BASE LINE CLIPPER       | Max ccw        |
| SCAN TIME PER DIVISION  | 2 MILLISECONDS |
| LOG REF LEVEL controls  | See text       |
| VIDEO FILTER            | OFF            |
| SCAN MODE               | INT            |
| SCAN TRIGGER            | LINE           |
| LOG-LINEAR              | 10 dB LOG      |

|             |         |
|-------------|---------|
| 608F:       |         |
| MODULATION  | CW      |
| ATTENUATION | -20 dBm |

ADJUSTMENTS

5-39. 44 MHz Rejection Adjustment (cont'd)

608F control settings (cont'd)

|                           |                            |
|---------------------------|----------------------------|
| MEGACYCLES . . . . .      | 50                         |
| AMPL TRIMMER . . . . .    | Press & peak meter reading |
| FREQUENCY RANGE . . . . . | C                          |

2. Adjust LOG REF LEVEL controls for a full-scale signal display. Use the signal generator frequency control to center the display.
3. Establish a reference by observing the position of the LOG REF LEVEL control with reference to the lit indicator light.
4. Tune the signal generator to 44 MHz and peak the AMPL TRIMMER. Use the LOG REF LEVEL control to once more get an on-screen display, but without disturbing the vernier. If necessary, use the signal generator frequency control to center the display.
5. Increase the signal level on the display while keeping track of the number of LOG REF LEVEL 10-dB steps. Use LOG REF LEVEL vernier for the final small adjustment.
6. Add up total attenuation. The level of the 44 MHz signal in step 5 should be at least 70 dB below the level in step 2.

44 MHz Rejection: 70 dB\_\_\_\_\_
7. If the rejection is not at least 70 dB, adjust the 44 MHz capacitors A3C11, 14, and 19 on the A3 50 MHz Converter assembly for minimum 44 MHz signal indication on the analyzer display.
8. When the 44 MHz rejection adjustment is completed, repeat the check and adjustment procedure in the 50 MHz IF Bandpass Check and Adjustment, paragraph 5-38.

5-40. 30 MHz Calibration Oscillator Check and Adjustment

REFERENCE: Schematic 18.

DESCRIPTION: The CAL OUTPUT at the front panel is measured and adjusted for 30 MHz at -30 dBm. The amplitude is measured on the analyzer CRT by comparing it to a calibrated signal. The frequency is amplified and measured with a counter.

ADJUSTMENTS

5-40. 30 MHz Calibration Oscillator Check and Adjustment (cont'd)

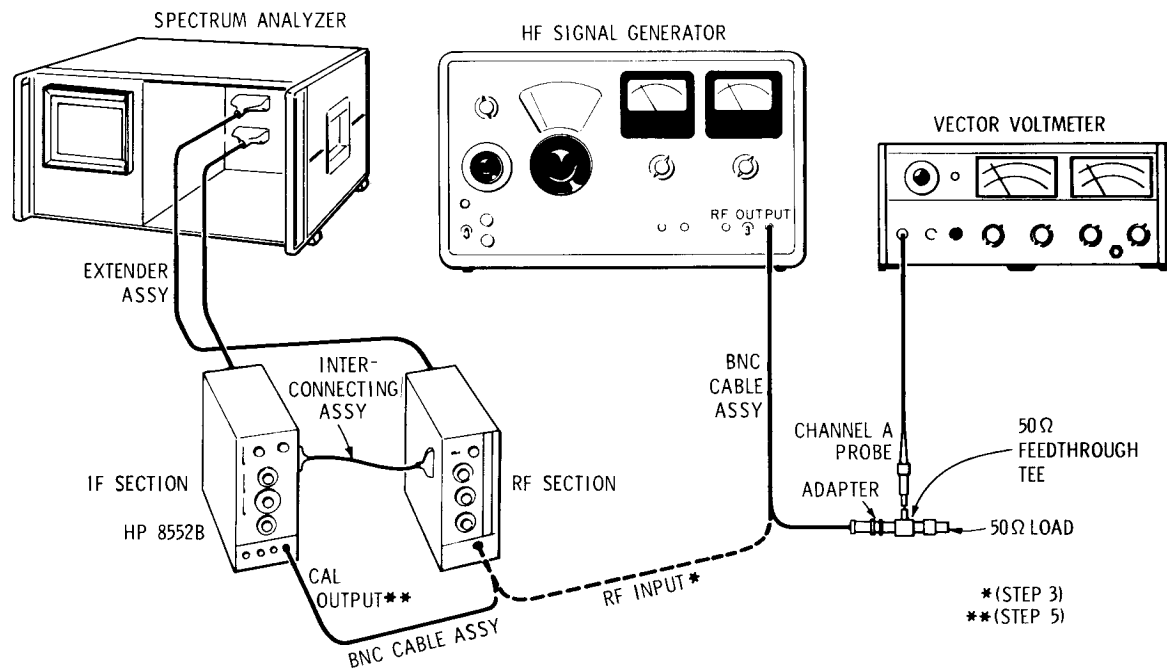


Figure 5-16. 30 MHz Calibration Amplitude Adjustment Setup

|                          |                |
|--------------------------|----------------|
| EQUIPMENT:               |                |
| VECTOR VOLTMETER         | HP 8405A       |
| CABLE ASSEMBLY (2)       | HP 10503A      |
| EXTENDER ASSEMBLY        | HP 11592-60015 |
| INTERCONNECTING ASSEMBLY | HP 11592-60016 |
| 50-OHM LOAD              | HP 908A        |
| 50-OHM TEE               | HP 11536A      |
| ADAPTER                  | UG-201A/U      |
| SIGNAL GENERATOR         | HP 606B        |

1. Connect the equipment shown in Figure 5-16 and make the following control settings:

|                         |                |
|-------------------------|----------------|
| ANALYZER:               |                |
| FREQUENCY               | 30 MHz         |
| BANDWIDTH               | 30 kHz         |
| SCAN WIDTH              | PER DIVISION   |
| SCAN WIDTH PER DIVISION | 20 kHz         |
| TUNING STABILIZER       | On             |
| INPUT ATTENUATOR        | 10 dB          |
| SCAN TIME PER DIVISION  | 5 MILLISECONDS |

## ADJUSTMENTS

---

### 5-40. 30 MHz Calibration Oscillator Check and Adjustment (con't.)

ANALYZER control settings (cont'd)

|                              |          |
|------------------------------|----------|
| LOG LINEAR . . . . .         | LINEAR   |
| LINEAR SENSITIVITY . . . . . | 1 mV/DIV |
| SCAN MODE . . . . .          | INT      |
| SCAN TRIGGER . . . . .       | AUTO     |

8405A:

|                                 |       |
|---------------------------------|-------|
| FREQUENCY RANGE — MHz . . . . . | 20–40 |
| CHANNEL . . . . .               | A     |
| AMPLITUDE RANGE — dB . . . . .  | -30   |

606B:

|                      |        |
|----------------------|--------|
| RANGE . . . . .      | 6      |
| FREQUENCY . . . . .  | 30 MHz |
| MODULATION . . . . . | CW     |
| ATTENUATOR . . . . . | 30 dB  |
| VERNIER . . . . .    | 0 dB   |

2. Set amplitude of signal generator (as read on vector voltmeter) to exactly -30 dBm with ATTENUATOR VERNIER.
3. Disconnect signal generator from vector voltmeter and connect to analyzer RF INPUT. Adjust analyzer FINE TUNE control to center signal.
4. Adjust signal with LINEAR SENSITIVITY vernier for a 7.0 division reference on CRT display.
5. Disconnect signal generator from RF INPUT. Connect CAL OUTPUT to RF INPUT.
6. Signal Amplitude should be 7.0 division  $\pm 0.2$  divisions.  

6.8\_\_\_\_\_7.2 div
7. If it is out of limits, peak signal with A6C15 and set signal level to 7.0 division with A6R54 CAL LEVEL.

#### NOTE

A6 must not be operated on extender board for this adjustment.

8. Measure the Calibrator frequency (see paragraph 4-23). Frequency limits:  

29.997\_\_\_\_\_30.003 MHz
9. If frequency is out of limits, replace A6Y1 and repeat steps 1 through 8.

ADJUSTMENTS

5-41. Analogic Check and Adjustment

REFERENCE: Schematic 17.

DESCRIPTION: The A5R75 THRESH control is adjusted so that under the conditions specified in this test, the DISPLAY UNCAL light comes on. Check the remaining positions of the switches in the table to verify operation of the DISPLAY UNCAL switch matrix.

- 1. Install the analyzer plug-ins on the two extender cable assemblies, and make the following control settings:

ANALYZER:

VIDEO FILTER . . . . . OFF  
SCAN TIME PER DIVISION . . . . . 1 MILLISECOND  
SCAN WIDTH . . . . . PER DIVISION  
SCAN WIDTH PER DIVISION . . . . . 1 MHz  
BANDWIDTH . . . . . 30 kHz

- 2. With the controls set as in step 1 above, the DISPLAY UNCAL light should be on. If not, adjust A5R75 THRESH control until the light just comes on.
- 3. Use Table 5-2 below to complete adjusting the THRESH control:

Table 5-2. Analogic Threshold Adjustment

| SCAN TIME PER DIVISION | BANDWIDTH | SCAN WIDTH PER DIVISION | DISPLAY UNCAL Light |
|------------------------|-----------|-------------------------|---------------------|
| 1 ms                   | 30 kHz    | 1 MHz                   | On                  |
| 2 ms                   | 30 kHz    | 1 MHz                   | Off                 |
| 10 s                   | 1 kHz     | 10 MHz                  | On                  |
| 10 s                   | 1 kHz     | 5 MHz                   | Off                 |

## CHECKS AND ADJUSTMENTS

## 5-41. Analogic Test and Adjustment (cont'd)

4. Check operation of DISPLAY UNCAL light using Table 5-3. When the table indicates the DISPLAY UNCAL light to be "off", it is acceptable for light to be "on" if the light subsequently goes "off" when either the SCAN TIME PER DIVISION or the SCAN WIDTH PER DIVISION control is switched one position counterclockwise.

Table 5-3. Display Calibration Conditions

| SCAN TIME PER DIVISION | BANDWIDTH | SCAN WIDTH PER DIVISION | DISPLAY UNCAL Light |
|------------------------|-----------|-------------------------|---------------------|
| 1 ms                   | 300 kHz   | 10 MHz                  | Off                 |
| 1 ms                   | 100 kHz   | 10 MHz                  | On                  |
| 1 ms                   | 100 kHz   | 5 MHz                   | Off                 |
| 1 ms                   | 30 kHz    | 5 MHz                   | On                  |
| 5 ms                   | 30 kHz    | 2 MHz                   | Off                 |
| 5 ms                   | 10 kHz    | 2 MHz                   | On                  |
| 20 ms                  | 10 kHz    | 1 MHz                   | Off                 |
| 20 ms                  | 3 kHz     | 1 MHz                   | On                  |
| 0.1 s                  | 3 kHz     | 0.5 MHz                 | Off                 |
| 0.1 s                  | 1 kHz     | 0.5 MHz                 | On                  |
| 0.5 s                  | 1 kHz     | 0.2 MHz                 | Off                 |
| 0.5 s                  | 0.3 kHz   | 0.2 MHz                 | On                  |
| 2 s                    | 0.3 kHz   | 0.1 MHz                 | Off                 |
| 2 s                    | 0.1 kHz   | 0.1 MHz                 | On                  |
| 10 s                   | 0.1 kHz   | .05 MHz                 | Off                 |
| 10 s                   | .05 kHz   | .05 MHz                 | On                  |
| 5 s                    | 0.1 kHz   | 20 kHz                  | Off                 |
| 2 s                    | 0.1 kHz   | 20 kHz                  | On                  |
| 2 s                    | 0.1 kHz   | 10 kHz                  | Off                 |
| 1 s                    | 0.1 kHz   | 10 kHz                  | On                  |
| 1 s                    | 0.1 kHz   | 5 kHz                   | Off                 |
| 0.5 s                  | 0.1 kHz   | 5 kHz                   | On                  |
| 0.5 s                  | 0.1 kHz   | 2 kHz                   | Off                 |
| 0.2 s                  | 0.1 kHz   | 2 kHz                   | On                  |
| 0.2 s                  | 0.1 kHz   | 1 kHz                   | Off                 |
| 0.1 s                  | 0.1 kHz   | 1 kHz                   | On                  |
| 0.1 s                  | 0.1 kHz   | 0.5 kHz                 | Off                 |
| 50 ms                  | 0.1 kHz   | 0.5 kHz                 | On                  |
| 50 ms                  | 0.1 kHz   | 0.2 kHz                 | Off                 |
| 20 ms                  | 0.1 kHz   | 0.2 kHz                 | On                  |



Table 5-4. Factory Selected Components

| Component      | Service Sheet | Basis of Selection                                                                                                                                    |
|----------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1R16          | 8             | Adjusts 10 kHz Bandwidth amplitude: 750 to 1200 ohms.                                                                                                 |
| A1R38          | 8             | Adjusts 300 kHz Bandwidth amplitude: 10 to 50 ohms.                                                                                                   |
| A3R3           | 3             | Adjusts 47 MHz LO level: 1.5K to 2.15K ohms.                                                                                                          |
| A3R9           | 3             | Adjusts 50 MHz Converter Gain: 18 to 52 ohms (4 ohm/dB change).                                                                                       |
| A4R125         | 11            | Adjusts overall gain of 8552B for full deflection to Log Ref graticule with $-13$ dBm input at J6 (LOG REF LEVEL at $-10$ dBm): 200 to 700 ohms.      |
| A6C13          | 15            | Adjusts scan time at 0.2 to 10 sec/div: 0 to 15 microfarads.                                                                                          |
| A8R3           | 12            | Optimizes 10 dB gain step: 1.47K to 2.37K.                                                                                                            |
| A10R8<br>A10R9 | 11            | Insures 10 dB/step attenuation: R8, 6.81K to 16.2K; R9, 21.5K to 51.1K.                                                                               |
| A4R25<br>A4R26 | 11            | Adjusts crystal filter skirt width. If out of specifications, change both resistors. Possible value ranges: R25, 19.6K to 23.7K; R26, 42.2K to 51.1K. |
| A4R44<br>A4R45 | 11            | Adjusts crystal filter skirt width. If out of specifications, change both resistors. Possible value ranges: R44, 23.7K to 26.1K; R45, 51.1K to 56.2K. |
| A4R70<br>A4R71 | 11            | Adjusts crystal filter skirt width. If out of specifications change both resistors. Possible value ranges: R70, 23.7K to 26.1K; R71, 51.1K to 56.2K.  |
| A4R81<br>A4R82 | 11            | Adjusts crystal filter skirt width. If out of specifications change both resistors. Possible value ranges: R81, 23.7K to 26.1K; R82, 51.1K to 56.2K.  |
| A12R14         | 4             | Adjusts search loop gain: 0 to 1K ohm.                                                                                                                |

Table 5-5. Check and Adjustment Test Record

Hewlett-Packard Model 8552  
Spectrum Analyzer IF Section

Test Performed by \_\_\_\_\_  
Date \_\_\_\_\_

Serial No. \_\_\_\_\_ - \_\_\_\_\_

| Para. No.   | Test Description                                | Measurement Unit | Min    | Actual | Max    |
|-------------|-------------------------------------------------|------------------|--------|--------|--------|
| <b>5-27</b> | <b>Power Supply Checks and Adjustments</b>      |                  |        |        |        |
|             | 103.5 — 126.5 Line Voltage:                     |                  |        |        |        |
|             | +20 Vdc supply                                  | Vdc              | +19.90 | _____  | +20.10 |
|             | Ripple                                          | mVrms            |        | _____  | 0.5    |
|             | -10 Vdc supply                                  | Vdc              | - 9.99 | _____  | -10.01 |
|             | Ripple                                          | mVp-p            |        | _____  | 0.02   |
| <b>5-28</b> | <b>Horizontal Scan Checks &amp; Adjustments</b> |                  |        |        |        |
|             | SCAN IN/OUT voltage:                            |                  |        |        |        |
|             | Rise Time                                       | ms               | 50     | _____  | 58     |
|             | SCAN TRIGGER . . . . EXT                        | Vdc              | - 4.98 | _____  | - 5.02 |
|             | Scan Amplitude                                  | Vdc              | + 4.9  | _____  | + 5.1  |
| <b>5-29</b> | <b>Final Scan Checks</b>                        |                  |        |        |        |
|             | Scan Linearity Graticule:                       |                  |        |        |        |
|             | -5                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | -4                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | -3                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | -2                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | -1                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | 0                                               | divisions        | - 0.1  | _____  | + 0.1  |
|             | +1                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | +2                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | +3                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | +4                                              | divisions        | - 0.1  | _____  | + 0.1  |
|             | SCAN TRIGGER . . . . EXT                        | Vp-p             | 2      | _____  | 20     |
|             | EXT SCAN MODE: voltage required for trace       | Vp-p             | 8      | _____  |        |
|             | VIDEO TRIGGER: voltage required for trace       | divisions        | 1.5    | _____  |        |
|             | MANUAL SCAN                                     | divisions        | 10     | _____  |        |
| <b>5-30</b> | <b>Vertical Deflection Amplifier Checks</b>     |                  |        |        |        |
|             | VERTICAL POSITION control check                 | divisions        | - 2    | _____  | + 2    |
|             | VERTICAL GAIN control check                     | divisions        | 2      | _____  |        |
|             | 2 dB LOG: at 0 dB                               | LOG REF          |        | _____  | (✓)    |
|             | at -10 dB                                       | -50 dB           |        | _____  | (✓)    |
|             | BASE LINE CLIPPER Check: full CW                | divisions        | 2      | _____  | 8      |

Table 5-5. Check and Adjustment Test Record (cont'd)

| Para. No. | Test Description                                                                                     | Measurement Unit | Min  | Actual | Max  |
|-----------|------------------------------------------------------------------------------------------------------|------------------|------|--------|------|
| 5-31      | <b>Log/Linear Amplifier Checks &amp; Adjustments</b><br>VERTICAL OUTPUT voltage: 7.07 div deflection | Vdc              |      | _____  |      |
|           | <u>Input Level at XA4-14</u> <u>Output at XA8-14</u>                                                 |                  |      |        |      |
|           | - 100 dBm      < 6 mVdc                                                                              | mVdc             |      | _____  | -6   |
|           | + 10 dBm      800 ±40                                                                                | mVdc             | -840 | _____  | -760 |
|           | 0 dBm      700 ±40                                                                                   | mVdc             | -740 | _____  | -660 |
|           | - 10 dBm      600 ±40                                                                                | mVdc             | -640 | _____  | -560 |
|           | - 20 dBm      500 ±40                                                                                | mVdc             | -540 | _____  | -460 |
|           | - 30 dBm      400 ±40                                                                                | mVdc             | -440 | _____  | -360 |
|           | - 40 dBm      300 ±40                                                                                | mVdc             | -340 | _____  | -260 |
|           | - 50 dBm      200 ±40                                                                                | mVdc             | -240 | _____  | -160 |
|           | - 60 dBm      100 ±40                                                                                | mVdc             | -140 | _____  | - 60 |
| 5-32      | <b>300 kHz Bandpass Filter Adjustment</b><br>Bandwidth                                               | kHz              | 240  | _____  | 360  |
| 5-33      | <b>LC Filter Adjustment</b><br>Gain Check:                                                           |                  |      |        |      |
|           | 300 kHz      Reference                                                                               |                  |      |        |      |
|           | 100 kHz      ±0.4 div                                                                                | divisions        | -0.4 | _____  | +0.4 |
|           | 30 kHz      ±0.4 div                                                                                 | divisions        | -0.4 | _____  | +0.4 |
|           | 10 kHz      ±0.4 div                                                                                 | divisions        | -0.4 | _____  | +0.4 |
|           | 3 kHz      ±0.4 div                                                                                  | divisions        | -0.4 | _____  | +0.4 |
|           | Bandwidth Check:                                                                                     |                  |      |        |      |
|           | 100 kHz                                                                                              | kHz              | 80   | _____  | 120  |
|           | 30 kHz                                                                                               | kHz              | 24   | _____  | 36   |
| 5-34      | <b>Crystal Filter Fine Adjustment</b><br>Gain Check:                                                 |                  |      |        |      |
|           | 3 kHz : set for 7 div                                                                                | divisions        | 6.7  | _____  | 7.3  |
|           | 1 kHz                                                                                                | divisions        | 6.7  | _____  | 7.3  |
|           | 0.3 kHz                                                                                              | divisions        | 6.7  | _____  | 7.3  |
|           | 0.1 kHz                                                                                              | divisions        | 6.7  | _____  | 7.3  |
|           | 0.03 kHz                                                                                             | divisions        | 6.5  | _____  | 7.5  |
|           | 0.01 kHz                                                                                             | divisions        | 6.0  | _____  | 7.0  |

Table 5-5. Check and Adjustment Test Record (cont'd)

| Para. No.          | Test Description                                        | Measurement Unit | Min   | Actual | Max   |
|--------------------|---------------------------------------------------------|------------------|-------|--------|-------|
| <b>5-34 (cont)</b> | Between 3 kHz and 300 kHz Bandwidth Check:              |                  |       |        |       |
|                    | 3 kHz                                                   | divisions        | 4.8   | _____  | 7.2   |
|                    | 1 kHz                                                   | divisions        | 4.0   | _____  | 6.0   |
|                    | 0.3 kHz                                                 | divisions        | 4.8   | _____  | 7.2   |
|                    | 0.1 kHz                                                 | divisions        | 4.0   | _____  | 6.0   |
|                    | .03 kHz                                                 | divisions        | 1.2   | _____  | 1.8   |
|                    | .01 kHz                                                 | divisions        | 0.4   | _____  | 0.6   |
|                    | 60 dB/3 dB Bandwidth Ratio                              |                  |       |        |       |
|                    | 3 kHz                                                   | Ratio            |       | _____  | 11:1  |
|                    | 1 kHz                                                   | Ratio            |       | _____  | 11:1  |
|                    | 0.3 kHz                                                 | Ratio            |       | _____  | 11:1  |
|                    | 0.1 kHz                                                 | Ratio            |       | _____  | 11:1  |
|                    | .03 kHz                                                 | Ratio            |       | _____  | 11:1  |
|                    | .01 kHz                                                 | Ratio            |       | _____  | 11:1  |
| <b>5-35</b>        | <b>Crystal Filter Coarse Adjustment</b><br>If necessary | (√)              |       | _____  |       |
| <b>5-36</b>        | <b>3 MHz If Gain Log Adjustments</b>                    |                  |       |        |       |
|                    | LOG REF LEVEL vernier: -0                               | Vdc              | -0.96 | _____  | +1.04 |
|                    | -1                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -2                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -3                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -4                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -5                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -6                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -7                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -8                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -9                                                      | Vdc              | -0.96 | _____  | +1.04 |
|                    | -10                                                     | Vdc              | -0.96 | _____  | +1.04 |
|                    | -11                                                     | Vdc              | -0.96 | _____  | +1.04 |
|                    | -12                                                     | Vdc              | -0.96 | _____  | +1.04 |
|                    | VERTICAL OUTPUT voltage:<br>7.07 div deflection         | Vdc              |       | _____  |       |

Table 5-5. Check and Adjustment Test Record (cont'd)

| Para. No.          | Test Description                                                | Measurement Unit | Min    | Actual | Max    |
|--------------------|-----------------------------------------------------------------|------------------|--------|--------|--------|
| <b>5-36 (cont)</b> | <u>Test Atten.</u> <u>LOG REF LEVEL</u> <u>Error Limit</u>      |                  |        |        |        |
|                    | 10 dB   -10 dBm   2 mVdc                                        | mVdc             | -2     | _____  | +2     |
|                    | 20 dB   -20 dBm   2 mVdc                                        | mVdc             | -2     | _____  | +2     |
|                    | 30 dB   -30 dBm   2 mVdc                                        | mVdc             | -2     | _____  | +2     |
|                    | 40 dB   -40 dBm   2 mVdc                                        | mVdc             | -2     | _____  | +2     |
|                    | 50 dB   -50 dBm   2 mVdc                                        | mVdc             | -2     | _____  | +2     |
|                    | <u>Test Atten.</u> <u>LINEAR SENSITIVITY</u> <u>Error Limit</u> |                  |        |        |        |
|                    | 43 dB   0.1 mV/DIV   ±15 mVdc                                   | mVdc             | -15    | _____  | +15    |
|                    | 33 dB   0.2 mV/DIV   ±15 mVdc                                   | mVdc             | -15    | _____  | +15    |
|                    | 23 dB   1 mV/DIV   ±15 mVdc                                     | mVdc             | -15    | _____  | +15    |
|                    | 13 dB   2 mV/DIV   ±15 mVdc                                     | mVdc             | -15    | _____  | +15    |
|                    | 3 dB   10 mV/DIV   ±15 mVdc                                     | mVdc             | -15    | _____  | +15    |
| <b>5-37</b>        | <b>47 MHz LO Automatic Phase Lock Check and Adjustment</b>      |                  |        |        |        |
|                    | Level at A12TP2                                                 | mV p-p           | 450    | _____  | 850    |
|                    | Frequency at A12TP2                                             | MHz              | 44.990 | _____  | 45.010 |
|                    | Level at C8                                                     | V p-p            | 8.5    | _____  | 11.5   |
|                    | Level at J8                                                     | V p-p            | 1.5    | _____  | 2.5    |
|                    | Level at A13TP1                                                 | mV p-p           | 650    | _____  | 1150   |
|                    | Frequency at A13TP1                                             | kHz              | 1998   | _____  | 2002   |
|                    | Frequency Linearity: Positive Offset                            | divisions        | 0.75   | _____  | 0.75   |
|                    | Negative Offset                                                 | divisions        | 0.75   | _____  | 0.75   |
|                    | No Offset                                                       | divisions        | 0.75   | _____  | 0.75   |
| <b>5-38</b>        | <b>50 MHz IF Bandpass Check &amp; Adjustment</b>                |                  |        |        |        |
|                    | Flatness: ±0.2 vertical divisions over 2 horizontal divisions   | divisions        | -0.2   | _____  | +0.2   |
| <b>5-39</b>        | <b>44 MHz Rejection Adjustment</b><br>44 MHz Rejection > 70 dB  | dB               | 70     | _____  |        |
| <b>5-40</b>        | <b>30 MHz Calibration Oscillator Check &amp; Adjustment</b>     |                  |        |        |        |
|                    | Amplitude                                                       | divisions        | 6.8    | _____  | 7.2    |
|                    | Frequency                                                       | MHz              | 29.997 | _____  | 30.003 |

Table 5-5. Check and Adjustment Test Record (cont'd)

| Para.<br>No. | Test Description                                                                                          | Measurement<br>Unit | Min | Actual | Max |
|--------------|-----------------------------------------------------------------------------------------------------------|---------------------|-----|--------|-----|
| 5-41         | <b>Analogic Check and Adjustment</b>                                                                      |                     |     |        |     |
|              | <u>SCAN</u> <u>SCAN</u> <u>BAND-</u> <u>DISPLAY</u><br><u>TIME</u> <u>WIDTH</u> <u>WIDTH</u> <u>UNCAL</u> |                     |     |        |     |
|              | 1 ms   1 MHz   30 kHz   On                                                                                | (√)                 |     | _____  |     |
|              | 2 ms   1 MHz   30 kHz   Off                                                                               | (√)                 |     | _____  |     |
|              | 10 s   10 MHz   1 kHz   On                                                                                | (√)                 |     | _____  |     |
|              | 10 s   5 MHz   1 kHz   Off                                                                                | (√)                 |     | _____  |     |

## SECTION VI

### REPLACEABLE PARTS

#### 6-1. INTRODUCTION

6-2. This section contains information for ordering parts. Table 6-1 is a list of exchange assemblies and Table 6-2 lists abbreviations used in the parts list and throughout the manual. Table 6-3 lists all replaceable parts in reference designator order. Table 6-4 contains names and addresses that correspond to the manufacturer's code numbers.

#### 6-3. EXCHANGE ASSEMBLIES

6-4. Table 6-1 lists assemblies within the instrument that may be replaced on an exchange basis, thus affording considerable cost savings. Exchange, factory-repaired and tested assemblies are available only on a trade-in basis, therefore the defective assemblies must be returned for credit. For this reason, assemblies required for spare parts stock must be ordered by the new assembly part number.

#### 6-5. ABBREVIATIONS

6-6. Table 6-2 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.

#### 6-7. REPLACEABLE PARTS LIST

6-8. Table 6-3 is the list of replaceable parts and is organized as follows:

a. Electrical assemblies and their components in alpha-numerical order by reference designation.

b. Chassis-mounted parts in alpha-numeric order by reference designation.

c. Miscellaneous parts.

d. Illustrated parts breakdown, if appropriate.

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. The 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.

#### 6-9. ORDERING INSTRUCTIONS

6-10. 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.

6-11. 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. Assemblies Available for Module Exchange*

| Assembly                                            | New Part No. | Exchange Part No. |
|-----------------------------------------------------|--------------|-------------------|
| A2 3 MHz Amplifier                                  | 08552-60139  | 08552-60116       |
| A3 50 MHz Converter                                 | 08552-60149  | 08552-60140       |
| A4 Crystal Filter                                   | 08552-60141  | 08552-60111       |
| A8 Log Amplifier                                    | 08552-6056   | 08552-6007        |
| A12 47 MHz APC                                      | 08552-60145  | 08552-60115       |
| *For module exchange procedure, see Paragraph 8-10. |              |                   |

Table 6-2. Reference Designations and Abbreviations

## REFERENCE DESIGNATIONS

|                                                                           |                                                             |                                                          |                                                     |
|---------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------|
| A . . . . . assembly                                                      | E . . . . . miscellaneous electrical part                   | P . . . . . electrical connector (movable portion); plug | U . . . . . integrated circuit; microcircuit        |
| AT . . . . . attenuator; isolator; termination                            | F . . . . . fuse                                            | Q . . . . . transistor; SCR; triode thyristor            | V . . . . . electron tube                           |
| B . . . . . fan; motor                                                    | FL . . . . . filter                                         | R . . . . . resistor                                     | VR . . . . . voltage regulator; breakdown diode     |
| BT . . . . . battery                                                      | H . . . . . hardware                                        | RT . . . . . thermistor                                  | W . . . . . cable; transmission path; wire          |
| C . . . . . capacitor                                                     | HY . . . . . circulator                                     | S . . . . . switch                                       | X . . . . . socket                                  |
| CP . . . . . coupler                                                      | J . . . . . electrical connector (stationary portion); jack | T . . . . . transformer                                  | Y . . . . . crystal unit (piezo-electric or quartz) |
| CR . . . . . diode; diode thyristor; varactor                             | K . . . . . relay                                           | TB . . . . . terminal board                              | Z . . . . . tuned cavity; tuned circuit             |
| DC . . . . . directional coupler                                          | L . . . . . coil; inductor                                  | TC . . . . . thermocouple                                |                                                     |
| DL . . . . . delay line                                                   | M . . . . . meter                                           | TP . . . . . test point                                  |                                                     |
| DS . . . . . annunciator; signaling device (audible or visual); lamp; LED | MP . . . . . miscellaneous mechanical part                  |                                                          |                                                     |

## ABBREVIATIONS

|                                           |                                                           |                                          |                                                                |
|-------------------------------------------|-----------------------------------------------------------|------------------------------------------|----------------------------------------------------------------|
| A . . . . . ampere                        | COEF . . . . . coefficient                                | EDP . . . . . electronic data processing | INT . . . . . internal                                         |
| ac . . . . . alternating current          | COM . . . . . common                                      | ELECT . . . . . electrolytic             | kg . . . . . kilogram                                          |
| ACCESS . . . . . accessory                | COMP . . . . . composition                                | ENCAP . . . . . encapsulated             | kHz . . . . . kilohertz                                        |
| ADJ . . . . . adjustment                  | COMPL . . . . . complete                                  | EXT . . . . . external                   | k $\Omega$ . . . . . kilohm                                    |
| A/D . . . . . analog-to-digital           | CONN . . . . . connector                                  | F . . . . . farad                        | kV . . . . . kilovolt                                          |
| AF . . . . . audio frequency              | CP . . . . . cadmium plate                                | FET . . . . . field-effect transistor    | lb . . . . . pound                                             |
| AFC . . . . . automatic frequency control | CRT . . . . . cathode-ray tube                            |                                          | LC . . . . . inductance-capacitance                            |
| AGC . . . . . automatic gain control      | CTL . . . . . complementary transistor logic              | F/F . . . . . flip-flop                  | LED . . . . . light-emitting diode                             |
| AL . . . . . aluminum                     | CW . . . . . continuous wave                              | FH . . . . . flat head                   | LF . . . . . low frequency                                     |
| ALC . . . . . automatic level control     | cw . . . . . clockwise                                    | FIL H . . . . . fillister head           | LG . . . . . long                                              |
| AM . . . . . amplitude modulation         | cm . . . . . centimeter                                   | FM . . . . . frequency modulation        | LH . . . . . left hand                                         |
| AMPL . . . . . amplifier                  | D/A . . . . . digital-to-analog                           | FP . . . . . front panel                 | LIM . . . . . limit                                            |
| APC . . . . . automatic phase control     | dB . . . . . decibel                                      | FREQ . . . . . frequency                 | LIN . . . . . linear taper (used in parts list)                |
| ASSY . . . . . assembly                   | dBm . . . . . decibel referred to 1 mW                    | FXD . . . . . fixed                      | lin . . . . . linear                                           |
| AUX . . . . . auxiliary                   | dc . . . . . direct current                               | g . . . . . gram                         | LK WASH . . . . . lock washer                                  |
| avg . . . . . average                     | deg . . . . . degree (temperature interval or difference) | GE . . . . . germanium                   | LO . . . . . low; local oscillator                             |
| AWG . . . . . American wire gauge         | ° . . . . . degree (plane angle)                          | GHz . . . . . gigahertz                  | LOG . . . . . logarithmic taper (used in parts list)           |
| BAL . . . . . balance                     | °C . . . . . degree Celsius (centigrade)                  | GL . . . . . glass                       | log . . . . . logarithm(ic)                                    |
| BCD . . . . . binary coded decimal        | °F . . . . . degree Fahrenheit                            | GRD . . . . . ground(ed)                 | LPF . . . . . low pass filter                                  |
| BD . . . . . board                        | °K . . . . . degree Kelvin                                | H . . . . . henry                        | LV . . . . . low voltage                                       |
| BE CU . . . . . beryllium copper          | DEPC . . . . . deposited carbon                           | h . . . . . hour                         | m . . . . . meter (distance)                                   |
| BFO . . . . . beat frequency oscillator   | DET . . . . . detector                                    | HET . . . . . heterodyne                 | mA . . . . . milliampere                                       |
| BH . . . . . binder head                  | diam . . . . . diameter                                   | HEX . . . . . hexagonal                  | MAX . . . . . maximum                                          |
| BKDN . . . . . breakdown                  | DIA . . . . . diameter (used in parts list)               | HD . . . . . head                        | M $\Omega$ . . . . . megohm                                    |
| BP . . . . . bandpass                     | DIFF AMPL . . . . . differential amplifier                | HDW . . . . . hardware                   | MEG . . . . . meg (10 <sup>6</sup> ) (used in parts list)      |
| BPF . . . . . bandpass filter             | div . . . . . division                                    | HF . . . . . high frequency              | MET FLM . . . . . metal film                                   |
| BRS . . . . . brass                       | DPDT . . . . . double-pole, double-throw                  | HG . . . . . mercury                     | MET OX . . . . . metallic oxide                                |
| BWO . . . . . backward-wave oscillator    | DR . . . . . drive                                        | HI . . . . . high                        | MF . . . . . medium frequency; microfarad (used in parts list) |
| CAL . . . . . calibrate                   | DSB . . . . . double sideband                             | HP . . . . . Hewlett-Packard             | MFR . . . . . manufacturer                                     |
| ccw . . . . . counter-clockwise           | DTL . . . . . diode transistor logic                      | HPF . . . . . high pass filter           | mg . . . . . milligram                                         |
| CER . . . . . ceramic                     | DVM . . . . . digital voltmeter                           | HR . . . . . hour (used in parts list)   | MHz . . . . . megahertz                                        |
| CHAN . . . . . channel                    | ECL . . . . . emitter coupled logic                       | HV . . . . . high voltage                | mH . . . . . millihenry                                        |
| cm . . . . . centimeter                   | EMF . . . . . electromotive force                         | Hz . . . . . Hertz                       | mho . . . . . mho                                              |
| CMO . . . . . cabinet mount only          |                                                           | IC . . . . . integrated circuit          | MIN . . . . . minimum                                          |
| COAX . . . . . coaxial                    |                                                           | ID . . . . . inside diameter             | min . . . . . minute (time)                                    |
|                                           |                                                           | IF . . . . . intermediate frequency      | ' . . . . . minute (plane angle)                               |
|                                           |                                                           | IMPG . . . . . impregnated               | MINAT . . . . . miniature                                      |
|                                           |                                                           | in . . . . . inch                        | mm . . . . . millimeter                                        |
|                                           |                                                           | INCD . . . . . incandescent              |                                                                |
|                                           |                                                           | INCL . . . . . include(s)                |                                                                |
|                                           |                                                           | INP . . . . . input                      |                                                                |
|                                           |                                                           | INS . . . . . insulation                 |                                                                |

## NOTE

All abbreviations in the parts list will be in upper-case.



Table 6-2. Reference Designations and Abbreviations (cont'd)

|                                                                     |                                                             |                                                     |                                                        |
|---------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------|
| MOD . . . . . modulator                                             | OD . . . . . outside diameter                               | PWV . . . . . peak working voltage                  | TD . . . . . time delay                                |
| MOM . . . . . momentary                                             | OH . . . . . oval head                                      | RC . . . . . resistance-capacitance                 | TERM . . . . . terminal                                |
| MOS . . . . . metal-oxide semiconductor                             | OP AMPL . . . . . operational amplifier                     | RECT . . . . . rectifier                            | TFT . . . . . thin-film transistor                     |
| ms . . . . . millisecond                                            | OPT . . . . . option                                        | REF . . . . . reference                             | TGL . . . . . toggle                                   |
| MTG . . . . . mounting                                              | OSC . . . . . oscillator                                    | REG . . . . . regulated                             | THD . . . . . thread                                   |
| MTR . . . . . meter (indicating device)                             | OX . . . . . oxide                                          | REPL . . . . . replaceable                          | THRU . . . . . through                                 |
| mV . . . . . millivolt                                              | oz . . . . . ounce                                          | RF . . . . . radio frequency                        | TI . . . . . titanium                                  |
| mVac . . . . . millivolt, ac                                        | $\Omega$ . . . . . ohm                                      | RFI . . . . . radio frequency interference          | TOL . . . . . tolerance                                |
| mVdc . . . . . millivolt, dc                                        | P . . . . . peak (used in parts list)                       | RH . . . . . round head; right hand                 | TRIM . . . . . trimmer                                 |
| mVpk . . . . . millivolt, peak                                      | PAM . . . . . pulse-amplitude modulation                    | RLC . . . . . resistance-inductance-capacitance     | TSTR . . . . . transistor                              |
| mVp-p . . . . . millivolt, peak-to-peak                             | PC . . . . . printed circuit                                | RMO . . . . . rack mount only                       | TTL . . . . . transistor-transistor logic              |
| mVrms . . . . . millivolt, rms                                      | PCM . . . . . pulse-code modulation; pulse-count modulation | rms . . . . . root-mean-square                      | TV . . . . . television                                |
| mW . . . . . milliwatt                                              | PDM . . . . . pulse-duration modulation                     | RND . . . . . round                                 | TVI . . . . . television interference                  |
| MUX . . . . . multiplex                                             | pF . . . . . picofarad                                      | ROM . . . . . read-only memory                      | TWT . . . . . traveling wave tube                      |
| MY . . . . . mylar                                                  | PH BRZ . . . . . phosphor bronze                            | R&P . . . . . rack and panel                        | U . . . . . micro ( $10^{-6}$ ) (used in parts list)   |
| $\mu$ A . . . . . microampere                                       | PHL . . . . . Phillips                                      | RWV . . . . . reverse working voltage               | UF . . . . . microfarad (used in parts list)           |
| $\mu$ F . . . . . microfarad                                        | PIN . . . . . positive-intrinsic-negative                   | S . . . . . scattering parameter                    | UHF . . . . . ultrahigh frequency                      |
| $\mu$ H . . . . . microhenry                                        | PIV . . . . . peak inverse voltage                          | s . . . . . second (time)                           | UNREG . . . . . unregulated                            |
| $\mu$ mho . . . . . micromho                                        | pk . . . . . peak                                           | " . . . . . second (plane angle)                    | V . . . . . volt                                       |
| $\mu$ s . . . . . microsecond                                       | PL . . . . . phase lock                                     | S-B . . . . . slow-blow (fuse) (used in parts list) | VA . . . . . voltampere                                |
| $\mu$ V . . . . . microvolt                                         | PLO . . . . . phase lock oscillator                         | SCR . . . . . silicon controlled rectifier; screw   | Vac . . . . . volts, ac                                |
| $\mu$ Vac . . . . . microvolt, ac                                   | PM . . . . . phase modulation                               | SE . . . . . selenium                               | VAR . . . . . variable                                 |
| $\mu$ Vdc . . . . . microvolt, dc                                   | PNP . . . . . positive-negative-positive                    | SECT . . . . . sections                             | VCO . . . . . voltage-controlled oscillator            |
| $\mu$ Vpk . . . . . microvolt, peak                                 | P/O . . . . . part of                                       | SHF . . . . . superhigh frequency                   | Vdc . . . . . volts, dc                                |
| $\mu$ Vp-p . . . . . microvolt, peak-to-peak                        | POLY . . . . . polystyrene                                  | SI . . . . . silicon                                | VDCW . . . . . volts, dc, working (used in parts list) |
| $\mu$ Vrms . . . . . microvolt, rms                                 | PORC . . . . . porcelain                                    | SIL . . . . . silver                                | V(F) . . . . . volts, filtered                         |
| $\mu$ W . . . . . microwatt                                         | POS . . . . . positive; position(s) (used in parts list)    | SL . . . . . slide                                  | VFO . . . . . variable-frequency oscillator            |
| nA . . . . . nanoampere                                             | POSN . . . . . position                                     | SNR . . . . . signal-to-noise ratio                 | VHF . . . . . very-high frequency                      |
| NC . . . . . no connection                                          | POT . . . . . potentiometer                                 | SPDT . . . . . single-pole, double-throw            | Vpk . . . . . volts, peak                              |
| N/C . . . . . normally closed                                       | p-p . . . . . peak-to-peak                                  | SPG . . . . . spring                                | Vp-p . . . . . volts, peak-to-peak                     |
| NE . . . . . neon                                                   | PP . . . . . peak-to-peak (used in parts list)              | SR . . . . . split ring                             | Vrms . . . . . volts, rms                              |
| NEG . . . . . negative                                              | PPM . . . . . pulse-position modulation                     | SPST . . . . . single-pole, single-throw            | VSWR . . . . . voltage standing wave ratio             |
| nF . . . . . nanofarad                                              | PREAMPL . . . . . preamplifier                              | SSB . . . . . single sideband                       | VTO . . . . . voltage-tuned oscillator                 |
| NI PL . . . . . nickel plate                                        | PRF . . . . . pulse-repetition frequency                    | SST . . . . . stainless steel                       | VTVM . . . . . vacuum-tube voltmeter                   |
| N/O . . . . . normally open                                         | PRR . . . . . pulse repetition rate                         | STL . . . . . steel                                 | V(X) . . . . . volts, switched                         |
| NOM . . . . . nominal                                               | ps . . . . . picosecond                                     | SQ . . . . . square                                 | W . . . . . watt                                       |
| NORM . . . . . normal                                               | PT . . . . . point                                          | SWR . . . . . standing-wave ratio                   | W/ . . . . . with                                      |
| NPN . . . . . negative-positive-negative                            | PTM . . . . . pulse-time modulation                         | SYNC . . . . . synchronize                          | WIV . . . . . working inverse voltage                  |
| NPO . . . . . negative-positive zero (zero temperature coefficient) | PWM . . . . . pulse-width modulation                        | T . . . . . timed (slow-blow fuse)                  | WW . . . . . wirewound                                 |
| NRFR . . . . . not recommended for field replacement                |                                                             | TA . . . . . tantalum                               | W/O . . . . . without                                  |
| NSR . . . . . not separately replaceable                            |                                                             | TC . . . . . temperature compensating               | YIG . . . . . yttrium-iron-garnet                      |
| ns . . . . . nanosecond                                             |                                                             |                                                     | Z <sub>0</sub> . . . . . characteristic impedance      |
| nW . . . . . nanowatt                                               |                                                             |                                                     |                                                        |
| OBD . . . . . order by description                                  |                                                             |                                                     |                                                        |

## NOTE

All abbreviations in the parts list will be in upper-case.

## MULTIPLIERS

| Abbreviation | Prefix | Multiple   |
|--------------|--------|------------|
| T            | tera   | $10^{12}$  |
| G            | giga   | $10^9$     |
| M            | mega   | $10^6$     |
| k            | kilo   | $10^3$     |
| da           | deka   | 10         |
| d            | deci   | $10^{-1}$  |
| c            | centi  | $10^{-2}$  |
| m            | milli  | $10^{-3}$  |
| $\mu$        | micro  | $10^{-6}$  |
| n            | nano   | $10^{-9}$  |
| p            | pico   | $10^{-12}$ |
| f            | femto  | $10^{-15}$ |
| a            | atto   | $10^{-18}$ |

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------|----------|----------------------|
| A1                    | 08552-60109    | 1   | BOARD ASSY:LC FILTER              | 28480    | 08552-60109          |
| A1C1                  | 0160-2055      | 92  | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C2                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C3                  | 0160-3024      | 4   | C:FXD MICA 1700 PF 1% 100VDCW     | 28480    | 0160-3024            |
| A1C4                  | 0121-0105      |     | C:VAR CER 9-35 PF NP0             | 28480    | 0121-0105            |
| A1C5                  | 0160-3132      | 4   | C:FXD CER 200 PF 10% 500VDCW      | 00656    | CN-19-201K N750      |
| A1C6                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C7                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C8                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C9                  | 0160-3024      |     | C:FXD MICA 1700 PF 1% 100VDCW     | 28480    | 0160-3024            |
| A1C10                 | 0121-0105      |     | C:VAR CER 9-35 PF NP0             | 28480    | 0121-0105            |
| A1C11                 | 0160-3132      |     | C:FXD CER 200 PF 10% 500VDCW      | 00656    | CN-19-201K N750      |
| A1C12                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C13                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C14                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C15                 | 0160-3024      |     | C:FXD MICA 1700 PF 1% 100VDCW     | 28480    | 0160-3024            |
| A1C16                 | 0121-0105      |     | C:VAR CER 9-35 PF NP0             | 28480    | 0121-0105            |
| A1C17                 | 0160-3132      |     | C:FXD CER 200 PF 10% 500VDCW      | 00656    | CN-19-201K N750      |
| A1C18                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C19                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C20                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C21                 | 0160-3024      |     | C:FXD MICA 1700 PF 1% 100VDCW     | 28480    | 0160-3024            |
| A1C22                 | 0121-0105      |     | C:VAR CER 9-35 PF NP0             | 28480    | 0121-0105            |
| A1C23                 | 0160-3132      |     | C:FXD CER 200 PF 10% 500VDCW      | 00656    | CN-19-201K N750      |
| A1C24                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C25                 | 0180-0116      | 17  | C:FXD ELECT 6.8 UF 10% 35VDCW     | 56289    | 15CD685X9035B2-DYS   |
| A1C26                 | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW     | 56289    | 15CD685X9035B2-DYS   |
| A1C27                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C28                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C29                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C30                 |                |     | NOT ASSIGNED                      |          |                      |
| A1C31                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C32                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C33                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C34                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C35                 | 0160-2201      | 4   | C:FXD MICA 51 PF 5%               | 72136    | RD1M5E510J1C         |
| A1C36                 | 0160-2055      | 4   | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C37                 | 0160-2150      |     | C:FXD MICA 33 PF 5%               | 28480    | 0160-2150            |
| A1C38                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A1C39                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDH |
| A1C40                 | 0160-2150      |     | C:FXD MICA 33 PF 5%               | 28480    | 0160-2150            |
| A1C41                 | 0160-3460      | 16  | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDH |
| A1C42                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDH |
| A1C43                 | 0160-3060      | 10  | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A1C44                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDH |
| A1CR1                 | 1901-0040      | 86  | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR2                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR3                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR4                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR5                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR6                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR7                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR8                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR9                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR10                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR11                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR12                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR13                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR14                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR15                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR16                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR17                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR18                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR19                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR20                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1CR21                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1C422                | 1901-0040      | 11  | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A1L1                  | 9140-0237      |     | COIL:FXD 200 UH 5%                | 28480    | 9140-0237            |
| A1L2                  | 9140-0237      | 4   | COIL:FXD 200 UH 5%                | 28480    | 9140-0237            |
| A1L3                  | 08552-6025     |     | INDUCTOR:LC FILTER                | 28480    | 08552-6025           |
| A1L4                  | 08552-6025     |     | INDUCTOR:LC FILTER                | 28480    | 08552-6025           |
| A1L5                  | 08552-6025     |     | INDUCTOR:LC FILTER                | 28480    | 08552-6025           |
| A1L6                  | 08552-6025     |     | INDUCTOR:LC FILTER                | 28480    | 08552-6025           |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----------------------------------|----------|-----------------|
| A1L7                  | 9140-0137      | 2   | COIL:FXD RF 1000 UH 5%            | 28480    | 9140-0137       |
| A1L8                  | 9100-1630      | 2   | COIL/CHOKE 51.0 UH 5%             | 28480    | 9100-1630       |
| A1L9                  | 9140-0237      |     | COIL:FXD 200 UH 5%                | 28480    | 9140-0237       |
| A1L10                 | 9140-0210      | 5   | COIL/CHOKE 100 UH 5%              | 82142    | 15-1315-12J     |
| A1Q1                  | 1854-0071      | 39  | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A1Q2                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A1Q3                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A1Q4                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A1Q5                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A1Q6                  | 1853-0020      | 27  | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A1Q7                  | 1854-0019      | 12  | TSTR:SI NPN                       | 28480    | 1854-0019       |
| A1R1                  | 0757-0438      | 21  | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R2                  | 0757-0428      | 8   | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R3                  | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R4                  | 0698-3153      | 4   | R:FXD MET FLM 3.83K OHM 1% 1/8W   | 28480    | 0698-3153       |
| A1R5                  | 0698-3445      | 7   | R:FXD MET FLM 348 OHM 1% 1/8W     | 28480    | 0698-3445       |
| A1R6                  | 0757-0401      | 26  | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R7                  | 0757-0421      | 2   | R:FXD MET FLM 825 OHM 1% 1/8W     | 28480    | 0757-0421       |
| A1R8                  | 0698-0084      | 14  | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R9                  | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R10                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R11                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R12                 | 0698-3153      |     | R:FXD MET FLM 3.83K OHM 1% 1/8W   | 28480    | 0698-3153       |
| A1R13                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R14                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W     | 28480    | 0698-3445       |
| A1R15                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R16                 | 0757-0421      | 3   | R:FXD MET FLM 825 OHM 1% 1/8W     | 28480    | 0757-0421       |
| A1R16                 |                |     | FACTORY SELECTED PART             |          |                 |
| A1R17                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R18                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R19                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R20                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R21                 | 0698-3153      |     | R:FXD MET FLM 3.83K OHM 1% 1/8W   | 28480    | 0698-3153       |
| A1R22                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R23                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W     | 28480    | 0698-3445       |
| A1R24                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R25                 | 0757-0421      |     | R:FXD MET FLM 825 OHM 1% 1/8W     | 28480    | 0757-0421       |
| A1R26                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R27                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R28                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R29                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R30                 | 0698-3153      |     | R:FXD MET FLM 3.83K OHM 1% 1/8W   | 28480    | 0698-3153       |
| A1R31                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A1R32                 | 0757-0420      | 8   | R:FXD MET FLM 750 OHM 1% 1/8W     | 28480    | 0757-0420       |
| A1R33                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W     | 28480    | 0698-3445       |
| A1R34                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R35                 | 2100-1757      | 4   | R:VAR WW 500 OHM 5% TYPE V 1W     | 28480    | 2100-1757       |
| A1R36                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R37                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R38                 | 0698-4087      | 1   | R:FXD MET FLM 24.6 OHM 1% 1/8W    | 28480    | 0698-4087       |
| A1R38                 |                |     | FACTORY SELECTED PART             |          |                 |
| A1R39                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R40                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R41                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A1R42                 | 0757-0440      | 10  | R:FXD MET FLM 7.50K OHM 1% 1/8W   | 28480    | 0757-0440       |
| A1R43                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R44                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R45                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R46                 | 0757-0280      | 39  | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A1R47                 | 0757-0421      |     | R:FXD MET FLM 825 OHM 1% 1/8W     | 28480    | 0757-0421       |
| A1R48                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W   | 28480    | 0757-0440       |
| A1R49                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R50                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A1R51                 | 0698-3157      | 6   | R:FXD MET FLM 19.6K OHM 1% 1/8W   | 28480    | 0698-3157       |
| A1R52                 | 0698-3442      | 1   | R:FXD MET FLM 237 OHM 1% 1/8W     | 28480    | 0698-3442       |
| A1R53                 | 0757-0416      | 10  | R:FXD MET FLM 511 OHM 1% 1/8W     | 28480    | 0757-0416       |
| A1R54                 | 0698-3429      | 2   | R:FXD MET FLM 19.6 OHM 1% 1/8W    | 28480    | 0698-3429       |
| A1R55                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A1R56                 | 0698-4037      | 1   | R:FXD MET FLM 46.4 OHM 1% 1/8W    | 28480    | 0698-4037       |
| A1R57                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A1R58                 | 2100-1755      | 4   | R:VAR WW 100 OHM 5% TYPE V 1W     | 28480    | 2100-1755       |
| A1R59                 | 2100-1756      | 3   | R:VAR WW 200 OHM 5% TYPE V 1W     | 28480    | 2100-1756       |
| A1R60                 | 0698-3443      | 3   | R:FXD MET FLM 287 OHM 1% 1/8W     | 28480    | 0698-3443       |
| A1R61                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A1R62                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A1TP1                 | THRU           |     |                                   |          |                 |
| A1TP5                 | 0360-1514      | 26  | TERMINAL PIN:SQUARE               | 28480    | 0360-1514       |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                          | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|--------------------------------------|----------|----------------------|
| A2                    | 08552-60116    | 1   | BOARD ASSY:3 MHZ AMPLIFIER           | 28480    | 08552-60116          |
| A2                    | 08552-60139    | 1   | EXCHANGE ASSY:3 MHZ AMPLIFIER        | 28480    | 08552-60139          |
| A2C1                  | 0380-0863      | 2   | STANDOFF:1/8" LG                     | 06540    | 9531-125-B0440-0     |
| A2C2                  | 0180-C116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW        | 56289    | 1500685X9035A2-DYS   |
|                       | 0180-C116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW        | 56289    | 1500685X9035A2-DYS   |
| A2C3                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C4                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C5                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C6                  |                |     | NOT ASSIGNED                         |          |                      |
| A2C9                  |                |     | NOT ASSIGNED                         |          |                      |
| A2C10                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C11                 | 0180-0291      | 4   | C:FXD ELECT 1.0 UF 10% 35VDCW        | 56289    | 1500105X9035A2-DYS   |
| A2C12                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C13                 | 0122-0221      | 2   | C:VOLTAGE VAR 100 PF 10% 30VDCW      | 28480    | 0122-0221            |
| A2C14                 | 0140-0205      | 7   | C:FXD MICA 62 PF 5% 300VDCW          | 00853    | ROM15E620J3C         |
| A2C15                 | 0122-0211      | 1   | C:VOLTAGE VAR 39 PF 1N4810A          | 28480    | 0122-0211            |
| A2C16                 | 0122-0221      |     | C:VOLTAGE VAR 100 PF 10% 30VDCW      | 28480    | 0122-0221            |
| A2C17                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C18                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C19                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C20                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C21                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C22                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C23                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C24                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C25                 | 0140-0205      |     | C:FXD MICA 62 PF 5% 300VDCW          | 00853    | ROM15E620J3C         |
| A2C26                 | 0160-2257      | 3   | C:FXD CER 10 PF 5% 500VDCW           | 72982    | 301-000-C0H0-100J    |
| A2C27                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C28                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C29                 | 0140-0205      |     | C:FXD MICA 62 PF 5% 300VDCW          | 00853    | ROM15E620J3C         |
| A2C30                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C31                 | 0122-0043      | 2   | C:VOLTAGE VAR 39-17.95PF 2% 4-25VDCW | 28480    | 0122-0043            |
| A2C32                 | 0122-0044      | 2   | C:VOLTAGE VAR 100-45.9PF 2% 4-25VDCW | 28480    | 0122-0044            |
| A2C33                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C34                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C35                 | 0180-0291      |     | C:FXD ELECT 1.0 UF 10% 35VDCW        | 56289    | 1500105X9035A2-DYS   |
| A2C36                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C37                 |                |     | NOT ASSIGNED                         |          |                      |
| A2C38                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C39                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C40                 | 0122-0043      |     | C:VOLTAGE VAR 39-17.95PF 2% 4-25VDCW | 28480    | 0122-0043            |
| A2C41                 | 0122-0044      |     | C:VOLTAGE VAR 100-45.9PF 2% 4-25VDCW | 28480    | 0122-0044            |
| A2C42                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C43                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW    | 56289    | C023F101F103ZS22-CDH |
| A2C44                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C45                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C46                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C47                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C48                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C49                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C50                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C51                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C52                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C53                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C54                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C55                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C56                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C57                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C58                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C59                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C60                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C61                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C62                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C63                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C64                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C65                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C66                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C67                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C68                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C69                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C70                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C71                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C72                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C73                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C74                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C75                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C76                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C77                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C78                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C79                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C80                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C81                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C82                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C83                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C84                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C85                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C86                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C87                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C88                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C89                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C90                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C91                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C92                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C93                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C94                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C95                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C96                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C97                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C98                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C99                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C100                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C101                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C102                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C103                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C104                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C105                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C106                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C107                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C108                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C109                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C110                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C111                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2C112                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV            | 07263    | FDG1088              |
| A2L1                  | 9140-0237      |     | COIL:FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2L2                  | 9140-0237      |     | COIL:FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2L3                  | 9140-0237      |     | COIL:FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2L4                  | 9140-0237      |     | COIL:FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2L5                  | 9140-0237      |     | COIL:FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2L6                  |                |     | NOT ASSIGNED                         |          |                      |
| A2L7                  | 9100-1611      | 2   | COIL:FXD 0.22 UH 20%                 | 28480    | 9100-1611            |
| A2L8                  | 9100-1636      | 2   | COIL/CHOKE 110 UH 5%                 | 28480    | 9100-1636            |
| A2L9                  |                |     | NOT ASSIGNED                         |          |                      |
| A2L10                 | 9140-0137      |     | COIL:FXD RF 1000 UH 5%               | 28480    | 9140-0137            |
| A2L11                 | 9100-1611      |     | COIL:FXD 0.22 UH 20%                 | 28480    | 9100-1611            |
| A2L12                 | 1854-0092      | 2   | TSTR:SI NPN                          | 80131    | 2N3563               |
| A2L13                 | 1853-0010      | 9   | TSTR:SI PNP(SELECTED FROM 2N3251)    | 28480    | 1853-0010            |
| A2L14                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)    | 28480    | 1853-0010            |
| A2L15                 | 1854-0092      |     | TSTR:SI NPN                          | 80131    | 2N3563               |
| A2L16                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)    | 28480    | 1853-0010            |
| A2L17                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)    | 28480    | 1853-0010            |
| A2L18                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)    | 28480    | 1853-0010            |
| A2L19                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)    | 28480    | 1854-0071            |
| A2L20                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)    | 28480    | 1853-0010            |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                          | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|--------------------------------------|----------|-----------------|
| A209                  | 1853-0010      |     | TSTR:SI NPN(SELECTED FROM 2N3251)    | 28480    | 1853-0010       |
| A2010                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)    | 28480    | 1854-0071       |
| A201                  | 2100-1755      |     | R:VAR WW 100 OHM 5% TYPE V 1W        | 28480    | 2100-1755       |
| A202                  | 0698-3151      | 1   | R:FXD MET FLM 2.87K OHM 1% 1/8W      | 28480    | 0698-3151       |
| A203                  | 0757-0199      | 8   | R:FXD MET FLM 21.5K OHM 1% 1/8W      | 28480    | 0757-0199       |
| A204                  | 0757-0447      | 4   | R:FXD MET FLM 16.2K OHM 1% 1/8W      | 28480    | 0757-0447       |
| A205                  | 0757-0442      | 13  | R:FXD MET FLM 10.0K OHM 1% 1/8W      | 28480    | 0757-0442       |
| A206                  | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W      | 28480    | 0757-0442       |
| A207                  | 0698-3162      | 5   | R:FXD MET FLM 46.4K OHM 1% 1/8W      | 28480    | 0698-3162       |
| A208                  | 0757-1094      | 4   | R:FXD MET FLM 1.47K OHM 1% 1/8W      | 28480    | 0757-1094       |
| A209                  | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W        | 28480    | 0757-0401       |
| A2010                 | 0757-0279      | 14  | R:FXD MET FLM 3.16K OHM 1% 1/8W      | 28480    | 0757-0279       |
| A2011                 | 0757-0346      | 8   | R:FXD MET FLM 10 OHM 1% 1/8W         | 28480    | 0757-0346       |
| A2012                 | 0698-3446      | 10  | R:FXD MET FLM 383 OHM 1% 1/8W        | 28480    | 0698-3446       |
| A2013                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W      | 28480    | 0757-0442       |
| A2014                 | 0698-3428      | 2   | R:FXD MET FLM 14.7 OHM 1% 1/8W       | 28480    | 0698-3428       |
| A2015                 | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W         | 28480    | 0757-0346       |
| A2016                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2017                 | 0757-0199      |     | R:FXD MET FLM 21.5K OHM 1% 1/8W      | 28480    | 0757-0199       |
| A2018                 | 0757-0276      | 4   | R:FXD MET FLM 61.9 OHM 1% 1/8W       | 28480    | 0757-0276       |
| A2019                 | 0757-1094      |     | R:FXD MET FLM 1.47K OHM 1% 1/8W      | 28480    | 0757-1094       |
| A2020                 | 0757-0418      | 6   | R:FXD MET FLM 619 OHM 1% 1/8W        | 28480    | 0757-0418       |
| A2021                 | 2100-1757      |     | R:VAR WW 500 OHM 5% TYPE V 1W        | 28480    | 2100-1757       |
| A2022                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2023                 | 0698-3441      | 7   | R:FXD MET FLM 215 OHM 1% 1/8W        | 28480    | 0698-3441       |
| A2024                 | 2100-1755      |     | R:VAR WW 100 OHM 5% TYPE V 1W        | 28480    | 2100-1755       |
| A2025                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2026                 | 0757-0276      |     | R:FXD MET FLM 61.9 OHM 1% 1/8W       | 28480    | 0757-0276       |
| A2027                 | 2100-1754      | 1   | R:VAR WW 50 OHM 5% TYPE V 1W         | 28480    | 2100-1754       |
| A2028                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2029                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W      | 28480    | 0698-0084       |
| A2030                 | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W        | 28480    | 0698-3441       |
| A2031                 | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W         | 28480    | 0757-0346       |
| A2032                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W        | 28480    | 0698-3446       |
| A2033                 | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W         | 28480    | 0757-0346       |
| A2034                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W        | 28480    | 0757-0420       |
| A2035                 | 0757-0199      | 6   | R:FXD MET FLM 21.5K OHM 1% 1/8W      | 28480    | 0757-0199       |
| A2036                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W      | 28480    | 0757-0460       |
| A2037                 | 0757-1094      |     | R:FXD MET FLM 1.47K OHM 1% 1/8W      | 28480    | 0757-1094       |
| A2038                 | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W         | 28480    | 0757-0346       |
| A2039                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W        | 28480    | 0698-3446       |
| A2040                 | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W         | 28480    | 0757-0346       |
| A2041                 | 0698-3428      |     | R:FXD MET FLM 14.7 OHM 1% 1/8W       | 28480    | 0698-3428       |
| A2042                 | 0757-0199      |     | R:FXD MET FLM 21.5K OHM 1% 1/8W      | 28480    | 0757-0199       |
| A2043                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W        | 28480    | 0757-0401       |
| A2044                 | 2100-1760      | 4   | R:VAR WW 5K OHM 5% TYPE V 1W         | 28480    | 2100-1760       |
| A2045                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W      | 28480    | 0698-0084       |
| A2046                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W      | 28480    | 0757-0442       |
| A2047                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W      | 28480    | 0757-0442       |
| A2048                 | 0757-0288      | 1   | R:FXD MET FLM 9.09K OHM 1% 1/8W      | 28480    | 0757-0288       |
| A2049                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2050                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W      | 28480    | 0757-0442       |
| A2051                 | 2100-1758      | 2   | R:VAR WW 1K OHM 5% TYPE V 1W         | 28480    | 2100-1758       |
| A2052                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2053                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W        | 28480    | 0757-0401       |
| A2054                 | 0757-0199      |     | R:FXD MET FLM 21.5K OHM 1% 1/8W      | 28480    | 0757-0199       |
| A2055                 | 0698-3162      |     | R:FXD MET FLM 46.4K OHM 1% 1/8W      | 28480    | 0698-3162       |
| A2056                 | 0698-3162      |     | R:FXD MET FLM 46.4K OHM 1% 1/8W      | 28480    | 0698-3162       |
| A2057                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W        | 28480    | 0757-0401       |
| A2058                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W         | 28480    | 0757-0280       |
| A2059                 |                |     | NOT ASSIGNED                         |          |                 |
| A2060                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W        | 28480    | 0757-0401       |
| A2061                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W        | 28480    | 0757-0401       |
| A2061 THRU<br>A2064   | 0360-0124      | 25  | TERMINAL:SOLDER LUG                  | 28480    | 0360-0124       |
| A221                  | 9170-0847      |     | CORE,MAG,SHIELDING BEAD .130D.047 ID | 02114    | 56-590-65/38    |
| A2A1                  | 08552-60129    | 1   | BOARD ASSY:300 KHZ                   | 28480    | 08552-60129     |
| A2A1C1                | 0160-3046      | 1   | C:FXD MICA 250 PF 1% 100VDCW         | 28480    | 0160-3046       |
| A2A1C2                | 0160-3047      | 1   | C:FXD MICA 3280 PF 1% 100VDCW        | 28480    | 0160-3047       |
| A2A1C3                | 0160-3045      | 1   | C:FXD MICA 53.8 PF 1% 100VDCW        | 28480    | 0160-3045       |
| A2A1C4                | 0160-3048      | 2   | C:FXD MICA 8000 PF 1% 100VDCW        | 28480    | 0160-3048       |
| A2A1L1                | 9100-2744      | 1   | COIL/CHOKE 7.8 UH 2%                 | 82142    | 10132-17        |
| A2A1L2                | 08552-6012     | 1   | INDUCTOR:300 KHZ FILTER #2           | 28480    | 08552-6012      |
| A2A1L3                | 9100-2476      | 1   | COIL/CHOKE 52.3 UH 1%                | 82142    | 10176-40        |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------|----------|----------------------|
| A2A1L4                | 08552-6011     | 1   | INDUCTOR:300 KHZ FILTER #1        | 28480    | 08552-6011           |
| A2A1MP1               | 08552-00113    | 1   | FILTER CAN ASSY:300 KHZ           | 28480    | 08552-00113          |
| A2A1MP2               | 08552-00112    | 1   | FILTER COVER ASSY:300 KHZ         | 28480    | 08552-00112          |
| A2A1MP3               | 08552-00123    | 1   | INSULATOR:300 KHZ FILTER          | 28480    | 08552-00123          |
| A3                    | 08552-60149    | 1   | BOARD ASSY:50 MHZ CONVERTER       | 28480    | 08552-60149          |
| A3                    | 08552-60140    | 1   | EXCHANGE ASSY:50 MHZ CONVERTER    | 28480    | 08552-60140          |
| A3C1                  | 0160-3456      | 21  | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C2                  | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | CC67F251F102KS22-CDH |
| A3C3                  | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C4                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW     | 56289    | 1500685X903582-DYS   |
| A3C5                  |                |     | NOT ASSIGNED                      |          |                      |
| A3C6                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW     | 56289    | 1500685X903582-DYS   |
| A3C7                  | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C8                  | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C9                  | 0160-2142      | 1   | C:FXD CER 1500 PF +100-0% 500VDCW | 91418    | TYPE SM              |
| A3C10                 | 0160-2307      | 1   | C:FXD MICA 47 PF 5%               | 28480    | 0160-2307            |
| A3C11                 | 0121-0059      | 4   | C:VAR CER 2-8 PF 300VDCW          | 28480    | 0121-0059            |
| A3C12                 | 0160-2254      | 3   | C:FXD CER 7.5 PF 500VDCW          | 72982    | 301-000-COHO-759C    |
| A3C13                 | 0160-2254      |     | C:FXD CER 7.5 PF 500VDCW          | 72982    | 301-000-COHO-759C    |
| A3C14                 | 0121-0059      |     | C:VAR CER 2-8 PF 300VDCW          | 28480    | 0121-0059            |
| A3C15                 | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C16                 | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C17                 | 0160-2201      |     | C:FXD MICA 51 PF 5%               | 72136    | RD15E510J1C          |
| A3C18                 | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A3C19                 | 0121-0059      |     | C:VAR CER 2-8 PF 300VDCW          | 28480    | 0121-0059            |
| A3C20                 | 0160-2254      |     | C:FXD CER 7.5 PF 500VDCW          | 72982    | 301-000-COHO-759C    |
| A3CR1                 | 1901-0050      | 7   | DIODE:SI 200 MA AT 1V             | 07263    | FDA 6308             |
| A3CR2                 | 1901-0050      |     | DIODE:SI 200 MA AT 1V             | 07263    | FDA 6308             |
| A3CR3                 | 1901-0050      |     | DIODE:SI 200 MA AT 1V             | 07263    | FDA 6308             |
| A3CR4                 | 1901-0050      |     | DIODE:SI 200 MA AT 1V             | 07263    | FDA 6308             |
| A3L1                  | 9140-0114      | 2   | COIL:FXD RF 10 UH                 | 28480    | 9140-0114            |
| A3L2                  | 9140-0129      | 4   | COIL:FXD RF 220 UH                | 28480    | 9140-0129            |
| A3L3                  | 9140-0129      |     | COIL:FXD RF 220 UH                | 28480    | 9140-0129            |
| A3L4                  | 9100-0346      | 1   | COIL:FXD 0.05 UH 20%              | 36196    | H-10886              |
| A3L5                  | 9140-0096      | 4   | COIL/CHOKE 1.00 UH 10%            | 99800    | 1537-12              |
| A3L6                  | 9140-0096      |     | COIL/CHOKE 1.00 UH 10%            | 99800    | 1537-12              |
| A3L7                  | 9140-0114      |     | COIL:FXD RF 10 UH                 | 28480    | 9140-0114            |
| A3L8                  | 9140-0096      |     | COIL/CHOKE 1.00 UH 10%            | 99800    | 1537-12              |
| A3L9                  | 9140-0096      |     | COIL/CHOKE 1.00 UH 10%            | 99800    | 1537-12              |
| A3Q1                  | 1854-0247      | 1   | TSTR:SI NPN                       | 28480    | 1854-0247            |
| A3Q2                  | 1853-0089      | 1   | TSTR:SI PNP                       | 80131    | 2N4917               |
| A3R1                  | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438            |
| A3R2                  | 0698-3155      | 1   | R:FXD MET FLM 4.64K OHM 1% 1/8W   | 28480    | 0698-3155            |
| A3R3                  | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W     | 28480    | 0757-0420            |
| A3R4                  | 0757-0159      | 1   | R:FXD MET FLM 1000 OHM 1% 1/2W    | 28480    | 0757-0159            |
| A3R5                  | 0698-3429      |     | R:FXD MET FLM 19.6 OHM 1% 1/8W    | 28480    | 0698-3429            |
| A3R6                  | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W     | 28480    | 0698-3441            |
| A3R7                  | 0757-1092      | 1   | R:FXD MET FLM 287 OHM 1% 1/2W     | 28480    | 0757-1092            |
| A3R8                  | 0698-3438      | 2   | R:FXD MET FLM 147 OHM 1% 1/8W     | 28480    | 0698-3438            |
| A3R8                  |                |     | FACTORY SELECTED PART             |          |                      |
| A3R9                  | 0698-3433      | 1   | R:FXD MET FLM 28.7 OHM 1% 1/8W    | 28480    | 0698-3433            |
| A3R9                  |                |     | FACTORY SELECTED PART             |          |                      |
| A3R10                 | 0757-0180      | 1   | R:FXD MET FLM 31.6 OHM 1% 1/8W    | 28480    | 0757-0180            |
| A3R11                 | 0757-0394      | 8   | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394            |
| A3R12                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394            |
| A3R13                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394            |
| A3R14                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394            |
| A3R15                 | 0757-0398      | 1   | R:FXD MET FLM 75 OHM 1% 1/8W      | 28480    | 0757-0398            |
| A3R16                 | 0698-0082      | 3   | R:FXD MET FLM 464 OHM 1% 1/8W     | 28480    | 0698-0082            |
| A3R17                 | 0757-0465      | 12  | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465            |
| A3T1                  | 08552-80105    | 2   | TRANSFORMER:RF 5 PIN              | 50436    | 08552-80105          |
| A3T2                  | 08552-6044     | 2   | TRANSFORMER:RF 5 PIN              | 50436    | 08552-6044           |
| A3T3                  | 08552-80105    |     | TRANSFORMER:RF 5 PIN              | 50436    | 08552-80105          |
| A3T4                  | 08552-6044     |     | TRANSFORMER:RF 5 PIN              | 50436    | 08552-6044           |
| A3A1                  | 08552-60148    | 1   | FILTER ASSY:50 MHZ                | 50436    | 08552-60148          |
| A3A1                  |                |     | SEALED UNIT:NRFR                  |          |                      |
| A3A1C1                | 0160-0778      | 2   | C:FXD CER 56 PF 10% 500VDCW       | 01121    | FR28                 |
| A3A1C2                | 0160-2236      | 1   | C:FXD CER 1.0 PF 500VDCW          | 72982    | 301-000-COHO-109C    |
| A3A1C3                | 0160-0145      | 2   | C:FXD MICA 82 PF 2% 100VDCW       | 84171    | RD15E820G1S          |
| A3A1C4                | 0160-2258      | 4   | C:FXD CER 11 PF 5% 500VDCW        | 72982    | 301-000-COHO-110J    |
| A3A1C5                | 0121-0036      | 10  | C:VAR CER 5.5-18 PF               | 28480    | 0121-0036            |
| A3A1C6                | 0121-0036      |     | C:VAR CER 5.5-18 PF               | 28480    | 0121-0036            |
| A3A1C7                | 0160-2258      |     | C:FXD CER 11 PF 5% 500VDCW        | 72982    | 301-000-COHO-110J    |
| A3A1C8                | 0160-2258      |     | C:FXD CER 11 PF 5% 500VDCW        | 72982    | 301-000-COHO-110J    |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                   | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------------------|----------|----------------------|
| A3A1C9                | 0121-0036      |     | C:VAR CER 5.5-18 PF                           | 28480    | 0121-0036            |
| A3A1C10               | 0121-0036      |     | C:VAR CER 5.5-18 PF                           | 28480    | 0121-0036            |
| A3A1C11               | 0160-2258      |     | C:FXD CER 11 PF 5% 500VDCW                    | 72982    | 301-000-C0G0-110J    |
| A3A1C12               | 0160-0145      |     | C:FXD MICA 82 PF 2% 100VDCW                   | 84171    | ROM15E820G1S         |
| A3A1C13               | 0160-0778      |     | C:FXD CER 56 PF 10% 500VDCW                   | 01121    | F82B                 |
| A3A1J1                | 1250-0829      | 1   | CONNECTOR:RF 50-OHM SCREW ON TYPE             | 98291    | 50-045-4610          |
| A3A1L1                | 08552-6023     | 2   | INDUCTOR ASSY:AIR CORE                        | 28480    | 08552-6023           |
| A3A1L2                | 08552-6017     | 7   | INDUCTOR ASSY:50 MHZ                          | 28480    | 08552-6017           |
| A3A1L3                | 08552-6023     |     | INDUCTOR ASSY:AIR CORE                        | 28480    | 08552-6023           |
| A3A1MP1               | 08552-00127    | 1   | SHIELD CAN:50 MHZ FILTER                      | 28480    | 08552-00127          |
| A3A1MP2               | 08552-0022     | 2   | SHIELD COVER:47 MHZ OSC                       | 28480    | 08552-0022           |
| A3A1MP3               | 08552-0023     | 2   | INSULATOR:47 MHZ OSC                          | 28480    | 08552-0023           |
| A3A2                  | 08552-60112    | 1   | OSCILLATOR ASSY:47 MHZ                        | 50436    | 08552-60112          |
| A3A2                  |                |     | SEALED UNIT:NRFR                              |          |                      |
| A3A2                  | 0380-0810      | 4   | STANDOFF:0.437" LG                            | 01255    | 153087/16-11         |
| A3A2C1                | 0122-0263      | 1   | C:VOLTAGE VAR 47 PF 10% 60WV                  | 04713    | 1N5148               |
| A3A2C2                | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C3                | 0160-2200      | 1   | C:FXD MICA 43 PF 5%                           | 72136    | ROM15E430J3C         |
| A3A2C4                | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C5                | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW                 | 56289    | 150D685X903582-DYS   |
| A3A2C6                | 0160-2261      | 1   | C:FXD CER 15 PF 5% 500VDCW                    | 72982    | 301-NP0-15 PF        |
| A3A2C7                | 0160-2265      | 2   | C:FXD CER 22 PF 5% 500VDCW                    | 72982    | 301-NP0-22PF         |
| A3A2C8                | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C9                | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C10               | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C11               | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C12               | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C13               | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW                 | 56289    | C067F251F102KS22-CDH |
| A3A2C14               | 0160-0134      | 2   | C:FXD MICA 220PF 5% 300VDCW                   | 14655    | ROM15F221J3C         |
| A3A2C15               | 0160-2199      | 2   | C:FXD MICA 30 PF 5% 300VDCW                   | 28480    | 0160-2199            |
| A3A2CR1               | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV                     | 07263    | F0G1C88              |
| A3A2CR2               | 1902-0041      | 2   | DIODE:BREAKDOWN 5.11V 5%                      | 04713    | S210939-98           |
| A3A2CR3               | 1902-0041      |     | DIODE:BREAKDOWN 5.11V 5%                      | 04713    | S210939-98           |
| A3A2J1                | 1250-1194      | 1   | CONNECTOR:RF BULKHEAD RECEPTACLE              | 98291    | 52-045-4610          |
| A3A2L1                | 08552-80103    | 1   | INDUCTOR ASSY:47 MHZ OSCILLATOR               | 28480    | 08552-80103          |
| A3A2L2                | 9100-2258      | 1   | COIL/CHOKER 1.20UH 10%                        | 28480    | 9100-2258            |
| A3A2MP1               | 0340-0038      | 5   | FEEDTHRU:TERMINAL                             | 28480    | 0340-0038            |
| A3A2MP2               | 0340-0039      | 5   | INSULATOR:BUSHING                             | 28480    | 0340-0039            |
| A3A2MP3               | 08552-00114    | 1   | SHIELD CAN:47 MC OSCILLATOR                   | 28480    | 08552-00114          |
| A3A2MP4               | 08552-0022     |     | SHIELD COVER:47 MHZ OSC                       | 28480    | 08552-0022           |
| A3A2MP5               | 08552-0023     |     | INSULATOR:47 MHZ OSC                          | 28480    | 08552-0023           |
| A3A2Q1                | 1854-0238      | 1   | TSTR:SI NPN                                   | 80131    | 2N3933               |
| A3A2Q2                | 1853-0038      | 1   | TSTR:SI PNP                                   | 28480    | 1853-0038            |
| A3A2Q3                | 1854-0019      |     | TSTR:SI NPN                                   | 28480    | 1854-0019            |
| A3A2Q3                | 1205-0037      | 2   | HEAT SINK:TRANSISTOR                          | 28480    | 1205-0037            |
| A3A2Q4                | 1854-0019      |     | TSTR:SI NPN                                   | 28480    | 1854-0019            |
| A3A2Q4                | 1205-0037      |     | HEAT SINK:TRANSISTOR                          | 28480    | 1205-0037            |
| A3A2R1                | 0698-3157      |     | R:FXD MET FLM 19.6K OHM 1% 1/8W               | 28480    | 0698-3157            |
| A3A2R2                | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W                | 28480    | 0757-0465            |
| A3A2R3                | 0757-0278      | 2   | R:FXD MET FLM 1.78K OHM 1% 1/8W               | 28480    | 0757-0278            |
| A3A2R4                | 0757-0405      | 4   | R:FXD MET FLM 162 OHM 1% 1/8W                 | 28480    | 0757-0405            |
| A3A2R5                | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W                 | 28480    | 0698-3441            |
| A3A2R6                | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W               | 28480    | 0757-0279            |
| A3A2R7                | 0757-0401      | 1   | R:FXD MET FLM 100 OHM 1% 1/8W                 | 28480    | 0757-0401            |
| A3A2R8                | 0757-0403      |     | R:FXD MET FLM 121 OHM 1% 1/8W                 | 28480    | 0757-0403            |
| A3A2R9                | 0757-0417      | 1   | IF REPLACING EITHER/OR A3A2R7,8, REPLACE BOTH | 28480    | 0757-0417            |
| A3A2R10               | 0757-0280      |     | R:FXD MET FLM 562 OHM 1% 1/8W                 | 28480    | 0757-0280            |
| A3A2R11               | 0757-0279      |     | R:FXD MET FLM 1K OHM 1% 1/8W                  | 28480    | 0757-0279            |
| A3A2R12               | 0757-0280      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W               | 28480    | 0757-0280            |
| A3A2R13               | 0757-0379      | 1   | R:FXD MET FLM 1K OHM 1% 1/8W                  | 28480    | 0757-0379            |
| A3A2R14               | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W                 | 28480    | 0757-0401            |
| A3A2R15               | 0757-0402      | 3   | R:FXD MET FLM 110 OHM 1% 1/8W                 | 28480    | 0757-0402            |
| A3A2R16               | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W                 | 28480    | 0698-3441            |
| A3A2T1                | 08552-80102    | 1   | INDUCTOR ASSY:47 MHZ OUT                      | 28480    | 08552-80102          |
| A4                    | 08552-60111    | 1   | BOARD ASSY:CRYSTAL FILTER                     | 28480    | 08552-60111          |
| A4                    | 08552-60141    | 1   | EXCHANGE ASSY:CRYSTAL FILTER                  | 28480    | 08552-60141          |
| A4C1                  | 0150-0121      | 3   | C:FXD CER 0.1 UF +80-20% 50VDCW               | 56289    | 5C50BIS-CML          |
| A4C2                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW             | 56289    | C023F101F103ZS22-CDH |
| A4C3                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW             | 56289    | C023F101F103ZS22-CDH |
| A4C4                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW             | 56289    | C023F101F103ZS22-CDH |
| A4C5                  | 0180-0197      | 15  | C:FXD ELECT 2.2 UF 10% 20VDCW                 | 56289    | 1500225X9020A2-DYS   |
| A4C6                  | 0180-0291      |     | C:FXD ELECT 1.0 UF 10% 35VDCW                 | 56289    | 1500105X9035A2-DYS   |
| A4C7                  | 0180-1745      | 1   | C:FXD ELECT 1.5 UF 10% 20VDCW                 | 28480    | 0180-1745            |
| A4C8                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW             | 56289    | C023F101F103ZS22-CDH |
| A4C9                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW             | 56289    | C023F101F103ZS22-CDH |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------|----------|----------------------|
| A4C10                 | 0160-2055      | 1   | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C11                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C12                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C13                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C14                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C15                 | 0160-2308      | 1   | C:FXD MICA 36 PF 5%               | 28480    | 0160-2308            |
| A4C16                 | 0160-2202      |     | C:FXD MICA 75 PF 5%               | 28480    | 0160-2202            |
| A4C17                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A4C18                 | 0121-0443      |     | C:VAR CER 3-9 PF 160VDCW          | 28480    | 0121-0443            |
| A4C19                 | 0121-0105      |     | C:VAR CER 9-35 PF NPO             | 28480    | 0121-0105            |
| A4C20                 | 0160-3460      | 1   | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C21                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A4C22                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C23                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C24                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C25                 | 0160-2055      | 5   | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C26                 | 0140-0191      |     | C:FXD MICA 56 PF 5% 300VDCW       | 19701    | RD15E560J 300V       |
| A4C27                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C28                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C29                 | 0140-0205      |     | C:FXD MICA 62 PF 5% 300VDCW       | 00853    | RD15E620J3C          |
| A4C30                 | 0121-0036      | 1   | C:VAR CER 5.5-18 PF               | 28480    | 0121-0036            |
| A4C31                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A4C32                 | 0121-0443      |     | C:VAR CER 3-9 PF 160VDCW          | 28480    | 0121-0443            |
| A4C33                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C34                 | 0121-0105      |     | C:VAR CER 9-35 PF NPO             | 28480    | 0121-0105            |
| A4C35                 | 0160-2055      | 1   | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C36                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C37                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C38                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C39                 | 0140-0191      |     | C:FXD MICA 56 PF 5% 300VDCW       | 19701    | RD15E560J 300V       |
| A4C40                 | 0160-2055      | 1   | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C41                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C42                 | 0140-0205      |     | C:FXD MICA 62 PF 5% 300VDCW       | 00853    | RD15E620J3C          |
| A4C43                 | 0121-0036      |     | C:VAR CER 5.5-18 PF               | 28480    | 0121-0036            |
| A4C44                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A4C45                 | 0121-0443      | 1   | C:VAR CER 3-9 PF 160VDCW          | 28480    | 0121-0443            |
| A4C46                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C47                 | 0121-0105      |     | C:VAR CER 9-35 PF NPO             | 28480    | 0121-0105            |
| A4C48                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A4C49                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C50                 | 0160-3460      | 1   | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C51                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C52                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C53                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C54                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C55                 | 0140-0191      | 1   | C:FXD MICA 56 PF 5% 300VDCW       | 19701    | RD15E560J 300V       |
| A4C56                 | 0140-0205      |     | C:FXD MICA 62 PF 5% 300VDCW       | 00853    | RD15E620J3C          |
| A4C57                 | 0121-0036      |     | C:VAR CER 5.5-18 PF               | 28480    | 0121-0036            |
| A4C58                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A4C59                 | 0121-0443      |     | C:VAR CER 3-9 PF 160VDCW          | 28480    | 0121-0443            |
| A4C60                 | 0160-3460      | 1   | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C61                 | 0121-0105      |     | C:VAR CER 9-35 PF NPO             | 28480    | 0121-0105            |
| A4C62                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A4C63                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C64                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C65                 | 0160-3460      | 1   | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C66                 | 0140-0191      |     | C:FXD MICA 56 PF 5% 300VDCW       | 19701    | RD15E560J 300V       |
| A4C67                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C68                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C69                 | 0140-0205      |     | C:FXD MICA 62 PF 5% 300VDCW       | 00853    | RD15E620J3C          |
| A4C70                 | 0121-0036      | 1   | C:VAR CER 5.5-18 PF               | 28480    | 0121-0036            |
| A4C71                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C72                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A4C73                 | 0121-0443      |     | C:VAR CER 3-9 PF 160VDCW          | 28480    | 0121-0443            |
| A4C74                 | 0121-0105      |     | C:VAR CER 9-35 PF NPO             | 28480    | 0121-0105            |
| A4C75                 | 0160-3060      | 1   | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A4C76                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C77                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C78                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023E101L503ZS22-CDM |
| A4C79                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C80                 | 0160-2055      | 1   | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C81                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C82                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C83                 | 0160-2150      |     | C:FXD MICA 33 PF 5%               | 28480    | 0160-2150            |
| A4C84                 | 0160-2257      |     | C:FXD CER 10 PF 5% 500VDCW        | 72982    | 3C1-000-COH0-100J    |

See introduction to this section for ordering information



Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------|----------|----------------------|
| A4C85                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C86                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C87                 | 0160-2150      |     | C:FXD MICA 33 PF 5%               | 28480    | 0160-2150            |
| A4C88                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 1500225X9020A2-OYS   |
| A4C89                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C90                 | 0160-3460      |     | C:FXD CER 0.05 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C91                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C92                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C93                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C94                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C95                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A4C96                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A4CR1                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR2                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR3                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR4                 | 1901-0040      | 5   | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR5                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR6                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR7                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR8                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR9                 | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR10                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR11                | 1901-0639      |     | DIODE:PIN 1MHZ TO 1GHZ            | 28480    | 1901-0639            |
| A4CR12                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR13                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR14                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR15                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR16                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR17                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR18                | 1901-0639      |     | DIODE:PIN 1MHZ TO 1GHZ            | 28480    | 1901-0639            |
| A4CR19                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR20                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR21                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR22                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR23                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR24                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR25                | 1901-0639      |     | DIODE:PIN 1MHZ TO 1GHZ            | 28480    | 1901-0639            |
| A4CR26                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR27                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR28                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR29                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR30                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR31                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR32                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR33                | 1901-0639      |     | DIODE:PIN 1MHZ TO 1GHZ            | 28480    | 1901-0639            |
| A4CR34                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR35                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR36                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR37                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR38                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR39                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR40                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR41                | 1901-0639      |     | DIODE:PIN 1MHZ TO 1GHZ            | 28480    | 1901-0639            |
| A4CR42                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR43                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR44                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR45                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR46                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR47                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR48                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4CR49                | 1901-0040      | 6   | DIODE:SILICON 50 MA 30 WV         | 07263    | FDG1088              |
| A4L1                  | 9100-1648      |     | COIL/CHOKE 560 UH 5%              | 82142    | 19-1331-29J          |
| A4L2                  | 9100-1648      |     | COIL/CHOKE 560 UH 5%              | 82142    | 19-1331-29J          |
| A4L3                  | 9140-0129      |     | COIL:FXD RF 220 UH                | 28480    | 9140-0129            |
| A4L4                  | 9100-1629      | 8   | COIL/CHOKE 47.0 UH 5%             | 28480    | 9100-1629            |
| A4L5                  | 9100-1629      |     | COIL/CHOKE 47.0 UH 5%             | 28480    | 9100-1629            |
| A4L6                  | 9100-1648      |     | COIL/CHOKE 560 UH 5%              | 82142    | 19-1331-29J          |
| A4L7                  | 9100-1648      |     | COIL/CHOKE 560 UH 5%              | 82142    | 19-1331-29J          |
| A4L8                  | 9100-1648      |     | COIL/CHOKE 560 UH 5%              | 82142    | 19-1331-29J          |
| A4L9                  | 9100-1648      |     | COIL/CHOKE 560 UH 5%              | 82142    | 19-1331-29J          |
| A4L10                 | 9100-1629      | 10  | COIL/CHOKE 47.0 UH 5%             | 28480    | 9100-1629            |
| A4L11                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%             | 28480    | 9100-1622            |
| A4L12                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%             | 28480    | 9100-1622            |
| A4L13                 | 9100-1629      |     | COIL/CHOKE 47.0 UH 5%             | 28480    | 9100-1629            |
| A4L14                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%             | 28480    | 9100-1622            |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                 | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---------------------------------------------|----------|-----------------|
| A4L15                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L16                 | 9100-1629      |     | COIL/CHOKE 47.0 UH 5%                       | 28480    | 9100-1629       |
| A4L17                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L18                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L19                 | 9100-1629      |     | COIL/CHOKE 47.0 UH 5%                       | 28480    | 9100-1629       |
| A4L20                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L21                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L22                 | 9100-1629      |     | COIL/CHOKE 47.0 UH 5%                       | 28480    | 9100-1629       |
| A4L23                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L24                 | 9100-1622      |     | COIL/CHOKE 24.0 UH 5%                       | 28480    | 9100-1622       |
| A4L25                 | 9100-1629      |     | COIL/CHOKE 47.0 UH 5%                       | 28480    | 9100-1629       |
| A4L26                 | 9140-0210      |     | COIL/CHOKE 100 UH 5%                        | 82142    | 15-1315-12J     |
| A4MP1                 | 0360-0124      |     | TERMINAL:SOLDER LUG                         | 28480    | 0360-0124       |
| A4MP10                | 0360-0124      |     | TERMINAL:SOLDER LUG                         | 28480    | 0360-0124       |
| A4Q1                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q2                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q3                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q4                  | 1854-0019      |     | TSTR:SI NPN                                 | 28480    | 1854-0019       |
| A4Q5                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q6                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q7                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q8                  | 1854-0019      |     | TSTR:SI NPN                                 | 28480    | 1854-0019       |
| A4Q9                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q10                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q11                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q12                 | 1854-0019      |     | TSTR:SI NPN                                 | 28480    | 1854-0019       |
| A4Q13                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q14                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q15                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q16                 | 1854-0019      |     | TSTR:SI NPN                                 | 28480    | 1854-0019       |
| A4Q17                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q18                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q19                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q20                 | 1854-0019      |     | TSTR:SI NPN                                 | 28480    | 1854-0019       |
| A4Q21                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q22                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702)           | 28480    | 1853-0020       |
| A4Q23                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704)           | 28480    | 1854-0071       |
| A4Q24                 | 1854-0019      |     | TSTR:SI NPN                                 | 28480    | 1854-0019       |
| A4R1                  | 0698-7253      | 3   | R:FXD MET FLM 5.11K OHM 2% 1/8W             | 28480    | 0698-7253       |
| A4R2                  | 0698-7223      | 5   | R:FXD FLM 287 OHM 2% 1/8W                   | 28480    | 0698-7223       |
| A4R3                  | 0698-7267      | 5   | R:FXD MET FLM 19.6K OHM 2% 1/8W             | 28480    | 0698-7267       |
| A4R4                  | 0698-7212      | 13  | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R5                  | 0698-7260      | 3   | R:FXD FLM 10K OHM 2% 1/8W                   | 28480    | 0698-7260       |
| A4R6                  | 0698-7267      |     | R:FXD MET FLM 19.6K OHM 2% 1/8W             | 28480    | 0698-7267       |
| A4R7                  | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R8                  | 0698-7260      |     | R:FXD FLM 10K OHM 2% 1/8W                   | 28480    | 0698-7260       |
| A4R9                  | 0698-7268      | 1   | R:FXD FLM 21.5K OHM 2% 1/8W                 | 28480    | 0698-7268       |
| A4R10                 | 0698-7260      |     | R:FXD FLM 10K OHM 2% 1/8W                   | 28480    | 0698-7260       |
| A4R11                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R12                 | 0698-7213      | 1   | R:FXD FLM 110 OHM 2% 1/8W                   | 28480    | 0698-7213       |
| A4R13                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R14                 | 0698-7209      | 1   | R:FXD FLM 75 OHM 2% 1/8W                    | 28480    | 0698-7209       |
| A4R15                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R16                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R17                 | 0698-7236      | 15  | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R18                 | 0698-3334      | 1   | R:FXD MET FLM 178 OHM 1% 1/2W               | 28480    | 0698-3334       |
| A4R19                 | 0698-7284      | 2   | R:FXD FLM 100K OHM 2% 1/8W                  | 28480    | 0698-7284       |
| A4R20                 | 0698-7231      | 14  | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R21                 | 0698-7227      | 6   | R:FXD FLM 422 OHM 2% 1/8W                   | 28480    | 0698-7227       |
| A4R22                 | 0698-7202      | 5   | R:FXD FLM 38.3 OHM 2% 1/8W                  | 28480    | 0698-7202       |
| A4R23                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R24                 | 0698-7214      | 5   | R:FXD FLM 121 OHM 2% 1/8W                   | 28480    | 0698-7214       |
| A4R25 **              | 0698-7269      |     | R:FXD FLM 23.7K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7269       |
| A4R26 **              | 0698-7277      | 1   | R:FXD FLM 51.1K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7277       |
| A4R27                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R28                 | 0698-7223      |     | R:FXD FLM 287 OHM 2% 1/8W                   | 28480    | 0698-7223       |
| A4R29                 | 0698-7227      |     | R:FXD FLM 422 OHM 2% 1/8W                   | 28480    | 0698-7227       |
| A4R30                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R31                 | 0698-7200      | 5   | R:FXD FLM 31.6 OHM 2% 1/8W                  | 28480    | 0698-7200       |
| A4R32                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R33                 | 0698-7240      | 6   | R:FXD MET FLM 1.47K OHM 2% 1/8W             | 28480    | 0698-7240       |
| A4R34                 | 0698-7244      | 18  | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R35                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R36                 | 0698-7256      | 4   | R:FXD FLM 6810 OHM 2% 1/8W                  | 28480    | 0698-7256       |
| A4R37                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |

See introduction to this section for ordering information

\*\*RECOMMENDED REPLACEMENT, SEE PAGE 5-39

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                 | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---------------------------------------------|----------|-----------------|
| A4R38                 | 0757-1060      | 1   | R:FXD MET FLM 196 OHM 1% 1/2W               | 28480    | 0757-1060       |
| A4R39                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R40                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R41                 | 0698-7202      |     | R:FXD FLM 38.3 OHM 2% 1/8W                  | 28480    | 0698-7202       |
| A4R42                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R43                 | 0698-7214      |     | R:FXD FLM 121 OHM 2% 1/8W                   | 28480    | 0698-7214       |
| A4R44 *               | 0698-7270      | 3   | R:FXD FLM 26.1K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7270       |
| A4R45 *               | 0698-7278      | 3   | R:FXD FLM 56.2K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7278       |
| A4R46                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R47                 | 0698-7223      |     | R:FXD FLM 287 OHM 2% 1/8W                   | 28480    | 0698-7223       |
| A4R48                 | 0698-7227      |     | R:FXD FLM 422 OHM 2% 1/8W                   | 28480    | 0698-7227       |
| A4R49                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R50                 | 0698-7200      |     | R:FXD FLM 31.6 OHM 2% 1/8W                  | 28480    | 0698-7200       |
| A4R51                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R52                 | 0698-7240      |     | R:FXD MET FLM 1.47K OHM 2% 1/8W             | 28480    | 0698-7240       |
| A4R53                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R54                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R55                 | 0698-7256      |     | R:FXD FLM 6810 OHM 2% 1/8W                  | 28480    | 0698-7256       |
| A4R56                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R57                 | 0757-1090      | 3   | R:FXD MET FLM 261 OHM 1% 1/2W               | 28480    | 0757-1090       |
| A4R58                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R59                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R60                 | 0698-7202      |     | R:FXD FLM 38.3 OHM 2% 1/8W                  | 28480    | 0698-7202       |
| A4R61                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R62                 | 0698-7214      |     | R:FXD FLM 121 OHM 2% 1/8W                   | 28480    | 0698-7214       |
| A4R63                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R64                 | 0698-7227      |     | R:FXD FLM 422 OHM 2% 1/8W                   | 28480    | 0698-7227       |
| A4R65                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R66                 | 0698-7240      |     | R:FXD MET FLM 1.47K OHM 2% 1/8W             | 28480    | 0698-7240       |
| A4R67                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R68                 | 0698-7257      | 1   | R:FXD FLM 7.5K OHM 2% 1/8W                  | 28480    | 0698-7257       |
| A4R69                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R70 *               | 0698-7270      |     | R:FXD FLM 26.1K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7270       |
| A4R71 *               | 0698-7278      |     | R:FXD FLM 56.2K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7278       |
| A4R72                 | 0698-7223      |     | R:FXD FLM 287 OHM 2% 1/8W                   | 28480    | 0698-7223       |
| A4R73                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R74                 | 0698-7200      |     | R:FXD FLM 31.6 OHM 2% 1/8W                  | 28480    | 0698-7200       |
| A4R75                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R76                 | 0757-1090      |     | R:FXD MET FLM 261 OHM 1% 1/2W               | 28480    | 0757-1090       |
| A4R77                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R78                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R79                 | 0698-7202      |     | R:FXD FLM 38.3 OHM 2% 1/8W                  | 28480    | 0698-7202       |
| A4R80                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R81 *               | 0698-7270      |     | R:FXD FLM 26.1K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7270       |
| A4R82 *               | 0698-7278      |     | R:FXD FLM 56.2K OHM 2% 1/8W(FACTORY SELECT) | 28480    | 0698-7278       |
| A4R83                 | 0698-7214      |     | R:FXD FLM 121 OHM 2% 1/8W                   | 28480    | 0698-7214       |
| A4R84                 | 0698-7223      |     | R:FXD FLM 287 OHM 2% 1/8W                   | 28480    | 0698-7223       |
| A4R85                 | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R86                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R87                 | 0698-7200      |     | R:FXD FLM 31.6 OHM 2% 1/8W                  | 28480    | 0698-7200       |
| A4R88                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R89                 | 0698-7227      |     | R:FXD FLM 422 OHM 2% 1/8W                   | 28480    | 0698-7227       |
| A4R90                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R91                 | 0757-1090      |     | R:FXD MET FLM 261 OHM 1% 1/2W               | 28480    | 0757-1090       |
| A4R92                 | 0698-7240      |     | R:FXD MET FLM 1.47K OHM 2% 1/8W             | 28480    | 0698-7240       |
| A4R93                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R94                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R95                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R96                 | 0698-7256      |     | R:FXD FLM 6810 OHM 2% 1/8W                  | 28480    | 0698-7256       |
| A4R97                 | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R98                 | 0698-7202      |     | R:FXD FLM 38.3 OHM 2% 1/8W                  | 28480    | 0698-7202       |
| A4R99                 | 0698-7231      |     | R:FXD FLM 619 OHM 2% 1/8W                   | 28480    | 0698-7231       |
| A4R100                | 0698-7212      |     | R:FXD FLM 100 OHM 2% 1/8W                   | 28480    | 0698-7212       |
| A4R101                | 0698-7214      |     | R:FXD FLM 121 OHM 2% 1/8W                   | 28480    | 0698-7214       |
| A4R102                | 0698-7267      |     | R:FXD MET FLM 19.6K OHM 2% 1/8W             | 28480    | 0698-7267       |
| A4R103                | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R104                | 0698-7253      |     | R:FXD MET FLM 5.11K OHM 2% 1/8W             | 28480    | 0698-7253       |
| A4R105                | 0698-7227      |     | R:FXD FLM 422 OHM 2% 1/8W                   | 28480    | 0698-7227       |
| A4R106                | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W                    | 28480    | 0698-7236       |
| A4R107                | 0698-7267      |     | R:FXD MET FLM 19.6K OHM 2% 1/8W             | 28480    | 0698-7267       |
| A4R108                | 0698-7240      |     | R:FXD MET FLM 1.47K OHM 2% 1/8W             | 28480    | 0698-7240       |
| A4R109                | 0698-7244      |     | R:FXD FLM 2.15K OHM 2% 1/8W                 | 28480    | 0698-7244       |
| A4R110                | 0698-7265      | 1   | R:FXD FLM 16.2K OHM 2% 1/8W                 | 28480    | 0698-7265       |
| A4R111                | 0698-7284      |     | R:FXD FLM 100K OHM 2% 1/8W                  | 28480    | 0698-7284       |
| A4R112                | 0698-7256      |     | R:FXD FLM 6810 OHM 2% 1/8W                  | 28480    | 0698-7256       |

See introduction to this section for ordering information

\* RECOMMENDED REPLACEMENT, SEE PAGE 5-39.

Table 6-3. Replaceable Parts

| Reference Designation                          | HP Part Number                                                  | Qty         | Description                                                                                                                                                                              | Mfr Code                                  | Mfr Part Number                                                                                  |
|------------------------------------------------|-----------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------|
| A4R113<br>A4R114<br>A4R115<br>A4R116<br>A4R117 | 0698-7244<br>0698-7224<br>0698-7212<br>2100-2574<br>0698-7244   | 1<br>1      | R:FXD FLM 2.15K OHM 2% 1/8W<br>R:FXD FLM 316 OHM 2% 1/8W<br>R:FXD FLM 100 OHM 2% 1/8W<br>R:VAR CERMET 500 OHM 10% LIN 1/2W<br>R:FXD FLM 2.15K OHM 2% 1/8W                                | 28480<br>28480<br>28480<br>28480<br>28480 | 0698-7244<br>0698-7224<br>0698-7212<br>2100-2574<br>0698-7244                                    |
| A4R118<br>A4R119<br>A4R120<br>A4R121<br>A4R122 | 0698-7236<br>0698-7212<br>0698-7244<br>0698-3403<br>0698-7236   | 1           | R:FXD FLM 1K OHM 2% 1/8W<br>R:FXD FLM 100 OHM 2% 1/8W<br>R:FXD FLM 2.15K OHM 2% 1/8W<br>R:FXD MET FLM 348 OHM 1% 1/2W<br>R:FXD FLM 1K OHM 2% 1/8W                                        | 28480<br>28480<br>28480<br>28480<br>28480 | 0698-7236<br>0698-7212<br>0698-7244<br>0698-3403<br>0698-7236                                    |
| A4R123<br>A4R124<br>A4R125<br>A4R125<br>A4R126 | 2100-2633<br>0698-7236<br>0698-7229<br>0698-7240                | 1<br>1      | R:VAR CERMET 1K OHM 10% LIN 1/2W<br>R:FXD FLM 1K OHM 2% 1/8W<br>R:FXD FLM 511 OHM 2% 1/8W<br>FACTORY SELECTED PART<br>R:FXD MET FLM 1.47K OHM 2% 1/8W                                    | 28480<br>28480<br>28480<br>28480<br>28480 | 2100-2633<br>0698-7236<br>0698-7229<br>0698-7240                                                 |
| A4R127<br>A4R128<br>A4R129<br>A4R130<br>A4R131 | 0698-7244<br>0698-7253<br>2100-2522<br>0698-7244<br>0698-7188   | 2<br>1      | R:FXD FLM 2.15K OHM 2% 1/8W<br>R:FXD MET FLM 5.11K OHM 2% 1/8W<br>R:VAR CERMET 10K OHM 10% LIN 1/2W<br>R:FXD FLM 2.15K OHM 2% 1/8W<br>R:FXD MET FLM 10 OHM 2% 1/8W                       | 28480<br>28480<br>28480<br>28480<br>28480 | 0698-7244<br>0698-7253<br>2100-2522<br>0698-7244<br>0698-7188                                    |
| A4R132<br>A4R133<br>A4TP1<br>A4TP10<br>A4W1    | 2100-2489<br>2100-1788<br>0360-0124<br>0360-0124<br>08552-60128 | 2<br>1<br>2 | R:VAR FLM 5K OHM 10% LIN 1/2W<br>R:VAR FLM 500 OHM 10% LIN 1/2W<br>TERMINAL PIN:ROUND<br>TERMINAL PIN:ROUND<br>CABLE ASSY:CRYSTAL                                                        | 28480<br>28480<br>28480<br>28480<br>28480 | 2100-2489<br>2100-1788<br>0360-0124<br>0360-0124<br>08552-60128                                  |
| A4W2<br>A4Y1<br>A4Y2<br>A4Y3<br>A4Y4           | 08552-60128<br>0410-0404                                        | 1           | CABLE ASSY:CRYSTAL<br>CRYSTAL:QUARTZ,MATCHED SET OF FIVE<br>N.S.R. PART OF A4Y1<br>N.S.R. PART OF A4Y1<br>N.S.R. PART OF A4Y1                                                            | 28480<br>00136                            | 08552-60128<br>0410-0404                                                                         |
| A4Y5<br>A5                                     | 08552-60107                                                     | 1           | N.S.R. PART OF A4Y1<br>BOARD ASSY:POWER SUPPLY                                                                                                                                           | 28480                                     | 08552-60107                                                                                      |
| A5C1<br>A5C2                                   | 0160-0163<br>0180-0116                                          | 2           | C:FXD MY 0.033 UF 10% 200VDCW<br>C:FXD ELECT 6.8 UF 10% 35VDCW                                                                                                                           | 56289<br>56289                            | 192P33392-PTS<br>150D685X903582-DYS                                                              |
| A5C3<br>A5C4<br>A5C5<br>A5C6<br>A5C7           | 0160-2208<br>0180-1747<br>0160-0162<br>0180-0116<br>0180-1747   | 1<br>2<br>5 | C:FXD MICA 330 PF 5% 300VDCW<br>C:FXD ELECT 150 UF 20% 15VDCW<br>C:FXD MY 0.022 UF 10% 200VDCW<br>C:FXD ELECT 6.8 UF 10% 35VDCW<br>C:FXD ELECT 150 UF 20% 15VDCW                         | 28480<br>28480<br>56289<br>56289<br>28480 | 0160-2208<br>0180-1747<br>192P22392-PTS<br>150D685X903582-DYS<br>0180-1747                       |
| A5C8<br>A5C9<br>A5C10<br>A5C11<br>A5C12        | 0180-0116<br>0160-0153<br>0180-0197<br>0150-0121<br>0180-0197   | 4           | C:FXD ELECT 6.8 UF 10% 35VDCW<br>C:FXD MY 0.001 UF 10% 200VDCW<br>C:FXD ELECT 2.2 UF 10% 20VDCW<br>C:FXD CER 0.1 UF +80-20% 50VDCW<br>C:FXD ELECT 2.2 UF 10% 20VDCW                      | 56289<br>56289<br>56289<br>56289<br>56289 | 150D685X903582-DYS<br>192P19292-PTS<br>150D225X9020A2-DYS<br>5C5081S-CML<br>150D225X9020A2-DYS   |
| A5C13<br>A5C14<br>A5C15<br>A5C16<br>A5C17, C18 | 0160-2211<br>0180-0058<br>0180-0058<br>0180-2215<br>0160-2055   | 1<br>3<br>1 | C:FXD MICA 510 PF 5% 300VDCW<br>C:FXD AL ELECT 50 UF +75-10% 25VDCW<br>C:FXD AL ELECT 50 UF +75-10% 25VDCW<br>C:FXD AL ELECT 170 UF +75-10% 170VDCW<br>C:FXD CER 0.01 UF +80-20% 100VDCW | 28480<br>56289<br>56289<br>56289<br>56289 | 0160-2211<br>30D506G025CC2-DSM<br>30D506G025CC2-DSM<br>30D177G0150D2-DSM<br>C023F101F103Z522-CDH |
| A5C19<br>A5C20<br>A5CR1<br>A5CR2<br>A5CR3      | 0180-0058<br>0160-2055<br>1901-0416<br>1902-3104<br>1901-0416   | 8<br>1      | C:FXD AL ELECT 50UF +75-10% 25VDCW<br>C:FXD CER 0.01 UF +80-20% 100VDCW<br>DIODE:SILICON 200PIV 3A<br>DIODE:BREAKDOWN 5.62V 5%<br>DIODE:SILICON 200PIV 3A                                | 56289<br>56289<br>28480<br>04713<br>28480 | 30D506G025CC2-DSM<br>C023F101F103Z522-CDH<br>1901-0416<br>SZ10939-110<br>1901-0416               |
| A5CR4<br>A5CR5<br>A5CR6<br>A5CR7<br>A5CR8      | 1884-0012<br>1902-3268<br>1902-0033<br>1901-0416<br>1901-0416   | 2<br>1<br>2 | RECTIFIER:SILICON CONTROLLED 2N3528<br>DIODE BREAKDOWN:26.1V 5%<br>DIODE:BREAKDOWN 6.2V<br>DIODE:SILICON 200PIV 3A<br>DIODE:SILICON 200PIV 3A                                            | 02735<br>28480<br>04713<br>28480<br>28480 | 2N3528<br>1902-3268<br>1N823<br>1901-0416<br>1901-0416                                           |
| A5CR9<br>A5CR10<br>A5CR11<br>A5CR12<br>A5CR13  | 1901-0416<br>1884-0012<br>1902-3256<br>1902-0040<br>1901-0416   | 1<br>1      | DIODE:SILICON 200PIV 3A<br>RECTIFIER:SILICON CONTROLLED 2N3528<br>DIODE:BREAKDOWN SILICON 23.7V 5%<br>DIODE BREAKDOWN:14.0V 5%<br>DIODE:SILICON 200PIV 3A                                | 28480<br>02735<br>28480<br>28480<br>28480 | 1901-0416<br>2N3528<br>1902-3256<br>1902-0040<br>1901-0416                                       |
| A5CR14<br>A5CR15<br>A5CR16<br>A5CR17<br>A5CR18 | 1902-0033<br>1901-0416<br>1901-0025<br>1902-3070<br>1902-3070   | 13<br>2     | DIODE:BREAKDOWN 6.2V<br>DIODE:SILICON 200PIV 3A<br>DIODE:SILICON 100MA/1V<br>DIODE:BREAKDOWN 4.22V 5%<br>DIODE:BREAKDOWN 4.22V 5%                                                        | 04713<br>28480<br>07263<br>04713<br>04713 | 1N823<br>1901-0416<br>FD 2387<br>SZ10939-74<br>SZ10939-74                                        |
| A5Q1<br>A5Q2<br>A5Q3<br>A5Q4<br>A5Q5           | 1854-0071<br>1853-0020<br>1854-0071<br>1854-0071<br>1854-0071   |             | TSTR:SI NPN(SELECTED FROM 2N3704)<br>TSTR:SI NPN(SELECTED FROM 2N3702)<br>TSTR:SI NPN(SELECTED FROM 2N3704)<br>TSTR:SI NPN(SELECTED FROM 2N3704)<br>TSTR:SI NPN(SELECTED FROM 2N3704)    | 28480<br>28480<br>28480<br>28480<br>28480 | 1854-0071<br>1853-0020<br>1854-0071<br>1854-0071<br>1854-0071                                    |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----------------------------------|----------|-----------------|
| A506                  | 1854-0071      | 2   | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A507                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A508                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A509                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5010                 | 1854-0221      |     | TSTR:SI NPN(REPL.BY 2N4044)       | 28480    | 1854-0221       |
| A5011                 | 1853-0020      | 1   | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5012                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5012                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5013                 | 1854-0221      |     | TSTR:SI NPN(REPL.BY 2N4044)       | 28480    | 1854-0221       |
| A5014                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5015                 | 1853-0006      | 1   | TSTR:SI PNP                       | 80131    | 2N3134          |
| A5016                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5017                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5018                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5019                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5020                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5021                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5022                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5023                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5024                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5025                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A5026                 | 1854-0003      |     | TSTR:SI NPN(SELECTED FROM 2N1711) | 28480    | 1854-0003       |
| A5027                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A5R1                  |                |     | NOT ASSIGNED                      |          |                 |
| A5R2                  | 0698-3420      |     | R:FXD MET FLM 34.8K OHM 1% 1/2W   | 28480    | 0698-3420       |
| A5R3                  | 0764-0018      | 1   | R:FXD MET FLM 4700 OHM 5% 2W      | 28480    | 0764-0018       |
| A5R4                  | 0757-0276      |     | R:FXD MET FLM 61.9 OHM 1% 1/8W    | 28480    | 0757-0276       |
| A5R5                  | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W     | 28480    | 0757-0416       |
| A5R6                  | 0757-0405      |     | R:FXD MET FLM 162 OHM 1% 1/8W     | 28480    | 0757-0405       |
| A5R7                  | 0698-3408      |     | R:FXD MET FLM 2.15K OHM 1% 1/2W   | 28480    | 0698-3408       |
| A5R8                  | 0699-0001      | 2   | R:FXD COMP 2.7 OHM 10% 1/2W       | 01121    | EB 27G1         |
| A5R9                  | 0757-0278      |     | R:FXD MET FLM 1.78K OHM 1% 1/8W   | 28480    | 0757-0278       |
| A5R10                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A5R11                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W   | 28480    | 0757-0460       |
| A5R12                 | 0698-3150      |     | R:FXD MET FLM 2.37K OHM 1% 1/8W   | 28480    | 0698-3150       |
| A5R13                 | 0698-3136      | 5   | R:FXD MET FLM 17.8K OHM 1% 1/8W   | 28480    | 0698-3136       |
| A5R14                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W   | 28480    | 0757-0460       |
| A5R15                 | 0698-0089      |     | R:FXD MET FLM 1780 OHM 1% 1/2W    | 28480    | 0698-0089       |
| A5R16                 | 2100-1756      |     | R:VAR WM 200 OHM 5% TYPE V 1W     | 28480    | 2100-1756       |
| A5R17                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W     | 28480    | 0757-0420       |
| A5R18                 |                | 17  | NOT ASSIGNED                      |          |                 |
| A5R19                 | 0757-0276      |     | R:FXD MET FLM 61.9 OHM 1% 1/8W    | 28480    | 0757-0276       |
| A5R20                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W   | 28480    | 0698-3419       |
| A5R21                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084       |
| A5R22                 | 0757-0405      |     | R:FXD MET FLM 162 OHM 1% 1/8W     | 28480    | 0757-0405       |
| A5R23                 | 0757-0416      | 1   | R:FXD MET FLM 511 OHM 1% 1/8W     | 28480    | 0757-0416       |
| A5R24                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A5R25                 | 0757-0317      |     | R:FXD MET FLM 1.33K OHM 1% 1/8W   | 28480    | 0757-0317       |
| A5R26                 | 0699-0001      |     | R:FXD COMP 2.7 OHM 10% 1/2W       | 01121    | EB 27G1         |
| A5R27                 | 0757-0199      |     | R:FXD MET FLM 21.5K OHM 1% 1/8W   | 28480    | 0757-0199       |
| A5R28                 | 0757-0441      | 4   | R:FXD MET FLM 8.25K OHM 1% 1/8W   | 28480    | 0757-0441       |
| A5R29                 | 0757-0418      |     | R:FXD MET FLM 619 OHM 1% 1/8W     | 28480    | 0757-0418       |
| A5R30                 | 0757-0199      |     | R:FXD MET FLM 21.5K OHM 1% 1/8W   | 28480    | 0757-0199       |
| A5R31                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W     | 28480    | 0698-3446       |
| A5R32                 | 2100-1756      |     | R:VAR WM 200 OHM 5% TYPE V 1W     | 28480    | 2100-1756       |
| A5R33                 | 0757-0420      | 5   | R:FXD MET FLM 750 OHM 1% 1/8W     | 28480    | 0757-0420       |
| A5R34                 | 0757-0199      |     | R:FXD MET FLM 21.5K OHM 1% 1/8W   | 28480    | 0757-0199       |
| A5R35                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465       |
| A5R36                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465       |
| A5R37                 | 0698-3453      |     | R:FXD MET FLM 196K OHM 1% 1/8W    | 28480    | 0698-3453       |
| A5R38                 | 0698-3453      | 1   | R:FXD MET FLM 196K OHM 1% 1/8W    | 28480    | 0698-3453       |
| A5R39                 | 0698-4519      |     | R:FXD FLM 140K OHM 1% 1/8W        | 28480    | 0698-4519       |
| A5R40                 | 0698-3458      |     | R:FXD MET FLM 348K OHM 1% 1/8W    | 28480    | 0698-3458       |
| A5R41                 | 0698-3453      |     | R:FXD MET FLM 196K OHM 1% 1/8W    | 28480    | 0698-3453       |
| A5R42                 | 0698-3447      |     | R:FXD MET FLM 422 OHM 1% 1/8W     | 28480    | 0698-3447       |
| A5R43                 | 0757-0444      | 1   | R:FXD MET FLM 12.1K OHM 1% 1/8W   | 28480    | 0757-0444       |
| A5R44                 | 0757-0441      |     | R:FXD MET FLM 8.25K OHM 1% 1/8W   | 28480    | 0757-0441       |
| A5R45                 | 2100-1760      |     | R:VAR WM 5K OHM 5% TYPE V 1W      | 28480    | 2100-1760       |
| A5R46                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W     | 28480    | 0698-3444       |
| A5R47                 | 0757-0400      |     | R:FXD MET FLM 90.9 OHM 1% 1/8W    | 28480    | 0757-0400       |
| A5R48                 | 0698-3450      | 6   | R:FXD MET FLM 42.2K OHM 1% 1/8W   | 28480    | 0698-3450       |
| A5R49                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W     | 28480    | 0757-0401       |
| A5R50                 | 0698-3162      |     | R:FXD MET FLM 46.4K OHM 1% 1/8W   | 28480    | 0698-3162       |
| A5R51                 | 0757-0402      |     | R:FXD MET FLM 110 OHM 1% 1/8W     | 28480    | 0757-0402       |
| A5R52                 | 0757-0458      |     | R:FXD MET FLM 51.1K OHM 1% 1/8W   | 28480    | 0757-0458       |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                  | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|----------------------------------------------|----------|----------------------|
| A5R53                 | 0757-0403      | 1   | R:FXD MET FLM 121 OHM 1% 1/8W                | 28480    | 0757-0403            |
| A5R54                 | 0757-0459      | 3   | R:FXD MET FLM 56.2K OHM 1% 1/8W              | 28480    | 0757-0459            |
| A5R55                 | 0698-3437      |     | R:FXD MET FLM 133 OHM 1% 1/8W                | 28480    | 0698-3437            |
| A5R56                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W              | 28480    | 0757-0460            |
| A5R57                 | 0698-3438      |     | R:FXD MET FLM 147 OHM 1% 1/8W                | 28480    | 0698-3438            |
| A5R58                 | 0757-0461      | 3   | R:FXD MET FLM 68.1K OHM 1% 1/8W              | 28480    | 0757-0461            |
| A5R59                 | 0757-0405      |     | R:FXD MET FLM 162 OHM 1% 1/8W                | 28480    | 0757-0405            |
| A5R60                 | 0757-0462      | 1   | R:FXD MET FLM 75.0K OHM 1% 1/8W              | 28480    | 0757-0462            |
| A5R61                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W              | 28480    | 0757-0438            |
| A5R62                 | 0698-0085      | 3   | R:FXD MET FLM 2.61K OHM 1% 1/8W              | 28480    | 0698-0085            |
| A5R63                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W                | 28480    | 0757-0401            |
| A5R64                 | 0698-3439      | 1   | R:FXD MET FLM 178 OHM 1% 1/8W                | 28480    | 0698-3439            |
| A5R65                 | 0757-0463      | 3   | R:FXD MET FLM 82.5K OHM 1% 1/8W              | 28480    | 0757-0463            |
| A5R66                 | 0698-3440      | 4   | R:FXD MET FLM 196 OHM 1% 1/8W                | 28480    | 0698-3440            |
| A5R67                 | 0757-0464      | 2   | R:FXD MET FLM 90.9K OHM 1% 1/8W              | 28480    | 0757-0464            |
| A5R68                 | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W                | 28480    | 0757-0416            |
| A5R69                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W               | 28480    | 0757-0465            |
| A5R70                 | 0698-3150      |     | R:FXD MET FLM 2.37K OHM 1% 1/8W              | 28480    | 0698-3150            |
| A5R71                 | 2100-1760      |     | R:VAR WW 5K OHM 5% TYPE V 1W                 | 28480    | 2100-1760            |
| A5R72                 | 0698-3150      |     | R:FXD MET FLM 2.37K OHM 1% 1/8W              | 28480    | 0698-3150            |
| A5R73                 |                |     | NOT ASSIGNED                                 |          |                      |
| A5R74                 | 0757-0453      | 1   | R:FXD MET FLM 30.1K OHM 1% 1/8W              | 28480    | 0757-0453            |
| A5R75                 | 2100-2489      |     | R:VAR FLM 5K OHM 10% LIN 1/2W                | 28480    | 2100-2489            |
| A5R76                 | 0757-0122      | 1   | R:FXD MET FLM 27.1K OHM 1% 1/8W              | 28480    | 0757-0122            |
| A5R77                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W              | 28480    | 0757-0442            |
| A5R78                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W              | 28480    | 0757-0279            |
| A5R79                 | 0757-0795      | 1   | R:FXD MET FLM 75 OHM 1% 1/2W                 | 28480    | 0757-0795            |
| A5TP1                 | 0360-1514      |     | TERMINAL PIN:SQUARE                          | 28480    | 0360-1514            |
| A5TP2                 | 0360-1514      |     | TERMINAL PIN:SQUARE                          | 28480    | 0360-1514            |
| A5TP3                 | 0360-1514      |     | TERMINAL PIN:SQUARE                          | 28480    | 0360-1514            |
| A5U1, U2              | 1826-0013      | 5   | IC:LINEAR                                    | 28480    | 1826-0013            |
| A5Z1                  | 9170-0016      | 1   | BEAD, MAGNETIC SHIELDING                     | 02114    | 56-590-65/38         |
| A5Z2                  | 9170-0029      | 1   | CORE, MAG, SHIELDING BEAD .1380D .047 ID     | 02114    | 56-590-65A2/4A       |
| A6                    | 08552-60137    | 1   | BOARD ASSY:SCAN GENERATOR(DELETE-OPT H01-02) | 28480    | 08552-60137          |
| A6                    | 08552-62006    | 1   | BOARD ASSY:SCAN GEN(OPT H01-H02 ONLY)        | 28480    | 08552-62006          |
| A6C1                  | 0180-1743      | 1   | C:FXD ELECT 0.1 UF 10% 35VDCW                | 56289    | 1500104X9035A2-DYS   |
| A6C2                  | 0140-0198      | 1   | C:FXD MICA 200 PF 5%                         | 72136    | RDM15F201J3C         |
| A6C3                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW                | 56289    | 1500685X9035B2-DYS   |
| A6C4                  | 0160-2218      | 1   | C:FXD MICA 1000 PF 5%                        | 28480    | 0160-2218            |
| A6C5                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW                | 56289    | 1500685X9035B2-DYS   |
| A6C6                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW                | 56289    | 1500685X9035B2-DYS   |
| A6C7                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW            | 56289    | C023F101F103ZS22-CDH |
| A6C8                  | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW            | 56289    | C023F101F103ZS22-CDH |
| A6C9                  | 0160-0939      | 1   | C: FXD MICA 430 PF 5% 300 VDCW               | 28480    | 0160-0939            |
| A6C10                 | 0160-0168      | 1   | C:FXD MY 0.1 UF 10% 200VDCW                  | 56289    | 192P10492-PTS        |
| A6C11                 | 0160-0153      |     | C:FXD MY 0.001 UF 10% 200VDCW                | 56289    | 192P10292-PTS        |
| A6C12                 | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW                | 56289    | 1500685X9035B2-DYS   |
| A6C13                 | 0180-2195      | 1   | C:FXD ELECT 15 UF 10% 35VDCW                 | 28480    | 0180-2195            |
| A6C13                 |                |     | FACTORY SELECTED PART                        |          |                      |
| A6C14                 | 0180-2268      | 1   | C:FXD TA ELECT 140 UF 10% 30VDCW             | 56289    | 1090147X9030T2-DYP   |
| A6C15                 | 0121-0059      |     | C:VAR CER 2-8 PF 300VDCW                     | 28480    | 0121-0059            |
| A6C16                 | 0150-0050      | 3   | C:FXD CER 1000 PF +80-20% 1000VDCW           | 56289    | C0678102E102ZS26-CDH |
| A6C17                 | 0160-2205      | 1   | C:FXD MICA 120 PF 5%                         | 28480    | 0160-2205            |
| A6C18                 | 0150-0050      |     | C:FXD CER 1000 PF +80-20% 1000VDCW           | 56289    | C0678102E102ZS26-CDH |
| A6C19                 | 0160-2257      |     | C:FXD CER 10 PF 5% 500VDCW                   | 72982    | 3C1-000-COH0-100J    |
| A6C20                 | 0160-2238      | 1   | C:FXD CER 1.5 PF 500VDCW                     | 72982    | 301-000-COK0-159C    |
| A6C21                 | 0150-0050      |     | C:FXD CER 1000 PF +80-20% 1000VDCW           | 56289    | C0678102E102ZS26-CDH |
| A6C22                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW            | 56289    | C023F101F103ZS22-CDH |
| A6CR1                 | 1902-3171      | 1   | DIODE BREAKDOWN:11.0V 5%                     | 28480    | 1902-3171            |
| A6CR2                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR3                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR4                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR5                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR6                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR7                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR8                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR9                 | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR10                | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR11                | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR12                | 1902-0785      | 1   | DIODE: BREAKDOWN 9.09V 5%                    | 04713    | 1N936                |
| A6CR13                | 1902-0202      | 1   | DIODE BREAKDOWN:15.0V 5% 1W                  | 28480    | 1902-0202            |
| A6CR14                | 1902-0556      | 1   | DIODE: BREAKDOWN 20.0V 5% 1W                 | 28480    | 1902-0556            |
| A6CR15                | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6CR16                | 1901-0025      |     | DIODE:SILICON 100MA/1V                       | 07263    | FD 2387              |
| A6L1                  | 9140-0210      |     | COIL/CHOKE 100 UH 5%                         | 82142    | 15-1315-12J          |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----------------------------------|----------|-----------------|
| A6L2                  | 9140-0210      |     | COIL/CHOKE 100 UH 5%              | 82142    | 15-1315-12J     |
| A6L3                  | 9140-0210      |     | COIL/CHOKE 100 UH 5%              | 82142    | 15-1315-12J     |
| A6L4                  | 9100-2267      | 1   | COIL/CHOKE 18 UH                  | 28480    | 9100-2267       |
| A6L5                  | 9100-2259      | 1   | COIL/CHOKE 1.50 UH 10%            | 99800    | 1025-24         |
| A6MP1                 | 08552-0024     | 1   | SHIELD:CAN,SCAN GENERATOR         | 28480    | 08552-0024      |
| A6Q1                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q2                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q3                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A6Q4                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q5                  | 1854-0039      | 2   | TSTR:SI NPN                       | 80131    | 2N3053          |
| A6Q6                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A6Q7                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q8                  | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A6Q9                  | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q10                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A6Q11                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q12                 | 1854-0232      | 12  | TSTR:SI NPN(SELECTED FROM 2N3440) | 28480    | 1854-0232       |
| A6Q13                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A6Q14                 | 1853-0020      |     | TSTR:SI PNP(SELECTED FROM 2N3702) | 28480    | 1853-0020       |
| A6Q15                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q16                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A6Q17                 | 1854-0019      |     | TSTR:SI NPN                       | 28480    | 1854-0019       |
| A6Q18                 | 1854-0019      |     | TSTR:SI NPN                       | 28480    | 1854-0019       |
| A6R1                  | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A6R2                  | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W      | 28480    | 0757-0346       |
| A6R3                  | 0757-0461      |     | R:FXD MET FLM 68.1K OHM 1% 1/8W   | 28480    | 0757-0461       |
| A6R4                  | 0698-3154      | 6   | R:FXD MET FLM 4.22K OHM 1% 1/8W   | 28480    | 0698-3154       |
| A6R5                  | 0757-0463      |     | R:FXD MET FLM 82.5K OHM 1% 1/8W   | 28480    | 0757-0463       |
| A6R6                  | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A6R7                  | 0757-0418      |     | R:FXD MET FLM 619 OHM 1% 1/8W     | 28480    | 0757-0418       |
| A6R8                  | 0757-0418      |     | R:FXD MET FLM 619 OHM 1% 1/8W     | 28480    | 0757-0418       |
| A6R9                  | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A6R10                 | 0698-3136      |     | R:FXD MET FLM 17.8K OHM 1% 1/8W   | 28480    | 0698-3136       |
| A6R11                 | 0757-0441      |     | R:FXD MET FLM 8.25K OHM 1% 1/8W   | 28480    | 0757-0441       |
| A6R12                 | 2100-1760      |     | R:VAR WW 5K OHM 5% TYPE V 1W      | 28480    | 2100-1760       |
| A6R13                 | 0698-3455      | 2   | R:FXD MET FLM 261K OHM 1% 1/8W    | 28480    | 0698-3455       |
| A6R14                 | 0757-0290      | 6   | R:FXD MET FLM 6.19K OHM 1% 1/8W   | 28480    | 0757-0290       |
| A6R15                 | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W     | 28480    | 0757-0416       |
| A6R16                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465       |
| A6R17                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A6R18                 | 0698-3136      |     | R:FXD MET FLM 17.8K OHM 1% 1/8W   | 28480    | 0698-3136       |
| A6R19                 | 0698-3454      | 2   | R:FXD MET FLM 215K OHM 1% 1/8W    | 28480    | 0698-3454       |
| A6R20                 | 0698-3162      |     | R:FXD MET FLM 46.4K OHM 1% 1/8W   | 28480    | 0698-3162       |
| A6R21                 | 0757-0418      |     | R:FXD MET FLM 619 OHM 1% 1/8W     | 28480    | 0757-0418       |
| A6R22                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W   | 28480    | 0757-0442       |
| A6R23                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A6R24                 | 0757-0123      | 3   | R:FXD MET FLM 34.8K OHM 1% 1/8W   | 28480    | 0757-0123       |
| A6R25                 | 0698-3451      | 3   | R:FXD MET FLM 133K OHM 1% 1/8W    | 28480    | 0698-3451       |
| A6R26                 | 0698-3154      |     | R:FXD MET FLM 4.22K OHM 1% 1/8W   | 28480    | 0698-3154       |
| A6R27                 | 0698-3451      |     | R:FXD MET FLM 133K OHM 1% 1/8W    | 28480    | 0698-3451       |
| A6R28                 | 0757-0123      |     | R:FXD MET FLM 34.8K OHM 1% 1/8W   | 28480    | 0757-0123       |
| A6R29                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280       |
| A6R30                 | 0698-3454      |     | R:FXD MET FLM 215K OHM 1% 1/8W    | 28480    | 0698-3454       |
| A6R31                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W   | 28480    | 0757-0290       |
| A6R32                 | 0698-3158      | 2   | R:FXD MET FLM 23.7K OHM 1% 1/8W   | 28480    | 0698-3158       |
| A6R33                 | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W     | 28480    | 0757-0416       |
| A6R34                 | 0698-3152      | 6   | R:FXD MET FLM 3.48K OHM 1% 1/8W   | 28480    | 0698-3152       |
| A6R35                 | 0698-3156      | 2   | R:FXD MET FLM 14.7K OHM 1% 1/8W   | 28480    | 0698-3156       |
| A6R36                 | 0698-3136      |     | R:FXD MET FLM 17.8K OHM 1% 1/8W   | 28480    | 0698-3136       |
| A6R37                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W   | 28480    | 0757-0290       |
| A6R38                 | 0757-0123      |     | R:FXD MET FLM 34.8K OHM 1% 1/8W   | 28480    | 0757-0123       |
| A6R39                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W   | 28480    | 0757-0442       |
| A6R40                 | 0757-0418      |     | R:FXD MET FLM 619 OHM 1% 1/8W     | 28480    | 0757-0418       |
| A6R41                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A6R42                 | 0698-0083      | 6   | R:FXD MET FLM 1.96K OHM 1% 1/8W   | 28480    | 0698-0083       |
| A6R43                 | 0698-3136      |     | R:FXD MET FLM 17.8K OHM 1% 1/8W   | 28480    | 0698-3136       |
| A6R44                 | 0757-0289      | 1   | R:FXD MET FLM 13.3K OHM 1% 1/8W   | 28480    | 0757-0289       |
| A6R45                 | 0698-3451      |     | R:FXD MET FLM 133K OHM 1% 1/8W    | 28480    | 0698-3451       |
| A6R46                 | 2100-1758      |     | R:VAR WW 1K OHM 5% TYPE V 1W      | 28480    | 2100-1758       |
| A6R47                 | 0698-3160      | 2   | R:FXD MET FLM 31.6K OHM 1% 1/8W   | 28480    | 0698-3160       |
| A6R48                 | 0698-0085      |     | R:FXD MET FLM 2.61K OHM 1% 1/8W   | 28480    | 0698-0085       |
| A6R49                 | 0698-0085      |     | R:FXD MET FLM 2.61K OHM 1% 1/8W   | 28480    | 0698-0085       |
| A6R50                 | 2100-1757      |     | R:VAR WW 500 OHM 5% TYPE V 1W     | 28480    | 2100-1757       |
| A6R51                 | 0698-0083      |     | R:FXD MET FLM 1.96K OHM 1% 1/8W   | 28480    | 0698-0083       |
| A6R52                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                   | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------------------|----------|----------------------|
| A6R53                 | 0698-3154      | 1   | R:FXD MET FLM 4.22K OHM 1% 1/8W               | 28480    | 0698-3154            |
| A6R54                 | 2100-1757      |     | R:VAR WW 500 OHM 5% TYPE V 1W                 | 28480    | 2100-1757            |
| A6R55                 | 0698-7232      |     | R:FXD FLM 681 OHM 2% 1/8W                     | 28480    | 0698-7232            |
| A6R56                 | 0698-7200      |     | R:FXD FLM 31.6 OHM 2% 1/8W                    | 28480    | 0698-7200            |
| A6R57                 | 0698-7236      |     | R:FXD FLM 1K OHM 2% 1/8W(DELETE FOR H01-02)   | 28480    | 0698-7236            |
| A6R57                 | 0698-7236      |     | R:FXD 1.1K OHM 2% 1/8W(OPT H01-02)            | 28480    | 0698-7236            |
| A6R58                 | 0757-0398      |     | R:FXD 75 OHM 1% 1/8W(OPT H01-02 ONLY)         | 28480    | 0757-0398            |
| A6R58                 | 0698-7205      | 1   | R:FXD FLM 51.1 OHM 2% 1/8W(DELETE FOR H01-02) | 28480    | 0698-7205            |
| A6R59                 | 0698-7238      | 1   | R:FXD FLM 1.21K OHM 2% 1/8W                   | 28480    | 0698-7238            |
| A6R60                 | 0698-7243      | 1   | R:FXD FLM 1.96K OHM 2% 1/8W                   | 28480    | 0698-7243            |
| A6R61                 | 0757-0438      | 1   | R:FXD MET FLM 5.11K OHM 1% 1/8W               | 28480    | 0757-0438            |
| A6R62                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W                | 28480    | 0757-0465            |
| A6S1                  | 3101-0973      | 1   | SWITCH:SLIDE DPDT C.5A 125V AC/DC             | 79727    | G126-0018            |
| A6TP1                 | 0360-1514      |     | TERMINAL PIN:SQUARE                           | 28480    | 0360-1514            |
| A6TP5                 | 0360-1514      |     | TERMINAL PIN:SQUARE                           | 28480    | 0360-1514            |
| A6U1                  | 1826-0013      |     | IC:LINEAR                                     | 28480    | 1826-0013            |
| A6U2                  | 1826-0013      |     | IC:LINEAR                                     | 28480    | 1826-0013            |
| A6Y1                  | 0410-0301      | 1   | CRYSTAL:QUARTZ 30 MHZ                         | 28480    | 0410-0301            |
| A7                    | 08552-60084    | 1   | BOARD ASSY:DEFLECTOR AMPLIFIER                | 28480    | 08552-60084          |
| A7C1                  | 0180-0116      | 1   | C:FXD ELECT 6.8 UF 10% 35VDCW                 | 56289    | 150D685X903582-DYS   |
| A7C2                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW                 | 56289    | 150D685X903582-DYS   |
| A7C3                  | 0160-2265      | 1   | C:FXD CER 22 PF 5% 500VDCW                    | 72982    | 301-NP0-22PF         |
| A7C4                  | 0180-0269      |     | C:FXD ELECT 1.0 UF +50-10% 150VDCW            | 56289    | 300105F1508A2-DSM    |
| A7C5                  | 0160-3448      | 1   | C:FXD CER 1000 PF 10% 1000VDCW                | 56289    | C0678251F102KS25-CDH |
| A7C6                  | 0140-0194      | 3   | C:FXD MICA 110 PF 5%                          | 72136    | RDML5F111J3C         |
| A7C7                  | 0160-2246      | 2   | C:FXD CER 3.6+/-0.25 PF 500VDCW               | 72982    | 301-000-C0J0-369C    |
| A7C8                  | 0160-2246      | 2   | C:FXD CER 3.6+/-0.25 PF 500VDCW               | 72982    | 301-000-C0J0-369C    |
| A7C9                  | 0160-0153      |     | C:FXD MY 0.001 UF 10% 200VDCW                 | 56289    | 192P10292-PTS        |
| A7C10                 | 0160-0194      |     | C:FXD MY 0.015 UF 10%                         | 56289    | 192P15392-PTS        |
| A7C11                 | 0160-2201      |     | C:FXD MICA 51 PF 5%                           | 72136    | RDML5E510J1C         |
| A7C12                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW                 | 56289    | 150D225X9020A2-DYS   |
| A7C13                 | 0160-3450      | 1   | C:FXD CER 5000 PF 10% 250VDCW                 | 56289    | C0678251H502KS25-CDH |
| A7C14                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW                 | 56289    | 150D225X9020A2-DYS   |
| A7C15                 | 0140-0194      | 3   | C:FXD MICA 110 PF 5%                          | 72136    | RDML5F111J3C         |
| A7C16                 | 0180-1746      |     | C:FXD ELECT 15 UF 10% 20VDCW                  | 28480    | 0180-1746            |
| A7C17                 | 0160-2256      | 2   | C:FXD CER 9.1 PF 500VDCW                      | 72982    | 301-000-C0K0-919C    |
| A7C18                 | 0160-2256      | 1   | C:FXD CER 9.1 PF 500VDCW                      | 72982    | 301-000-C0K0-919C    |
| A7C19                 | 0160-2201      |     | C:FXD MICA 51 PF 5%                           | 72136    | RDML5E510J1C         |
| A7C20                 | 0160-0155      |     | C:FXD MY 0.0033 UF 10% 200VDCW                | 56289    | 192P33292-PTS        |
| A7CR1                 | 1901-0096      | 2   | DIODE:SILICON 120V                            | 01295    | UG-888               |
| A7CR2                 | 1901-0081      | 8   | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CP3                 | 1901-0081      | 2   | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR4                 | 1901-0096      |     | DIODE:SILICON 120V                            | 01295    | UG-888               |
| A7CR5                 | 1901-0081      |     | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR6                 | 1901-0081      |     | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR7                 | 1901-0081      |     | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR8                 | 1902-0683      | 2   | DIODE BREAKDOWN:100V 2%                       | 28480    | 1902-0683            |
| A7CR9                 | 1902-0683      |     | DIODE BREAKDOWN:100V 2%                       | 28480    | 1902-0683            |
| A7CR10                | 1901-0081      |     | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR11                | 1901-0081      | 2   | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR12                | 1902-0025      |     | DIODE,BREAKDOWN:10.0V 5% 400 MW               | 28480    | 1902-0025            |
| A7CR13                | 1901-0040      | 1   | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7CR14                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7CR15                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7CR16                | 1901-0081      |     | DIODE:SILICON 50 VOLTS WORKING                | 07263    | F01415               |
| A7CR17                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7CR18                | 1901-0040      | 1   | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7CR19                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7CR20                | 1901-0040      |     | DIODE:SILICON 50 MA 30 WV                     | 07263    | FDG1088              |
| A7K1                  | 0490-0399      |     | RELAY:REED ASSY, 1200 OHM 12VDC               | 28480    | 0490-0399            |
| A7L1                  | 9140-0129      |     | COIL:FXD RF 220 UH                            | 28480    | 9140-0129            |
| A7MP1                 | 1205-0011      | 2   | HEAT DISSIPATOR:FOR T0-5 AND T0-9 CASES       | 98978    | TXBF-032-025B        |
| A7MP2                 | 1205-0011      | 2   | HEAT DISSIPATOR:FOR T0-5 AND T0-9 CASES       | 98978    | TXBF-032-025B        |
| A7Q1                  | 1853-0034      |     | TSTR:SI NPN(SELECTED FROM 2N3251)             | 28480    | 1853-0034            |
| A7Q2                  | 1854-0404      | 4   | TSTR:SI NPN                                   | 28480    | 1854-0404            |
| A7Q3                  | 1853-0007      | 3   | TSTR:SI NPN                                   | 80131    | 2N3251               |
| A7Q4                  | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q5                  | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q6                  | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q7                  | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q8                  | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q9                  | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q10                 | 1854-0404      |     | TSTR:SI NPN                                   | 28480    | 1854-0404            |
| A7Q11                 | 1854-0404      |     | TSTR:SI NPN                                   | 28480    | 1854-0404            |
| A7Q12                 | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |
| A7Q13                 | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)             | 28480    | 1854-0232            |

See introduction to this section for ordering information



Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|--------------------------------------------|----------|-----------------|
| A7Q14                 | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)          | 28480    | 1854-0232       |
| A7Q15                 | 1853-0007      |     | TSTR:SI PNP                                | 80131    | 2N3251          |
| A7Q16                 | 1853-0007      |     | TSTR:SI PNP                                | 80131    | 2N3251          |
| A7Q17                 | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)          | 28480    | 1854-0232       |
| A7Q18                 | 1854-0232      |     | TSTR:SI NPN(SELECTED FROM 2N3440)          | 28480    | 1854-0232       |
| A7Q19                 | 1854-0404      |     | TSTR:SI NPN                                | 28480    | 1854-0404       |
| A7R1                  | 0757-0447      | 7   | R:FXD MET FLM 16.2K OHM 1% 1/8W            | 28480    | 0757-0447       |
| A7R2                  | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W            | 28480    | 0757-0443       |
| A7R3                  | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W            | 28480    | 0698-3152       |
| A7R4                  | 0698-0082      |     | R:FXD MET FLM 464 OHM 1% 1/8W              | 28480    | 0698-0082       |
| A7R5                  | 0757-0464      |     | R:FXD MET FLM 90.9K OHM 1% 1/8W            | 28480    | 0757-0464       |
| A7R6                  | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W            | 28480    | 0698-3152       |
| A7R7                  | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W              | 28480    | 0698-3444       |
| A7R8                  | 0698-3418      | 2   | R:FXD MET FLM 26.1K OHM 1% 1/2W            | 28480    | 0698-3418       |
| A7R9                  | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W            | 28480    | 0757-0443       |
| A7R10                 | 0698-3418      |     | R:FXD MET FLM 26.1K OHM 1% 1/2W            | 28480    | 0698-3418       |
| A7R11                 | 0757-0439      | 1   | R:FXD MET FLM 6.81K OHM 1% 1/8W            | 28480    | 0757-0439       |
| A7R12                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W               | 28480    | 0757-0280       |
| A7R13                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W              | 28480    | 0698-3444       |
| A7R14                 | 0698-3154      |     | R:FXD MET FLM 4.22K OHM 1% 1/8W            | 28480    | 0698-3154       |
| A7R15                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W            | 28480    | 0757-0460       |
| A7R16                 | 0757-0470      | 1   | R:FXD MET FLM 162K OHM 1% 1/8W             | 28480    | 0757-0470       |
| A7R17                 | 0698-3158      |     | R:FXD MET FLM 23.7K OHM 1% 1/8W            | 28480    | 0698-3158       |
| A7R18                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W              | 28480    | 0698-3444       |
| A7R19                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W              | 28480    | 0698-3445       |
| A7R20                 | 0698-3421      | 1   | R:FXD MET FLM 38.3K OHM 1% 1/2W            | 28480    | 0698-3421       |
| A7R21                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W            | 28480    | 0757-0279       |
| A7R22                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W              | 28480    | 0698-3444       |
| A7R23                 | 0698-3455      |     | R:FXD MET FLM 261K OHM 1% 1/8W             | 28480    | 0698-3455       |
| A7R24                 | 0698-3453      |     | R:FXD MET FLM 196K OHM 1% 1/8W             | 28480    | 0698-3453       |
| A7R25                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W            | 28480    | 0757-0460       |
| A7R26                 | 0757-0463      |     | R:FXD MET FLM 82.5K OHM 1% 1/8W            | 28480    | 0757-0463       |
| A7R27                 | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W            | 28480    | 0757-0443       |
| A7R28                 | 0698-3132      | 1   | R:FXD FLM 261 OHM 1% 1/8W                  | 28480    | 0698-3132       |
| A7R29                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W            | 28480    | 0757-0290       |
| A7R30                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W            | 28480    | 0757-0290       |
| A7R31                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W               | 28480    | 0757-0280       |
| A7R32                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W               | 28480    | 0757-0280       |
| A7R33                 | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W            | 28480    | 0698-3152       |
| A7R34                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W             | 28480    | 0757-0465       |
| A7R35                 | 2100-2514      | 1   | R:VAR CERMET 20K OHM 10% LIN 1/2W          | 28480    | 2100-2514       |
| A7R36                 | 0757-0421      |     | R:FXD MET FLM 825 OHM 1% 1/8W              | 28480    | 0757-0421       |
| A7R37                 | 2100-2413      | 2   | R:VAR FLM 200 OHM 10% LIN 1/2W             | 28480    | 2100-2413       |
| A7R38                 | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W            | 28480    | 0698-3152       |
| A7R39                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W            | 28480    | 0757-0290       |
| A7R40                 | 0757-0400      |     | R:FXD MET FLM 90.9 OHM 1% 1/8W             | 28480    | 0757-0400       |
| A7R41                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W            | 28480    | 0757-0279       |
| A7R42                 | 0698-3453      |     | R:FXD MET FLM 196K OHM 1% 1/8W             | 28480    | 0698-3453       |
| A7R43                 | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W            | 28480    | 0757-0443       |
| A7R44                 | 0757-0459      |     | R:FXD MET FLM 56.2K OHM 1% 1/8W            | 28480    | 0757-0459       |
| A7R45                 | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W             | 28480    | 0757-0465       |
| A7R46                 | 0698-3157      |     | R:FXD MET FLM 19.6K OHM 1% 1/8W            | 28480    | 0698-3157       |
| A7R47                 | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W            | 28480    | 0757-0443       |
| A7R48                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W              | 28480    | 0757-0420       |
| A7R49                 | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W            | 28480    | 0757-0443       |
| A7R50                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W              | 28480    | 0757-0420       |
| A7R51                 | 0698-3450      |     | R:FXD MET FLM 42.2K OHM 1% 1/8W            | 28480    | 0698-3450       |
| A7R52                 | 0698-3450      |     | R:FXD MET FLM 42.2K OHM 1% 1/8W            | 28480    | 0698-3450       |
| A7R53                 | 0764-0012      | 2   | R:FXD MET FLM 6800 OHM 5% 2W               | 28480    | 0764-0012       |
| A7R54                 | 0757-0436      | 2   | R:FXD MET FLM 4.32K OHM 1% 1/8W            | 28480    | 0757-0436       |
| A7R55                 | 0757-0436      |     | R:FXD MET FLM 4.32K OHM 1% 1/8W            | 28480    | 0757-0436       |
| A7R56                 | 0698-3150      |     | R:FXD MET FLM 2.37K OHM 1% 1/8W            | 28480    | 0698-3150       |
| A7R57                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W            | 28480    | 0757-0442       |
| A7R58                 | 0698-0083      |     | R:FXD MET FLM 1.96K OHM 1% 1/8W            | 28480    | 0698-0083       |
| A7R59                 | 0698-0083      |     | R:FXD MET FLM 1.96K OHM 1% 1/8W            | 28480    | 0698-0083       |
| A7R60                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W              | 28480    | 0698-3446       |
| A7R61                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W              | 28480    | 0698-3446       |
| A7U1                  | 1821-0001      | 2   | TSTR ARRAY:SI NPN                          | 02735    | CA3046          |
| A7U2                  | 1821-0001      |     | TSTR ARRAY:SI NPN                          | 02735    | CA3046          |
| A7U3                  | 1826-0081      | 1   | IC:LINEAR OPERATIONAL AMPLIFIER            | 12040    | LM318H          |
| A8                    | 08552-6007     | 1   | BOARD ASSY:LOG AMPL(DELETE FOR OPT H01-02) | 28480    | 08552-6007      |
| A8                    | 08552-62003    | 1   | BOARD ASSY:LOG AMPL(OPT H01-H02 ONLY)      | 28480    | 08552-62003     |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                        | Mfr Code | Mfr Part Number    |
|-----------------------|----------------|-----|------------------------------------|----------|--------------------|
| AR                    | 08552-6056     | 1   | EXCHANGE ASSY: LOG AMPLIFIER       | 28480    | 08552-6056         |
| ARC1                  | 0160-3208      | 19  | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC2                  | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC3                  | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC4                  | 0160-0162      |     | C:FXD MY 0.022 UF 10% 200VDCW      | 56289    | 192P22392-PTS      |
| ARC5                  | 0160-0162      |     | C:FXD MY 0.022 UF 10% 200VDCW      | 56289    | 192P22392-PTS      |
| ARC6                  | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC7                  | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC8                  | 0160-0339      | 1   | C:FXD MICA 534 PF 1%               | 28480    | 0160-0339          |
| ARC9                  | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC10                 | 0160-2207      | 8   | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC11                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC12                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC13                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC14                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC15                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC16                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC17                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC18                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC19                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC20                 | 0160-0162      |     | C:FXD MY 0.022 UF 10% 200VDCW      | 56289    | 192P22392-PTS      |
| ARC21                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC22                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC23                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC24                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC25                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC26                 | 0160-0162      |     | C:FXD MY 0.022 UF 10% 200VDCW      | 56289    | 192P22392-PTS      |
| ARC27                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC28                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC29                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC30                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC31                 | 0160-3048      |     | C:FXD MICA 8000 PF 1% 100VDCW      | 28480    | 0160-3048          |
| ARC32                 | 0160-3208      |     | C:FXD CER 0.025 UF +80-20% 100VDCW | 84411    | TA                 |
| ARC33                 | 0160-2207      |     | C:FXD MICA 300 PF 5%               | 28480    | 0160-2207          |
| ARC34                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW      | 56289    | 150D225X9020A2-DYS |
| ARC35                 | 0150-0121      |     | C:FXD CER 0.1 UF +80-20% 50VDCW    | 56289    | 5C5081S-CML        |
| ARC36                 | 0160-2199      |     | C:FXD MICA 30 PF 5% 300VDCW        | 28480    | 0160-2199          |
| ARC37                 | 0140-0194      |     | C:FXD MICA 110 PF 5%               | 72136    | RDML5F111J3C       |
| ARC38                 | 0140-0193      | 1   | C:FXD MICA 82 PF 5%                | 28480    | 0140-0193          |
| ARC39                 | 1901-0050      |     | DIODE:SI 200 MA AT 1V              | 07263    | FDA 6308           |
| ARC40                 | 1901-0050      |     | DIODE:SI 200 MA AT 1V              | 07263    | FDA 6308           |
| ARC41                 | 1901-0179      | 2   | DIODE:SILICON 15WV                 | 28480    | 1901-0179          |
| ARC42                 | 1901-0179      |     | DIODE:SILICON 15WV                 | 28480    | 1901-0179          |
| ARC43                 | 1901-0028      | 1   | DIODE:SILICON 0.75A 400PIV         | 04713    | SR1358-9           |
| ARC44                 | 9100-2474      | 1   | COIL/CHOKE 5.6 UH 1%               | 82142    | 10133-4            |
| ARL2                  | 9100-1641      | 10  | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL3                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL4                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL5                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL6                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL7                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL8                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL9                  | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL10                 | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL11                 | 9100-1641      |     | COIL:MOLDED CHOKE 240.0 UH         | 28480    | 9100-1641          |
| ARL12                 | 08552-6013     | 1   | INDUCTOR ASSY:VAR 10T              | 28480    | 08552-6013         |
| ARL13                 | 9100-1636      |     | COIL/CHOKE 110 UH 5%               | 28480    | 9100-1636          |
| ARL14                 | 9100-1644      | 1   | COIL/CHOKE 330 UH 5%               | 28480    | 9100-1644          |
| ARQ1                  | 1854-0351      | 25  | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ2                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ3                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ4                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ5                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ6                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ7                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ8                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ9                  | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ10                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ11                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ12                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ13                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ14                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ15                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ16                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ17                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ18                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ19                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ20                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ21                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |
| ARQ22                 | 1854-0351      |     | TSTR:SI NPN                        | 04713    | 2N3904             |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                              | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|------------------------------------------|----------|-----------------|
| A8Q23                 | 1854-0351      |     | TSTR:SI NPN                              | 04713    | 2N3904          |
| A8Q24                 | 1854-0351      |     | TSTR:SI NPN                              | 04713    | 2N3904          |
| A8Q25                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)        | 28480    | 1853-0010       |
| A8Q26                 | 1854-0039      |     | TSTR:SI NPN                              | 80131    | 2N3053          |
| A8Q27                 | 1854-0351      |     | TSTR:SI NPN                              | 04713    | 2N3904          |
| A8Q28                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)        | 28480    | 1853-0010       |
| A8Q29                 | 1853-0010      |     | TSTR:SI PNP(SELECTED FROM 2N3251)        | 28480    | 1853-0010       |
| A8R1                  | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R2                  | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R3                  | 0698-0083      |     | R:FXD MET FLM 1.96K OHM 1% 1/8W          | 28480    | 0698-0083       |
| A8R3                  |                |     | FACTORY SELECTED PART                    |          |                 |
| A8R4                  | 0698-3440      |     | R:FXD MET FLM 196 OHM 1% 1/8W            | 28480    | 0698-3440       |
| A8R5                  | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W            | 28480    | 0757-0401       |
| A8R6                  | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R7                  | 0698-6694      | 8   | R:FXD MET FLM 178 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R8                  | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R9                  | 0698-6694      | 7   | R:FXD MET FLM 619 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R10                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W          | 28480    | 0757-0279       |
| A8R11                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W          | 28480    | 0757-0279       |
| A8R12                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W            | 28480    | 0757-0401       |
| A8R13                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R14                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R15                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/3W         | 28480    | 0698-6694       |
| A8R16                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R17                 | 0698-6694      |     | R:FXD MET FLM 619 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R18                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R19                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W          | 28480    | 0757-0440       |
| A8R20                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W          | 28480    | 0757-0279       |
| A8R21                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W            | 28480    | 0757-0401       |
| A8R22                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R23                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R24                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R25                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R26                 | 0698-6694      |     | R:FXD MET FLM 619 OHM 0.25% 1/8W         | 23480    | 0698-6694       |
| A8R27                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R28                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W          | 28480    | 0757-0440       |
| A8R29                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W          | 28480    | 0757-0279       |
| A8R30                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W            | 28480    | 0757-0401       |
| A8R31                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R32                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R33                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R34                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R35                 | 0698-6694      |     | R:FXD MET FLM 619 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R36                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R37                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W          | 28480    | 0757-0440       |
| A8R38                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W          | 23480    | 0757-0279       |
| A8R39                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W            | 28480    | 0757-0401       |
| A8R40                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R41                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R42                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R43                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R44                 | 0698-6694      |     | R:FXD MET FLM 619 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R45                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R46                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W          | 28480    | 0757-0440       |
| A8R47                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W            | 28480    | 0698-3446       |
| A8R48                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W          | 28480    | 0757-0279       |
| A8R49                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R50                 | 0698-3446      |     | R:FXD 383 OHM 1% 1/8W(DELETE FOR H01-02) | 28480    | 0698-3446       |
| A8R50                 | 0698-3132      |     | R:FXD 261 OHM 1% 1/8W(OPT H01-02 ONLY)   | 28480    | 0698-3132       |
| A8R51                 | 0698-3440      |     | R:FXD 196 OHM 1% 1/8W(DELETE FOR H01-02) | 28480    | 0698-3440       |
| A8R51                 | 0757-0405      |     | R:FXD 162 OHM 1% 1/8W(OPT H01-02 ONLY)   | 28480    | 0757-0405       |
| A8R52                 | 2100-2413      |     | R:VAR FLM 200 OHM 10% LIN 1/2W           | 28480    | 2100-2413       |
| A8R53                 | 0698-3417      | 2   | R:FXD MET FLM 23.7K OHM 1% 1/8W          | 28480    | 0698-3417       |
| A8R54                 | 0698-6694      |     | R:FXD MET FLM 619 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R55                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/8W         | 28480    | 0698-6694       |
| A8R56                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R57                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W          | 28480    | 0698-3419       |
| A8R58                 | 0698-3417      |     | R:FXD MET FLM 23.7K OHM 1% 1/2W          | 28480    | 0698-3417       |
| A8R59                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W             | 28480    | 0757-0280       |
| A8R60                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W          | 28480    | 0757-0440       |
| A8R61                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W            | 28480    | 0698-3446       |
| A8R62                 | 0698-3440      |     | R:FXD 196 OHM 1% 1/8W(DELETE FOR H01-02) | 28480    | 0698-3440       |
| A8R62                 | 0698-3437      |     | R:FXD 133 OHM 1% 1/8W(OPT H01-02 ONLY)   | 28480    | 0698-3437       |
| A8P63                 | 2100-1755      |     | R:VAR WM 100 OHM 5% TYPE V 1W            | 28480    | 2100-1755       |
| A8R64                 | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W          | 28480    | 0698-0084       |
| A8R65                 | 0698-3159      | 1   | R:FXD MET FLM 26.1K OHM 1% 1/8W          | 28480    | 0698-3159       |
| A8R66                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W            | 28480    | 0757-0401       |
| A8R67                 | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W          | 28480    | 0698-3152       |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                         | Mfr Code | Mfr Part Number    |
|-----------------------|----------------|-----|-------------------------------------|----------|--------------------|
| A8R68                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W       | 28480    | 0757-0401          |
| A8R69                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W        | 28480    | 0757-0280          |
| A8R70                 | 0698-6696      |     | R:FXD MET FLM 619 OHM 0.25% 1/8W    | 28480    | 0698-6696          |
| A8R71                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/8W    | 28480    | 0698-6694          |
| A8R72                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W     | 28480    | 0698-3419          |
| A8R73                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W     | 28480    | 0698-3419          |
| A8R74                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W        | 28480    | 0757-0280          |
| A8R75                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W     | 28480    | 0757-0440          |
| A8R76                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W     | 28480    | 0757-0279          |
| A8R77                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W       | 28480    | 0757-0401          |
| A8R78                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W        | 28480    | 0757-0280          |
| A8R79                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W       | 28480    | 0757-0420          |
| A8R80                 | 0698-6694      |     | R:FXD MET FLM 178 OHM 0.25% 1/8W    | 28480    | 0698-6694          |
| A8R81                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W     | 28480    | 0698-3419          |
| A8R82                 | 0698-3419      |     | R:FXD MET FLM 31.6K OHM 1% 1/2W     | 28480    | 0698-3419          |
| A8R83                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W     | 28480    | 0757-0279          |
| A8R84                 | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W        | 28480    | 0757-0280          |
| A8R85                 | 0698-3446      |     | R:FXD MET FLM 383 OHM 1% 1/8W       | 28480    | 0698-3446          |
| A8R86                 | 0757-0346      |     | R:FXD MET FLM 10 OHM 1% 1/8W        | 28480    | 0757-0346          |
| A8R87                 | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W       | 28480    | 0757-0416          |
| A8R88                 | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W       | 28480    | 0757-0416          |
| A8R89                 | 0757-0401      |     | R:FXD MET FLM 100 OHM 1% 1/8W       | 28480    | 0757-0401          |
| A8R90                 | 0698-3450      |     | R:FXD MET FLM 42.2K OHM 1% 1/8W     | 28480    | 0698-3450          |
| A8R91                 | 0698-3154      |     | R:FXD MET FLM 4.22K OHM 1% 1/8W     | 28480    | 0698-3154          |
| A8R92                 | 0698-3156      |     | R:FXD MET FLM 14.7K OHM 1% 1/8W     | 28480    | 0698-3156          |
| A8R93                 | 0764-0012      |     | R:FXD MET FLM 6800 OHM 5% 2W        | 28480    | 0764-0012          |
| A8R94                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W      | 28480    | 0757-0394          |
| A8R95                 | 0757-0424      | 1   | R:FXD MET FLM 1.10K OHM 1% 1/8W     | 28480    | 0757-0424          |
| A8R96                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W     | 28480    | 0757-0440          |
| A8R97                 | 0698-3154      |     | R:FXD MET FLM 4.22K OHM 1% 1/8W     | 28480    | 0698-3154          |
| A8R98                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W     | 28480    | 0757-0438          |
| ARTP1                 | 0360-0124      |     | TERMINAL:SOLDER LUG                 | 28480    | 0360-0124          |
| ARTP5                 | 0360-0124      |     | TERMINAL:SOLDER LUG                 | 28480    | 0360-0124          |
| A9                    | 08552-60123    | 1   | SWITCH ASSY:SCAN TIME               | 28480    | 08552-60123        |
| A9C1                  | 0180-2125      | 1   | C:FXD ELECT 15 UF 5% 20VDCW         | 28480    | 0180-2125          |
| A9C2                  | 0180-2126      | 1   | C:FXD ELECT 1.5 UF 5% 35VDCW        | 28480    | 0180-2126          |
| A9C3                  | 0180-2127      | 1   | C:FXD ELECT 0.15 UF 5% 35VDCW       | 28480    | 0180-2127          |
| A9C4                  | 0160-3017      | 1   | C:FXD MY 0.015 UF 5% 200VDCW        | 28480    | 0160-3017          |
| A9C5                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW       | 56289    | 150D685X903582-0Y5 |
| A9R1                  | 0757-0459      |     | R:FXD MET FLM 56.2K OHM 1% 1/8W     | 28480    | 0757-0459          |
| A9P2                  | 0698-3449      | 1   | R:FXD MET FLM 28.7K OHM 1% 1/8W     | 28480    | 0698-3449          |
| A9P3                  | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W     | 28480    | 0757-0443          |
| A9P4                  | 0683-3355      | 1   | R:FXD COMP 3.3 MEGOHM 5% 1/4W       | 01121    | CR 3355            |
| A9P5                  | 0757-0485      | 1   | R:FXD MET FLM 681K OHM 1% 1/8W      | 28480    | 0757-0485          |
| A9P6                  | 0698-3450      |     | R:FXD MET FLM 42.2K OHM 1% 1/8W     | 28480    | 0698-3450          |
| A9R7                  | 0698-3153      | 1   | R:FXD MET FLM 3.83K OHM 1% 1/8W     | 28480    | 0698-3153          |
| A9R8                  | 0698-3260      | 7   | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9R9                  | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9R10                 | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9R11                 | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9R12                 | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9R13                 | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9P14                 | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W      | 28480    | 0698-3260          |
| A9R15                 | 0698-3271      | 6   | R:FXD MET FLM 115K OHM 1% 1/8W      | 28480    | 0698-3271          |
| A9R16                 | 0698-3271      |     | R:FXD MET FLM 115K OHM 1% 1/8W      | 28480    | 0698-3271          |
| A9R17                 | 0698-3157      |     | R:FXD MET FLM 19.6K OHM 1% 1/8W     | 28480    | 0698-3157          |
| A9R18                 | 0698-3157      |     | R:FXD MET FLM 19.6K OHM 1% 1/8W     | 28480    | 0698-3157          |
| A9R19                 | 0698-3271      |     | R:FXD MET FLM 115K OHM 1% 1/8W      | 28480    | 0698-3271          |
| A9R20                 | 0698-3271      |     | R:FXD MET FLM 115K OHM 1% 1/8W      | 28480    | 0698-3271          |
| A9R21                 | 0698-3271      |     | R:FXD MET FLM 115K OHM 1% 1/8W      | 28480    | 0698-3271          |
| A9R22                 | 0698-3271      |     | R:FXD MET FLM 115K OHM 1% 1/8W      | 28480    | 0698-3271          |
| A9R23                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W     | 28480    | 0757-0438          |
| A9S1                  | 3100-2656      | 1   | SWITCH:ROTARY 16 POSITION           | 28480    | 3100-2656          |
| A10                   | 08552-60134    | 1   | SWITCH ASSY:REF LEVEL               | 28480    | 08552-60134        |
| A10L1                 | 9100-1630      |     | COIL/CHOKE 51.0 OH 5%               | 28480    | 9100-1630          |
| A10R1                 | 0698-6310      | 1   | R:FXD MET FLM 78.41 OHM 0.25% 1/8W  | 28480    | 0698-6310          |
| A10P2                 | 0698-5401      | 1   | R:FXD MET FLM 247.50 OHM 0.25% 1/8W | 28480    | 0698-5401          |
| A10R3                 | 0698-6311      | 1   | R:FXD MET FLM 139.8 OHM 0.25% 1/8W  | 28480    | 0698-6311          |
| A10R4                 | 0698-0082      |     | R:FXD MET FLM 464 OHM 1% 1/8W       | 28480    | 0698-0082          |
| A10R5                 | 0757-1094      |     | R:FXD MET FLM 1.47K OHM 1% 1/8W     | 28480    | 0757-1094          |
| A10R6                 | 0698-6941      | 1   | R:FXD MET FLM 114.6 OHM 0.25% 1/8W  | 28480    | 0698-6941          |
| A10R7                 | 0757-0440      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W     | 28480    | 0757-0440          |
| A10R8                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W     | 28480    | 0757-0442          |
| A10R9                 | 0698-3160      |     | R:FXD MET FLM 31.6K OHM 1% 1/8W     | 28480    | 0698-3160          |
| A10R10                | 0757-0001      | 1   | R:FXD MET FLM 13.3 OHM 1% 1/2W      | 28480    | 0757-0001          |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------|----------|----------------------|
| A10S1                 | 3100-2092      | 1   | SWITCH:ROTARY                     | 28480    | 3100-2092            |
| A11                   | 08552-60106    | 1   | SWITCH ASSY:VIDEO FILTER          | 28480    | 08552-60106          |
| A11C1                 | C180-0374      | 1   | C:FXD TANT. 10 UF 10% 20VDCW      | 56289    | 15CD106X9020A2-DYS   |
| A11C2                 | 0160-0161      | 1   | C:FXD MY 0.01 UF 10% 200VDCW      | 56289    | 192P10392-PTS        |
| A11C3                 | 0180-0291      | 1   | C:FXD ELECT 1.0 UF 10% 35VDCW     | 56289    | 150D105X9035A2-DYS   |
| A11R1                 | 0757-0454      | 1   | R:FXD MET FLM 33.2K OHM 1% 1/8W   | 28480    | 0757-0454            |
| A11R2                 | 0698-4507      | 1   | R:FXD MET FLM 76.8K OHM 1% 1/8W   | 28480    | 0698-4507            |
| A11R3                 | 0698-4207      | 1   | R:FXD MET FLM 44.2K OHM 1% 1/8W   | 28480    | 0698-4207            |
| A11S1                 | 3100-2673      | 1   | SWITCH:LEVER 4 POSITION           | 28480    | 3100-2673            |
| A12                   | 08552-60115    | 1   | BOARD ASSY:47 MHZ APC             | 28480    | 08552-60115          |
| A12                   | 08552-60145    | 1   | EXCHANGE ASSY:47 MHZ APC          | 28480    | 08552-60145          |
| A12C1                 | 0160-3456      | 2   | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A12C2                 | 0140-0191      |     | C:FXD MICA 56 PF 5% 300VDCW       | 19701    | RD15E560J 300V       |
| A12C3                 | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A12C4                 | 0160-0134      |     | C:FXD MICA 220PF 5% 300VDCW       | 14655    | RD15F221J3C          |
| A12C5                 | 0140-0200      |     | C:FXD MICA 390 PF 5%              | 72136    | RD15F391-J3C         |
| A12C6                 | 0140-0200      | 1   | C:FXD MICA 390 PF 5%              | 72136    | RD15F391-J3C         |
| A12C7                 | 0160-0153      |     | C:FXD MY 0.001 UF 10% 200VDCW     | 56289    | 192P10292-PTS        |
| A12C8                 | 0160-0298      |     | C:FXD MY 0.0015 UF 10% 200VDCW    | 56289    | 192P15292-PTS        |
| A12C9                 | 0160-0302      |     | C:FXD MY 0.018 UF 10% 200VDCW     | 56289    | 192P18392-PTS        |
| A12C10                | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A12C11                | 0160-0163      | 1   | C:FXD MY 0.033 UF 10% 200VDCW     | 56289    | 192P33392-PTS        |
| A12C12                | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 150D225X9020A2-DYS   |
| A12C13                | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A12C14                | 0160-3456      |     | C:FXD CER 1000 PF 10% 250VDCW     | 56289    | C067F251F102KS22-CDH |
| A12C41                | 1902-0025      | 2   | DIODE,BREAKDOWN:10.0V 5% 400 MW   | 28480    | 1902-0025            |
| A12E1                 | 10534C         |     | MIXER:200 MHZ                     | 28480    | 10534C               |
| A12E2                 | 10534C         | 2   | MIXER:200 MHZ                     | 28480    | 10534C               |
| A12L1                 | 9140-0098      |     | COIL/CHOKE 2.20 UH 10%            | 99800    | 1537-20              |
| A12L2                 | 9140-0098      | 1   | COIL/CHOKE 2.20 UH 10%            | 99800    | 1537-20              |
| A12L3                 | 9100-1621      |     | COIL/CHOKE 18.0 UH 10%            | 99800    | 1537-42              |
| A12L4                 | 9100-1618      |     | COIL:MOLDED CHOKE 5.60 UH         | 28480    | 9100-1618            |
| A12L5                 | 9100-1618      |     | COIL:MOLDED CHOKE 5.60 UH         | 28480    | 9100-1618            |
| A12L6                 | 9140-0237      |     | COIL:FXD 200 UH 5%                | 28480    | 9140-0237            |
| A12L7                 | 9140-0129      | 1   | COIL:FXD,MOLDED RF CHOKE 220UH 5% | 28480    | 9140-0129            |
| A12Q1                 | 1854-0019      |     | TSTR:SI NPN                       | 28480    | 1854-0019            |
| A12Q2                 | 1853-0034      |     | TSTR:SI PNP(SELECTED FROM 2N3251) | 28480    | 1853-0034            |
| A12P1                 | 0757-0316      |     | R:FXD MET FLM 42.2 OHM 1% 1/8W    | 28480    | 0757-0316            |
| A12R2                 | 0757-0402      |     | R:FXD MET FLM 110 OHM 1% 1/8W     | 28480    | 0757-0402            |
| A12R3                 | 0757-0438      | 2   | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438            |
| A12R4                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438            |
| A12R5                 | 0757-0382      |     | R:FXD MET FLM 16.2 OHM 1% 1/8W    | 28480    | 0757-0382            |
| A12R6                 | 0757-0397      |     | R:FXD MET FLM 68.1 OHM 1% 1/8W    | 28480    | 0757-0397            |
| A12R7                 | 0757-0382      |     | R:FXD MET FLM 16.2 OHM 1% 1/8W    | 28480    | 0757-0382            |
| A12R8                 | 0757-0438      | 1   | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438            |
| A12R9                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394            |
| A12R10                | 0698-0084      |     | R:FXD MET FLM 2.15K OHM 1% 1/8W   | 28480    | 0698-0084            |
| A12R11                | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465            |
| A12R12                | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465            |
| A12R13                | 0757-0280      | 1   | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280            |
| A12R14                | 0757-0416      |     | R:FXD MET FLM 511 OHM 1% 1/8W     | 28480    | 0757-0416            |
| A12R15                | 0757-0465      |     | R:FXD MET FLM 100K OHM 1% 1/8W    | 28480    | 0757-0465            |
| A12R16                | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W      | 28480    | 0757-0280            |
| A12T1                 | 08552-80101    |     | INDUCTOR ASSY:45 MHZ OSC          | 50436    | 08552-80101          |
| A12TP1                | 0360-1514      | 1   | TERMINAL PIN:SQUARE               | 28480    | 0360-1514            |
| A12U1                 | 1826-0013      |     | IC:LINEAR                         | 28480    | 1826-0013            |
| A12XA13               | 1251-0478      | 1   | CONNECTOR:PC (2 X 6) 12 CONTACTS  | 71785    | 252-06-30-340        |
| A12Y1                 | 0410-0406      | 1   | CRYSTAL:QUARTZ 45 MHZ             | 28480    | 0410-0406            |
| A13                   | 08552-60117    | 1   | BOARD ASSY:2 MHZ OSCILLATOR       | 28480    | 08552-60117          |
| A13C1                 | 0122-0051      | 2   | DIODE:TUNING 100 PF 5%            | 28480    | 0122-0051            |
| A13C2                 | 0122-0051      |     | DIODE:TUNING 100 PF 5%            | 28480    | 0122-0051            |
| A13C3                 | 0180-1746      |     | C:FXD ELECT 15 UF 10% 20VDCW      | 28480    | 0180-1746            |
| A13C4                 | 0160-0194      |     | C:FXD MY 0.015 UF 10%             | 56289    | 192P15392-PTS        |
| A13C5                 | 0160-3060      | 1   | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A13C6                 | 0160-2055      |     | C:FXD CER 0.01 UF +80-20% 100VDCW | 56289    | C023F101F103ZS22-CDH |
| A13C7                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A13C8                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |
| A13C9                 | 0160-3060      |     | C:FXD CER 0.1 UF 20% 25VDCW       | 56289    | 3C42A-CML            |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                       | Mfr Code | Mfr Part Number    |
|-----------------------|----------------|-----|-----------------------------------|----------|--------------------|
| A13C10                | 0180-2207      | 1   | C:FXD ELECT 100 UF 10% 10VDCW     | 56289    | 1500101X9010R2-DYS |
| A13C11                | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW     | 56289    | 1500225X9020A2-DYS |
| A13C12                | 0180-1746      |     | C:FXD ELECT 15 UF 10% 20VDCW      | 28480    | 0180-1746          |
| A13L1                 | 9140-0237      |     | COIL:FXD 200 OHM 5%               | 28480    | 9140-0237          |
| A13L2                 | 9140-0237      |     | COIL:FXD 200 OHM 5%               | 28480    | 9140-0237          |
| A1301                 | 1853-0050      | 1   | TSTR:SI PNP                       | 28480    | 1853-0050          |
| A1302                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071          |
| A1303                 | 1853-0012      |     | TSTR:SI PNP                       | 80131    | 2N2904A            |
| A1304                 | 1854-0071      |     | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071          |
| A13R1                 | 0757-0447      |     | R:FXD MET FLM 16.2K OHM 1% 1/8W   | 28480    | 0757-0447          |
| A13R2                 | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W   | 28480    | 0757-0442          |
| A13R3                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W     | 28480    | 0698-3445          |
| A13R4                 | 0698-0083      |     | R:FXD MET FLM 1.96K OHM 1% 1/8W   | 28480    | 0698-0083          |
| A13R5                 | 2100-2522      |     | R:VAR CERMET 10K OHM 10% LIN 1/2W | 28480    | 2100-2522          |
| A13R6                 | 0757-0447      |     | R:FXD MET FLM 16.2K OHM 1% 1/8W   | 28480    | 0757-0447          |
| A13R7                 | 0698-3450      |     | R:FXD MET FLM 42.2K OHM 1% 1/8W   | 28480    | 0698-3450          |
| A13R8                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W     | 28480    | 0698-3445          |
| A13R9                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394          |
| A13R10                | 0698-3157      |     | R:FXD MET FLM 19.6K OHM 1% 1/8W   | 28480    | 0698-3157          |
| A13R11                | 0757-0442      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W   | 28480    | 0757-0442          |
| A13R12                | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W     | 28480    | 0698-3441          |
| A13R13                | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W    | 28480    | 0757-0394          |
| A13R14                | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W     | 28480    | 0698-3441          |
| A13R15                | 0698-3435      |     | R:FXD MET FLM 38.3 OHM 1% 1/8W    | 28480    | 0698-3435          |
| A13R16                | 0698-3430      |     | R:FXD MET FLM 21.5 OHM 1% 1/8W    | 28480    | 0698-3430          |
| A13R17                | 0698-0083      | 1   | R:FXD MET FLM 1.96K OHM 1% 1/8W   | 28480    | 0698-0083          |
| A13T1                 | 08552-80104    |     | INDUCTOR ASSY:2 MHZ VTO           | 50436    | 08552-80104        |
| A13TP1                | 0360-1514      |     | TERMINAL PIN:SQUARE               | 28480    | 0360-1514          |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                           | Mfr Code | Mfr Part Number   |
|-----------------------|----------------|-----|---------------------------------------|----------|-------------------|
| CHASSIS PARTS         |                |     |                                       |          |                   |
| C1                    | 0160-2049      | 2   | C:FXD CER FEED-THRU 5000 PF +80-20%   | 28480    | 0160-2049         |
| C2                    | 0160-3219      | 3   | C:FXD FEED-THRU 100 PF                | 28480    | 0160-3219         |
| C3                    | 0160-2049      |     | C:FXD CER FEED-THRU 5000 PF +80-20%   | 28480    | 0160-2049         |
| C4                    | 0160-3219      |     | C:FXD FEED-THRU 100 PF                | 28480    | 0160-3219         |
| C5                    | 0150-0093      | 1   | C:FXD CER 0.01 UF +80-20% 100VDCW     | 72982    | 801-K80C011       |
| C6                    | 0160-2437      | 4   | C:FXD CER 5000 PF +80-20% 200VDCW     | 72982    | 2425-000-X5V-502P |
| C7                    | 0160-2437      |     | C:FXD CER 5000 PF +80-20% 200VDCW     | 72982    | 2425-000-X5V-502P |
| C8                    | 0160-2436      | 1   | C:FXD CER 10 PF 20% 200VDCW           | 72982    | 2425-000-X5P-100G |
| C9                    | 0160-2437      |     | C:FXD CER 5000 PF +80-20% 200VDCW     | 72982    | 2425-000-X5V-502P |
| C10                   | 0160-2437      |     | C:FXD CER 5000 PF +80-20% 200VDCW     | 72982    | 2425-000-X5V-502P |
| C11                   |                |     |                                       |          |                   |
| C18                   |                |     | NOT ASSIGNED                          |          |                   |
| C19                   | 0160-3219      |     | C:FXD FEED-THRU 100 PF                | 28480    | 0160-3219         |
| CR1                   | 1901-0416      |     | DIODE:SILICON 200PIV 3A               | 28480    | 1901-0416         |
| DS1                   | 2140-0058      | 6   | LAMP:INCANDESCENT 10.0V 0.04 AMPS     | 08806    | 367               |
| DS2                   | 2140-0058      |     | LAMP:INCANDESCENT 10.0V 0.04 AMPS     | 08806    | 367               |
| DS3                   | 2140-0058      |     | LAMP:INCANDESCENT 10.0V 0.04 AMPS     | 08806    | 367               |
| DS4                   | 2140-0058      |     | LAMP:INCANDESCENT 10.0V 0.04 AMPS     | 08806    | 367               |
| DS5                   | 2140-0058      |     | LAMP:INCANDESCENT 10.0V 0.04 AMPS     | 08806    | 367               |
| DS6                   | 2140-0058      |     | LAMP:INCANDESCENT 10.0V 0.04 AMPS     | 08806    | 367               |
| DS7                   | 2140-0258      | 2   | LAMP:INCANDESCENT 10V                 | 71744    | CM-2107           |
| DS7                   | 5040-0235      | 3   | BASE:LAMPHOLDER                       | 28480    | 5040-0235         |
| DS7                   | 08552-8002     | 1   | LAMPHOLDER:TIMES                      | 28480    | 08552-8002        |
| DS8                   | 2140-0258      |     | LAMP:INCANDESCENT 10V                 | 71744    | CM-2107           |
| DS8                   | 5040-0235      |     | BASE:LAMPHOLDER                       | 28480    | 5040-0235         |
| DS8                   | 08552-8001     | 1   | LAMPHOLDER:PLUS                       | 28480    | 08552-8001        |
| DS9                   | 2140-0022      | 1   | LAMP:GLOW 1.0 MILLIAMPS 0.1W          | 08806    | A9A(NF-2E)        |
| DS9                   | 5040-0234      | 1   | LAMPHOLDER                            | 28480    | 5040-0234         |
| DS9                   | 5040-0235      |     | BASE:LAMPHOLDER                       | 28480    | 5040-0235         |
| F1                    | 2110-0001      | 2   | FUSE:1 AMP 250V                       | 75915    | 312001.           |
| F2                    | 2110-0001      |     | FUSE:1 AMP 250V                       | 75915    | 312001.           |
| J1                    | 1250-0252      | 1   | BODY:RF CONNECTOR BULKHEAD RECEPTACLE | 28480    | 1250-0252         |
| J1                    |                |     | (CAL OUT) P/O W4                      |          |                   |
| J2                    | 1250-0118      | 3   | CONNECTOR:BNC                         | 24931    | 28JR 128-1        |
| J2                    |                |     | (PEN LIFT OUT, TRIG IN)               |          |                   |
| J3                    | 1251-2080      | 1   | CONNECTOR:41 FEMALE CONTACT           | 83148    | DDMF-43W25        |
| J3                    |                |     | (INTERCONNECTING PLUG, RF/IF)         |          |                   |
| J4                    | 1250-0118      |     | CONNECTOR:BNC                         | 24931    | 28JR 128-1        |
| J4                    |                |     | (VERTICAL OUT)                        |          |                   |
| J5                    | 1250-0118      |     | CONNECTOR:BNC                         | 24931    | 28JR 128-1        |
| J5                    |                |     | (SCAN IN, OUT)                        |          |                   |
| J6                    | 1250-0830      | 2   | CONNECTOR:RF                          | 98291    | 50-047-0000       |
| J6                    |                |     | (RF INPUT)                            |          |                   |
| J7                    | 1250-0830      |     | CONNECTOR:RF                          | 98291    | 50-047-0000       |
| J7                    |                |     | (47 MHZ OUTPUT)                       |          |                   |
| J8                    | 1250-0828      | 1   | CONNECTOR:RF 50-OHM SCREW ON TYPE     | 98291    | 50-043-4610       |
| L1                    | 9140-0142      | 3   | COIL:FXD RF 2.20 UH 10%               | 82142    | 09-4436-4K        |
| L2                    | 9140-0142      |     | COIL:FXD RF 2.20 UH 10%               | 82142    | 09-4436-4K        |
| L3                    | 9140-0142      |     | COIL:FXD RF 2.20 UH 10%               | 82142    | 09-4436-4K        |
| L4                    | 9100-1615      | 1   | COIL/CHOKE FXD 1.20 UH 10%            | 28480    | 9100-1615         |
| P1                    | 1251-0055      | 1   | CONNECTOR:MALE 24 CONTACTS            | 28480    | 1251-0055         |
| Q1                    |                |     |                                       |          |                   |
| Q22                   |                |     | NOT ASSIGNED IN CHASSIS PARTS         |          |                   |
| Q23                   | 1853-0052      | 1   | TSTR:SI PNP                           | 80131    | 2N3740            |
| Q23                   | 0340-0162      | 2   | INSULATOR:TSTR FOR T0-66              | 13103    | A0340-0162-1      |
| Q23                   | 1200-0168      |     | SOCKET:TRANSISTOR                     | 28480    | 1200-0168         |
| Q24                   | 1854-0341      | 1   | TSTR:SI NPN                           | 28480    | 1854-0341         |
| Q24                   | 0340-0162      |     | INSULATOR:TSTR FOR T0-66              | 13103    | A0340-0162-1      |
| Q24                   | 1200-0168      |     | SOCKET:TRANSISTOR                     | 28480    | 1200-0168         |
| R1                    | 0811-2501      | 1   | R:FXD WW 180 OHM 3% 50W               | 28480    | 0811-2501         |
| R2                    | 0683-3315      | 2   | R:FXD COMP 330 OHM 5% 1/4W            | 01121    | CR 3315           |
| R3                    | 0683-3315      |     | R:FXD COMP 330 OHM 5% 1/4W            | 01121    | CR 3315           |
| R4                    | 2100-2492      | 2   | R:VAR COMP 5K OHM 20% LIN 1/2W        | 28480    | 2100-2492         |
| R5                    | 2100-2488      | 2   | R:VAR COMP 10K OHM 20% LIN 1/2W       | 28480    | 2100-2488         |
| R6                    | 0757-0441      |     | R:FXD MET FLM 8.25K OHM 1% 1/8W       | 28480    | 0757-0441         |
| R7                    | 0767-0010      | 2   | R:FXD MET FLM 15K OHM 5% 3W           | 28480    | 0767-0010         |
| R8                    | 0767-0010      |     | R:FXD MET FLM 15K OHM 5% 3W           | 28480    | 0767-0010         |
| R9                    | 0757-0461      |     | R:FXD MET FLM 68.1K OHM 1% 1/8W       | 28480    | 0757-0461         |
| R10                   | 2100-2806      | 1   | R:VAR COMP 2.5K OHM 20% LIN 1/2W      | 28480    | 2100-2806         |
| R11                   | 2100-2661      | 1   | R:VAR COMP 1K OHM 20% LIN 1/2W        | 28480    | 2100-2661         |
| R12                   | 2100-2501      | 1   | R:VAR WW 2K OHM 20% LIN 1.5W          | 28480    | 2100-2501         |
| R13                   | 0698-3399      | 1   | R:FXD MET FLM 133 OHM 1% 1/2W         | 28480    | 0698-3399         |
| R14                   | 0698-3400      | 1   | R:FXD MET FLM 147 OHM 1% 1/2W         | 28480    | 0698-3400         |
| R15                   | 2100-2488      |     | R:VAR COMP 10K OHM 20% LIN 1/2W       | 28480    | 2100-2488         |

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                   | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|-----------------------------------------------|----------|-----------------|
| R16                   | 0687-2731      | 1   | R:FxD COMP 27K OHM 10% 1/2W                   | 01121    | ER 2731         |
| R17                   | 0812-0100      | 1   | R:FxD WW 2K OHM 5% 5W                         | 2848C    | G812-0100       |
| R18                   | 0811-1666      | 1   | R:FxD WW 1.0 OHM 5% 2W                        | 28480    | 0811-1666       |
| R19                   | 0683-1045      | 1   | R:FxD COMP 100K OHMS 5% 1/4W                  | 01121    | CB 1045         |
| R20                   | 2100-2492      | 1   | R:VAR COMP 5K OHM 20% LIN 1/2W                | 28480    | 2100-2492       |
| S1                    | 3101-0897      | 1   | SWITCH:SLIDE DP3T 0.5 AMP<br>(LOG/LINEAR)     | 79727    | G-1285-0021     |
| S1                    | 3101-0052      | 1   | SWITCH:PUSHBUTTON SPST                        | 82389    | 961 LESS HWD    |
| S3                    | 08552-60105    | 1   | SWITCH ASSY:SCAN MODE                         | 2848C    | 08552-60105     |
| S4                    | 08552-60135    | 1   | SWITCH ASSY:SCAN TRIGGER                      | 2848C    | 08552-60135     |
| W1                    | 8120-1110      | 1   | CABLE:RF(GREEN)                               | 2848C    | 8120-1110       |
| W2                    | 8120-1111      | 1   | CABLE:RF(BLUE)                                | 2848C    | 8120-1111       |
| W3                    | 08552-6015     | 1   | CABLE ASSY:GRAY                               | 28480    | 08552-6015      |
| W4                    | 08552-60118    | 1   | CABLE ASSY:CAL OUT(DELETE FOR OPT H01-02)     | 2848C    | 08552-60118     |
| W4                    | 08552-62001    | 1   | CABLE ASSY:CAL OUT(OPT H01 ONLY)              | 28480    | 08552-62001     |
| W4                    | 08552-62004    | 1   | CABLE ASSY:CAL OUT(OPT H02 ONLY)              | 28480    | 08552-62004     |
| W5                    | 08552-60136    | 1   | CABLE ASSY:ORANGE                             | 28480    | 08552-60136     |
| W6                    | 08552-60119    | 1   | CABLE ASSY:VERTICAL OUTPUT                    | 2848C    | 08552-60119     |
| W7                    | 08552-6038     | 1   | CABLE ASSY:50 MHZ                             | 28480    | 08552-6038      |
| W8                    | 08552-6039     | 1   | CABLE ASSY:47 MHZ(YELLOW STRIPE)              | 28480    | 08552-6039      |
| W9                    | 08552-60122    | 1   | CABLE ASSY:47 MHZ APC                         | 28480    | 08552-60122     |
| W10                   | 08552-60132    | 1   | CABLE ASSY:BLUE                               | 2848C    | 08552-60132     |
| W11                   | 08552-60131    | 1   | CABLE ASSY:SHIELDED                           | 28480    | 08552-60131     |
| W12                   | 08552-6028     | 1   | CABLE ASSY:RED                                | 2848C    | 08552-6028      |
| W13                   | 08552-60083    | 1   | CABLE ASSY:3 MHZ                              | 28480    | 08552-60083     |
| XA1                   | 1251-0135      | 4   | CONNECTOR:PC EDGE 15 CONTACT                  | 95354    | 91-6915-1500-00 |
| XA2                   | 1251-0135      | 4   | CONNECTOR:PC EDGE 15 CONTACT                  | 95354    | 91-6915-1500-00 |
| XA3                   | 1251-0194      | 1   | CONNECTOR:PC EDGE 15 CONTACT                  | 95354    | 91-6915-1113-00 |
| XA4                   | 1251-0135      | 1   | CONNECTOR:PC EDGE 15 CONTACT                  | 95354    | 91-6915-1500-00 |
| XA5                   | 1251-0159      | 3   | CONNECTOR:PC EDGE 2 X 15 CONTACT              | 71785    | 251-15-30-261   |
| XA6                   | 1251-0159      | 3   | CONNECTOR:PC EDGE 2 X 15 CONTACT              | 71785    | 251-15-30-261   |
| XA7                   | 1251-0159      | 3   | CONNECTOR:PC EDGE 2 X 15 CONTACT              | 71785    | 251-15-30-261   |
| XA8                   | 1251-0135      | 2   | CONNECTOR:PC EDGE 15 CONTACT                  | 95354    | 91-6915-1500-00 |
| XF1                   | 2110-0087      | 2   | FUSEHOLDER:OPEN TYPE                          | 28480    | 2110-0087       |
| XF2                   | 2110-0087      | 2   | FUSEHOLDER:OPEN TYPE                          | 28480    | 2110-0087       |
| MISCELLANEOUS         |                |     |                                               |          |                 |
|                       | 0370-0151      | 2   | KNOB:ROUND FOR 0.125" DIA SHAFT               | 28480    | 0370-0151       |
|                       | 0370-0432      | 3   | KNOB:BLACK LEVER                              | 28480    | 0370-0432       |
|                       | 0403-0026      | 8   | GLIDE:NYLON                                   | 28480    | 0403-0026       |
|                       | 0510-0048      | 2   | FASTENER:6-32 THREADED HOLE                   | 16585    | 771C065-632     |
|                       | 0590-0159      | 4   | NUT:HEX FOR 0160-3219 CAPACITOR               | 72982    | 2499-202        |
|                       | 1400-0093      | 6   | CLAMP:CABLE FOR 1/4" DIA HOLE                 | 00000    | 0RD             |
|                       | 1460-0931      | 1   | SPRING:EXTENSION                              | 00000    | 0RD             |
|                       | 1490-0838      | 2   | STUD:LATCHING #8-32 THREAD                    | 28480    | 1490-0838       |
|                       | 2190-0057      | 4   | WASHER:LOCK FOR #12 HDW                       | 00000    | 0RD             |
|                       | 3050-0381      | 4   | WASHER:THRUST(DELRI)                          | 28480    | 3050-0381       |
|                       | 6460-0016      | 4   | PLUG:NYLON 0.125" DIA HOLE                    | 00000    | 0RD             |
|                       | 03950-4001     | 1   | EXTRACTOR:TOOL                                | 28480    | 03950-4001      |
|                       | 08552-0016     | 1   | DIAL-KNOB ASSY:LOG REF. FINE                  | 28480    | 08552-0016      |
|                       | 08552-0015     | 1   | DIAL-KNOB ASSY:SCAN TIME                      | 28480    | 08552-0015      |
|                       | 08552-0025     | 9   | INSULATOR:VERTICAL                            | 28480    | 08552-0025      |
|                       | 08552-4006     | 1   | INDICATOR UNIT:IF GAIN                        | 2848C    | 08552-4006      |
|                       | 08552-6017     | 1   | INDUCTOR ASSY:50 MHZ                          | 28480    | 08552-6017      |
|                       | 08552-2016     | 1   | RETAINER:BULB                                 | 2848C    | 08552-2016      |
|                       | 08552-60133    | 1   | CHASSIS ASSY:MAIN BODY                        | 28480    | 08552-60133     |
|                       | 08552-90013    | 1   | GRATICULE:OVERLAY                             | 28480    | 08552-90013     |
|                       | 08552-90014    | 1   | GRATICULE:OVERLAY                             | 2848C    | 08552-90014     |
|                       | 0360-0268      | 15  | TERMINAL SOLDER:LUG                           | 78189    | 2103-06-00      |
|                       | 5000-0230      | 1   | INSULATOR:P.C. BOARD                          | 28480    | 5000-0230       |
|                       | 08552-0018     | 2   | BRACKET:SHIELD                                | 28480    | 08552-0018      |
|                       | 08552-2017     | 6   | CONTACT:LAMPHOLDER P/O A10                    | 28480    | 08552-2017      |
|                       | 0460-0114      | 1   | TAPE:POLYURETHANE 1-1/4 IN WIDE               | 85471    | TESAMOLL-2      |
|                       | 08552-0014     | 1   | DIAL-KNOB ASSY IF LEVEL(DELETE FOR H01-02-04) | 28480    | 08552-0014      |
|                       | 08552-02002    | 1   | DIAL-KNOB ASSY IF LEVEL(OPT H01-02 ONLY)      | 28480    | 08552-02002     |
|                       | 08552-0027     | 1   | DIAL-KNOB ASSY IF LEVEL(OPT H04 ONLY)         | 28480    | 08552-0027      |
|                       | 08552-00131    | 1   | PLATE:CONNECTOR(DELETE FOR OPT H01-02)        | 28480    | 08552-00131     |
|                       | 08552-02005    | 1   | PLATE:CONNECTOR(OPT H01-02 ONLY)              | 28480    | 08552-02005     |

See introduction to this section for ordering information



Table 6-3. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                  | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|------------------------------|----------|-----------------|
|                       |                |     | CABINET PARTS                |          |                 |
|                       | 08552-0003     | 1   | PANEL:REAR                   | 28480    | 08552-0003      |
|                       | 08552-0009     | 1   | COVER:SHIELD                 | 28480    | 08552-0009      |
|                       | 08552-00104    | 1   | PLATE:CONNECTOR              | 28480    | 08552-00104     |
|                       | 08552-00106    | 1   | PANEL:FRONT                  | 28480    | 08552-00106     |
|                       | 08552-00107    | 1   | PANEL:SUB                    | 28480    | 08552-00107     |
|                       | 08552-00108    | 1   | BRACE                        | 28480    | 08552-00108     |
|                       | 08552-00109    | 1   | COVER:VTO                    | 28480    | 08552-00109     |
|                       | 08552-00111    | 1   | COVER:PHASE LOCK             | 28480    | 08552-00111     |
|                       | 08552-00124    | 1   | COVER:BOTTOM                 | 28480    | 08552-00124     |
|                       | 08552-00132    | 1   | PANEL:FRONT, MINT GRAY       | 28480    | 08552-00132     |
|                       | 08552-00131    | 1   | PLATE:CONNECTOR, OLIVE BLACK | 28480    | 08552-00131     |
|                       | 08552-0014     | 1   | DIAL-KNOB ASSY:IF LEVEL      | 28480    | 08552-0014      |
|                       | 08552-0013     | 1   | BRACKET:POT                  | 28480    | 08552-0013      |
|                       | 08552-0018     | 1   | BRACKET:SHIELD               | 28480    | 08552-0018      |
|                       | 08552-2044     | 1   | BAR LATCH                    | 28480    | 08552-2044      |
|                       | 08552-4001     | 1   | HANDLE:LATCH                 | 28480    | 08552-4001      |
|                       | 08552-0004     | 1   | DECK:PLUG-IN                 | 28480    | 08552-0004      |
|                       | 08552-0005     | 1   | DECK:RIGHT SIDE              | 28480    | 08552-0005      |
|                       | 08552-0006     | 1   | DECK:LEFT SIDE               | 28480    | 08552-0006      |
|                       | 08552-0007     | 6   | DECK:DIVIDER                 | 28480    | 08552-0007      |
|                       | 08552-00121    | 1   | PHASE LOCK BOX ASSY          | 28480    | 08552-00121     |
|                       | 08552-00125    | 1   | DECK:BRACE                   | 28480    | 08552-00125     |
|                       | 08552-0017     | 1   | DECK:REAR DIVIDER            | 28480    | 08552-0017      |

Table 6-4. Code List of Manufacturers

| MFR NO. | MANUFACTURER NAME                                      | ADDRESS                   | ZIP CODE |
|---------|--------------------------------------------------------|---------------------------|----------|
| 00000   | U.S.A. COMMON                                          | ANY SUPPLIER OF U.S.A.    |          |
| 00136   | MC COY ELECTRONICS CO.                                 | MT. HOLLY SPRINGS, PA.    | 17065    |
| 00656   | AEROVOX CORP.                                          | NEW BEDFORD, MASS.        | 02745    |
| 00853   | SANGAMO ELECTRIC CO. PICKENS DIV.                      | PICKENS, S.C.             | 29671    |
| 01121   | ALLEN BRADLEY CO.                                      | MILWAUKEE, WIS.           | 53204    |
| 01255   | LITTON INDUSTRIES INC. (USECO)                         | BEVERLY HILLS, CALIF.     | 90210    |
| 01295   | TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV.   | DALLAS, TEX.              | 75231    |
| 02114   | FERROXCUBE CORP.                                       | SAUGERTIES, N.Y.          | 12477    |
| 02735   | RCA SOLID STATE & RECEIVING TUBE DIV.                  | SOMERVILLE, N.J.          | 08876    |
| 04713   | MOTOROLA SEMICONDUCTOR PROD. INC.                      | PHOENIX, ARIZ.            | 85008    |
| 06540   | AMATOM ELECT. HARDWARE CO. INC.                        | NEW ROCHELLE, N.Y.        | 10801    |
| 07263   | FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.      | MOUNTAIN VIEW, CALIF.     | 94040    |
| 08806   | G.E. CO. MINIATURE LAMP DEPT.                          | CLEVELAND, OHIO           | 44112    |
| 12040   | NATIONAL SEMICONDUCTOR CORP.                           | DANBURY, CONN.            | 06810    |
| 13103   | THERMALLOY CO.                                         | DALLAS, TEX.              | 75247    |
| 14655   | CORNELL DUBLIER ELECT. DIV. FEDERAL PACIFIC ELECT. CO. | NEWARK, N.J.              | 07105    |
| 16585   | ROOTS AIRCRAFT NUT CORP. WESTERN DIV.                  | PASADENA, CALIF.          | 91100    |
| 19701   | ELECTRA/MIDLAND CORP.                                  | MINERAL WELLS, TEX.       | 76067    |
| 24931   | SPECIALTY CONNECTOR CO. INC.                           | INDIANAPOLIS, IND.        | 46227    |
| 23480   | HEWLETT-PACKARD CO. CORPORATE HQ                       | YOUR NEAREST HP OFFICE    |          |
| 36196   | STANWYCK COIL PROD. LTD.                               | HAWKSBURY ONTARIO, CANADA |          |
| 50436   | HEWLETT-PACKARD CO. MICROWAVE DIV                      | PALO ALTO, CALIF          | 94304    |
| 56289   | SPRAGUE ELECTRIC CO.                                   | N. ADAMS, MASS.           | 01247    |
| 71744   | CHICAGO MINIATURE LAMP WORKS                           | CHICAGO, ILL.             | 60640    |
| 71785   | CINCH MFG. CO. DIV TRW INC.                            | ELK GROVE VILLAGE, ILL.   |          |
| 72136   | ELECTRO MOTIVE MFG. CO. INC.                           | WILLIMANTIC, CONN.        | 06226    |
| 72982   | ERIE TECHNOLOGICAL PROD. INC.                          | ERIE, PA.                 | 16512    |
| 75915   | LITTELFUSE INC.                                        | DES PLAINES, ILL.         | 60016    |
| 78189   | SHAKEPROOF DIV. ILLINOIS TOOL WORKS                    | ELGIN, ILL.               | 60120    |
| 79727   | CONTINENTAL-WIRT ELECTRONICS CORP.                     | WARMINSTER, PA.           | 18974    |
| 80131   | ELECTRONIC INDUSTRIES ASSOCIATION                      | WASHINGTON D.C.           | 20006    |
| 82142   | AIRCO SPEER ELECT. COMP.                               | DU BOIS, PA.              | 15801    |
| 82389   | SWITCHCRAFT INC.                                       | CHICAGO, ILL.             | 60630    |
| 83148   | ITT WIRE & CABLE DIV.                                  | LOS ANGELES, CALIF.       | 90031    |
| 84171   | ARCO ELECT. INC.                                       | GREAT NECK, N.Y.          | 11022    |
| 84411   | TRW CAPACITOR DIV.                                     | OGALLALA, NEBR.           | 69153    |
| 85471   | BOYD A.B. CO.                                          | SAN FRANCISCO, CALIF.     | 94103    |
| 91418   | RADIO MATERIALS CO.                                    | CHICAGO, ILL.             | 60646    |
| 95354   | METHODE MFG. CO.                                       | ROLLING MEADOWS, ILL.     | 60008    |
| 98291   | SEAELECTRO CORP.                                       | MAMARONECK, N.Y.          | 10544    |
| 98978   | INTERNATIONAL ELECT. RESEARCH CORP.                    | BURBANK, CALIF.           | 91502    |
| 99800   | DELEVAN ELECTRONICS CORP.                              | E. AURORA, N.Y.           | 14052    |

See introduction to this section for ordering information

## SECTION VII MANUAL CHANGES

### 7-1. INTRODUCTION

7-1. This section contains information for adapting this manual to instruments for which the content does not apply directly.

7-3. To adapt this manual to your instrument, refer to Table 7-1 and make all of the manual changes listed opposite your instrument serial number. Per-

form these changes in the sequence listed.

7-4. If your instrument serial number is not listed on the title page of this manual, or in Table 7-1, it may be documented in a yellow MANUAL CHANGES supplement available from Hewlett-Packard. For additional important information about serial number coverage, refer to INSTRUMENTS COVERED BY MANUAL in Section I.

*Table 7-1. Manual Changes by Serial Number*

| Serial Prefix or No. | Make Manual Changes |
|----------------------|---------------------|
| 1345A                | A                   |
| 1335A04961 to 05360  | A, B                |
| 1335A04861 to 04960  | A, B, C             |
| 1311A                | A through D         |
| 1250A                | A through E         |
| 1234A02983 to 03210  | A through F         |
| 1217A                | A through G         |
| 1210A                | A through H         |
| 1209A                | A through I         |
| 1144A01311 to 01810  | A through J         |
| 1144A01211 to 01310  | A through K         |
| 1137A                | A through L         |

| Serial Prefix or No. | Make Manual Changes |
|----------------------|---------------------|
| 1131A                | A through M         |
| 1121A00811 to 00960  | A through N         |
| 1121A00761 to 00810  | A through O         |
| 1107A00561 to 00760  | A through P         |
| 1107A00436 to 00560  | A through Q         |
| 1050A00386 to 00435  | A through R         |
| 1050A00311 to 00385  | A through S         |
| 977-00261 to 00310   | A through T         |
| 977-00186 to 00260   | A through U         |
| 977-00161 to 00185   | A through V         |
| 974                  | A through W         |
| 971                  | A through X         |

Table 7-2. Summary of Changes by Component (1 of 2)

| Changes          | A  | B                                                                         | C  | D          | E   | G | H         | I                         | J   | K    |
|------------------|----|---------------------------------------------------------------------------|----|------------|-----|---|-----------|---------------------------|-----|------|
| A1               | L7 | R4, R7, R12,<br>R21, R25, R26,<br>R30, R44, R45,<br>R70, R71, R81,<br>R82 |    |            | R60 |   |           |                           |     |      |
| A2               |    |                                                                           | Z1 |            |     |   |           |                           |     |      |
| A3               |    |                                                                           |    |            |     |   |           |                           |     |      |
| A3A2             |    |                                                                           |    |            |     |   |           |                           |     |      |
| A4               |    |                                                                           |    |            |     |   |           | R36<br>R55<br>R96<br>R112 |     | R122 |
| A5               |    |                                                                           |    | C20<br>R18 |     |   |           |                           |     |      |
| A6               |    |                                                                           |    |            | R57 |   |           |                           |     |      |
| A7               |    |                                                                           |    |            |     |   | Note<br>2 |                           |     |      |
| A8               |    |                                                                           |    |            |     |   |           |                           | R98 |      |
| A10              |    |                                                                           |    |            |     |   |           |                           |     |      |
| A11              |    |                                                                           |    |            |     |   |           |                           |     |      |
| A12              |    |                                                                           |    |            |     |   |           |                           |     |      |
| A13              |    |                                                                           |    |            |     |   |           |                           |     |      |
| W13              |    |                                                                           |    |            |     |   |           |                           | W13 |      |
| CHASSIS<br>PARTS |    |                                                                           |    |            |     |   |           |                           |     |      |

Table 7-2. Summary of Changes by Component (2 of 2)

| Changes          | L         | N                      | O                                                 | P            | R                                    | S   | T          | V            | W                                                                                    | X     | Y                             |
|------------------|-----------|------------------------|---------------------------------------------------|--------------|--------------------------------------|-----|------------|--------------|--------------------------------------------------------------------------------------|-------|-------------------------------|
| A1               |           |                        |                                                   |              |                                      |     |            |              | R38                                                                                  |       |                               |
| A2               |           |                        |                                                   |              |                                      |     |            |              |                                                                                      |       |                               |
| A3               |           |                        |                                                   |              |                                      |     |            |              |                                                                                      | Note1 |                               |
| A3A2             |           |                        |                                                   |              |                                      |     |            |              | C15, R3<br>R7, R8, R13,<br>R14                                                       |       |                               |
| A4               |           |                        |                                                   | CR48<br>CR49 | CR11<br>CR18<br>CR25<br>CR33<br>CR41 |     |            | R115<br>R122 | R10, R44,<br>R45, R70<br>R71, R81,<br>R82, R102,<br>R115, R117<br>R122, R126<br>R132 |       |                               |
| A5               |           |                        |                                                   | Z1           |                                      |     |            | U1<br>U2     |                                                                                      |       | C14,15<br>C19                 |
| A6               |           |                        |                                                   |              |                                      |     |            | C13          |                                                                                      |       |                               |
| A7               | C4,<br>R7 |                        | Q2,Q9<br>R7,R20<br>R21,R24<br>R25,<br>CR23<br>R12 |              |                                      |     | Q10<br>Q19 | R23<br>R24   |                                                                                      |       |                               |
| A8               |           |                        |                                                   |              |                                      |     |            |              |                                                                                      |       |                               |
| A10              |           |                        |                                                   |              |                                      | R10 |            |              |                                                                                      |       |                               |
| A11              |           |                        |                                                   |              |                                      |     | R1         |              |                                                                                      |       |                               |
| A12              |           | C1<br>C3<br>C13<br>C14 |                                                   |              |                                      |     |            |              |                                                                                      |       | L4,<br>L5<br>L6<br>R14<br>R16 |
| A13              |           |                        |                                                   |              |                                      |     |            |              |                                                                                      | L2    |                               |
| W13              |           |                        |                                                   |              |                                      |     |            |              |                                                                                      |       |                               |
| CHASSIS<br>PARTS |           |                        |                                                   |              |                                      | R13 | XF1<br>XF2 |              |                                                                                      |       |                               |

## NOTES

1. Extensive changes in A3 assembly. New parts list and schematic for instruments with serial prefix 974- and lower.
2. The instrument contains a new A7 board assembly. Section 7 of this manual contains the information contained on Service Sheet 14 for instruments with serial number prefixes 1217A and lower.

## 7-5. MANUAL CHANGE INSTRUCTIONS

### CHANGE A

Page 6-23, Table 6-3:

Delete A12L7 (entire line).

Page 8-27, Figure 8-19 (Service Sheet 4):

Delete L7 on lead from “+20” to “TO C10” on right-hand side of A12 assembly.

Page 8-21 (Service Sheet 4):

Add A12L7 between “+20 V” on A12 Assembly and C10 feedthrough capacitor.

### CHANGE B

Page 6-5, Table 6-3:

Change A1R7 and A1R25 to 0757-0421, R: FXD MET FLM 909 OHM 1% 1/8W, 28480, 0757-0422.

Change A1R4, A1R12, A1R21, and A1R30 to 0757-0434, R: FXD MET FLM 3.65K OHM 1% 1/8W, 28480, 0757-0434.

Page 6-12, Table 6-3:

Change A4R25 to 0698-7267, R: FXD MET FLM 19.6K OHM 2% 1/8W, 28480, 0698-7267.

Change A4R26 to 0698-7275, R: FXD FLM 42.2K OHM 2% 1/8W, 28480, 0698-7275.

Page 6-13, Table 6-3:

Change A4R44, A4R70, and A4R81 to 0698-7269, R: FXD FLM 23.7K OHM 2% 1/8W, 28480, 0698-7269.

Change A4R45, A4R71, and A4R82 to 0698-7277, R: FXD MET FLM 51.1K OHM 2% 1/8W, 28480, 0698-7277.

Page 8-35, Figure 8-29 (Service Sheet 8):

Change A1R4, A1R12, A1R21, and A1R30 to 3.65K ohms.

Page 8-39, Figure 8-32 (Service Sheet 10):

Change A4R25\* to A4R25 19.6K ohms.

Change A4R26\* to A4R26 42.2K ohms.

Change A4R44†\* to A4R44† 23.7K ohms.

Change A4R45†\* to A4R45† 51.1K ohms.

Page 8-41, Figure 8-34 (Service Sheet 11):

Change A4R70†\* to A4R70† 23.7K ohms.

Change A4R71†\* to A4R71† 51.1K ohms.

Change A4R81†\* to A4R81† 23.7K ohms.

Change A4R82†\* to A4R82† 51.1K ohms.

### CHANGE C

Page 6-7, Table 6-3:

Delete A2Z1 (entire line).

Page 6-16, Table 6-3:

Delete A5Z2 (entire line).

Page 8-31, Figure 8-25 (Service Sheet 6):

Delete shielding bead A2Z1 adjacent to A2C10.

Page 8-57, Figure 8-51 (Service Sheet 19):

Delete A5Z2 at base lead of A5Q23 (top left-hand side of schematic).

**CHANGE D**

Page 6-14, Table 6-3:

Delete A5C20 (entire line).

Page 6-15, Table 6-3:

Add A5R18, 0757-0416, R: FXD MET FLM 511 OHM 1% 1/8W, 28480, 0757-0416.

Page 8-57, Figure 8-50, (Service Sheet 19):

Change C20 to R18 on A5 Power Supply.

Page 8-57, Figure 8-51 (Service Sheet 19):

Delete A5C20 .01  $\mu$ F (lower left-hand portion of schematic).

Add A5R18 511 ohms in place of A5C20 (from gate to cathode of A5CR10).

**CHANGE E**

Page 6-5, Table 6-3:

Change A1R60 to 0698-3438, R: FXD MET FLM 147 OHM 1% 1/8W, 28480, 0698-3438.

Page 8-35, Figure 8-29 (Service Sheet 8):

Change the value of R60 to 147 ohms.

**CHANGE F**

Page 8-23, Table 8-5 (Service Sheet 2):

Delete under connector J3: Pin 22, Wire Color Code, 90; Function, Scan width Ground.

Page 8-29, Figure 8-23 (Service Sheet 5):

Change the diagram as shown in the partial schematic.

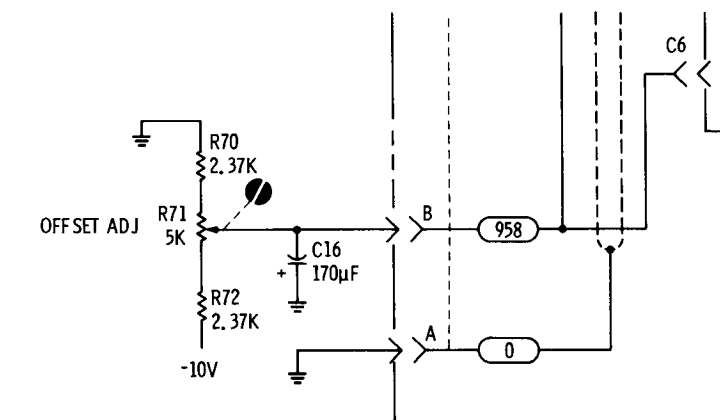


Figure 7-1. Power Supply Partial Schematic (Part of Change F)



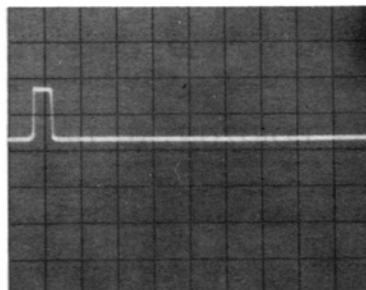
**SERVICE SHEET 14 TEXT (cont'd)**

(Part of Change H)

**CONTROL SETTINGS:**  
(Waveform B)Oscilloscope:  
Same as A.Analyzer: Same as  
above except rotate  
BASE LINE CLIPPER  
full cw.

If waveform A was  
GOOD and B was  
BAD, trouble  
should be in the  
baseline clipper  
circuits.

If correct waveforms  
were obtained,  
blanking circuits and  
baseline clipper cir-  
cuit is functioning  
properly. Proceed  
to step **2**

**2 BASELINE CLIPPER AND CLIPPER CIRCUIT**

Q3/Q13 operates as a comparator in which the video signal is compared to a reference level established by the BASE LINE CLIPPER control and the clipper override circuit.

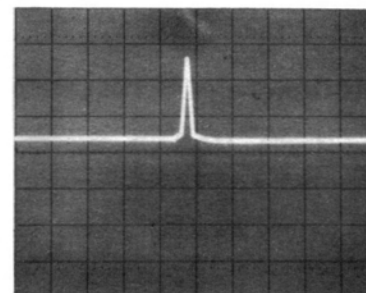
When R10 is turned fully ccw and marker signals are not present, Q13 conducts heavily and the dc level at the junction of CR5/CR6 reaches approximately +14 volts dc. Under these conditions Q3 cannot conduct and the display CRT is unblanked except when blanking pulses are present.

When the BASE LINE CLIPPER control is turned in a clockwise direction, Q13 conduction decreases, the dc level at the junction of CR5/CR6 decreases, and Q3 conducts when the negative-going deflection pulses are more positive than the established threshold. When Q3 conducts the CRT display is blanked. When a marker signal appears, Q20 inverts the marker and the dc level at the base of Q13 rises. Q13 conduction increases and holds Q3 off while the marker is present regardless of the position of the BASE LINE CLIPPER control.

**TEST PROCEDURE 2**

Operation of the BASE LINE CLIPPER is verified by the test procedure in step **1**. To verify

operation of the clipper override circuit, connect the HP 180A/1801A/1821A to TP B (Q20-c) and observe the waveform.

**CONTROL SETTINGS:**Oscilloscope:  
0.1 V/Div  
2 msec/Div  
10:1 probeAnalyzer:  
SCAN WIDTH:  
preset SCAN

Rotate the BASE LINE CLIPPER control and observe that marker signal remains regardless of BASE LINE CLIPPER control position.

Waveform GOOD: Clipper override functions properly.

Waveform BAD: Check Q20. (After verifying presence of marker input.)

**3 2 dB LOG AND VERTICAL PREAMPLIFIER CIRCUITS**

Q15, Q16 and associated circuitry comprise an operational amplifier; when S1 (LOG-LINEAR switch) is in the 10 dB LOG position the amplifier's gain is 1. When S1 is in the 2 dB LOG position, K1 is energized by Q25. This adds a feedback divider and an offset to the amplifier to increase its gain to 5 and re-reference the maximum signal point to the CRT LOG REF graticule. Q24 is used as a dual diode and prevents any signal on the CRT display from going below the base line.

Q5, Q6, Q7 and associated circuitry comprise an operational amplifier with a gain of approximately 10. VERTICAL GAIN control, R11, controls the amplifier's feedback and thus its gain.

**TEST PROCEDURE 3**

3a. With LOG-LINEAR in 10 dB LOG, switch LOG REF LEVEL to -20 dBm to put the signal peak at the -10 dB graticule on the CRT display. Switch LOG-LINEAR to 2 dB LOG; signal should drop approximately to the -50 dB graticule.

Test GOOD: Proceed to 3b.

Test BAD: Check Q15, Q16, Q24, Q25 and associated circuitry.

3b. Connect HP 180A/1801A/1821A to TP C (Q5-c) and observe the waveform.



**SERVICE SHEET 14 TEXT (cont'd)**

(Part of Change H)

**CONTROL SETTINGS**

Oscilloscope:

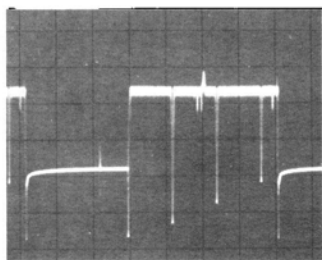
0.1 V/Div

2 msec/Div

10:1 probe

Analyzer:

Same as basic except:



SCAN WIDTH . . . . . 0–100 MHz  
 SCAN TIME PER DIVISION . . . 1 MILLISECOND  
 LOG REF LEVEL . . . . . -10 dBm  
 FREQUENCY . . . . . 50 MHz

Note negative-going video and positive-going marker pulses. Rotate vertical gain control to verify proper operation.

Waveform GOOD: Proceed to step

Waveform BAD: Check Q5, Q6, Q7 and associated circuitry.

**NOTE**

If repairs to the 2 dB LOG and vertical pre-amplifier circuits are required, the adjustments specified in paragraphs 5-30 of Section V should be performed.

**VERTICAL DEFLECTION POWER AMPLIFIERS**

The vertical deflection signals from the vertical pre-amplifier are dc coupled through VR1 and R34 to output drive stage Q2. VR1 also provides a dc offset level for the vertical signals and Q1 provides a temperature compensation for the voltage control circuit. Q8 inverts the deflection signals to provide negative-going signals at the Q8 collector to drive one of the CRT deflection plates. Q8 also provides a non-inverted signal which is emitter coupled to Q18. Q18 does not invert the signal and it appears at the collector of Q18 as a positive-going deflection signal. Thus the signals at the emitters and bases of Q8 and Q18 are in phase and the collector signals are 180 degrees out of phase to provide push-pull deflection. VERTICAL POSITION control R15 controls the vertical position of the CRT trace by controlling the dc level of the pedestal on which the vertical deflection signals are applied to the CRT deflection plates.

**TEST PROCEDURE 4**

Connect the HP 180A/1801A/1821A Channel A probe to TP D (Q8-e) and the Channel B probe to TP E (Q18-e), and observe the waveforms.

**CONTROL SETTINGS**

Oscilloscope:

1 V/Div

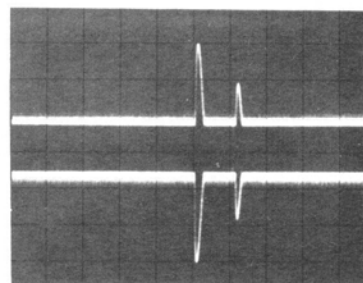
2 msec/Div

10:1 probes

Analyzer:

Same as basic

except:



SCAN TIME PER DIVISION 0.5 MILLISECOND  
 LOG REF LEVEL . . . . . -10 dBm

Waveform GOOD: Proceed to step **5**

Waveform BAD: Check Q1, VR1, VR2, Q2, Q8, Q9, Q10, Q18, Q19 and associated components.

**5 HORIZONTAL DEFLECTION AMPLIFIER**

Driver stage Q23 inverts the scan ramp and applies it to the base of Q22. Q22 inverts the signal and supplies the positive-going deflection signal. The scan ramp is also emitter coupled to Q14 which supplies the negative-going deflection signal. The signals at the emitters and bases of Q14 and Q22 are in phase but the collector signals are 180 degrees out of phase and provide push-pull deflection signals to the horizontal deflection plates of the CRT. Controls are provided to vary the width and position of the CRT trace.

**TEST PROCEDURE 5**

Connect the HP 180A/1801A/1821A Channel A input to TP G (Q22-c) and the Channel B input to TP H (Q14-c) and observe the waveforms.

Waveform GOOD: Assembly functions properly.

If neither waveform is good, check Q1/Q2/Q8/Q10 and associated components.

If Channel A waveform is good and Channel B waveform is bad, check Q9/Q18/Q19 and associated components.

**NOTE**

If repairs to the deflection amplifier assembly are required, the Front Panel Check Procedure, paragraph 4-12 of Section IV, should be performed.

**SERVICE SHEET 14 TEXT (cont'd)**

(Part of Change H)

**CONTROL SETTINGS**

Oscilloscope:

2V/Div

5 msec/Div

10:1 probe

Waveform GOOD:

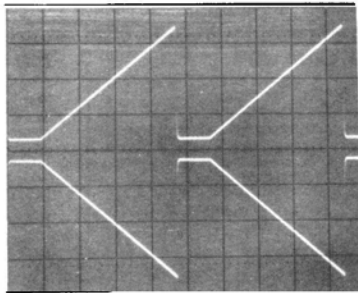
Unit functions  
properlyWaveform A GOOD and B BAD check  
Q4/Q14 and associated components.Both waveforms BAD check Q23/Q22 and  
associated components.**CHANGE I**

Table 6-3:

Change:

A4R36, R55, R96 and R112 to 0698-7257, R: FXD FLM 7.5K OHM 2% 1/8W, 28480, 0698-7257.

Service Sheet 11 and 12 Schematics:

Change:

A4R36, R55, R96 and R112 to 7500 OHMS.

Table 7-3. Replaceable Parts (Part of Change H) (1 of 2)

| Reference Designation | HP Part Number | Qty | Description                             | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------------|----------|----------------------|
| A7                    | 08552-60144    | 1   | BOARD ASSY:DEFLECT AMPLIFIER            | 28480    | 08552-60108          |
| A7                    | 08552-60144    | 1   | EXCHANGE ASSY:DEFLECT AMPLIFIER         | 28480    | 08552-60144          |
| A7C1                  | 0180-0116      | 1   | C:FXD ELECT 6.8 UF 10% 35VDCW           | 56289    | 1500685X903582-DYS   |
| A7C2                  | 0180-0116      | 1   | C:FXD ELECT 6.8 UF 10% 35VDCW           | 56289    | 1500685X903582-DYS   |
| A7C3                  | 0160-2265      | 1   | C:FXD CER 22 PF 5% 500VDCW              | 72982    | 301-NPO-22PF         |
| A7C4                  | 0180-0269      | 1   | C:FXD ELECT 1.0 UF +50-10% 150VDCW      | 56289    | 300105F150BA2-DSM    |
| A7C5                  | 0150-0050      | 1   | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102ZE19-CDH |
| A7C6                  | 0140-0194      | 1   | C:FXD MICA 110 PF 5%                    | 72136    | RDH15F111J3C         |
| A7C7                  | 0140-0194      | 1   | C:FXD MICA 110 PF 5%                    | 72136    | RDH15F111J3C         |
| A7C8                  | 0180-1746      | 1   | C:FXD ELECT 15 UF 10% 20VDCW            | 28480    | 0180-1746            |
| A7C9                  | 0140-0194      | 4   | C:FXD MICA 110 PF 5%                    | 72136    | RDH15F111J3C         |
| A7C10                 | 0160-0155      | 3   | C:FXD MY 0.0033 UF 10% 200VDCW          | 56289    | 192P33292-PTS        |
| A7C11                 | 0160-2246      | 3   | C:FXD CER 3.6+/-0.25 PF 500VDCW         | 72982    | 301-000-COJO-369C    |
| A7C12                 | 0160-2246      | 3   | C:FXD CER 3.6+/-0.25 PF 500VDCW         | 72982    | 301-000-COJO-369C    |
| A7C13                 | 0160-0155      | 2   | C:FXD MY 0.0033 UF 10% 200VDCW          | 56289    | 192P33292-PTS        |
| A7C14                 | 0160-2246      | 4   | C:FXD CER 3.6+/-0.25 PF 500VDCW         | 72982    | 301-000-COJO-369C    |
| A7C15                 | 0160-2246      | 1   | C:FXD CER 3.6+/-0.25 PF 500VDCW         | 72982    | 301-000-COJO-369C    |
| A7C16                 | 0160-0153      | 1   | C:FXD MY 0.001 UF 10% 200VDCW           | 56289    | 192P10292-PTS        |
| A7C17                 | 0140-0190      | 1   | C:FXD MICA 39 PF 5%                     | 72136    | RDH15E390J3C         |
| A7C18                 | 0160-0194      | 1   | C:FXD MY 0.015 UF 10%                   | 56289    | 192P15392-PTS        |
| A7CR1                 | 1901-0096      | 1   | DIODE:SILICON 120V                      | 01295    | UG-888               |
| A7CR2                 | 1901-0081      | 2   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR3                 | 1901-0081      | 4   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR4                 | 1901-0096      | 1   | DIODE:SILICON 120V                      | 01295    | UG-888               |
| A7CR5                 | 1901-0081      | 15  | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR6                 | 1901-0081      | 15  | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR7                 | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR8                 | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR9                 | 1901-0096      | 1   | DIODE:SILICON 120V                      | 01295    | UG-888               |
| A7CR10                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR11                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR12                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR13                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR14                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR15                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR16                | 1901-0096      | 1   | DIODE:SILICON 120V                      | 01295    | UG-888               |
| A7CR17                | 1902-0683      | 1   | DIODE BREAKDOWN:100V 2%                 | 28480    | 1902-0683            |
| A7CR18                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR19                | 1901-0081      | 1   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR20                | 1902-0683      | 2   | DIODE BREAKDOWN:100V 2%                 | 28480    | 1902-0683            |
| A7CR21                | 1901-0081      | 2   | DIODE:SILICON 50 VOLTS WORKING          | 07263    | FD1415               |
| A7CR22                | 1901-0518      | 1   | DIODE:HOT CARRIER                       | 28480    | 1901-0518            |
| A7CR23                | 1902-0785      | 1   | DIODE:BREAKDOWN 9.09V 5%                | 04713    | 1N936                |
| A7K1                  | 0490-0399      | 1   | RELAY:REED ASSY, 1200 OHM 12VDC         | 28480    | 0490-0399            |
| A7L1                  | 9140-0129      | 1   | COIL:FXD RF 220 UH                      | 28480    | 9140-0129            |
| A7L2                  | 9140-0129      | 1   | COIL:FXD RF 220 UH                      | 28480    | 9140-0129            |
| A7Q1                  | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q2                  | 1853-0050      | 1   | TSTR:SI PNP                             | 28480    | 1853-0050            |
| A7Q3                  | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q4                  | 1853-0020      | 1   | TSTR:SI PNP(SELECTED FROM 2N3702)       | 28480    | 1853-0020            |
| A7Q5                  | 1854-0071      | 5   | TSTR:SI NPN(SELECTED FROM 2N3704)       | 28480    | 1854-0071            |
| A7Q6                  | 1853-0050      | 1   | TSTR:SI PNP                             | 28480    | 1853-0050            |
| A7Q7                  | 1853-0050      | 1   | TSTR:SI PNP                             | 28480    | 1853-0050            |
| A7Q8                  | 1854-0234      | 2   | TSTR:SI NPN                             | 80131    | 2N3440               |
| A7Q8                  | 1205-0011      | 2   | HEAT DISSIPATOR:FOR TO-5 AND TO-9 CASES | 98978    | TX8F-032-0258        |
| A7Q9                  | 1853-0050      | 2   | TSTR:SI PNP                             | 28480    | 1853-0050            |
| A7Q10                 | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q11                 | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q12                 | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q13                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704)       | 28480    | 1854-0071            |
| A7Q14                 | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q15                 | 1854-0221      | 1   | TSTR:SI NPN(REPL.BY 2N4044)             | 28480    | 1854-0221            |
| A7Q16                 | 1853-0034      | 2   | TSTR:SI PNP(SELECTED FROM 2N3251)       | 28480    | 1853-0034            |
| A7Q17                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704)       | 28480    | 1854-0071            |
| A7Q18                 | 1854-0234      | 1   | TSTR:SI NPN                             | 80131    | 2N3440               |
| A7Q18                 | 1205-0011      | 1   | HEAT DISSIPATOR:FOR TO-5 AND TO-9 CASES | 98978    | TX8F-032-0258        |
| A7Q19                 | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q20                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704)       | 28480    | 1854-0071            |
| A7Q21                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704)       | 28480    | 1854-0071            |
| A7Q22                 | 1854-0232      | 1   | TSTR:SI NPN(SELECTED FROM 2N3440)       | 28480    | 1854-0232            |
| A7Q23                 | 1853-0020      | 1   | TSTR:SI PNP(SELECTED FROM 2N3702)       | 28480    | 1853-0020            |
| A7Q24                 | 1854-0221      | 1   | TSTR:SI NPN(REPL.BY 2N4044)             | 28480    | 1854-0221            |
| A7Q25                 | 1853-0020      | 1   | TSTR:SI PNP(SELECTED FROM 2N3702)       | 28480    | 1853-0020            |
| A7R1                  | 0757-0447      | 4   | R:FXD MET FLM 16.2K OHM 1% 1/8W         | 28480    | 0757-0447            |
| A7R2                  | 0757-0443      | 4   | R:FXD MET FLM 11.0K OHM 1% 1/8W         | 28480    | 0757-0443            |
| A7R3                  | 0698-3152      | 4   | R:FXD MET FLM 3.48K OHM 1% 1/8W         | 28480    | 0698-3152            |

See introduction to this section for ordering information

Table 7-3. Replaceable Parts (Part of Change H) (2 of 2)

| Reference Designation | HP Part Number | Qty | Description                     | Mfr Code | Mfr Part Number |
|-----------------------|----------------|-----|---------------------------------|----------|-----------------|
| A7R4                  | 0698-0082      | 2   | R:FXD MET FLM 464 OHM 1% 1/8W   | 28480    | 0698-0082       |
| A7R5                  | 0757-0464      |     | R:FXD MET FLM 90.9K OHM 1% 1/8W | 28480    | 0757-0464       |
| A7R6                  | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W | 28480    | 0698-3152       |
| A7R7                  | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R8                  | 0698-3418      |     | R:FXD MET FLM 26.1K OHM 1% 1/2W | 28480    | 0698-3418       |
| A7R9                  | 0757-0443      | 1   | R:FXD MET FLM 11.0K OHM 1% 1/8W | 28480    | 0757-0443       |
| A7R10                 | 0698-3418      |     | R:FXD MET FLM 26.1K OHM 1% 1/2W | 28480    | 0698-3418       |
| A7R11                 | 0757-0439      |     | R:FXD MET FLM 6.81K OHM 1% 1/8W | 28480    | 0757-0439       |
| A7R12                 | 0698-3445      |     | R:FXD MET FLM 348 OHM 1% 1/8W   | 28480    | 0698-3445       |
| A7R13                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R14                 | 0698-0083      | 2   | R:FXD MET FLM 1.96K OHM 1% 1/8W | 28480    | 0698-0083       |
| A7R15                 | 0698-3454      |     | R:FXD MET FLM 215K OHM 1% 1/8W  | 28480    | 0698-3454       |
| A7R16                 | 0757-0424      |     | R:FXD MET FLM 1.10K OHM 1% 1/8W | 28480    | 0757-0424       |
| A7R17                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W | 28480    | 0757-0290       |
| A7R18                 | 0757-0463      |     | R:FXD MET FLM 82.5K OHM 1% 1/8W | 28480    | 0757-0463       |
| A7R19                 | 0698-0084      | 1   | R:FXD MET FLM 2.15K OHM 1% 1/8W | 28480    | 0698-0084       |
| A7R20                 | 0757-0441      |     | R:FXD MET FLM 8.25K OHM 1% 1/8W | 28480    | 0757-0441       |
| A7R21                 | 2100-2521      |     | R:VAR FLM 2000 OHM 10% LIN 1/2W | 28480    | 2100-2521       |
| A7R22                 | 0698-3152      |     | R:FXD MET FLM 3.48K OHM 1% 1/8W | 28480    | 0698-3152       |
| A7R23                 | 0757-0421      |     | R:FXD MET FLM 825 OHM 1% 1/8W   | 28480    | 0757-0421       |
| A7R24                 | 2100-2413      | 2   | R:VAR FLM 200 OHM 10% LIN 1/2W  | 28480    | 2100-2413       |
| A7R25                 | 0757-0441      |     | R:FXD MET FLM 8.25K OHM 1% 1/8W | 28480    | 0757-0441       |
| A7R26                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W   | 28480    | 0757-0420       |
| A7R27                 | 0698-3157      |     | R:FXD MET FLM 19.6K OHM 1% 1/8W | 28480    | 0698-3157       |
| A7R28                 | 0757-0443      |     | R:FXD MET FLM 11.0K OHM 1% 1/8W | 28480    | 0757-0443       |
| A7R29                 | 0757-0394      | 3   | R:FXD MET FLM 51.1 OHM 1% 1/8W  | 28480    | 0757-0394       |
| A7R30                 | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W   | 28480    | 0757-0420       |
| A7R31                 | 0698-3153      |     | R:FXD MET FLM 3.83K OHM 1% 1/8W | 28480    | 0698-3153       |
| A7R32                 | 0757-0858      |     | R:FXD MET FLM 90.9K OHM 1% 1/2W | 28480    | 0757-0858       |
| A7R33                 | 0757-0464      |     | R:FXD MET FLM 90.9K OHM 1% 1/8W | 28480    | 0757-0464       |
| A7R34                 | 0757-0438      | 2   | R:FXD MET FLM 5.11K OHM 1% 1/8W | 28480    | 0757-0438       |
| A7R35                 | 0683-1555      |     | R:FXD COMP 1.5 MEGOHM 5% 1/4W   | 01121    | CB 1555         |
| A7R36                 | 0698-3647      |     | R:FXD MET OX 15K OHM 5% 2W      | 28480    | 0698-3647       |
| A7R37                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R38                 | 0698-3416      |     | R:FXD MET FLM 21.5K OHM 1% 1/2W | 28480    | 0698-3416       |
| A7R39                 | 0764-0020      | 1   | R:FXD MET FLM 5600 OHM 5% 2W    | 28480    | 0764-0020       |
| A7R40                 | 0698-3153      |     | R:FXD MET FLM 3.83K OHM 1% 1/8W | 28480    | 0698-3153       |
| A7R41                 | 0764-0006      |     | R:FXD MET OX 18K OHM 5% 2W      | 28480    | 0764-0006       |
| A7R42                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R43                 | 0698-3416      |     | R:FXD MET FLM 21.5K OHM 1% 1/2W | 28480    | 0698-3416       |
| A7R44                 | 0757-0858      | 1   | R:FXD MET FLM 90.9K OHM 1% 1/2W | 28480    | 0757-0858       |
| A7R45                 | 0683-1555      |     | R:FXD COMP 1.5 MEGOHM 5% 1/4W   | 01121    | CB 1555         |
| A7R46                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W | 28480    | 0757-0460       |
| A7R47                 | 0757-0470      |     | R:FXD MET FLM 162K OHM 1% 1/8W  | 28480    | 0757-0470       |
| A7R48                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R49                 | 0698-3455      | 1   | R:FXD MET FLM 261K OHM 1% 1/8W  | 28480    | 0698-3455       |
| A7R50                 | 0698-3158      |     | R:FXD MET FLM 23.7K OHM 1% 1/8W | 28480    | 0698-3158       |
| A7R51                 | 0698-3421      |     | R:FXD MET FLM 38.3K OHM 1% 1/2W | 28480    | 0698-3421       |
| A7R52                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W | 28480    | 0757-0460       |
| A7R53                 | 0698-3453      |     | R:FXD MET FLM 196K OHM 1% 1/8W  | 28480    | 0698-3453       |
| A7R54                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W | 28480    | 0757-0279       |
| A7R55                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R56                 | 0698-3455      |     | R:FXD MET FLM 261K OHM 1% 1/8W  | 28480    | 0698-3455       |
| A7R57                 | 0757-0400      |     | R:FXD MET FLM 90.9 OHM 1% 1/8W  | 28480    | 0757-0400       |
| A7R58                 | 0757-0428      |     | R:FXD MET FLM 1.62K OHM 1% 1/8W | 28480    | 0757-0428       |
| A7R59                 | 0757-0290      |     | R:FXD MET FLM 6.19K OHM 1% 1/8W | 28480    | 0757-0290       |
| A7R60                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R61                 | 0757-0438      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W | 28480    | 0757-0438       |
| A7R62                 | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W   | 28480    | 0698-3444       |
| A7R63                 | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W | 28480    | 0757-0279       |
| A7R64                 | 0757-0280      | 1   | R:FXD MET FLM 1K OHM 1% 1/8W    | 28480    | 0757-0280       |
| A7R65                 | 0698-3454      |     | R:FXD MET FLM 215K OHM 1% 1/8W  | 28480    | 0698-3454       |
| A7T81                 | 08552-20108    |     | BOARD:BLANK PC                  | 28480    | 08552-20108     |
| A7VR1                 | 1940-0021      |     | TUBE:ELECTRON 103V REF TYPE     | 74276    | Z103R2          |
| A7VR2                 | 1940-0021      |     | TUBE:ELECTRON 103V REF TYPE     | 74276    | Z103R2          |

See introduction to this section for ordering information

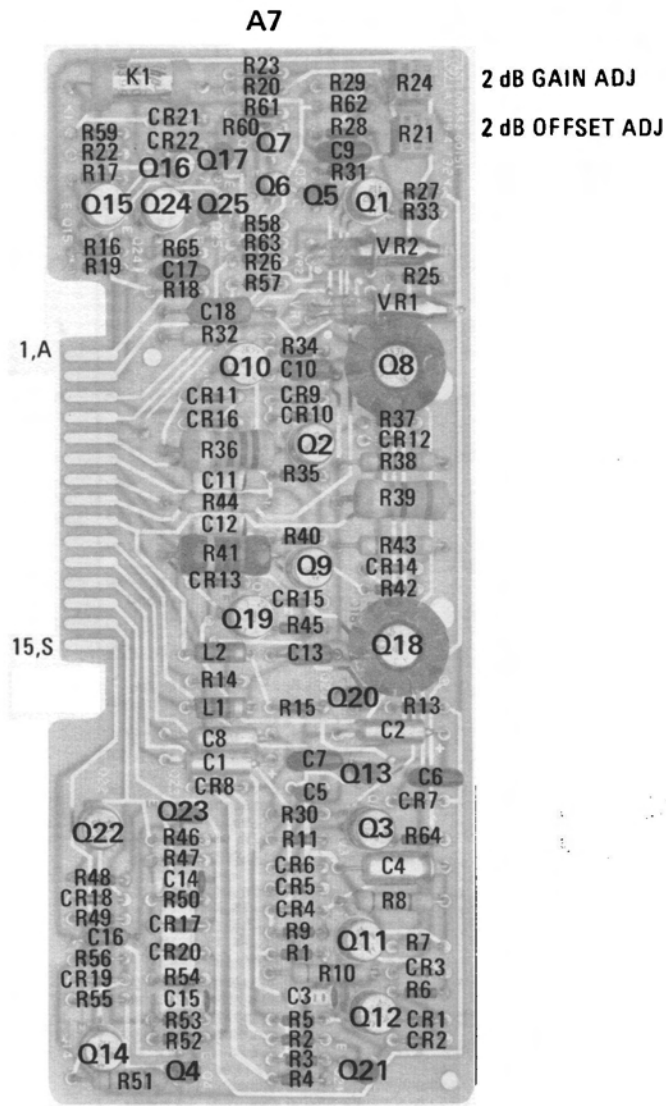


Figure 7-2. Deflection Amplifier A7 Component Identification (Part of Change H)

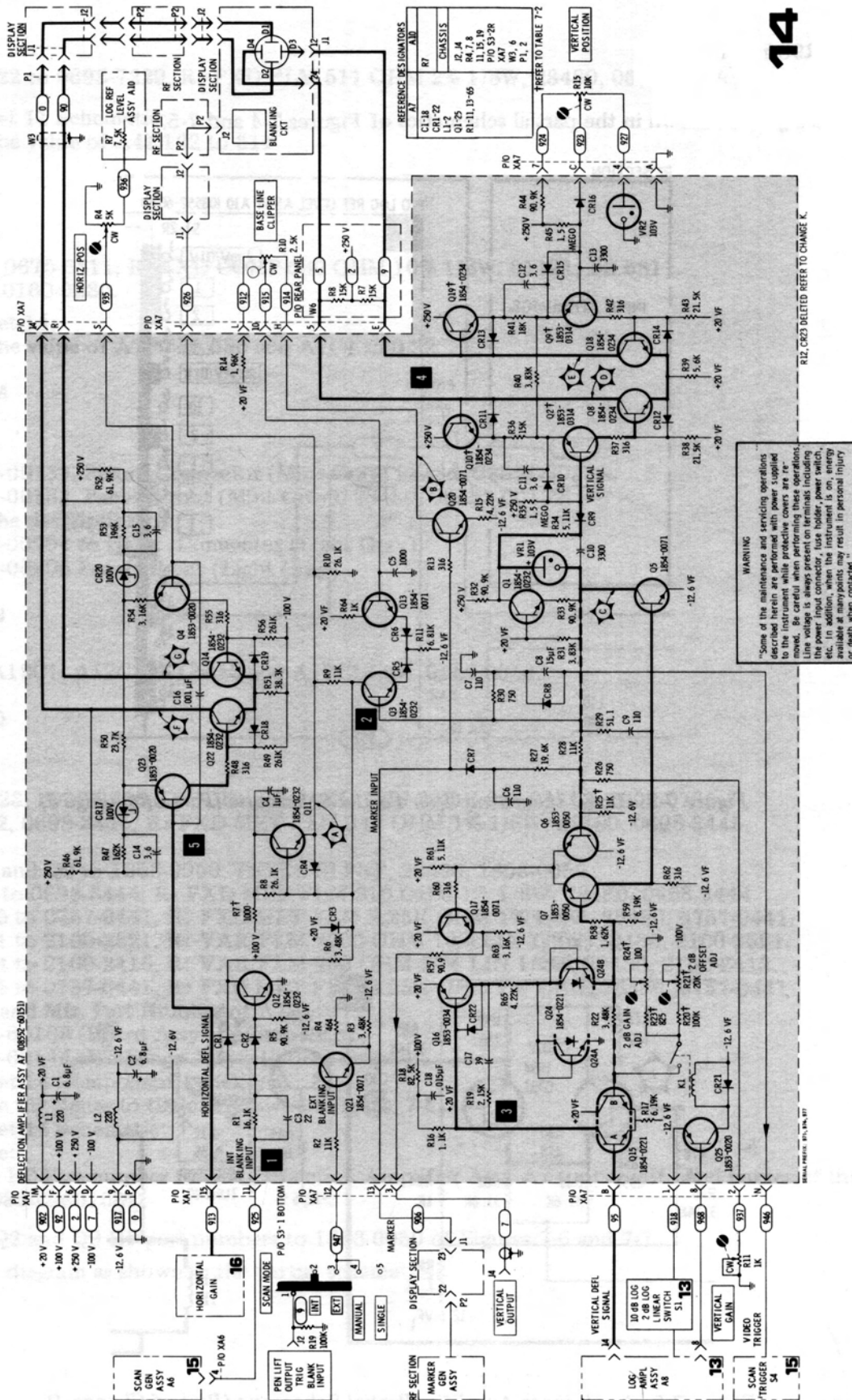


Figure 7-3. Deflection Amplifier (Part of Change H)

**CHANGE J**

Table 6-3:

Delete A8R98 and W13.

Service Sheet 13 Schematic:

Change the figure as shown in the partial schematics of Figures 7-4 and 7-5.

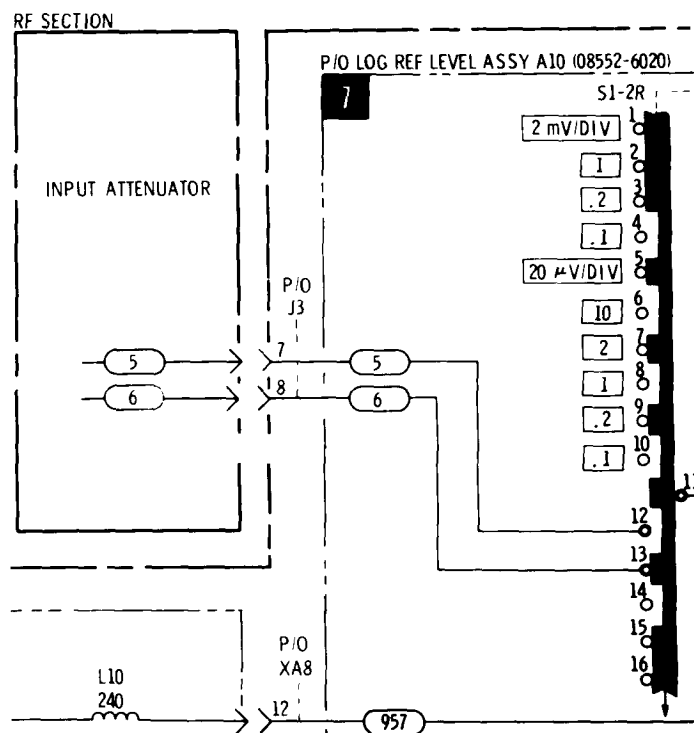


Figure 7-4. Log/Linear Amplifier Partial Schematic (Part of Change J)

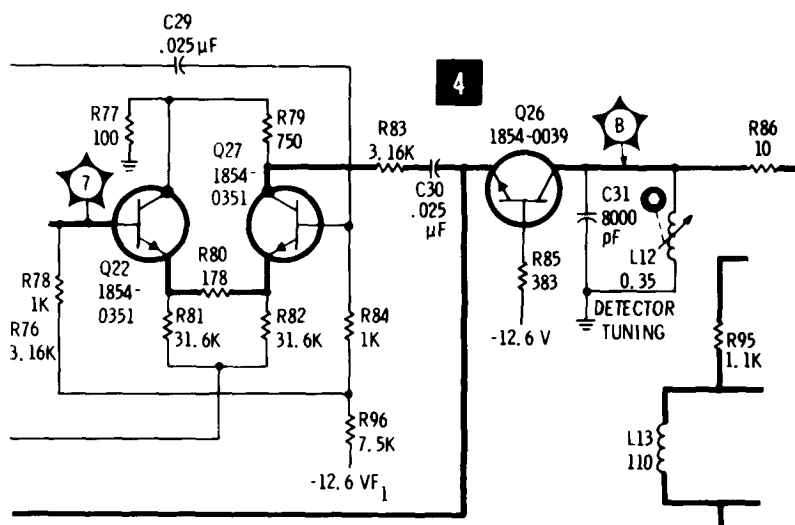


Figure 7-5. Log/Linear Amplifier Partial Schematic (Part of Change J)

**CHANGE K**

Table 6-3:

Change:

A4R122 to 0698-7229, R: FXD FLM 511 OHM 2% 1/8W, 28480, 0698-7229.

Service Sheet 11 Schematic:

Change the value of A4R122 to 511.

**CHANGE L**

Table 6-3:

Change:

A7R7 to 0675-6811, R: FXD COMP 680 OHM 10% 1/8W, 01121, BB 6811.

A7C4 to 0160-0380.

Service Sheet 14:

Change the value of A7R7 to 680 and A7C4 to 0.22.

**CHANGE M**

Table 6-3:

Add:

08552-00131, Plate: Connector (Mint Gray) 28480, 08552-00131.

08552-00132, Panel: Front (Mint Gray), 28480, 08552-00132.

Change the description of:

08552-00104 to Plate: Connector (Light Gray).

08552-00106 Panel: Front (Light Gray).

**CHANGE N**

Table 6-3:

Change A12C1, A12C3, A12C13 and A12C14 to: 0150-0050.

**CHANGE O**

Table 6-3:

Add:

A7CR23, 1902-0785, DIODE: BREAKDOWN 9.09V 5%, 04713, 1902-0785.

A7R12, 0698-3445, R: FXD MET FLM 348 OHM 1% 1/8W, 28480, 0698-3445.

Change:

A7Q2 and Q9 to 1853-0050, TSTR: SI PNP, 28480, 1853-0050.

A7R7 to 0698-3444, R: FXD MET FLM 316 OHM 1% 1/8W, 28480, 0698-3444.

A7R20 to 0757-0441, R: FXD MET FLM 8.25K OHM 1% 1/8W, 28480, 0757-0441.

A7R21 to 2100-2521, R: VAR FLM 2000 OHM 10% LIN 1/2W, 28480, 2100-2521.

A7R24 to 2100-2415, R: VAR FLM 200 OHM 10% LIN 1/2W, 28480, 2100-2413.

A7R25 to 0757-0441, R: FXD MET FLM 8.25K OHM 1% 1/8W, 28480, 0757-0441.

Change HP and Mfr. Part Number of A7 to:

08552-60108 (Board Assy: Deflect Amp).

08552-60144 (Exchange Assy: Deflect Amp).

Service Sheet 14 Component Locations:

Change the figure to the one shown in Figure 7-5.

Service Sheet 14 Schematic:

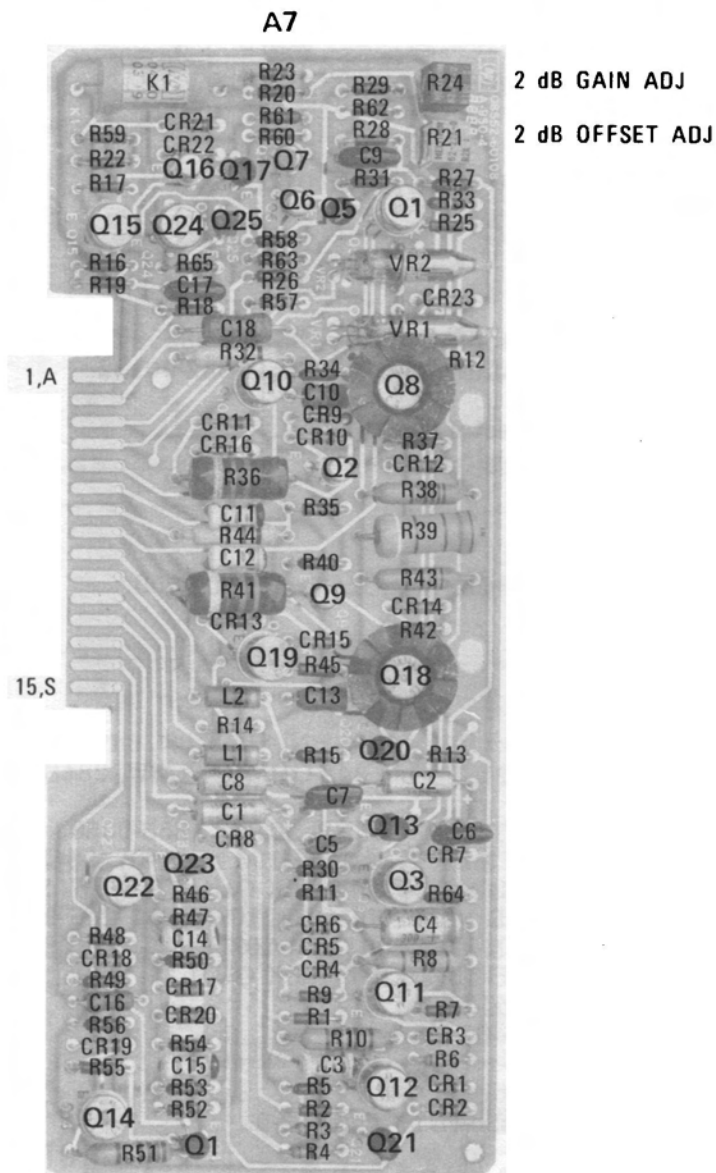
Change:

The HP Part number for the Deflection Amplifier Assy A7 (upper left-hand corner of the schematic) to 08552-60108.

A7Q2 and Q9 HP part numbers to 1853-0050 of Figures 7-6 and 7-7.

The diagram as shown in the partial schematics.





*Figure 7-6. Deflection Amplifier A7 Component Identification (Part of Change O)*

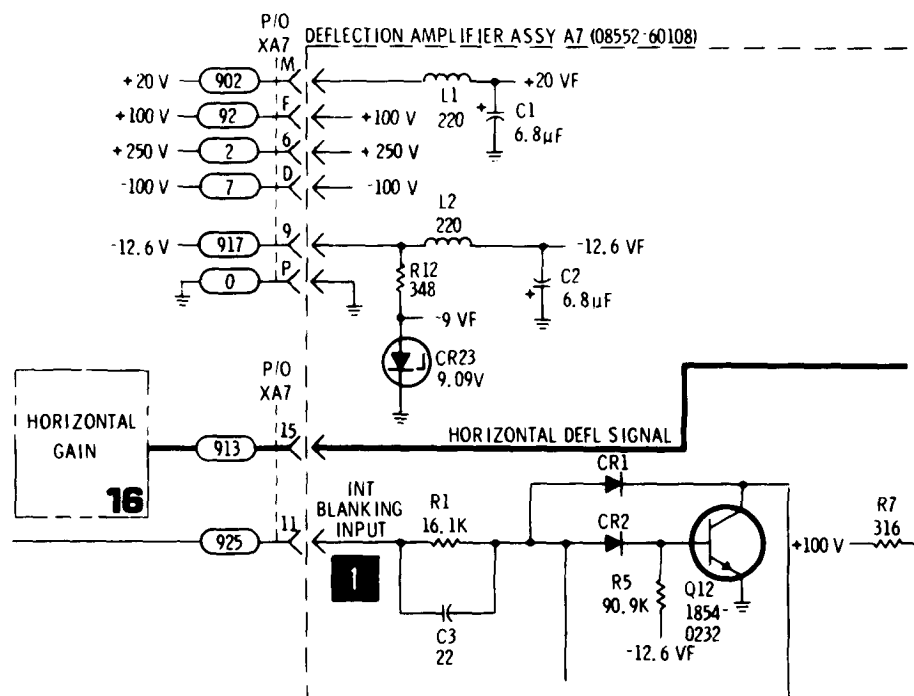


Figure 7-7. Deflection Amplifier Partial Schematic (Part of Change O)

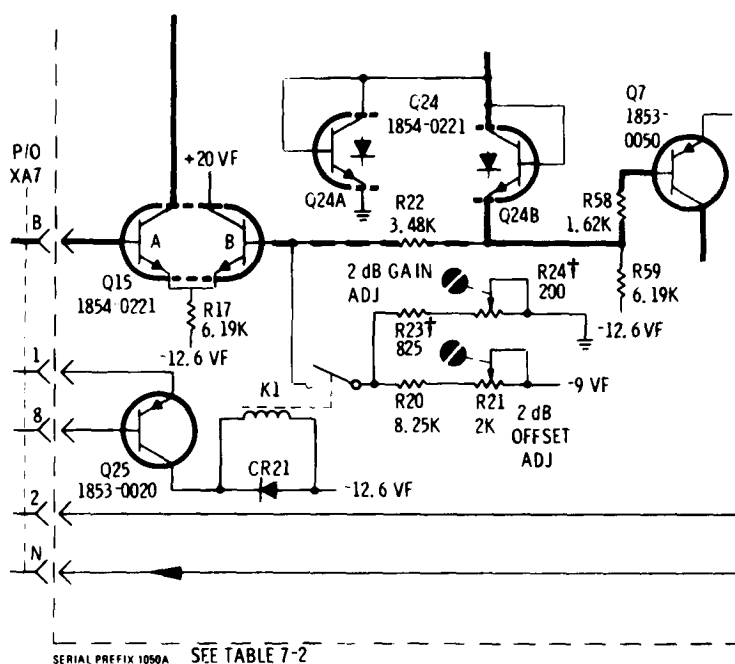


Figure 7-8. Deflection Amplifier Partial Schematic (Part of Change O)

**CHANGE P**

Table 6-3 and Service Sheet 19 Schematic:  
Delete A5Z1.  
Table 6-3 and Service Sheet 10 Schematic:  
Delete A4CR48 and CR49.

**CHANGE Q**

Table 1-1:  
Change the AMPLITUDE SPECIFICATIONS:  
Amplitude Accuracy:  
Switching between bandwidths (at 20°C)

|                | LOG       | LINEAR  |
|----------------|-----------|---------|
| 0.03 — 300 kHz | ± 0.05 dB | ± 5.8%  |
| 0.01 — 300 kHz | ± 1.0 dB  | ± 19.0% |

**CHANGE R**

Table 6-3:  
Change:  
A4CR11, CR18, CR25, CR33 and CR41 to 1901-0040, DIODE SI 30 MA 30 WV, 07263, FDG 1088.

**CHANGE S**

Table 6-3:  
Change:  
R13 to 0698-3400, R: FXD MET FLM 147 OHM 1% 1/2W, 28480, 0698-3400.  
Delete: A10R10.  
Service Sheet 13 Schematic:  
Change: R13 value to 147.  
Delete: A10R10 and show the -12.6 Vdc supply voltage connected directly to the switch contact.

**CHANGE T**

Table 6-3:  
Change:  
A7Q10 and Q19 to 1854-0232, TSTR: SI NPN (Selected 2N3440), 28480, 1854-0232.  
A11R1 to 0757-0123, R: FXD MET FLM 34.8K OHM 1% 1/8W, 28480, 0757-0123.  
XF1 to 2100-0281, FUSE HOLDER: DUAL CLIP, 28480, 2110-0281.  
Delete: XF2.  
Service Sheet 14:  
Change: A7Q10 and Q19 to 1854-0232.  
Service Sheet 17:  
Change: A11R1 to 34.8K.

## CHANGE U

### Service Sheet 13 Schematic:

Change the diagram as shown in the partial Schematics, Figure 7-9 and 7-10.

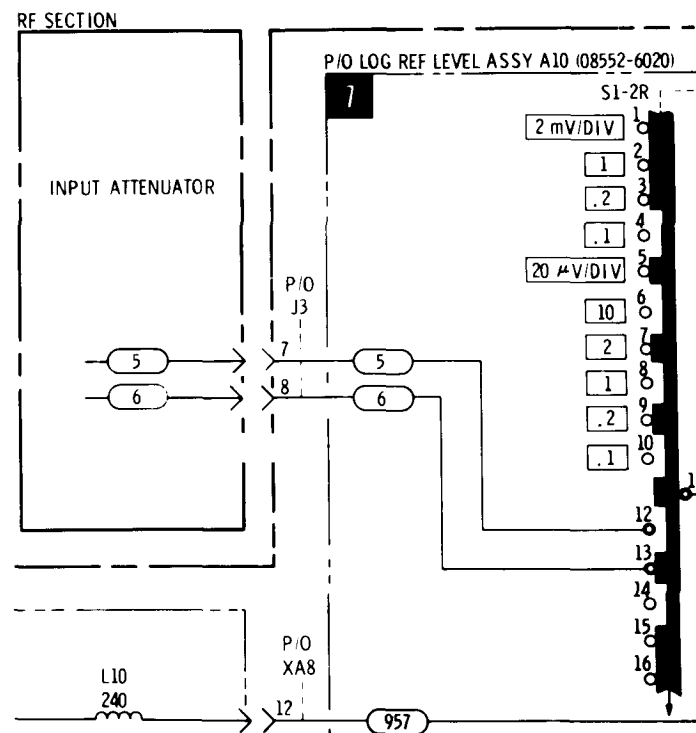


Figure 7-9. Log/Linear Amplifier Partial Schematic (Part of Change U)

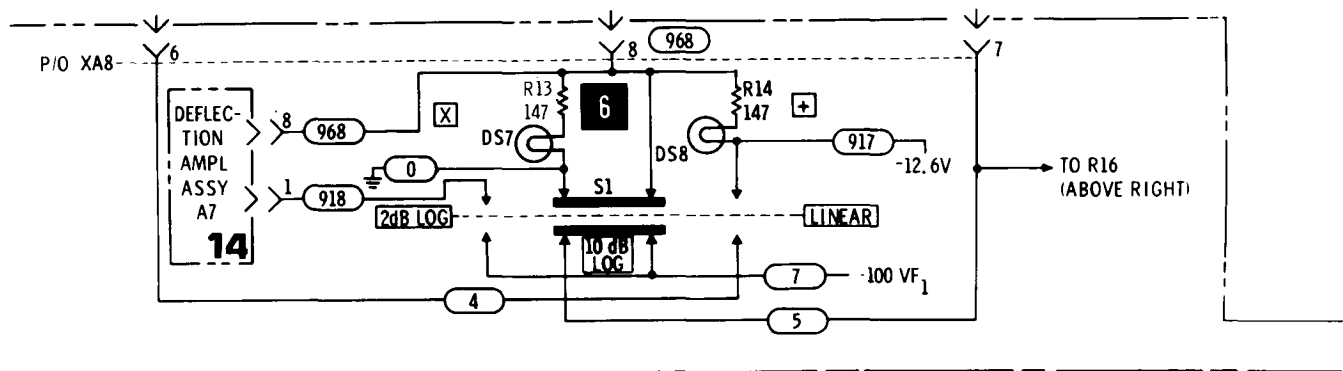


Figure 7-10. Log/Linear Amplifier Partial Schematic (Part of Change U)

**CHANGE V**

Table 6-3:

## Change:

A4R115 to 0698-7216 R: FXD MET FLM 147 OHM 2% 1/8W, 28480, 0698-7216.  
 A4R122 to 0698-7236 R: FXD MET FLM 1K OHM 2% 1/8W, 28480, 0698-7236.  
 A5U1 and U2 to 1820-0216.  
 A6C13 to 0180-0116, C: FXD ELECT 12 UF 10% 35 VDCW, 28480, 0180-0116.  
 A6U1 and U2 to 1820-0216.  
 A7R23 to 0757-0422 R: FXD MET FLM 909 OHM 1% 1/8W, 28480, 0757-0422.  
 A7R24 to 2100-2631 R: VAR FLM 100 OHM 10% LIN 1/2W, 28480, 2100-2632.  
 A12U1 to 1820-0216.

## Service Sheet 4 Schematic:

Change: A12U1 HP Part number to 1820-0216.

## Service Sheet 5 Schematic:

Change: A5U1 and U2 HP part numbers to 1820-0216.

## Service Sheet 11 Schematic:

Change the value of:

A4R115 to 147.  
 A4R122 to 1000.

## Service Sheet 14 Schematic:

Change:

The value of A7R23 to 909.  
 A7R24 to 100 ohm potentiometer.

## Service Sheet 15 Schematic:

Change:

The value of A6C13 to 12.  
 A6U1 and U2 HP part numbers to 1820-0216.

**CHANGE W**

Table 6-3:

## Change:

A1R38 to 0757-0394, R:FXD MET FLM 51.1 OHM 1% 1/8W, 28480, 0757-0394.  
 A3A2 C15 to 0140-0190, C:FXD MICA 39  $\rho$ F 5%, 72136, RDM 15E390J3C.  
 A3A2R3 to 0698-0084, R:FXD MET FLM 2.15K OHM 1% 1/8W, 28480, 0698-0084.  
 A3A2R7 to 0698-3438, R:FXD MET FLM 147 OHM 1% 1/8W, 28480, 0698-3438.  
 A3A2R8 to 0757-0276, R:FXD MET FLM 61.9 OHM 1% 1/8W, 28480, 0757-0276.  
 A3A2R13 to 0698-3430, R:FXD MET FLM 21.5 OHM 1% 1/8W, 28480, 0698-3430.  
 A3A2R14 to 0757-0400, R:FXD MET FLM 90.9 OHM 1% 1/8W, 28480, 0757-0400.  
 A4R44, A4R70 and A4R81 to 0698-7267, R:FXD MET FLM 19.6K OHM 20% 1/8W, 28480, 0698-7267.  
 A4R45, A4R71 and A4R82 to 0698-7275 R:FXD FLM 42.2K OHM 2% 1/8W, 28480, 0698-7275.  
 A4R102 to 0698-7262, R:FXD FLM 12.1K OHM 2% 1/8W, 28480, 0698-7262.  
 A4R115 to 0698-7205, R:FXD FLM 51.1 OHM 2% 1/8W, 28480, 0698-7205.  
 A4R117 to 0698-7240, R:FXD FLM 1.47K OHM 2% 1/8W, 28480, 0698-7240.  
 A4R122 to 0698-7229, R:FXD FLM 511 OHM 2% 1/8W, 28480, 0698-7229.  
 A4R126 and R128 to 0698-7236, R:FXD FLM 1K OHM 2% 1/8W, 28480, 0698-7236.  
 A4R132 to 2100-2522, R:VAR CER MET 10K OHM 10% LIN 1/2W, 28480, 2100-2522.  
 A12R10 to 0698-0084, R:FXD MET FLM 2.15K OHM 1% 1/8W, 28480, 0698-0084.

**CHANGE W (cont'd)**

## Service Sheet 3 Schematic:

Change the value of:

A3A2C15 to 39  
A3A2R3 to 2150  
A3A2R7 to 147  
A3A2R8 to 61.9  
A3A2R13 to 21.5  
A3A2R14 to 90.9.

## Service Sheet 4 Schematic:

Change the value of A4R10 to 2.15K.

## Service Sheet 8 Schematic:

Change the value of A1R38 to 51.1.

## Service Sheet 10 Schematic:

Change the value of:

A4R44 to 19.6K  
A4R45 to 42.2K.

## Service Sheet 11 Schematic:

Change the value of:

A4R70 and A4R81 to 19.6K  
A4R71 and A4R82 to 42.2K  
A4R102 to 12.1K  
A4R115 to 51.1  
A4R122 to 511  
A4R126 and R128 to 1K  
A4R132 to 10K.

**CHANGE X**

## Table 6-3:

Change the parts list for the A3 assembly to that shown on Table 7-4.

A12L4 and A12L5 to 9140-0105, COIL: MOLDED CHOKE 8.2  $\mu$ H 10%, 28480, 9140-0105.

A12R14 to 2100-1986, R:VAR CER MET 1000 OHM 10% LIN 1/2W, 28480, 2100-1986.

A13L2 to 9100-1625, COIL/CHOKE 33.0  $\mu$ H 5%, 99800, 1537-52.

Delete: A12L6.

## Service Sheet 3 Schematic Diagram:

Change the schematic to the one shown in Figure 7-11.

## Service Sheet 4 Schematic Diagram:

Change the value of:

A12L4 and A12L5 to 8.2.  
A12R14 to a 1000 ohm variable resistor.  
A12R16 to 26.1  
A13L2 to 33.0

Delete: A12L2.

Table 7-4. Replaceable Parts (Part of Change X)

| Reference Designation | HP Part Number | Qty | Description                             | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------------|----------|----------------------|
| A3                    | 08552-60114    | 1   | BOARD ASSY:50 MHZ CONVERTER             | 28480    | 08552-60114          |
| A3C1                  | 0150-0050      | 24  | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C2                  | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C3                  | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C4                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW           | 56289    | 1500685X903582-DYS   |
| A3C5                  |                |     | NOT ASSIGNED                            |          |                      |
| A3C6                  | 0180-0116      |     | C:FXD ELECT 6.8 UF 10% 35VDCW           | 56289    | 1500685X903582-DYS   |
| A3C7                  | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C8                  | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C9                  | 0160-2142      | 1   | C:FXD CER 1500 PF +100-0% 500VDCW       | 91418    | TYPE SM              |
| A3C10                 | 0160-2307      | 1   | C:FXD MICA 47 PF 5%                     | 28480    | 0160-2307            |
| A3C11                 | 0121-0059      | 4   | C:VAR CER 2-8 PF 300VDCW                | 28480    | 0121-0059            |
| A3C12                 | 0160-2254      | 3   | C:FXD CER 7.5 PF 500VDCW                | 72982    | 301-000-C0G0-759C    |
| A3C13                 | 0160-2254      |     | C:FXD CER 7.5 PF 500VDCW                | 72982    | 301-000-C0G0-759C    |
| A3C14                 | 0121-0059      |     | C:VAR CER 2-8 PF 300VDCW                | 28480    | 0121-0059            |
| A3C15                 | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C16                 | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C17                 | 0160-2201      |     | C:FXD MICA 51 PF 5%                     | 72136    | ADM15E510J1C         |
| A3C18                 | 0150-0050      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E1022E19-CDM |
| A3C19                 | 0121-0059      |     | C:VAR CER 2-8 PF 300VDCW                | 28480    | 0121-0059            |
| A3C20                 | 0160-2254      |     | C:FXD CER 7.5 PF 500VDCW                | 72982    | 301-000-C0G0-759C    |
| A3C21                 | 1901-0050      | 7   | DICDE:SiLICCn 75V                       | 14433    | S270                 |
| A3C22                 | 1901-0050      |     | DICDE:SiLICCn 75V                       | 14433    | S270                 |
| A3C23                 | 1901-0050      |     | DICDE:SiLICCn 75V                       | 14433    | S270                 |
| A3C24                 | 1901-0050      |     | DICDE:SiLICCn 75V                       | 14433    | S270                 |
| A3C25                 | 1901-0050      |     | DICDE:SiLICCn 75V                       | 14433    | S270                 |
| A3L1                  | 9140-0114      | 2   | COIL:FXD RF 10 UH                       | 28480    | 9140-0114            |
| A3L2                  | 9140-0129      | 5   | COIL:FXD RF 220 UH                      | 28480    | 9140-0129            |
| A3L3                  | 9140-0129      |     | COIL:FXD RF 220 UH                      | 28480    | 9140-0129            |
| A3L4                  | 9100-0346      | 1   | COIL:FXD 0.05 UH 20%                    | 36196    | M-10886              |
| A3L5                  | 9140-0096      | 4   | COIL:FXD RF 1 UH                        | 28480    | 9140-0096            |
| A3L6                  | 9140-0096      |     | COIL:FXD RF 1 UH                        | 28480    | 9140-0096            |
| A3L7                  | 9140-0114      |     | COIL:FXD RF 10 UH                       | 28480    | 9140-0114            |
| A3L8                  | 9140-0096      |     | COIL:FXD RF 1 UH                        | 28480    | 9140-0096            |
| A3L9                  | 9140-0096      |     | COIL:FXD RF 1 UH                        | 28480    | 9140-0096            |
| A3L1                  | 1854-0247      | 1   | TSTR:SI NPN                             | 28480    | 1854-0247            |
| A3C2                  | 1853-0089      | 1   | TSTR:SI PNP                             | 80131    | 2N4917               |
| A3R1                  | 0757-0438      |     | R:FXD MET FLM 5.11K 1% 1/8W             | 14674    | C4                   |
| A3R2                  | 0698-3155      | 1   | R:FXD MET FLM 4.64K 1% 1/8W             | 91637    | MFF-1/10-32          |
| A3R3                  | 0757-0420      |     | R:FXD MET FLM 75C OHM 1% 1/8W           | 14674    | C4                   |
| A3R4                  | 0757-0159      | 1   | R:FXD MET FLM 1000 OHM 1% 1/2W          | 28480    | 0757-0159            |
| A3R5                  | 0698-3429      |     | R:FXD MET FLM 19.6 OHM 1% 1/8W          | 28480    | 0698-3429            |
| A3R6                  | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W           | 91637    | MF-1/10-32           |
| A3R7                  | 0757-1092      | 1   | R:FXD MET FLM 287 OHM 1% 1/2W           | 28480    | 0757-1092            |
| A3R8                  | 0698-3438      |     | R:FXD MET FLM 147 OHM 1% 1/8W           | 28480    | 0698-3438            |
| A3R9                  | 0698-3433      | 1   | FACTORY SELECTED PART                   |          |                      |
| A3R10                 | 0757-0180      | 1   | R:FXD MET FLM 31.6 OHM 1% 1/8W          | 28480    | 0757-0180            |
| A3R11                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W          | 14674    | C4                   |
| A3R12                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W          | 14674    | C4                   |
| A3R13                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W          | 14674    | C4                   |
| A3R14                 | 0757-0394      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W          | 14674    | C4                   |
| A3R15                 | 0757-0398      | 1   | R:FXD MET FLM 75 OHM 1% 1/8W            | 28480    | 0757-0398            |
| A3R16                 | 0698-0082      | 3   | R:FXD MET FLM 464 OHM 1% 1/8W           | 14674    | C4                   |
| A3R17                 | 0757-0465      | 10  | R:FXD MET FLM 100K 1% 1/8W              | 14674    | C4                   |
| A3T1                  | 08552-6018     | 2   | TRANSFORMER:RF (CODE=REC)               | 28480    | 08552-6018           |
| A3T2                  | 08552-6044     | 2   | TRANSFORMER:RF (5 PIN)                  | 28480    | 08552-6044           |
| A3T3                  | 08552-6018     |     | TRANSFORMER:RF (CODE=REC)               | 28480    | 08552-6018           |
| A3T4                  | 08552-6044     |     | TRANSFORMER:RF (5 PIN)                  | 28480    | 08552-6044           |
| A3T81                 | 08552-20114    | 1   | BOARD:BLANK PC                          | 28480    | 08552-20114          |
| A3A1                  | 08552-6009     | 1   | FILTER ASSY:50 MHZ                      | 28480    | 08552-6009           |
| A3A1C1                | 0160-0778      | 2   | C:FXD CER 56 PF 10% 500VDCW             | 01121    | F828                 |
| A3A1C2                | 0160-2236      | 1   | C:FXD CER 1.0 PF 500VDCW                | 72982    | 301-000-C0G0-110J    |
| A3A1C3                | 0160-0145      | 2   | C:FXD MICA 82PF 2% 100VDCW              | 04062    | ADM15E820G6S         |
| A3A1C4                | 0160-2258      | 4   | C:FXD CER 11 PF 5% 500VDCW              | 72982    | 301-000-C0G0-110J    |
| A3A1C5                | 0121-0036      | 9   | C:VAR CER 5.5-18 PF                     | 28480    | 0121-0036            |
| A3A1C6                | 0121-0036      |     | C:VAR CER 5.5-18 PF                     | 28480    | 0121-0036            |
| A3A1C7                | 0160-2258      |     | C:FXD CER 11 PF 5% 500VDCW              | 72982    | 301-000-C0G0-110J    |
| A3A1C8                | 0160-2258      |     | C:FXD CER 11 PF 5% 500VDCW              | 72982    | 301-000-C0G0-110J    |
| A3A1C9                | 0121-0036      |     | C:VAR CER 5.5-18 PF                     | 28480    | 0121-0036            |
| A3A1C10               | 0121-0036      |     | C:VAR CER 5.5-18 PF                     | 28480    | 0121-0036            |
| A3A1C11               | 0160-2258      |     | C:FXD CER 11 PF 5% 500VDCW              | 72982    | 301-000-C0G0-110J    |

See introduction to this section for ordering information

Table 7-4. Replaceable Parts (Part of Change X)

| Reference Designation | HP Part Number | Qty | Description                             | Mfr Code | Mfr Part Number     |
|-----------------------|----------------|-----|-----------------------------------------|----------|---------------------|
| A3A1C12               | 0160-0145      |     | C:FXD MICA 82PF 2% 100VDCW              | 04062    | RUM15E820665        |
| A3A1C13               | 0160-0778      |     | C:FXD CER 56 PF 10% 500VDCW             | 01121    | F826                |
| A3A1J1                | 1250-0829      | 1   | CONNECTOR:RF                            | 98291    | 50-045-0000         |
| A3A1L1                | 08552-6023     | 2   | INDUCTOR ASSY:AIR CORE                  | 28480    | 08552-6023          |
| A3A1L2                | 08552-6017     | 7   | INDUCTOR ASSY:50 MHZ                    | 28480    | 08552-6017          |
| A3A1L3                | 08552-6023     |     | INDUCTOR ASSY:AIR CORE                  | 28480    | 08552-6023          |
| A3A1MP1               | 08552-0021     | 1   | SHIELD CAN:50 MHZ FILTER                | 28480    | 08552-0021          |
| A3A1MP2               | 08552-0022     | 2   | SHIELD COVER:47 MHZ OSC                 | 28480    | 08552-0022          |
| A3A1MP3               | 08552-0023     | 2   | INSULATOR:47 MHZ OSC                    | 28480    | 08552-0023          |
| A3A1TB1               | 08552-2042     | 1   | BOARD:BLANK PC                          | 28480    | 08552-2042          |
| A3A1TB1               | 08552-6042     | 1   | BOARD ASSY:50 MHZ FILTER                | 28480    | 08552-6042          |
| A3A2                  | 08552-60112    | 1   | OSCILLATOR ASSY:47 MHZ                  | 28480    | 08552-60112         |
| A3A2                  | 08552-60113    | 1   | BOARD ASSY:47 MHZ OSCILLATOR            | 28480    | 08552-60113         |
| A3A2                  | 0380-0810      | 4   | STANDOFF:0.437" LG                      | 08145    | 15306716-11         |
| A3A2C1                | 0122-0263      | 1   | C:VOLTAGE VAR 47 PF 10% 60WV            | 04713    | 1N5148              |
| A3A2C2                | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C3                | 0160-2200      | 1   | C:FXD MICA 43 PF 5%                     | 72136    | RUM15E430J3C        |
| A3A2C4                | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C5                | 0180-0116      |     | C:FXD ELECT 6.8 LF 10% 35VDCW           | 56289    | 150Q685X903562-DYS  |
| A3A2C6                | 0160-2261      | 1   | C:FXD CER 15 PF 5% 500VDCW              | 72982    | 301-NPU-15 PF       |
| A3A2C7                | 0160-2265      | 2   | C:FXD CER 22 PF 5% 500VDCW              | 72982    | 301-NPU-22PF        |
| A3A2C8                | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C9                | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C10               | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C11               | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C12               | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C13               | 0150-0650      |     | C:FXD CER DISC 1000 PF +80-20% 1000VDCW | 56289    | C0678102E102Z19-CDH |
| A3A2C14               | 0160-0134      | 2   | C:FXD MICA 220PF 5% 300VDCW             | 14655    | RUM15F221J3C        |
| A3A2CR1               | 1901-0040      |     | DICDE:SILICON 30MA 30WV                 | 07263    | F0G1088             |
| A3A2CR2               | 1902-0041      | 2   | DICDE:BREAKDOWN 5.11V 5%                | 04713    | S210939-98          |
| A3A2CR3               | 1902-0041      |     | DICDE:BREAKDOWN 5.11V 5%                | 04713    | S210939-98          |
| A3A2J1                | 1250-1194      | 1   | CONNECTOR:RF BULKHEAD RECEPTACLE        | 98291    | 52-045-4610         |
| A3A2L1                | 08552-80103    | 1   | INDUCTOR ASSY:47 MHZ OSCILLATOR         | 28480    | 08552-80103         |
| A3A2L2                | 9100-2258      | 1   | COIL/CHOKE 1.2UH 10%                    | 28480    | 9100-2258           |
| A3A2MP1               | 0340-0038      | 5   | FEEDTHRU:TERMINAL                       | 28480    | 0340-0038           |
| A3A2MP2               | 0340-0039      | 5   | INSULATOR:BLUSHING                      | 28480    | 0340-0039           |
| A3A2MP3               | 08552-00114    | 1   | SHIELD CAN:47 PF OSCILLATOR             | 28480    | 08552-00114         |
| A3A2MP4               | 08552-0022     |     | SHIELD COVER:47 MHZ OSC                 | 28480    | 08552-0022          |
| A3A2MP5               | 08552-0023     |     | INSULATOR:47 MHZ OSC                    | 28480    | 08552-0023          |
| A3A2Q1                | 1854-0238      | 1   | TSTR:SI NPN                             | 80131    | 2N3933              |
| A3A2Q2                | 1853-0038      | 1   | TSTR:SI PNP                             | 28480    | 1853-0038           |
| A3A2Q3                | 1854-0019      |     | TSTR:SI NPN                             | 28480    | 1854-0019           |
| A3A2Q3                | 1205-0037      | 3   | HEAT SINK:TRANSISTOR                    | 28480    | 1205-0037           |
| A3A2Q4                | 1854-0019      |     | TSTR:SI NPN                             | 28480    | 1854-0019           |
| A3A2Q4                | 1205-0037      |     | HEAT SINK:TRANSISTOR                    | 28480    | 1205-0037           |
| A3A2R1                | 0698-3157      |     | R:FXD MET FLM 19.6K 1% 1/8W             | 14674    | C4                  |
| A3A2R2                | 0757-0465      |     | R:FXD MET FLM 100K 1% 1/8W              | 14674    | C4                  |
| A3A2R3                | 0698-0084      |     | R:FXD MET FLM 2.15K 1% 1/8W             | 14674    | C4                  |
| A3A2R4                | 0757-0405      | 4   | R:FXD MET FLM 162 OHM 1% 1/8W           | 28480    | 0757-0405           |
| A3A2R5                | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W           | 91637    | MF-1/10-32          |
| A3A2R6                | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W         | 14674    | C4                  |
| A3A2R7                | 0698-3438      |     | R:FXD MET FLM 147 OHM 1% 1/8W           | 28480    | 0698-3438           |
| A3A2R8                | 0757-0276      |     | R:FXD MET FLM 61.9 OHM 1% 1/8W          | 28480    | 0757-0276           |
| A3A2R9                | 0757-0417      | 1   | R:FXD MET FLM 562 OHM 1% 1/8W           | 14674    | C4                  |
| A3A2R10               | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W            | 14674    | C4                  |
| A3A2R11               | 0757-0279      |     | R:FXD MET FLM 3.16K OHM 1% 1/8W         | 14674    | C4                  |
| A3A2R12               | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W            | 14674    | C4                  |
| A3A2R13               | 0698-3430      | 2   | R:FXD MET FLM 21.5 OHM 1% 1/8W          | 28480    | 0698-3430           |
| A3A2R14               | 0757-0400      | 3   | R:FXD MET FLM 90.9 OHM 1% 1/8W          | 01295    | MC550               |
| A3A2R15               | 0757-0402      | 3   | R:FXD MET FLM 110 OHM 1% 1/8W           | 28480    | 0757-0402           |
| A3A2R16               | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W           | 91637    | MF-1/10-32          |
| A3A2T1                | 08552-80102    | 1   | INDUCTOR ASSY:47 MHZ OUT                | 28480    | 08552-80102         |
| A3A2TB1               | 08552-20113    | 1   | BOARD:BLANK PC                          | 28480    | 08552-20113         |

See introduction to this section for ordering information



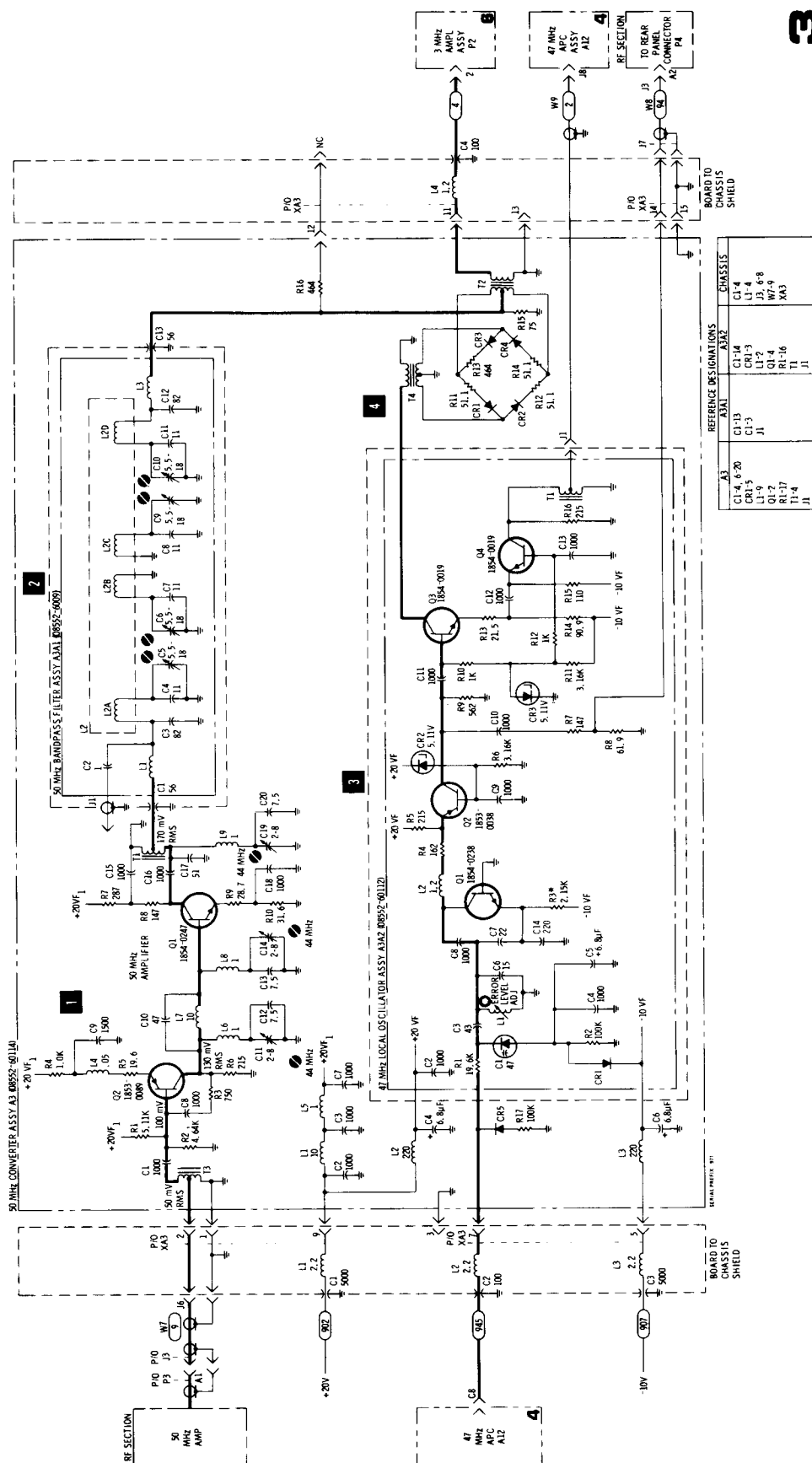


Figure 7-11. 50 MHz Converter (part of Change X)

**CHANGE Y**

Table 6-3:

Change

A5C14 to 0180-0049, C:FXD ELECT 40  $\mu$ F +75-10% 50 VDCW, 56289, 30D206 G 050CC2-DSM.A5C15 to 0180-0098, C:FXD ELECT 100  $\mu$ F 2% 20VDCW, 56289, 150D 107X 002OS2-DYS.

Delete: A5C19.

Service Sheet 5 Schematic Diagram:

Change the Schematic as shown in Figure 7-12.

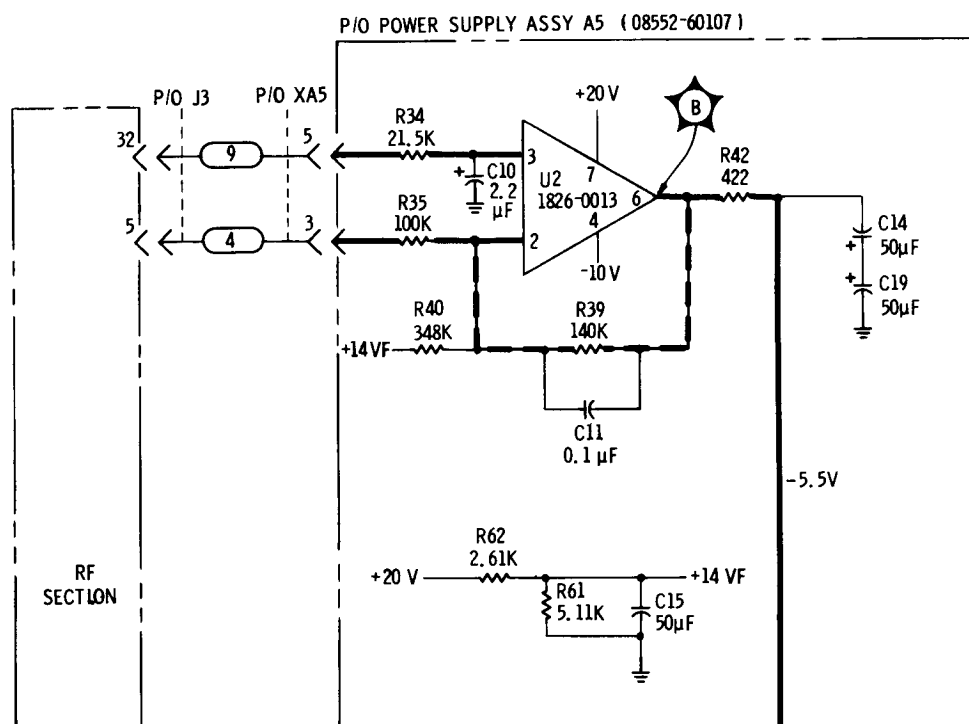


Figure 7-12. Power Supply Partial Schematic Diagram (Part of Change Y)

## SECTION VIII

### SERVICE

#### 8-1. INTRODUCTION

8-2. This section provides instructions for troubleshooting and repair of the HP 8552B Spectrum Analyzer IF Section.

#### 8-3. LINE VOLTAGE REQUIREMENTS

8-4. During adjustment and testing, the Spectrum Analyzer must be installed with an RF Section into a 140 Series Display Section which is connected to a source of power which is 50 to 60 Hz and 115 or 230 Vac  $\pm 10\%$ . If adjustment of the dc voltage regulators is necessary, the Spectrum Analyzer should be connected to the ac power source through a variable auto transformer and then be adjusted to check regulator action when the line voltage varies as much as 10%.

#### 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 connec-

tor, 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."

#### 8-5. MAINTENANCE AIDS

8-6. Servicing aids provided on circuit boards include holes to fit the board removal tool, numbered test points (on some boards), transistor designators, adjustment callouts, and assembly stock numbers.

#### 8-7. TEST EQUIPMENT AND ACCESSORIES REQUIRED

8-8. Test equipment and accessory requirements are listed in the System Test and Troubleshooting Procedure, the individual Service Sheets, and in the Test Equipments and Accessories list, Table 1-2. Test instruments other than those listed may be used if their performance equals or exceeds that of the equipment listed.

8-9. Two circuit board extenders are required to service the 8552B IF Section. A 15-pin extender is supplied with the HP 11592A Service Kit. It may be used to extend the A1 through A8 Assemblies. In addition, a 6-pin extender (HP 5060-5914) is required to extend the A13 Assembly.

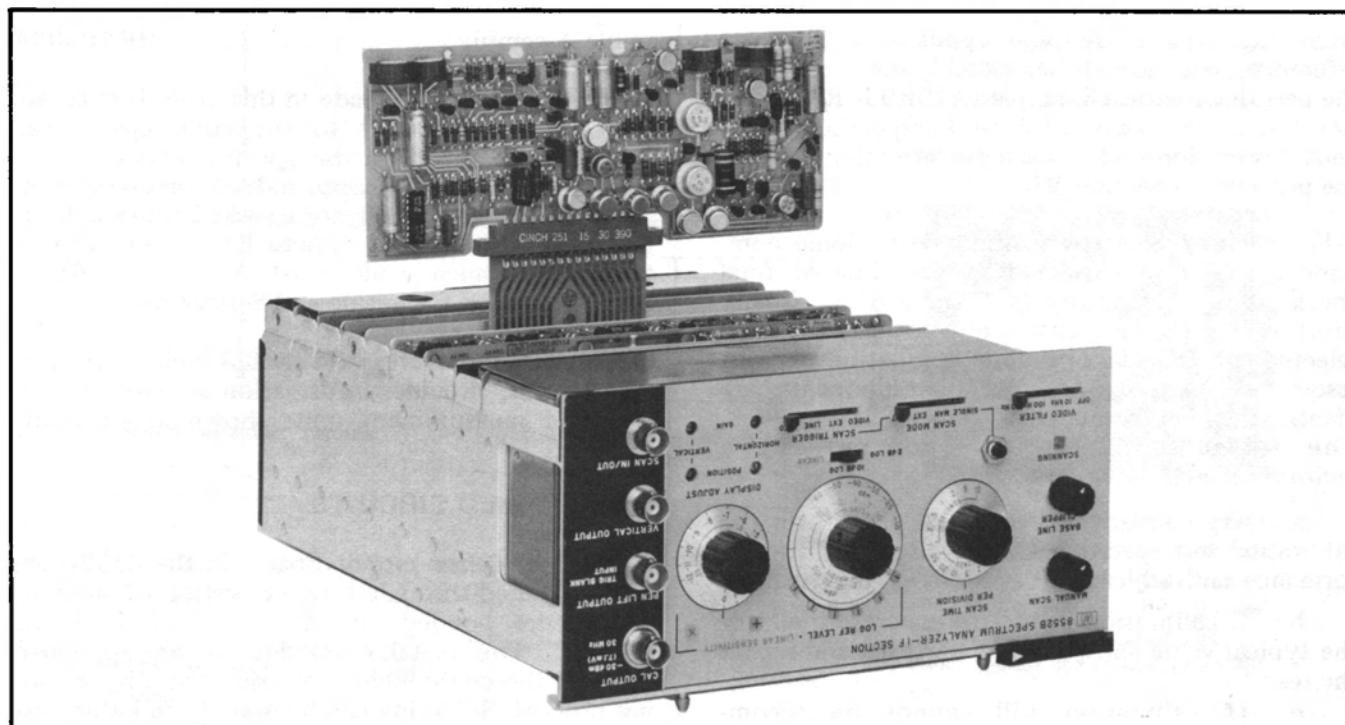


Figure 8-1. 8552B IF Section with Circuit Board Extended for Maintenance

## 8-10. ADJUSTMENTS

8-11. The procedures contained in these sections do not include calibration or adjustment. Service Sheets which contain adjustable components refer to procedures in the Performance and Adjustment Sections which should be performed after repairs are accomplished.

## 8-12. GENERAL PROCEDURES

8-13. The troubleshooting procedure is divided into two maintenance levels. The first, System Test and Troubleshooting Procedure, is designed to quickly isolate the cause of a malfunction to a circuit or assembly. The second provides circuit analysis and test procedures to aid in isolating faults to a defective component. Circuit descriptions and test procedures for the second maintenance level are located on the page facing the schematic diagram of the circuit to be repaired.

8-14. After the cause of a malfunction has been located and remedied in any circuit containing adjustable components, the applicable procedure specified in the Performance and Adjustment Section should be performed.

## 8-15. GENERAL SERVICE INFORMATION

**8-16. Part Location Aids.** The locations of chassis-mounted parts and major assemblies are shown in Figure 8-8. The locations of individual components mounted on printed circuit boards or other assemblies are shown on the appropriate schematic diagram page or on the page opposite it. The part reference designator is the assembly designator plus the part designator. (Example: A10R9 is R9 on the Log Reference Assembly A10). For specific component description and ordering information refer to the parts list in Section VI.

**8-17. Factory Selected Components.** Some component values are selected at the time of final checkout at the factory (see Table 5-4). Usually these values are not extremely critical; they are selected to provide optimum compatibility with associated components. These components are identified on individual schematics by an asterisk. The recommended procedure for replacing a factory-selected part is as follows:

- a. Try the original value, then perform the calibration test specified for the circuit in the performance and adjustment sections of this manual.
- b. If calibration cannot be accomplished, try the typical value shown in the parts list and repeat the test.
- c. If calibration still cannot be accomplished, perform the calibration test using various values until calibration is accomplished.

**8-18. Modular Exchange Program.** Circuit boards for the 8552B Spectrum Analyzer IF Section are available on an exchange basis at a considerable savings in cost. Simply contact the Hewlett-Packard office nearest you and make your requirements known. The local Hewlett-Packard office will arrange for immediate airmail shipment to minimize equipment downtime. At least 90% of the orders for exchange modules (circuit boards) received by an HP Field Sales office will be shipped the same day — either from the sales office itself or from service center.

8-19. An exchange module should be ordered by the “Exchange Assembly” part number listed under the assembly designation in Table 6-3, Replaceable Parts. Upon receiving the exchange module, the faulty module should be returned in the same special carton in which the exchange module was received. A flow diagram of the Modular Exchange Program is shown in Figure 8-2.

**8-20. System Test and Troubleshooting Procedure.** Table 8-2 provides information that will, in most cases, isolate the causes of a malfunction to a circuit or assembly, RF Section, or Display Section. This procedure should be used in conjunction with the block diagrams and text located on Service Sheet 1. The test equipment required follows:

|                            |                     |
|----------------------------|---------------------|
| RF Voltmeter . . . . .     | HP 3406A            |
| Oscilloscope . . . . .     | HP 180A/1801A/1821A |
| Signal Generator . . . . . | HP 608F             |
| Service Kit . . . . .      | HP 11592A           |
| Adapter . . . . .          | UG-201 A/U          |
| Cable Assembly . . . . .   | HP 10503A           |

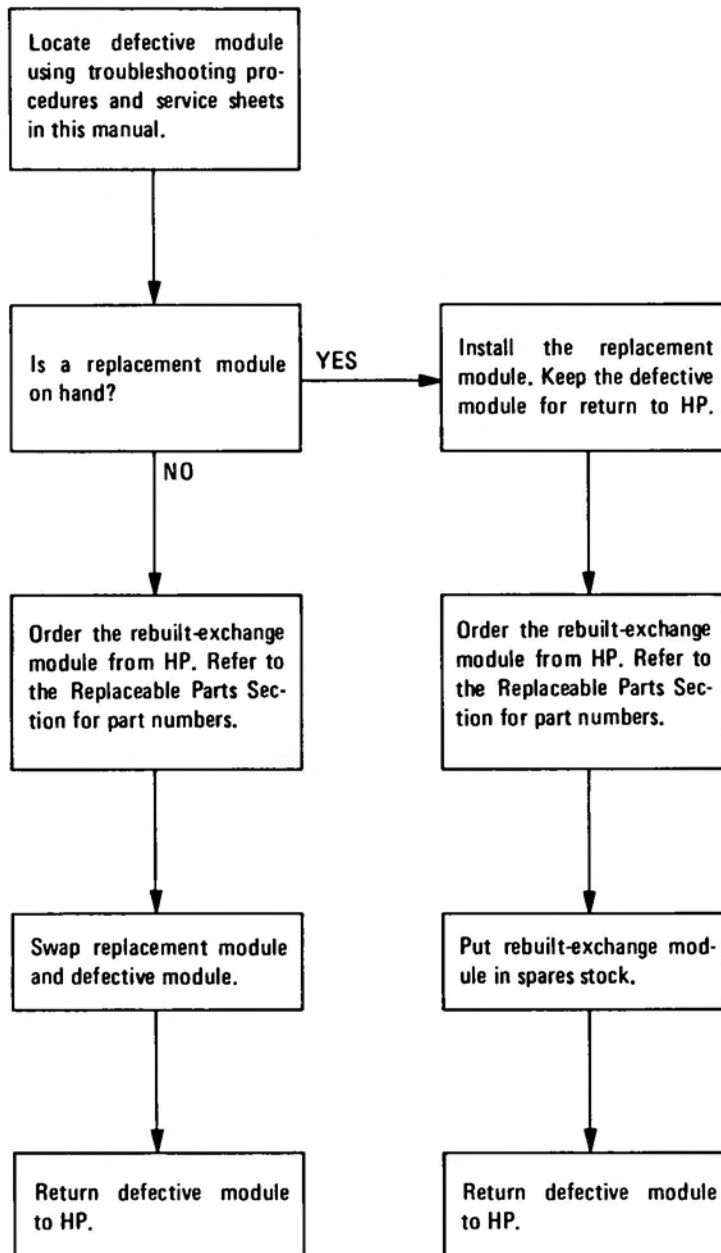
8-21. No attempt is made in this procedure to isolate causes of trouble to the component level. Reference is made to the specific Service Sheet which describes the circuits and test procedures for the portion of the analyzer to which the malfunction has been isolated. Where RF or Display Section maintenance is indicated, refer to the RF or Display Section Operating and Service manual.

**8-22. Diagram Notes.** Table 8-3, Schematic Diagram Notes, provides information relative to symbols and measurement units shown in schematic diagrams.

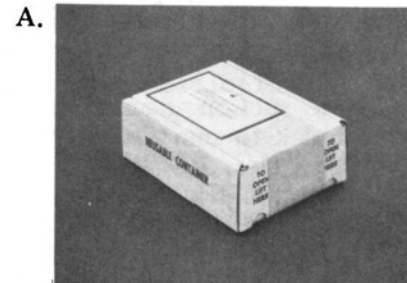
## 8-23. ETCHED CIRCUITS

8-24. The etched circuit boards in the 8552B 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 8-1 lists recommendations and precautions pertinent to

The module exchange program described here is a fast, efficient, economical method of keeping your Hewlett-Packard instrument in service.

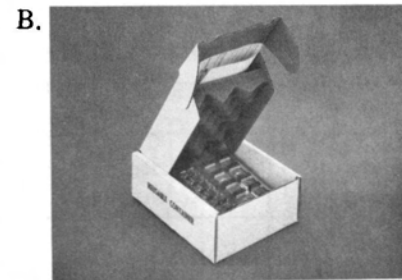


\*HP pays postage on boxes mailed in U.S.A.



Rebuilt-exchange modules are shipped individually in boxes like this. In addition to the circuit module, the box contains:

Module repair report  
Return Address label  
Tape for resealing box



Open box carefully - it will be used to return defective module to HP. Complete repair report. Place it and defective module in box. Be sure to remove enclosed return address label.



Seal box with tape provided. Inside U.S.A.\*, stick preprinted return address label over label already on box, and return box to HP. Outside U.S.A., do not use address label: instead, address box to the nearest HP office.

Figure 8-2. Diagram of Modular Exchange Program

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 8-1) 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 8-1 for recommendations.

**8-25. 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.

## 8-26. COMPONENT REPLACEMENT.

a. Remove defective component from board.

### 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.

*Table 8-1. Etched Circuit Soldering Equipment*

| Item                                                                                                                                                                                                                                                                | Use                                                                            | Specification                                                                   | Item Recommended                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------|
| Soldering tool                                                                                                                                                                                                                                                      | Soldering<br>Unsoldering                                                       | Wattage rating: 47½ — 56½<br>Tip Temp: 850—900 degrees                          | Ungar #776 Handle with<br>*Ungar #4037 Heating Unit |
| Soldering *Tip                                                                                                                                                                                                                                                      | Soldering<br>Unsoldering                                                       | *Shape: pointed                                                                 | *Ungar #PL111                                       |
| De-soldering Aid                                                                                                                                                                                                                                                    | To remove molten solder from connection                                        | Suction device                                                                  | Soldapullt by Edsyn Co.<br>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<br>Acetone<br>Lacquer Thinner                 |
| Solder                                                                                                                                                                                                                                                              | Component replacement<br>Circuit board repair<br>Wiring                        | Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred  |                                                     |
| Protective Coating                                                                                                                                                                                                                                                  | Contamination, corrosion protection                                            | Good electrical insulation, corrosion-prevention properties                     | Silicone Resin such as GE DRI-FILM**88              |
| <p>*For working on 8552B Boards: for general purpose work, use Ungar No. 1237 Heating Unit (37.5W, tip temperature of 750—800 degrees) and Ungar No. PL113 1/8" chisel tip.</p> <p>**General Electric Co., Silicone Products Dept., Waterford, New York, U.S.A.</p> |                                                                                |                                                                                 |                                                     |

b. If component was unsoldered, remove solder from mounting holes, and position component as original was positioned. **DO NOT FORCE LEADS INTO MOUNTING HOLES;** sharp lead ends may damage plated-through conductor.

### 8-27. Transistor Replacement

8-28. Solid state transistors are in many physical forms. This sometimes results in confusion as to which lead is the collector, which is the emitter, and which is the base. Figures 8-3 and 8-4 show epoxy and metal case transistors and integrated circuits and the means of identifying the leads.

8-29. To replace a transistor, proceed as follows:

a. Do not apply excessive heat; see Table 8-1 for recommended soldering tools.

b. Use long-nose pliers between transistor and hot soldering iron as a heat sink. The instant

solder is melted, use pliers to pull lead free of board.

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

d. Integrated circuit replacement instructions are the same as those for transistors.

8-30. Some transistors are mounted for good heat dissipation. This requires good thermal contact with mounting surfaces. To assure good thermal contact for a replacement transistor, coat both sides of the black insulator with Dow Corning No. 5 silicone compound or equivalent before fastening the transistor to the chassis. Dow Corning No. 5 compound is available in 8-oz. tubes from Hewlett-Packard; order HP Part No. 8500-0059.

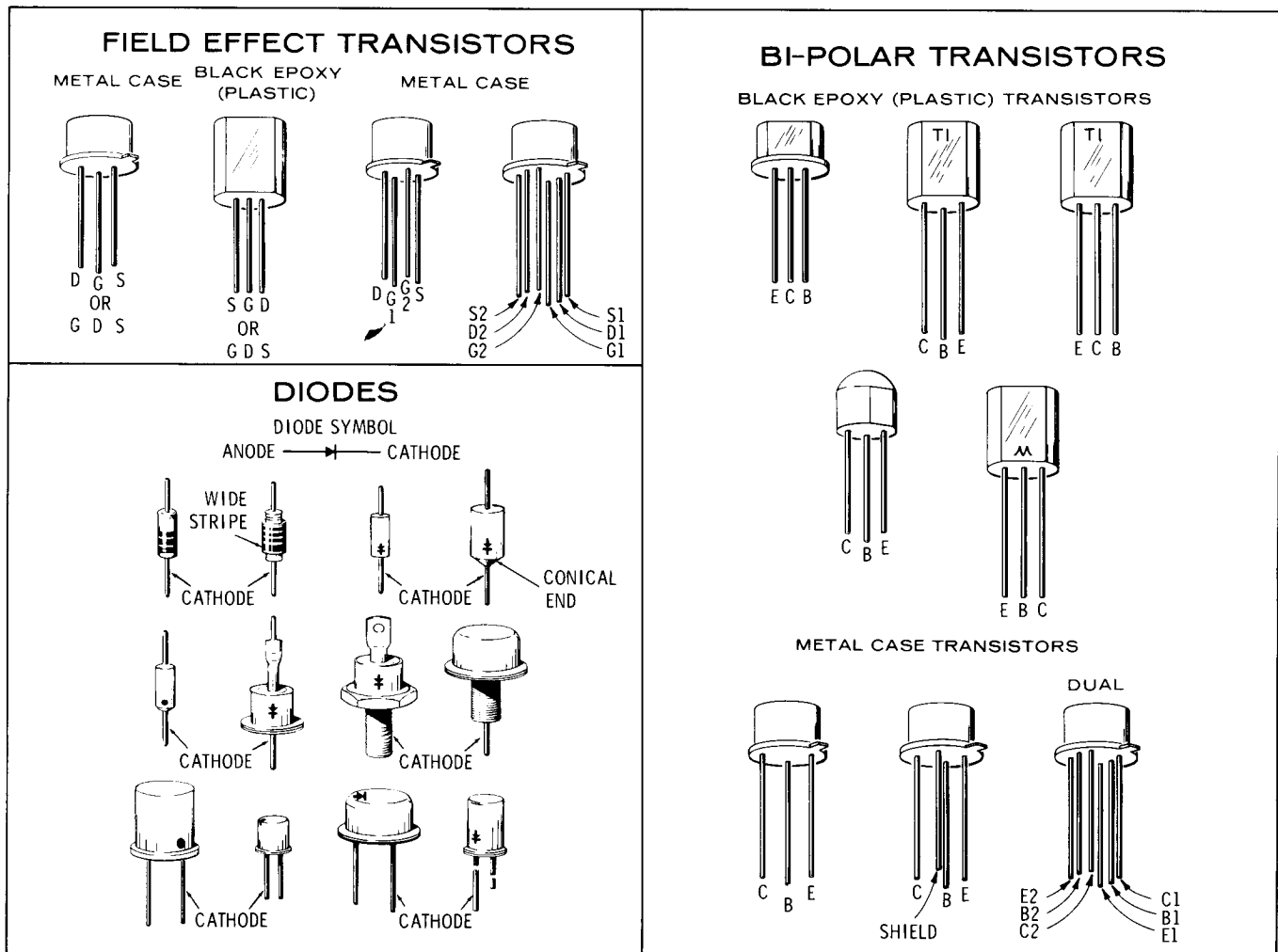


Figure 8-3. Examples of Diode and Transistor Marking Methods

### 8-31. Diode Replacement

8-32. Solid state diodes are in many physical forms. This sometimes results in confusion as to which lead or connection is for the cathode (negative) or anode (positive), since not all diodes are marked with the standard symbols. Figure 8-3 shows examples of some diode marking methods. If doubt exists as to polarity, an ohmmeter may be used to determine the proper connection. It is necessary to know the polarity of the ohms lead with respect to the common lead for the ohmmeter used. (For the HP Model 410B Vacuum Tube Voltmeter, the ohms lead is negative with respect to the common; for the HP Model 412A DC Vacuum Tube Voltmeter, the ohms lead is positive with respect to the common.) When the ohmmeter indicates the least diode resistance, the cathode of the diode is connected to the ohmmeter lead which is negative with respect to the other lead.

#### NOTE

Replacement instructions are the same as those listed for transistor replacement.

### 8-33. SWITCHING INFORMATION

8-34. The manner in which switch wafers are schematically presented in this manual is distinctly different from that used in previous Hewlett-Packard manuals. If the following information concerning the evolution of this system of switch presentation is carefully studied, it will be seen that circuits are more easily understood and much more easily traced.

8-35. One of the major objections to drawing switch wafer symbols as the wafer appears is that many lines must cross other lines on the schematics. This problem has not been completely eliminated by use of straight-line presentation, but it has been minimized and circuits are much easier to follow once the basic principles are understood.

8-36. Figure 8-5 illustrates the evolution of straight-line switch presentation from the pictorial view of a switch wafer. Part A shows the wafer as it actually appears. In parts B and C, when the wafer is viewed as being a flexible, stretchable material, the transition from wafer to straight-line presentation begins to be obvious. In part D the transition is complete and the wafer now appears to be a slide type switch. In part E the final result is shown. Note that those contacts which maintain contact with the metallic portion of the rotor regardless of switch position (in the illustration contact 7) are moved to the other side for clarification. Note too that lead lines and arrows to switch contacts are no longer required.

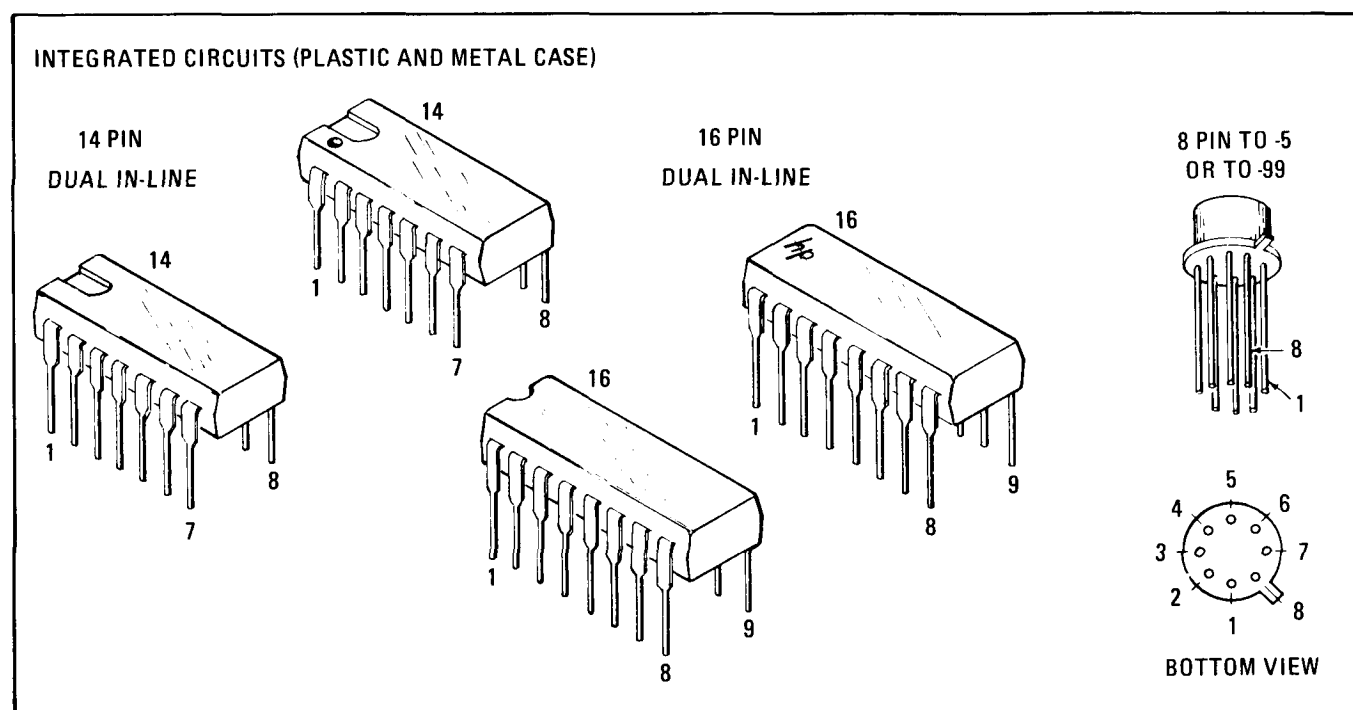


Figure 8-4. Integrated Circuit Packaging



8-37. In all schematics in this manual, the switches are shown in the maximum ccw position, unless otherwise noted. The physical layout of the switches are shown as well as a straight-line presentation of switch action. In Figure 8-6 note that the straight

line rotor contact moves from the bottom to the top when the switch moves one step in a cw direction. Figure 8-7 illustrates the difference between the old method of switch presentation and the straight line presentation.

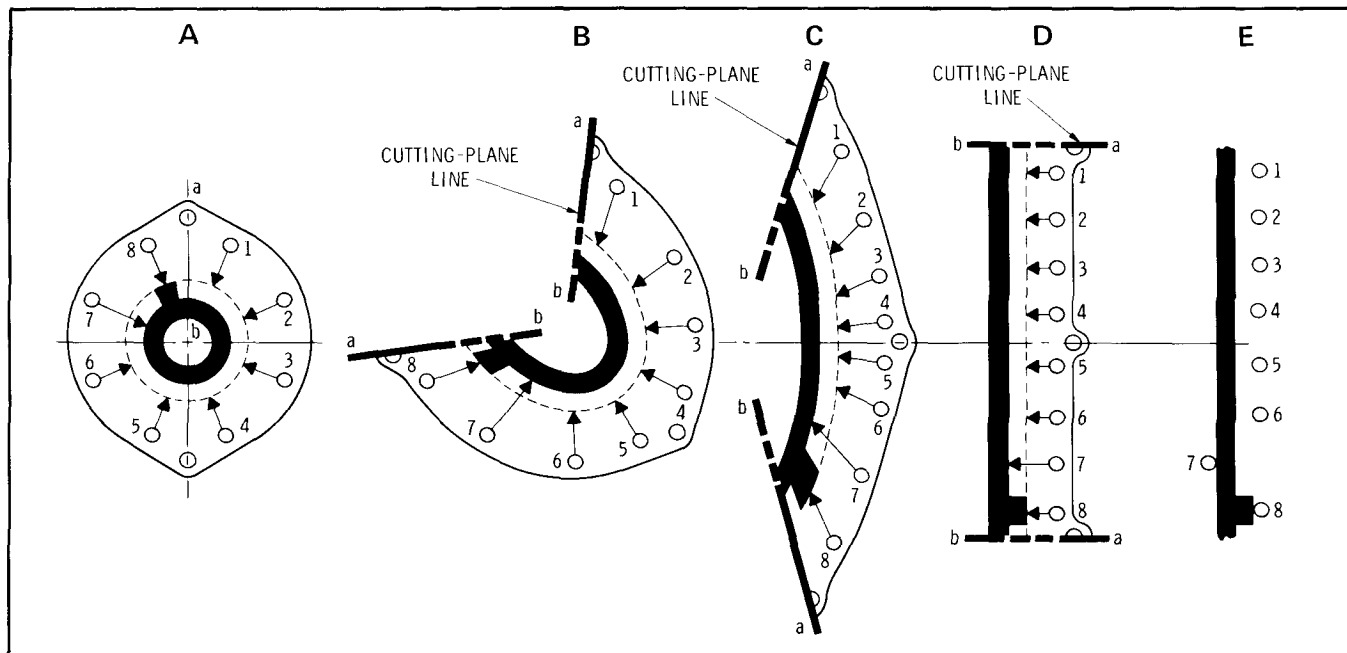


Figure 8-5. Evolution of Straight-Line Switch Presentation

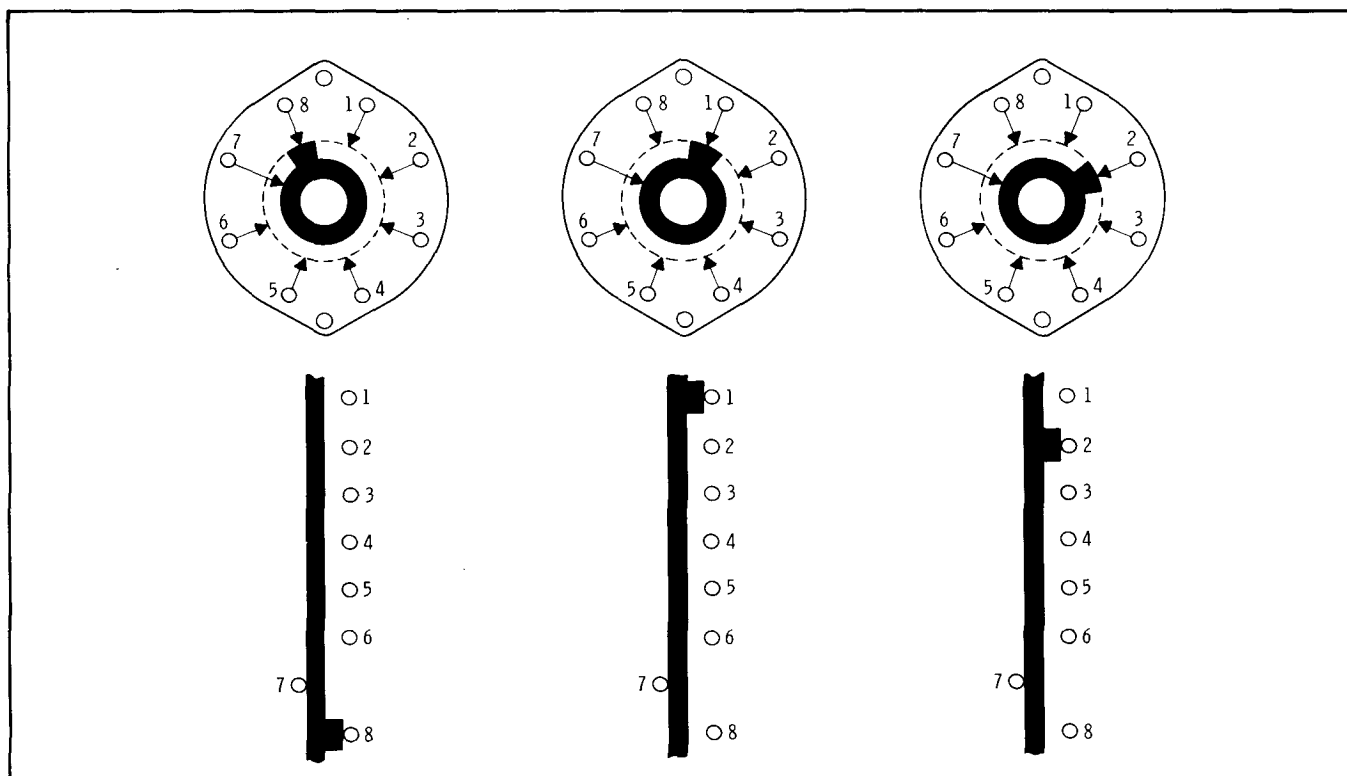


Figure 8-6. Three Positions of Typical Switch Wafers

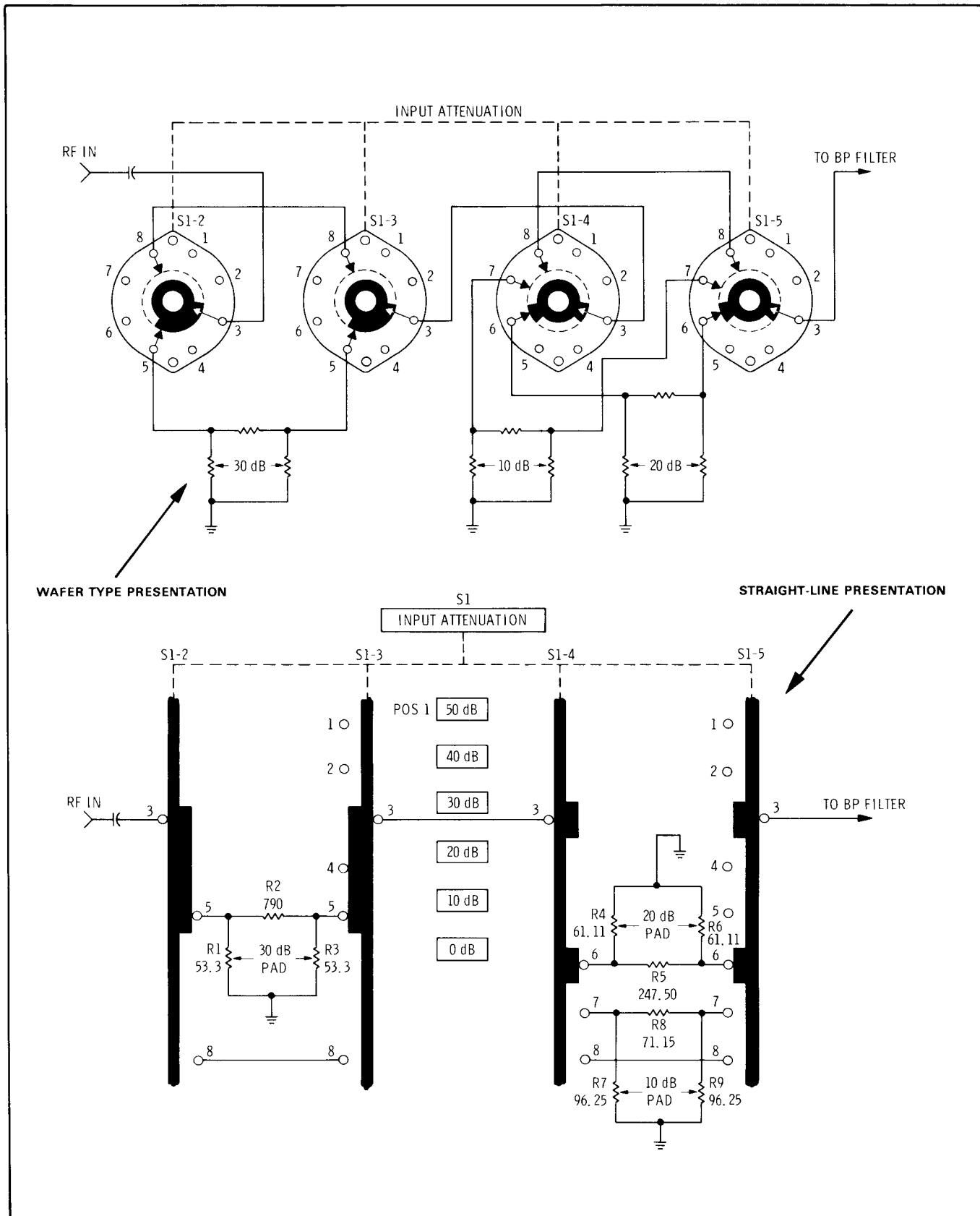


Table 8-2. System Test and Troubleshooting Procedure

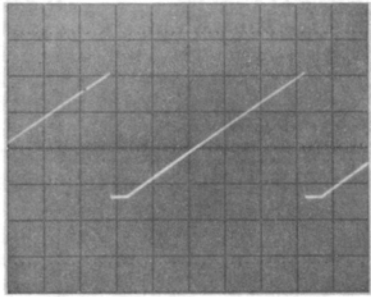
| TEST                                                                                                                                                                                                                 | FAULT                                                                   | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Set POWER switch to ON.<br>Power lamp on, fan operates.<br>Proceed to test 2.                                                                                                                                     | Light not on<br>and/or fan<br>inoperative                               | Check Display Section                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2. Rotate INPUT ATTENUATION control and observe LOG REF LEVEL index lights.<br><br>Lights operate properly.<br><br>Proceed to test 3.                                                                                | None of the lights illuminate<br><br>Some but not all lights illuminate | Check the -12.6 volt supply from Display Section. If voltage is present see Service Sheet 18. If voltage is not present, check the Display Section power supply.<br><br>Check light bulbs on Service Sheet 18.                                                                                                                                                                                                                                                                                                                                      |
| 3. Set Analyzer controls as follows:<br>SCAN TIME PER DIVISION . 5 ms<br>SCAN MODE . . . . . INT<br>SCAN TRIGGER . . . . . AUTO<br>and observe SCANNING light.<br><br>Light operates normally.<br>Proceed to test 4. | SCANNING light does not illuminate                                      | Check power supply circuits on Service Sheet 19.<br><br>If the power supply circuits are operating properly, proceed to test 4.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4. Adjust Display Section for a baseline trace.                                                                                                                                                                      | Trace does not appear                                                   | Connect the oscilloscope to the SCAN IN/OUT jack on the front panel of the analyzer and observe the waveform.<br><br> <p>Oscilloscope control settings:<br/>0.2V/Div<br/>10 msec/Div<br/>10:1 probe</p> <p>If the waveform is not present, check the scan amplifier and the scan generator (Service Sheets 15 and 16). If the waveform is present, check the horizontal deflection amplifier, Service Sheet 14. If trouble persists, check Display Section.</p> |
| Baseline trace is normal,<br>Proceed to test 5                                                                                                                                                                       |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Table 8-2. System Test and Troubleshooting Procedure (cont'd)

| TEST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FAULT                                                                                                                                     | PROCEDURE                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>5. Set analyzer controls as follows:</p> <p>FREQUENCY ..... 30 MHz<br/> BANDWIDTH ..... 10 kHz<br/> FINE TUNE ..... Centered<br/> SCAN WIDTH ..... PER DIVISION<br/> SCAN WIDTH PER DIVISION 1 MHz<br/> INPUT ATTENUATION .... 10 dB<br/> TUNING STABILIZER ..... On<br/> BASE LINE CLIPPER ..... ccw<br/> LOG REF LEVEL ..... 0 dBm<br/> LOG REF LEVEL Vernier ..... ccw<br/> LOG LINEAR ..... 10 dB LOG<br/> VIDEO FILTER ..... OFF<br/> SCAN TIME PER DIVISION ..... 2 MILLISECONDS</p> <p>Connect CAL OUTPUT to RF INPUT and observe display. The 30 MHz signal should appear close to the center of the display CRT at a level of -30 dBm. If signal is correct, proceed to test 8.</p>                                                              | <p>Signal does not appear on Display Section CRT</p> <p>Signal appears but sweeps back and forth about <math>\pm 1</math> Div on CRT.</p> | <p>Connect the RF voltmeter to CAL OUTPUT jack. The voltmeter should indicate approximately -30 dBm. If the signal is not present refer to Service Sheet 17. Repair the calibration oscillator and repeat the test. If CAL OUTPUT is present proceed to test 6.</p> <p>Refer to Service Sheet 4 and check the 47 MHz APC and the 2 MHz VTO circuits.</p> |
| <p>6. Set analyzer controls as follows:</p> <p>BANDWIDTH ..... 10 kHz<br/> FINE TUNE ..... Centered<br/> SCAN WIDTH ..... PER DIVISION<br/> SCAN WIDTH PER DIVISION 20 kHz<br/> INPUT ATTENUATION .... 0 dB<br/> TUNING STABILIZER ..... OFF<br/> BASELINE CLIPPER ..... ccw<br/> LOG REF LEVEL ..... -30 dBm<br/> LOG REF LEVEL Vernier ..... ccw<br/> LOG LINEAR ..... 10 dB LOG<br/> VIDEO FILTER ..... OFF<br/> SCAN TIME PER DIVISION ..... 2 MILLISECONDS</p> <p>Connect a 50 MHz -33 dBm signal from the signal generator to J6 on the top of the 8552B using the 11592-60001 cable. Tune the signal generator slightly around 50 MHz until the signal is centered. With AMPL CAL centered the signal should read -30 dBm <math>\pm 2</math> dBm.</p> | <p>If signal is correct</p> <p>Signal is missing</p>                                                                                      | <p>IF Section operating correctly. Trouble in RF Section. See Systems Test and Troubleshooting Procedure in RF Section Manual.</p> <p>Proceed to test 7</p>                                                                                                                                                                                              |
| <p style="text-align: center;">NOTE</p> <p>For steps 7a through 7g connect CAL OUTPUT to RF INPUT and set the analyzer controls as specified in step 6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                          |

Table 8-2. System Test and Troubleshooting Procedure (cont'd)

| TEST                                                                                                                                                                                                                                                                                         | FAULT                          | PROCEDURE                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7. Perform the following sub-tests until a malfunction has been found and corrected, then repeat test.                                                                                                                                                                                       |                                |                                                                                                                                                        |
| 7a. Connect the RF voltmeter to terminal labeled 3 MHz (C4) on the top of the 8552B. Tune frequency for maximum signal around 30 MHz. Signal should be about 8 mV rms. If signal is correct, proceed to test 7b.                                                                             | Signal is missing or incorrect | Refer to Service Sheet 3 and repair the 50 MHz Converter.                                                                                              |
| 7b. Connect the RF voltmeter to the 3 MHz terminal (C4), peak FREQUENCY, then set SCAN TIME PER DIVISION to 1 SECOND. Meter should fluctuate with peaks at about 8 mV rms. If signal is correct set SCAN TIME PER DIVISION to 2 MILLISECONDS and proceed to test 7c.                         | Meter does not fluctuate       | Refer to Service Sheet 4 and check the 47 MHz APC and the 2 MHz VTO circuits. If trouble persists, check the 2 MHz Shaping circuits (Service Sheet 5). |
| 7c. Set SCAN WIDTH to ZERO, connect the RF voltmeter to XA2 pin 14 and tune FREQUENCY for maximum. Signal level should be about 38 mV rms. Rotate AMPL CAL and LOG REF vernier cw; signal should increase. If signal is correct, re-center AMPL CAL, set vernier ccw and proceed to test 7d. | Signal is missing or incorrect | Refer to Service Sheets 6 and 7 and repair the 3 MHz Amplifier.                                                                                        |
| 7d. Connect the RF voltmeter to XA1 pin 2 and tune FREQUENCY and FINE TUNE for maximum. Signal level should be about 230 mV rms. If signal is correct, proceed to test 7e.                                                                                                                   | Signal is missing or incorrect | Refer to Service Sheet 8 and repair the LC Filter.                                                                                                     |
| 7e. Connect the RF voltmeter to XA4 pin 14 and tune FREQUENCY and FINE TUNE for maximum. Signal should be about 930 mV rms. Set BANDWIDTH to 3 kHz and peak signal with FINE TUNE. Signal should remain about the same. If signal is correct, proceed to test 7f.                            | Signal is missing or incorrect | Refer to Service Sheets 10 and 11 and repair the Crystal Filter.                                                                                       |

Table 8-2. System Test and Troubleshooting Procedure (cont'd)

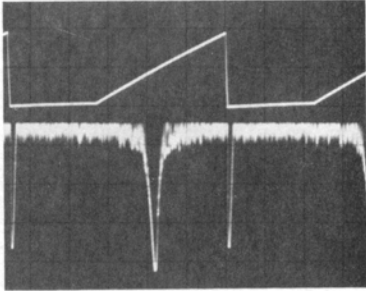
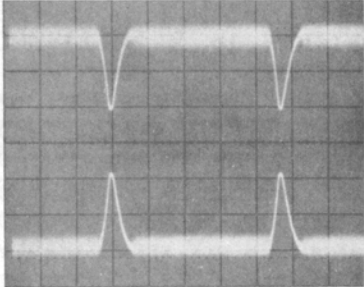
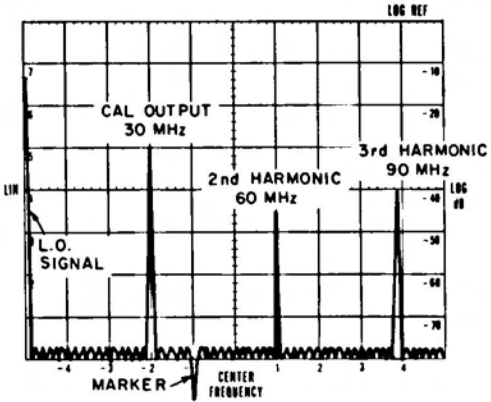
| TEST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | FAULT                                                                                                     | PROCEDURE                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>7f. Set SCAN WIDTH to PER DIVISION and connect oscilloscope channel A probe to SCAN IN/OUT jack and the channel B probe to XA7, pin B. Oscilloscope control settings:</p> <p>Time/Div . . . . . 0.5 msec/div<br/> Channel A . . . . . 0.5 V/div<br/> Channel B . . . . . 0.02 V/div<br/> 10:1 probes<br/> If waveform is correct, proceed to test 7g.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                | Waveform B is missing or incorrect                                                                        | <p>Refer to Service Sheet 12 and 13 and repair the Log-Linear Amplifier circuits.</p>                                                                                                                             |
| <p>7g. Connect the oscilloscope channel A input to XA7 pin 5 and the channel B input to XA7 pin E with analyzer set as in 7f.</p> <p>Oscilloscope control settings:</p> <p>VOLTS/DIV . . . . . 2V/Div<br/> TIME/DIV . . . . . 2 msec/Div<br/> 10:1 probes</p> <p>If waveform is correct, trouble is in the Display Section or in interconnecting wiring. After making repairs, repeat test 5.</p>                                                                                                                                                                                                                                                                                                                                                                                           | Either waveform is missing or incorrect                                                                   | <p>Refer to Service Sheet 14 and repair the vertical deflection circuit.</p>                                                                                                                                     |
| <p>8. Set analyzer controls as follows:</p> <p>FREQUENCY . . . . . 40 MHz<br/> FINE TUNE . . . . . Centered<br/> BANDWIDTH . . . . . 300 kHz<br/> SCAN WIDTH . . . . . 0-100 MHz<br/> SCAN WIDTH PER DIVISION . . . . . 10 MHz<br/> INPUT ATTENUATION . . . . . 10 dB<br/> RANGE - MHz . . . . . 0-110<br/> TUNING STABILIZER . . . . . On<br/> BASE LINE CLIPPER . . . . . ccw<br/> SCAN TIME PER DIVISION . . . . . 2 MILLISECONDS<br/> LOG REF LEVEL . . . . . -10 dBm<br/> LOG REF LEVEL Vernier . . . . . 0<br/> LOG-LINEAR . . . . . 10 dB LOG<br/> VIDEO FILTER . . . . . OFF<br/> SCAN MODE . . . . . INT<br/> SCAN TRIGGER . . . . . AUTO</p> <p>Connect CAL OUTPUT to RF INPUT using a BNC to BNC cable. The display should be similar to that shown in the procedure column.</p> | <p>Sweep does not extend to full width of graticule</p> <p>Not all signals present or properly spaced</p> |  <p>30 MHz Calibrator Signal &amp; Harmonics</p> <p>See Service Sheet 14. Check Scan Generator assembly.</p> <p>Same as above. Also refer to System Test and Troubleshooting Procedure in RF Section Manual.</p> |

Table 8-2. System Test and Troubleshooting Procedure (cont'd)

| TEST                                                                                                                                                                                                                                                                                                                                                                                                                            | FAULT                                                                             | PROCEDURE                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Test 8 (cont'd)</p> <p>Vary VERTICAL position to center baseline trace on bottom CRT graticule. Signal amplitude is unimportant in this test. Proceed to test 9.</p>                                                                                                                                                                                                                                                         | Baseline trace does not vary                                                      | See Service Sheet 14.<br>Check vertical deflection circuit                                                                                   |
| <p>9. Set LOG REF LEVEL maximum ccw. Set SCAN TIME PER DIVISION to 10 SECONDS and adjust focus and astigmatism. Adjust trace align to center trace on bottom CRT graticule. Proceed to test 10.</p>                                                                                                                                                                                                                             | Focus and astigmatism inoperative or trace will not align                         | Refer to Display Section Manual and repair as required.                                                                                      |
| <p>10. Turn FREQUENCY control and observe marker. Marker should move as FREQUENCY is tuned. Proceed to test 11.</p>                                                                                                                                                                                                                                                                                                             | Marker is missing                                                                 | See System Test and Troubleshooting Procedure in RF Section Manual.                                                                          |
| <p>11. Tune FREQUENCY control to move the marker exactly under the signal three divisions from the left. The signal will null when the marker is tuned to the exact frequency of the signal. Set SCAN WIDTH PER DIVISION control to 0.05 MHz, BANDWIDTH to 10 kHz, and SCAN WIDTH to PER DIVISION. 30 MHz signal should appear close to the center graticule on the CRT. If correct signal is observed, proceed to test 12.</p> | 30 MHz signal does not appear on CRT                                              | Check calibration and alignment of the analyzer.                                                                                             |
| <p>12. Adjust FREQUENCY to center the 30 MHz signal on CRT, then reduce SCAN WIDTH PER DIVISION to 10 kHz and recenter the display with FINE TUNE control. Signal centers properly. Proceed to test 13.</p>                                                                                                                                                                                                                     | <p>Signal is unstable.</p> <p>FINE TUNE does not vary signal position</p>         | <p>Refer to System Test and Troubleshooting Procedure in RF Section manual.</p> <p>See Service Sheet 5. Check 2 MHz VTO Shaping Circuit.</p> |
| <p>13. Turn LOG REF LEVEL fully ccw. Top of signal should be -70 dB graticule. Rotate LOG REF LEVEL seven steps cw. CRT display should be as shown in the figure. The fault column lists these steps in numerical order beginning with the first step from the ccw position.</p>                                                                                                                                                | Each of the first 4 steps: no increase in gain, not 10 dB gain or loss of signal. | See Service Sheet 11.                                                                                                                        |

Table 8-2. System Test and Troubleshooting Procedure (cont'd)

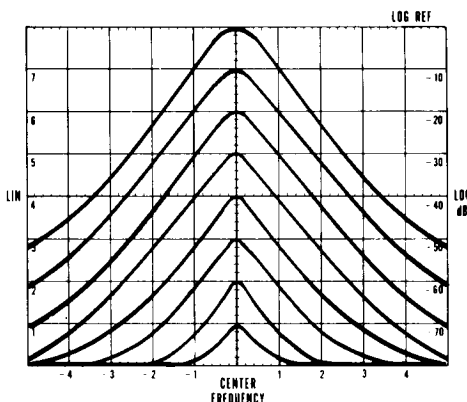
| TEST                                                                                                                                                                                                                                                                                                                                     | FAULT                                                                                                                                                                                                        | PROCEDURE                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>13. (cont'd)</p> <p>Set INPUT ATTENUATION to 30 dB and rotate LOG REF LEVEL cw for remaining two steps. Signal amplitude should again reach the top CRT graticule.</p> <p>INPUT ATTENUATION to 10 dB, LOG REF LEVEL to 0 dBm. Rotate LOG REF LEVEL Vernier to full cw. Signal shown should increase by 12 dB. Proceed to test 14.</p> | <p>Steps 5 and 6 same as above</p> <p>Steps 7, 8 and 9 same as above</p> <p>All or most levels incorrect and cannot be corrected by adjustment.</p> <p>No change in signal level or change is incorrect.</p> |  <p>Check 3 MHz step gain amplifier, Service Sheets 8 and 9.</p> <p>Check 3 MHz step gain amplifier, Service Sheets 6 and 9.</p> <p>Check Lin/Log amplifier, Service Sheets 12, 13.</p> <p>Check variable gain amplifier, Service Sheet 7.</p> |
| <p>14. Set LOG REF LEVEL to -30 dBm (-30 +0). Adjust AMPL CAL so that the top of the signal is exactly on the LOG REF (TOP) graticule of the CRT. Proceed to test 15.</p>                                                                                                                                                                | <p>AMPL CAL does not vary signal level.</p>                                                                                                                                                                  | <p>See Service Sheet 6.</p> <p>Check calibration amplifier.</p>                                                                                                                                                                                                                                                                  |
| <p>15. Set LOG·LINEAR to 2 dB LOG. Signal should remain at LOG REF graticule on CRT. Set LOG REF LEVEL to -20 dBm. Signal should drop to about -50 dB graticule on CRT. Proceed to step 16.</p>                                                                                                                                          | <p>Either level incorrect</p>                                                                                                                                                                                | <p>See Service Sheet 14. Check 2 dB Log Amplifier.</p>                                                                                                                                                                                                                                                                           |



Table 8-2. System Test and Troubleshooting Procedure (cont'd)

| TEST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | FAULT                                                                                                                                                                                                        | PROCEDURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16. Set LOG·LINEAR to LINEAR and LINEAR SENSITIVITY to 1 mV/DIV. The CRT deflection should be adjusted by the AMPL CAL control to 7.1 divisions. If display is correct, proceed to test 17.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | AMPL CAL cannot be adjusted for 7:1 division display.                                                                                                                                                        | See Service Sheets 12 and 13. Probable trouble is in linear amplifier compensation circuit or linear scale factor circuit.                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p>17. Set analyzer controls as follows:</p> <p>SCAN WIDTH . . . . 0–100 MHz<br/> SCAN WIDTH<br/> PER DIVISION . . . . . 10 MHz<br/> BANDWIDTH . . . . . 10 kHz<br/> LOG·LINEAR . . . . . 10 dB LOG<br/> LOG REF LEVEL . . . . -10 dBm</p> <p>Turn BASE LINE CLIPPER full ccw.</p> <p>Switch SCAN TIME PER DIVISION through its range.</p> <p>Return SCAN TIME PER DIVISION to 2 MILLISECONDS.</p> <p>Set SCAN WIDTH to PER DIVISION.</p> <p>Set SCAN TIME PER DIVISION to 2 SECONDS, SCAN MODE to SINGLE and push the button; a dot should appear on the CRT display moving from left to right. Push the SINGLE scan button again; the dot should disappear.</p> <p>Set SCAN MODE to MAN and rotate the MANUAL SCAN knob. Knob should control the dot on the CRT.</p> <p>Set SCAN MODE to INT and SCAN TRIGGER to LINE. The scan circuits should trigger and sweep normally.</p> | <p>Bottom 2 divisions of CRT not blanked.</p> <p>Scan does not occur in all positions</p> <p>DISPLAY UNCAL does not illuminate</p> <p>Display incorrect</p> <p>Display incorrect</p> <p>No sweep on CRT.</p> | <p>See Service Sheets 14, 15, and 16.</p> <p>Check base line clipper circuit.</p> <p>Check scan generator circuit.</p> <p>Refer to System Test and Troubleshooting Procedure in RF Section Manual and Service Sheet 17. Probable cause of trouble is in the analogic circuit or switching circuits.</p> <p>Refer to Service Sheet 15 and repair the scan control flip-flop or S2.</p> <p>Refer to Service Sheet 16 and check the manual scan circuits.</p> <p>Refer to Service Sheet 15 and check the scan trigger circuits.</p> |

## SCHEMATIC DIAGRAM NOTES

Resistance in ohms, capacitance in picofarads, and inductance in microhenries unless otherwise noted.

P/O = part of.

\*Asterisk denotes a factory-selected value. Value shown is typical. Capacitors may be omitted or resistors jumpered.



Screwdriver adjustment.



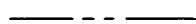
Panel control.



Encloses front panel designations.



Encloses rear panel designation.



Circuit assembly borderline.



Other assembly borderline.



Heavy line with arrows indicates path and direction of main signal.



Heavy dashed line with arrows indicates path and direction of main feedback.



Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.



Numbers in stars on circuit assemblies show locations of test points.



Encloses wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number identifies the narrower stripe. E.g., (947) denotes white base, yellow wide stripe, violet narrow stripe.

Table 8-3. Schematic Diagram Notes

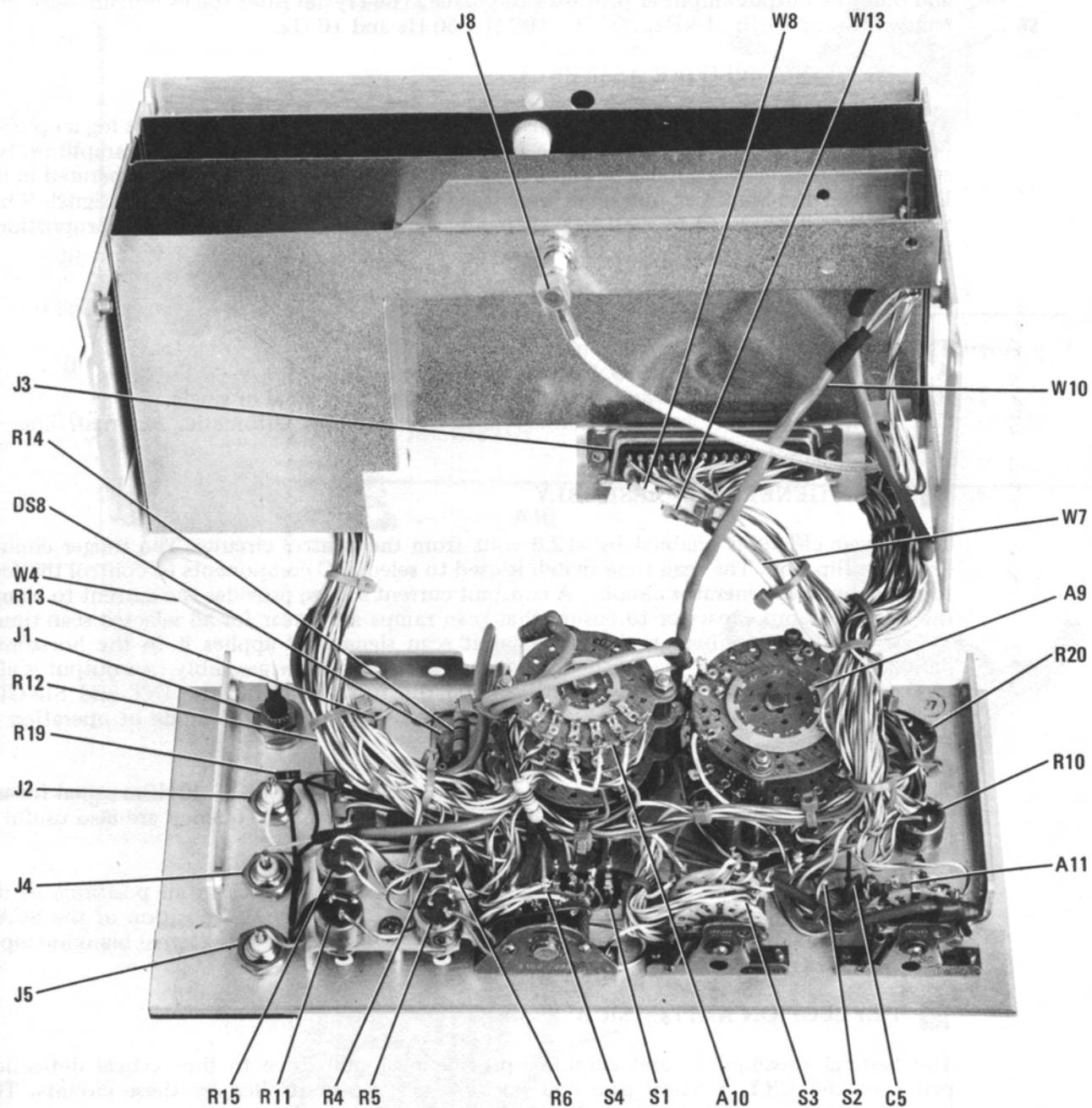
Table 8-4. IF Section Assembly and Component Location

| Assembly                                | Service Sheet                          | Photo                   |
|-----------------------------------------|----------------------------------------|-------------------------|
| A1 LC Filter                            | 8                                      | Figure 8-28             |
| A2 3 MHz Amplifier                      | 6, 7                                   | Figure 8-24, 8-26       |
| A3 50 MHz Converter                     | 3                                      | Figure 8-17             |
| A4 Crystal Filter                       | 10, 11                                 | Figure 8-31, 8-33       |
| A5 Power Supply                         | 5, 17, 19                              | Figure 8-22, 8-46, 8-50 |
| A6 Scan Generator                       | 15, 16, 18                             | Figure 8-42, 8-44, 8-47 |
| A7 Deflection Amplifier                 | 14                                     | Figure 8-40             |
| A8 Log Amplifier                        | 12, 13                                 | Figure 8-36, 8-38       |
| A9 Scan Time Switch                     | 5, 15, 17                              | Figure 8-13             |
| A10 Log Ref Level                       | 6, 9, 11, 13, 18                       | Figure 8-12             |
| A11 Video Filter Switch                 | 13, 17                                 | Figure 8-11             |
| A12 47 MHz APC                          | 4                                      | Figure 8-19             |
| A13 2 MHz VTO (requires 6-pin extender) | 4                                      | Figure 8-20             |
| Component                               | Service Sheet                          | Photo/Location          |
| C1 — 4                                  | 3                                      | Chassis Top             |
| C5                                      | 15                                     | Front Panel             |
| C6 — 10                                 | 4                                      | Chassis Bottom          |
| CR1                                     | 17                                     | Rear Panel              |
| DS 1 — 6 LOG REF Index Lights           | 18                                     | Front Panel             |
| DS 7 X                                  | 13                                     | Front Panel             |
| DS 8 +                                  | 13                                     | Front Panel             |
| DS 9 SCANNING                           | 15                                     | Front Panel             |
| F1, 2                                   | 17                                     | Rear Panel              |
| J1 CAL OUTPUT                           | 18                                     | Front Panel             |
| J2 PEN LIFT OUTPUT                      | 14, 15, 16                             | Front Panel             |
| J3 IF Section/RF Section                | 1, 3, 5, 6, 8, 9, 14, 16<br>17, 18, 19 | Chassis Top             |
| J4 VERTICAL OUTPUT                      | 14                                     | Front Panel             |
| J5 SCAN IN/OUT                          | 16                                     | Front Panel             |
| J6 50 MHz input                         | 3                                      | Chassis Top             |
| J7 47 MHz output                        | 3                                      | Chassis Top             |
| J8                                      | 4                                      | Chassis Bottom          |
| L1 — 4                                  | 3                                      | On XA 3                 |
| P1 IF Section/Display Section           | 2, 14, 17, 19                          | Rear Panel              |
| Q23, 24                                 | 19                                     | Rear Panel              |
| R1 — R3                                 | 19                                     | Rear Panel              |
| R4 HORIZONTAL POSITION                  | 14                                     | Front Panel             |
| R5 HORIZONTAL GAIN                      | 16                                     | Front Panel             |

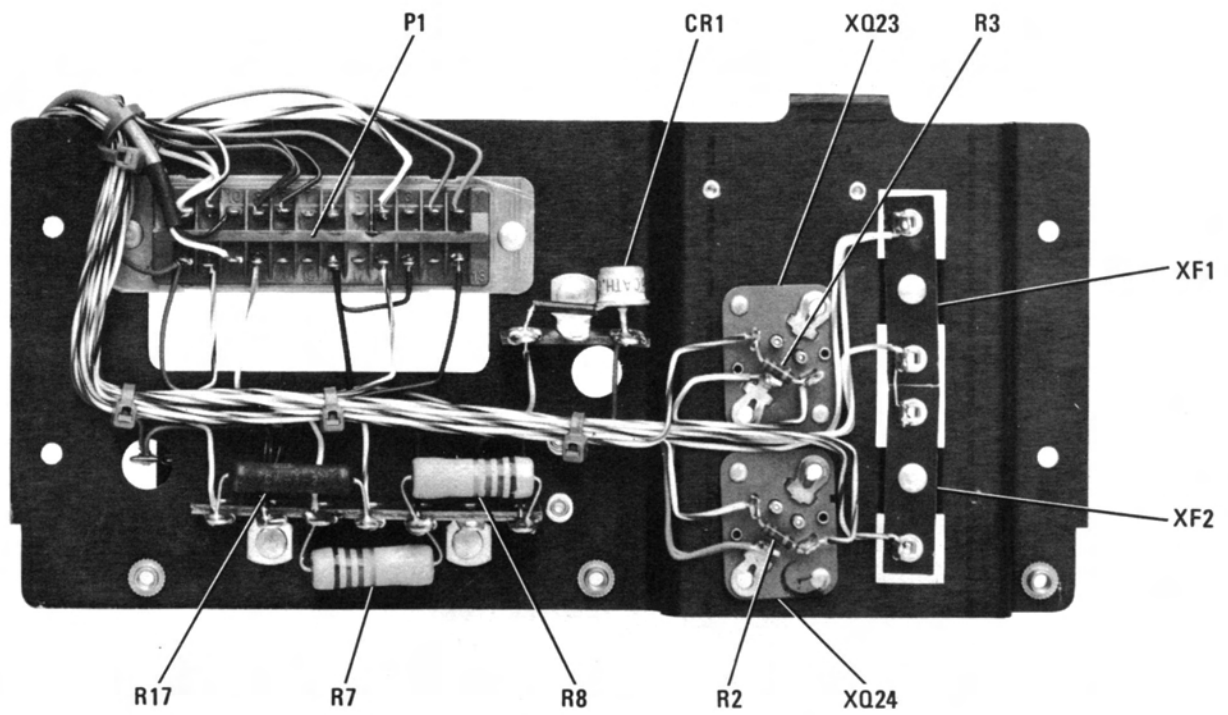
Table 8-4. IF Section Assembly and Component Location (cont'd)

| Component |                     | Service Sheet | Photo/Location |
|-----------|---------------------|---------------|----------------|
| R6        |                     | 14, 16        | Front Panel    |
| R7, 8     |                     | 14            | Rear Panel     |
| R9        |                     | 15            | Front Panel    |
| R10       | BASE LINE CLIPPER   | 14            | Front Panel    |
| R11       | VERTICAL GAIN       | 14            | Front Panel    |
| R12       | Vernier             | 7             | Front Panel    |
| R13, 14   |                     | 13            | Front Panel    |
| R15       | VERTICAL POSITION   | 14            | Front Panel    |
| R16       |                     | 13            | Front Panel    |
| R17       |                     | 12            | Rear Panel     |
| R18       |                     | 19            | Chassis Top    |
| R19       |                     | 14, 15, 16    | Front Panel    |
| R20       | MANUAL SCAN         | 16            | Front Panel    |
| S1        | LOG·LINEAR          | 13, 14        | Front Panel    |
| S2        | SINGLE SCAN         | 15            | Front Panel    |
| S3        | SCAN MODE           | 15, 16, 17    | Front Panel    |
| S4        | SCAN TRIGGER        | 15, 16        | Front Panel    |
| W1        | Green               | 11, 12        | Figure 8-8     |
| W2        | Blue, shielded      | 11            | Figure 8-8     |
| W3        | Horiz Output        | 14            | Figure 8-8     |
| W4        | Cal Output          | 18            | Figure 8-8     |
| W5        | Orange              | 13            | Figure 8-8     |
| W6        | Vert Output         | 14            | Figure 8-8     |
| W7        | 50 MHz Input        | 3             | Figure 8-8     |
| W8        | 47 MHz Output       | 3             | Figure 8-8     |
| W9        | 47 MHz APC          | 3, 4          | Figure 8-8     |
| W10       | Blue, Twisted Pair  | 4, 5          | Figure 8-8     |
| W11       | Blue, Shielded Pair | 4, 5          | Figure 8-8     |
| W12       | Red                 | 8, 10         | Figure 8-8     |

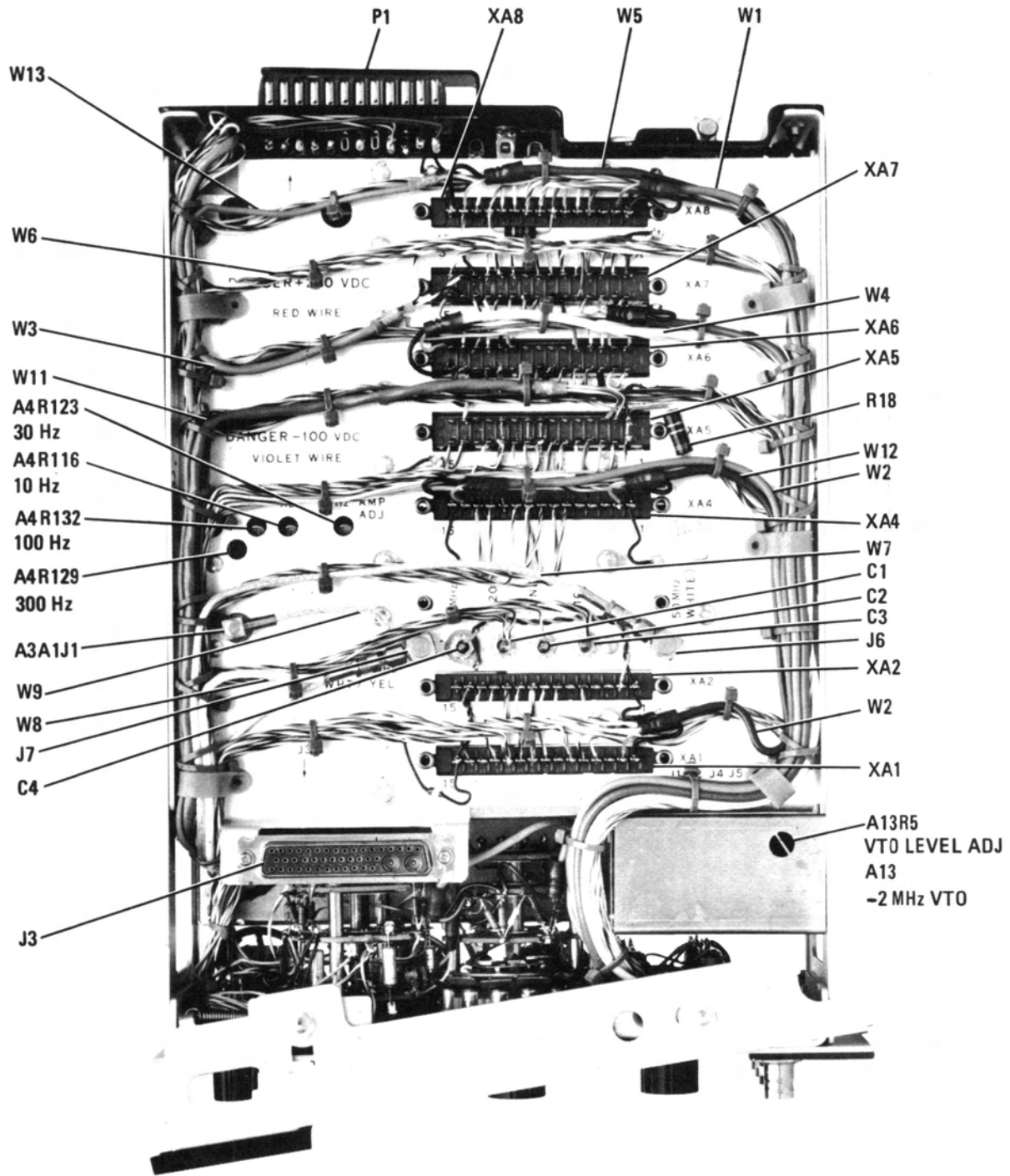
# INSIDE FRONT PANEL



# INSIDE REAR PANEL



TOP



#### **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.”



## BOTTOM

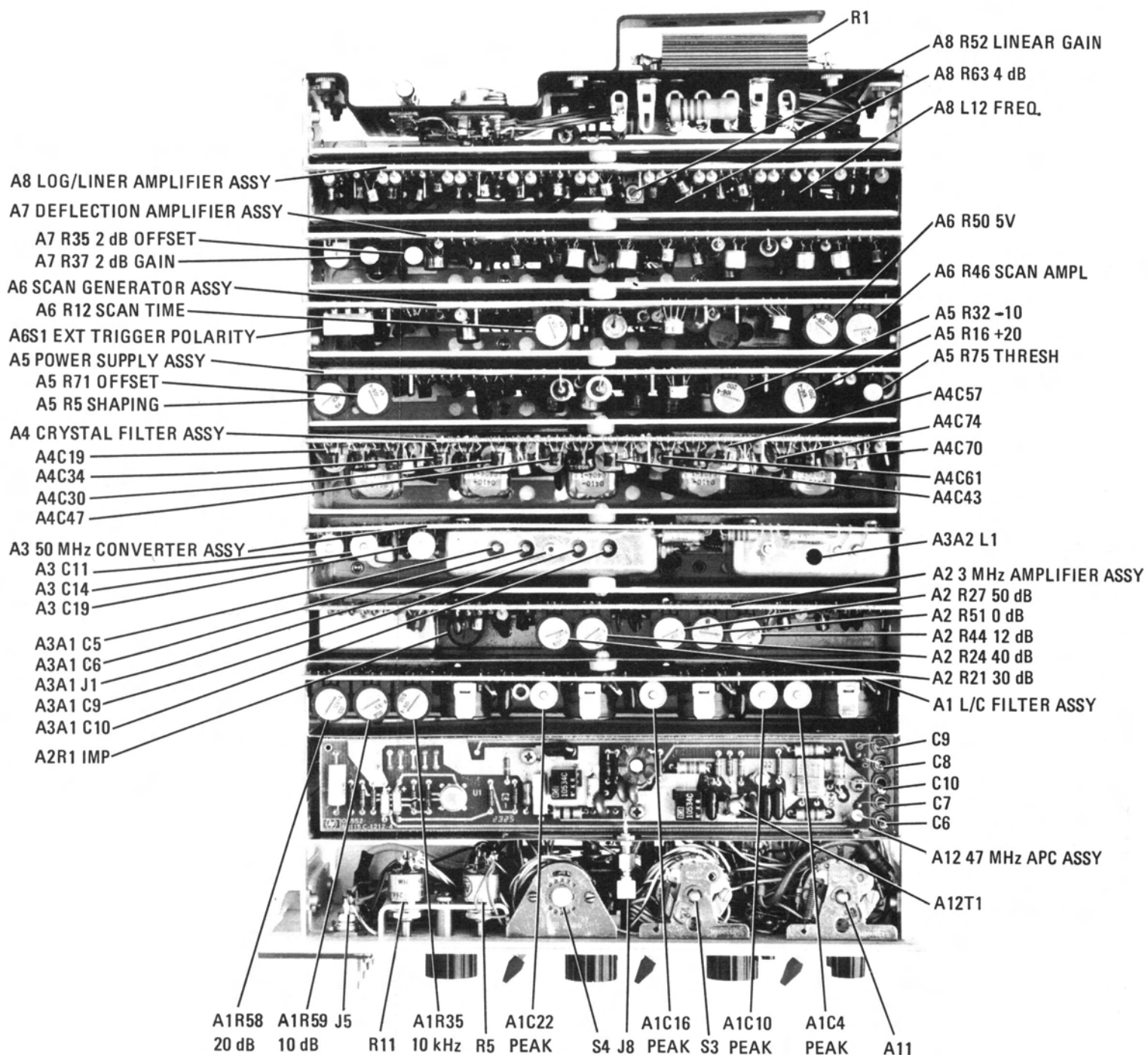


Figure 8-8. 8552B Component, Assembly, and Adjustment Locations

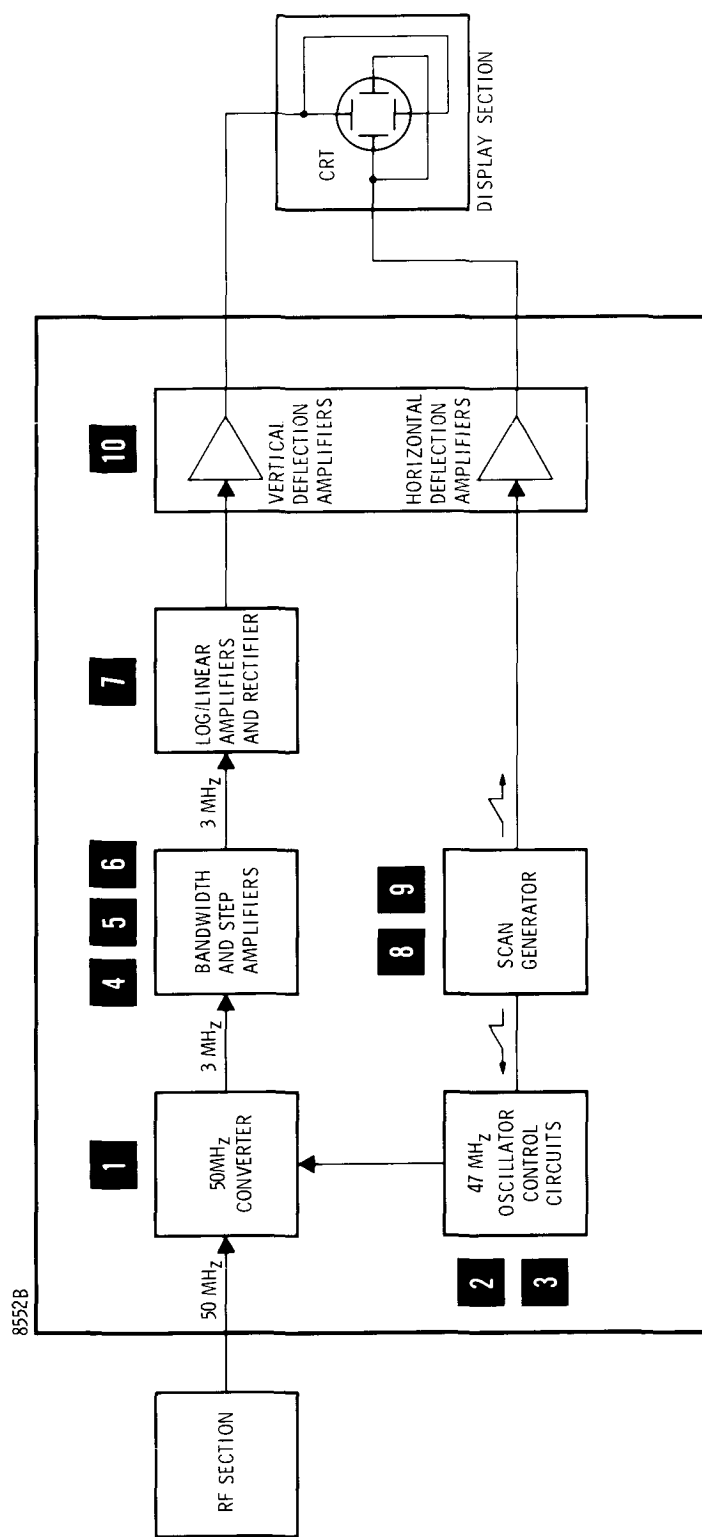


Figure 8-9. Simplified Block Diagram

## SERVICE SHEET 1

### **1** 50 MHz CONVERTER ASSEMBLY

The 50 MHz Converter assembly consists of an IF amplifier, a bandpass filter, a 47 MHz oscillator, and a double balanced mixer. The broadband IF amplifier provides 10 dB of gain. The 47 MHz oscillator is varactor controlled; the frequency is fixed or swept depending on the control voltage received from the APC Assembly.

### **2** POWER SUPPLY ASSEMBLY

The summing and offset amplifiers combine dc levels and a ramp received from the RF Section. (The dc levels eventually set the center frequency of the 47 MHz VTO — the ramp will sweep it symmetrically about that frequency). The RF Section inputs may or may not be present, depending upon the RF Section used and its switch positions. The shaping network converts the linear input into an exponential ramp which controls the 2 MHz VTO. This will cause the 2 MHz VTO output frequency to sweep linearly.

The light driver is controlled by the IF Section VIDEO FILTER and SCAN TIME PER DIVISION switches, and the RF Section SCAN WIDTH PER DIVISION and BANDWIDTH switches. When the switch settings prevent accurate amplitude calibration of the analyzer the light driver turns on and lights the DISPLAY UNCAL lamp in the RF Section.

### **3** 47 MHz APC

The automatic phase control circuits lock the 47 MHz VTO to a stable reference: the 45 MHz crystal oscillator plus the 2 MHz VTO. The 47 MHz VTO frequency is mixed with the 45 MHz reference, filtered and the nominal 2 MHz result is compared to the 2 MHz VTO frequency (which may or may not be sweeping). Any phase difference is detected and used to correct the 47 MHz VTO.

### **4** 3 MHz IF AMPLIFIER

The 3 MHz IF Amplifier consists of a bandpass filter, the calibrate amplifier, the 30/40/50 dB step amplifier, a 0 to 12 dB variable amplifier and an emitter follower output stage. The input bandpass filter is tuneable and is adjusted to provide a 300 kHz bandpass centered at 3 MHz.

### **5** LC BANDWIDTH FILTER ASSEMBLY

The LC Bandwidth Filter Assembly contains four tuned filter circuits, the 10/20 dB step amplifier and an output circuit to provide a low impedance source to the crystal filter input circuit. The bandwidth of individual filter stages is controlled by the RF Section BANDWIDTH switch which forward biases diodes to place resistors in parallel in the signal path. When the analyzer is operated in the 300 kHz bandwidth mode the four tuned stages are bypassed and only the output stage and the step amplifier process the signal. The four tuned stages provide selectable bandwidths of 100 kHz, 30 kHz, and 10 kHz.

**SERVICE SHEET 1 (cont'd)****6 CRYSTAL FILTER ASSEMBLY**

The Crystal Filter Assembly consists of five filter stages and an output amplifier. When the analyzer is operated at bandwidths of 10 kHz or greater, the five filter stages are bypassed and only the output amplifier processes the signal. The crystal filter stages provide selectable bandwidths of 3 kHz, 1 kHz, 300 Hz, 100 Hz, 30 Hz and 10 Hz.

**7 LOG/LIN AMPLIFIER ASSEMBLY**

The Log/Lin Amplifier Assembly consists of an input emitter follower, eight log amplifiers (six of these amplifiers are used in the LINEAR mode), a linear scale factor amplifier, two summing and isolation amplifiers, and a linear detector. When the analyzer is operated in the LOG mode, the amplifier output is logarithmically proportional to the input signal. When the analyzer is operated in the LINEAR mode, the amplifier output is directly proportional to the input signal.

**8 SCAN CONTROL AND TRIGGER CIRCUITS**

These circuits control the operation of the analyzer's scan.

- A. SCAN TIME PER DIVISION selects internal scan time.
- B. SCAN MODE selects scan source: internal, external, manual or single.
- C. SCAN TRIGGER selects internal-scan trigger source: automatic, external, line, or video.

**9 SCAN GENERATOR ASSEMBLY**

The trigger circuit is enabled by -12.6 volts from the control circuits. The trigger circuits drive the flip-flop. The scan time switch is used to select RC components to control the scan time of the scan generator circuits. A constant current source provides the current to charge the selected ramp capacitor to ensure that scan ramps are linear for all selected scan times. The scan ramp amplifier amplifies the input scan signal and applies it to the horizontal deflection amplifier and the RF Section scan width attenuator assembly. An output is also provided at the SCAN IN/OUT connector, on the front panel, in the INT and SINGLE modes of operation. The connector may also be used in the EXT mode of operation to apply a signal from an external scan generator.

The calibration oscillator is crystal controlled and provides a 30 MHz, -30 dBm signal for use in calibrating the analyzer. The harmonics of the fundamental frequency are also useful in evaluating analyzer performance.

The penlift circuit provides penlift operation to recording devices in all positions of the SCAN TRIGGER switch except EXT and in the INT and SINGLE position of the SCAN MODE switch. In the EXT position of the SCAN MODE switch an external blanking input of -1.5 volts is required to blank the CRT.

**10 DEFLECTION AMPLIFIER ASSEMBLY**

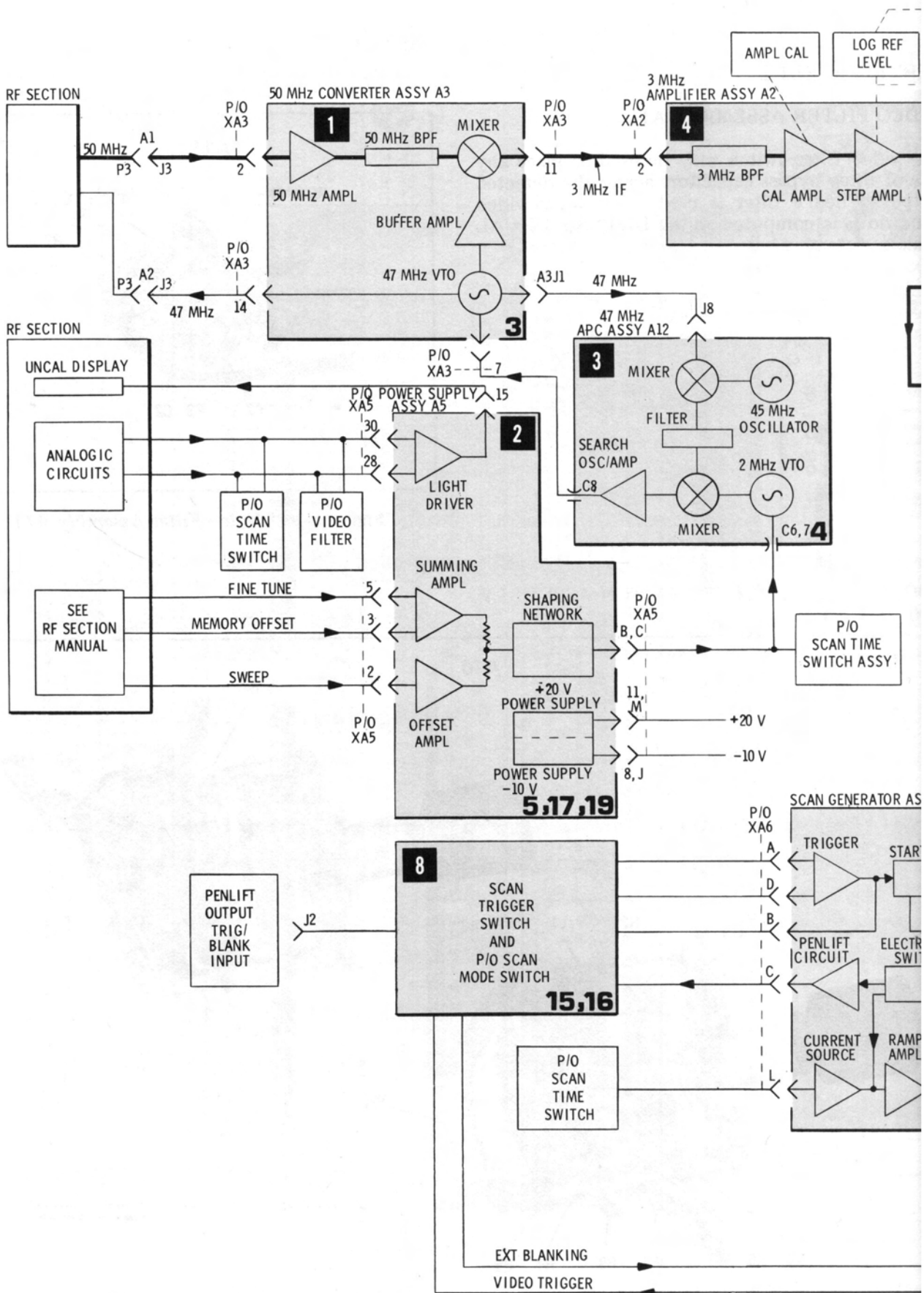
The vertical preamplifier and amplifier provide push-pull drive to the vertical deflection plates of the CRT. Vertical gain and position are also controlled by these circuits. The blanking circuits provide blanking during the retrace cycle.

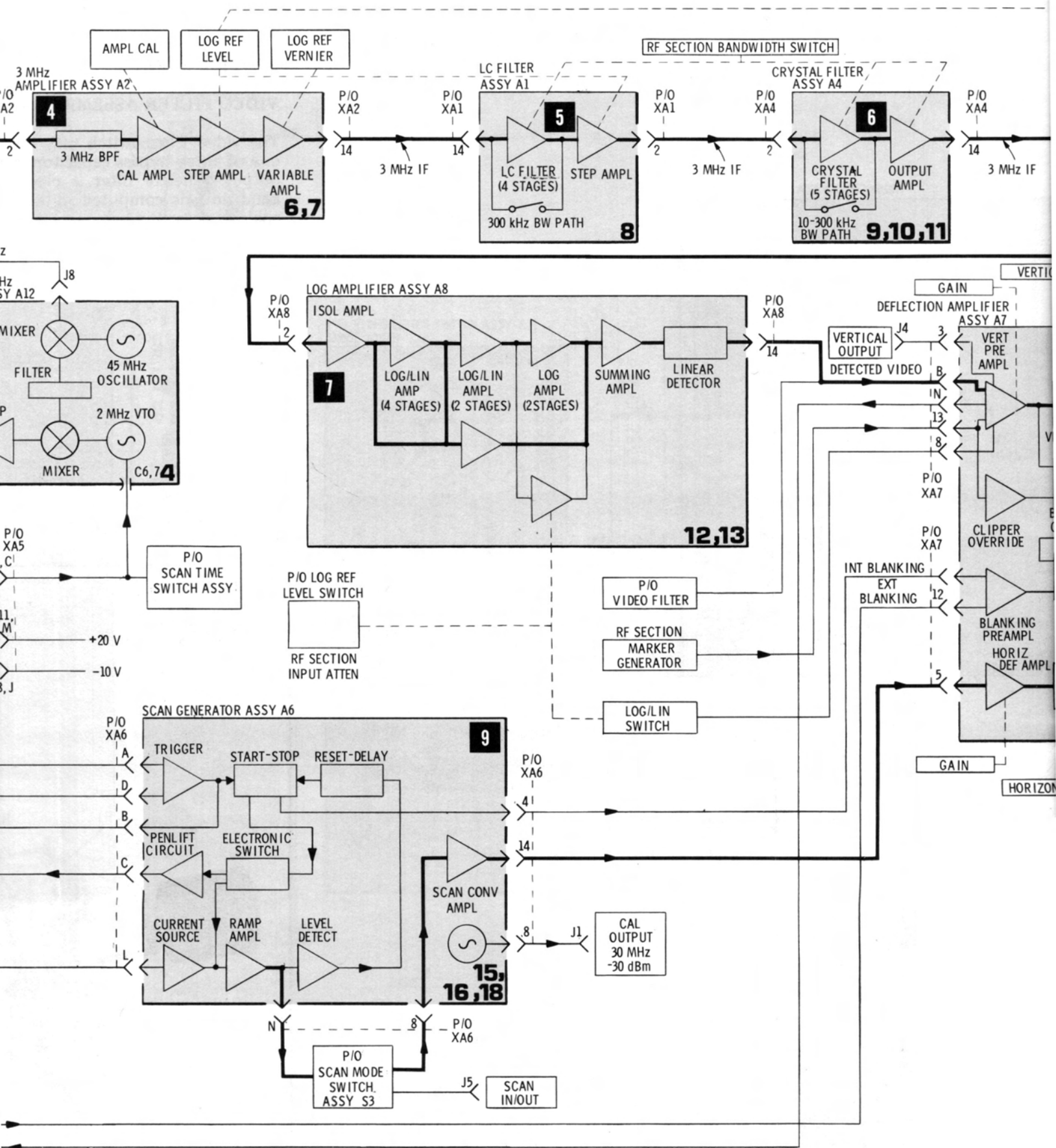
The base line clipper and clipper override circuits blank the CRT when the BASE LINE CLIPPER control is adjusted to activate the circuit. When a marker from the RF Section is present, the clipper override circuit is activated and the CRT is not blanked.

The horizontal amplifiers provide push-pull drive to the CRT horizontal circuits. Horizontal gain and position are also controlled by these circuits.

Table 8-5. Gain Changes When LOG REF LEVEL Switch is Adjusted

| LOG REF LEVEL<br>Switch<br>Positions                                                                                                                                  | 3 MHz Amp<br>Assy Gain *<br>(dB) | LC Filter<br>Assy Gain<br>(dB) | Crystal<br>Filter<br>Assy Gain | LOG REF LEVEL<br>Assy Atten<br>(dB) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------|--------------------------------|-------------------------------------|
| -60                                                                                                                                                                   | 30                               | 20                             | 0                              | 0                                   |
| -50                                                                                                                                                                   | 20                               | 20                             | 0                              | 0                                   |
| -40                                                                                                                                                                   | 10                               | 20                             | 0                              | 0                                   |
| -30                                                                                                                                                                   | 0                                | 20                             | 0                              | 0                                   |
| -20                                                                                                                                                                   | 0                                | 10                             | 0                              | 0                                   |
| -10                                                                                                                                                                   | 0                                | 0                              | 0                              | 0                                   |
| 0                                                                                                                                                                     | 0                                | 0                              | 0                              | -10                                 |
| 10                                                                                                                                                                    | 0                                | 0                              | 0                              | -20                                 |
|                                                                                                                                                                       | 0                                | 0                              | 0                              | -30                                 |
|                                                                                                                                                                       | 0                                | 0                              | 0                              | -40                                 |
| *Individual 3 MHz IF assembly gains resulting in a constant IF system gain (-10 dB) into LOG AMPLIFIER when LOG REF LEVEL switch is in logarithmic display positions. |                                  |                                |                                |                                     |





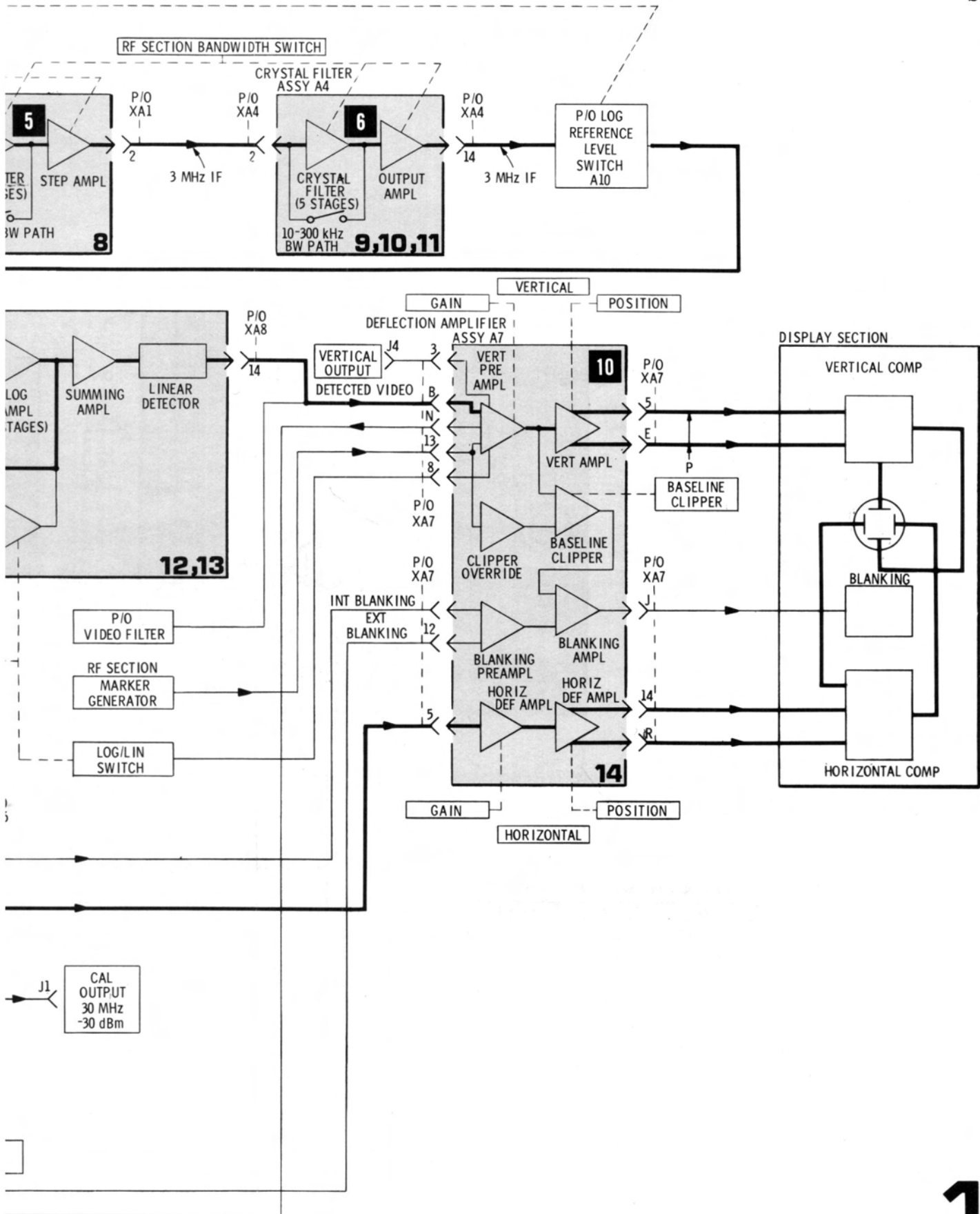


Figure 8-10. 8552B Block Diagram



## SERVICE SHEET 2

### VIDEO FILTER ASSEMBLY A11

The video filter switch may be used to place any one of three bypass capacitors across the detected output. When a filter is used the reduced video bandwidth is computed in the DISPLAY UNCAL analogic summing buss.

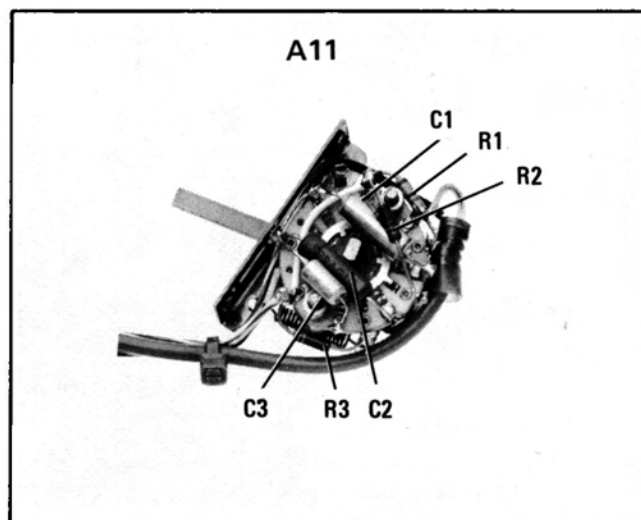


Figure 8-11. Video Filter Assembly A11

### LOG REFERENCE LEVEL SWITCH ASSEMBLY A10

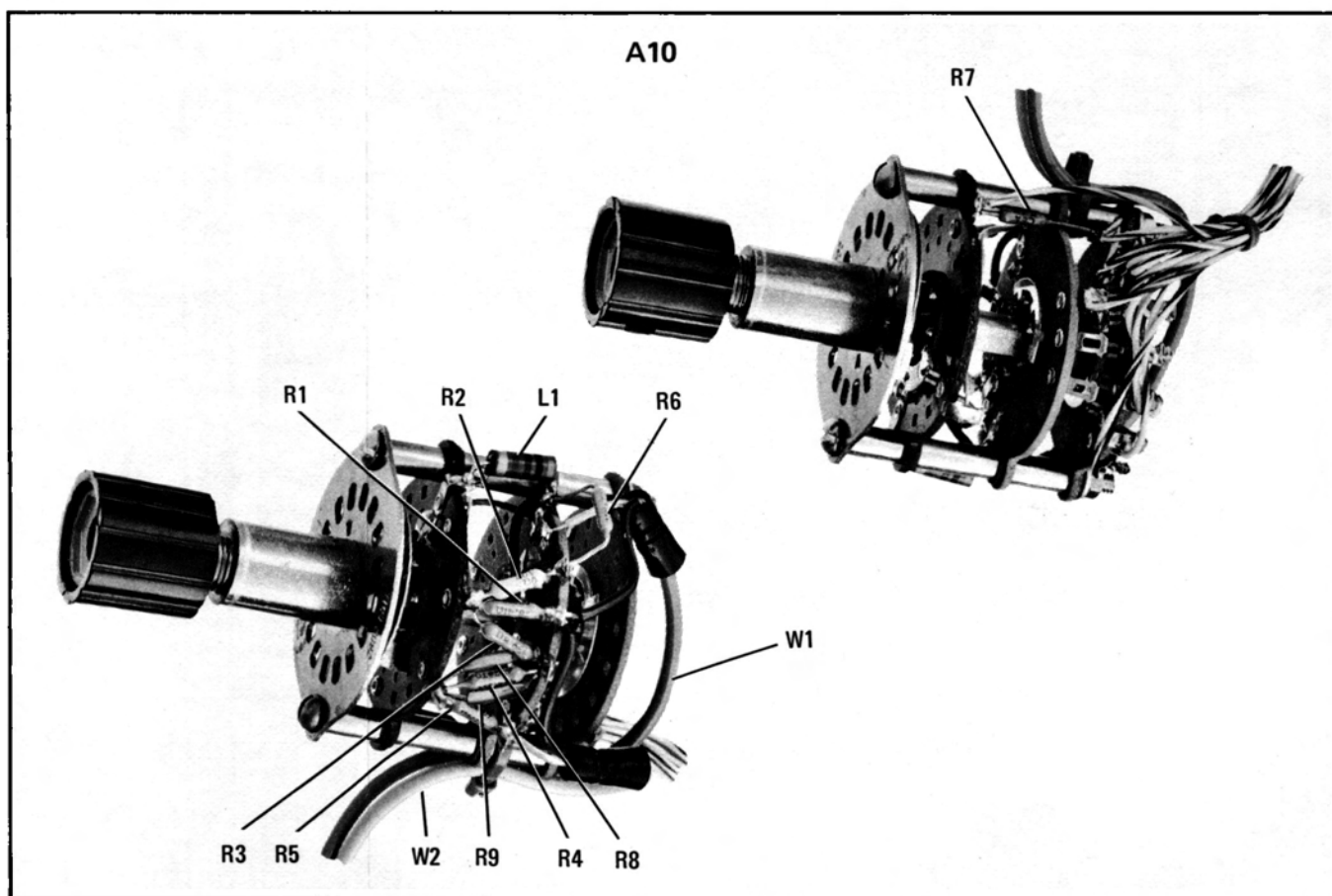


Figure 8-12. Log Reference Level Switch Assembly A10

A1,A2, A3, A4, A5, A6, A7, A8, A12

Block Diagram

◀ SERVICE SHEET 1

**SERVICE SHEET 2 (cont'd)**

Switch wafers S1-1F, S1-2F, and S1-1R connect the 3 MHz IF Signal from the crystal filter circuit to the Log/Lin amplifier and provide attenuation to this signal when required.

Switch wafer S1-2R, in conjunction with the RF Section INPUT ATTENUATION control, programs the gain compensation function of the linear scale factor amplifier in the Log/Lin amplifier when the analyzer is operating in the LINEAR mode.

Switch wafers S1-3F and S1-3R provide dc levels to enable or disable diode switches which, in turn, enable or disable step gain amplifiers in the 3 MHz IF and LC Filter Assemblies.

**SCAN TIME SWITCH ASSEMBLY A9**

The various functions of the scan time switch assembly are as follows:

S1-1F selects the capacitor to be charged to generate the scan ramp.

S1-2R connects (or removes) a ground to R10 to partially control the operational parameters of constant current source Q6.

S1-2F selects the resistor to be used in the emitter circuit of constant current source Q6.

S1-1R selects the resistor (or resistors) to control the sweep reset (dead time) of the scan generator and switches a filter into the shaping circuit output on slow scan times.

S1-3F and S1-3R provide current to the analogic scanning buss to aid in illuminating the DISPLAY UNCAL lamp when switch settings are not compatible with analyzer calibration requirements.

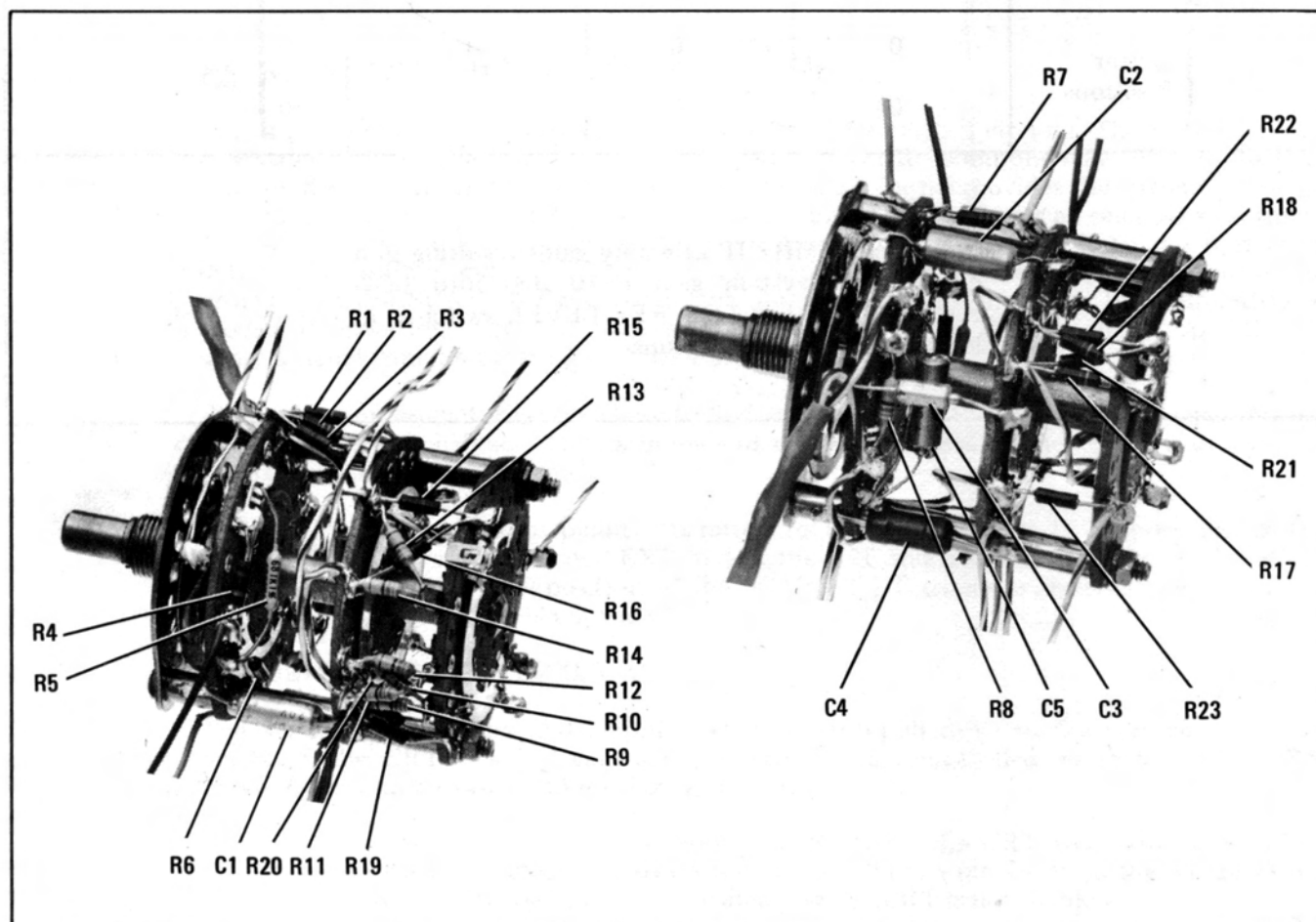


Figure 8-13. Scan Time Switch Assembly A9

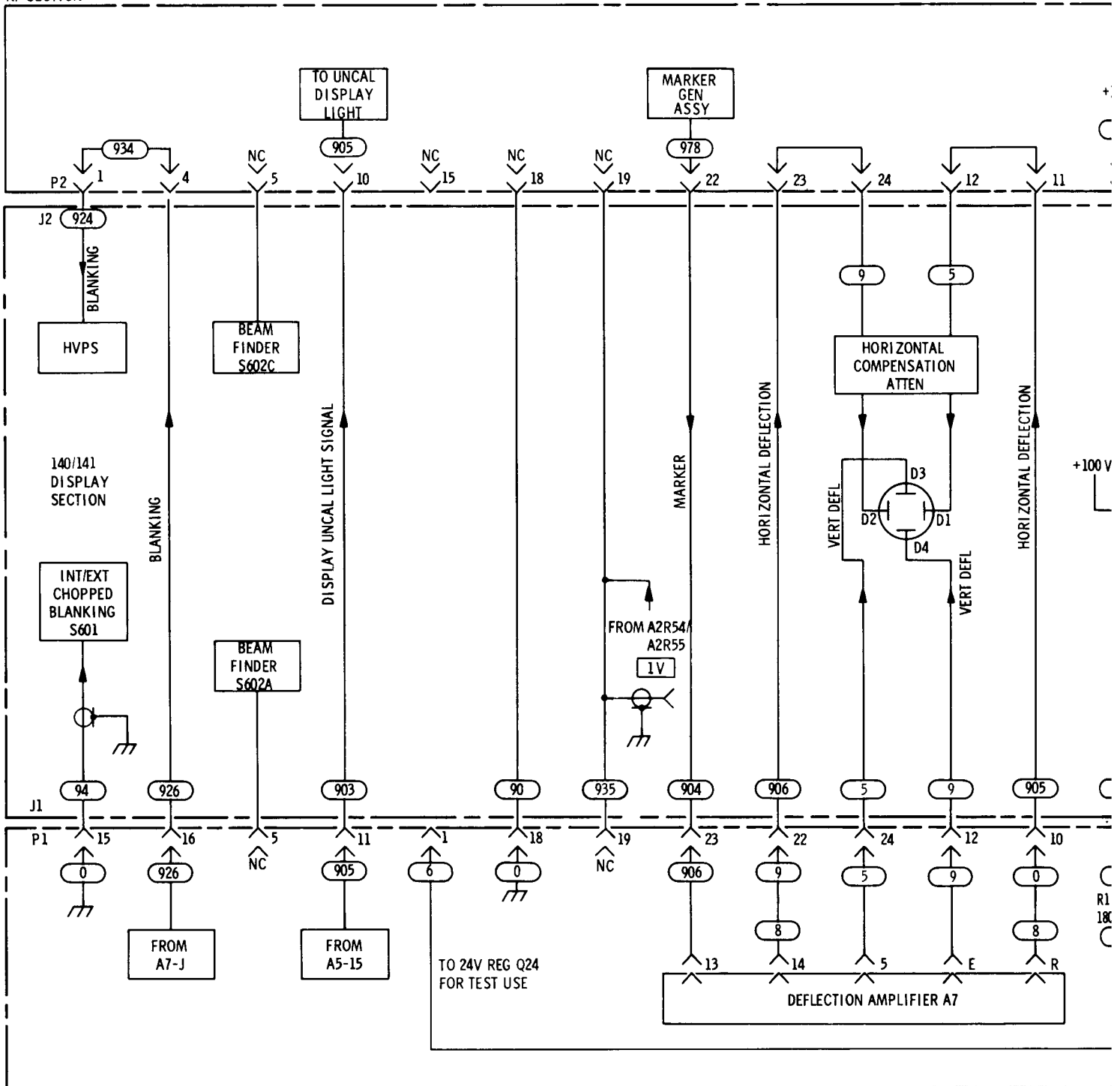
Table 8-6. IF-to-RF Sections Interconnecting Jack Identification

| J3<br>Pin No. | Wire<br>Color<br>Code | Circuit Function                                |
|---------------|-----------------------|-------------------------------------------------|
| Pin 1         | 912                   | .03 kHz Bandwidth                               |
| 2             | 913                   | 0.1 kHz Bandwidth                               |
| 3             | 914                   | 0.3 kHz Bandwidth                               |
| 4             | 915                   | 1 kHz Bandwidth                                 |
| 5             | 4                     | Phase Lock Compensation                         |
| 6             | 3                     | Preset Scan Voltage                             |
| 7             | 5                     | Linear Compensation Control Voltage             |
| 8             | 6                     | Linear Compensation Control Voltage             |
| 9             | 938                   | Log Ref Level Lamp No. 4                        |
| 10            | 945                   | Log Ref Level Lamp No. 5                        |
| 11            | 946                   | Log Ref Level Lamp No. 6                        |
| 12            | 90                    | Sensing Ground                                  |
| 13            | 8                     | Blanking for Tracking Generator                 |
| 14            | 925                   | .01 kHz Bandwidth                               |
| 15            | 902                   | +20 Volts for connector J3                      |
| 22            | 90                    | Scanwidth Ground                                |
| 23            | 8 (cable)             | 3 MHz IF                                        |
| 24            | 8 (cable)             | Ground                                          |
| 25            | 916                   | 10 kHz Bandwidth                                |
| 26            | 927                   | 30 kHz Bandwidth                                |
| 27            | 918                   | 100 kHz Bandwidth                               |
| 28            | 923                   | 300 kHz Bandwidth                               |
| 29            | 96                    | Ampl Cal Adjustment                             |
| 30            | 957                   | Normal Analogic Line                            |
| 31            | 934                   | Scan Voltage to Shaping Ckt.                    |
| 32            | 9                     | Fine Tune Voltage to Shaping Ckt.               |
| 33            | 935                   | Log Ref Level Lamp No. 1                        |
| 34            | 936                   | Log Ref Level Lamp No. 2                        |
| 35            | 937                   | Log Ref Level Lamp No. 3                        |
| 36            | 907                   | -10 Volts                                       |
| 37            | 902                   | +20 Volts                                       |
| 38            | 956                   | Video Filter Analogic Line                      |
| 39            | 958                   | Zero Scan Analogic Disable Line                 |
| 40            | 968                   | Log/Linear Sense                                |
| 41            | 928                   | 0 to 8V ramp-scan control to tracking generator |
| A1            | 9                     | W7 50 MHz IF                                    |
| A2            | 6                     | 47 MHz Auxiliary Line                           |

Table 8-7. IF-to-Display Sections Interconnecting Plug Identification

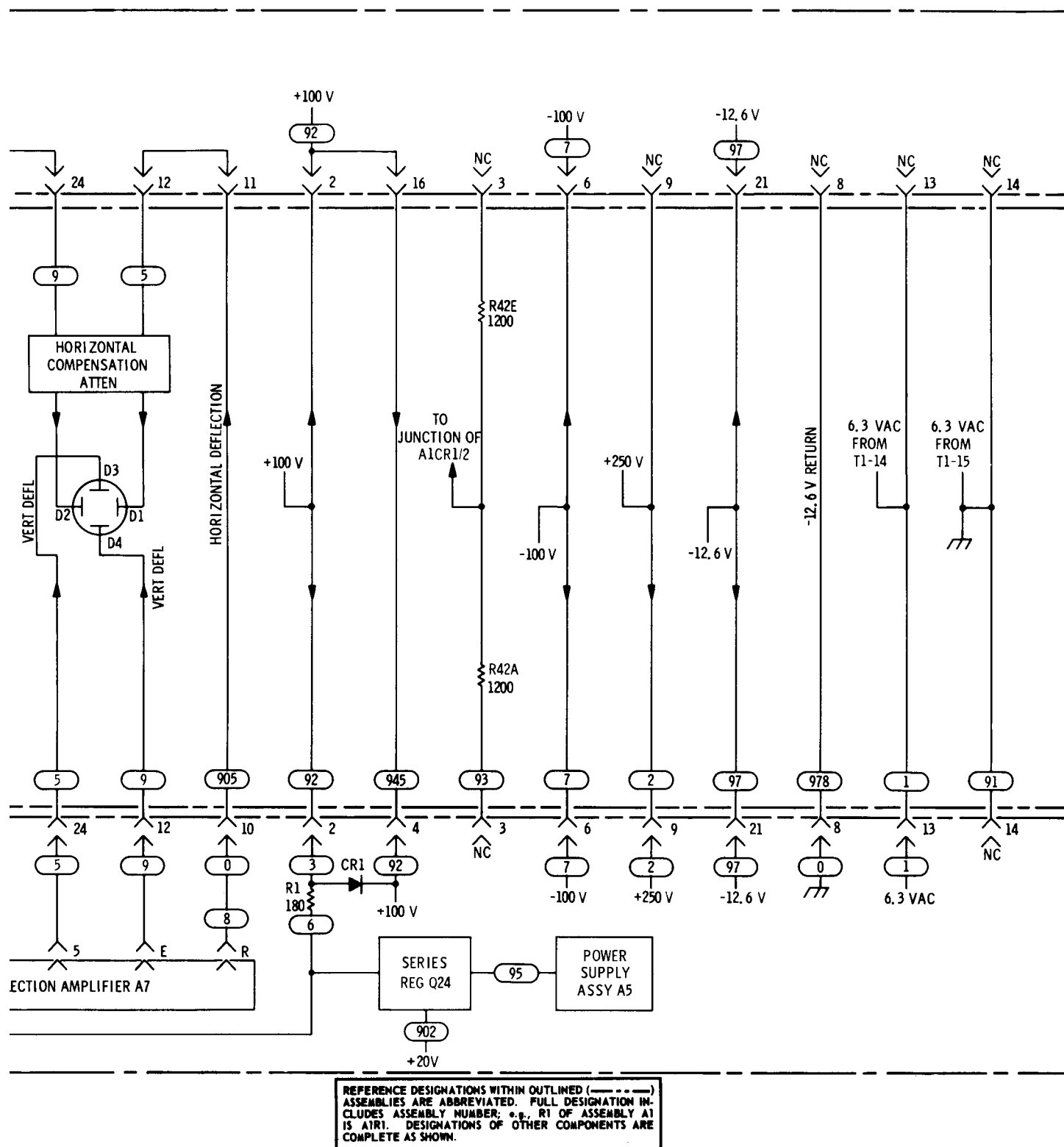
| P1<br>Pin No. | Wire<br>Color<br>Code | Circuit Function      |
|---------------|-----------------------|-----------------------|
| Pin 1         | 6                     | +20V                  |
| 2             | 3                     | +100V                 |
| 3             |                       | Open                  |
| 4             | 92                    | +100V                 |
| 5             |                       | Open                  |
| 6             | 7                     | -100V                 |
| 7             |                       | Open                  |
| 8             | 0                     | Ground                |
| 9             | 2                     | +250V                 |
| 10            | 0                     | Horizontal Deflection |
| 11            | 905                   | Display Uncal Light   |
| 12            | 5                     | Vertical Deflection   |
| 13            | 1                     | 6.3 Vac               |
| 14            |                       | Open                  |
| 15            | 0                     | Ground                |
| 16            | 926                   | Blanking              |
| 17            |                       | Open                  |
| 18            | 0                     | Ground                |
| 19            |                       | Open                  |
| 20            |                       | Open                  |
| 21            | 97                    | -12.6V                |
| 22            | 9                     | Horizontal Deflection |
| 23            | 906                   | Marker                |
| 24            | 9                     | Vertical Deflection   |

RF SECTION



8552B

SERIAL PREFIX: 971, 974, 977



2

Figure 8-14. RF Section/IF Section/Display Section Interconnections

### SERVICE SHEET 3

It is assumed that the procedures in Paragraphs 5-37, 5-38, and 5-39 of Section V could not be satisfactorily conducted. It is further assumed that the tuning input from A12, the 50 MHz input, and the correct operating voltages are present.

#### TROUBLESHOOTING PROCEDURE

When a malfunction has been isolated to the 50 MHz converter assembly, it should be removed from the mainframe and reinstalled using the extender board to provide easy access to all components. Both ground flanges will have to be connected to chassis ground. Connect CAL OUTPUT to 8447A INPUT and 8447A OUTPUT to RF INPUT. Test procedures follow the circuit description in each of the steps below.

#### EQUIPMENT REQUIRED

|                             |                |
|-----------------------------|----------------|
| AMPLIFIER . . . . .         | HP 8447A       |
| SERVICE KIT . . . . .       | HP 11592A      |
| VECTOR VOLTMETER . . . . .  | HP 8405A       |
| FREQUENCY COUNTER . . . . . | HP 5245L/5251A |

#### CONTROL SETTINGS

Unless otherwise specified in individual tests.

|                             |         |
|-----------------------------|---------|
| SCAN WIDTH . . . . .        | ZERO    |
| BANDWIDTH . . . . .         | 300 kHz |
| FREQUENCY . . . . .         | 30 MHz  |
| INPUT ATTENUATION . . . . . | .0 dB   |
| TUNING STABILIZER . . . . . | OFF     |

#### **1** 50 MHz AMPLIFIER

Broadband amplifier Q1/Q2 has built in 44 MHz traps to suppress image responses. (44 MHz mixed with the 47 MHz oscillator signal would produce a false 3 MHz IF signal). Input and output signals are applied through isolation transformers. Gain of the two-stage amplifier is typically 10 dB.

#### TEST PROCEDURE **1**

With a 30 MHz, -10 dBm signal applied to the analyzer RF INPUT, and the HP 8405A connected to XA3-2, tune the analyzer FREQUENCY control for maximum signal. Nominal reading is 44 mV rms. Next, connect the HP 8405A to the 50 MHz amplifier output (input feedthru capacitor C1 to the 50 MHz bandpass filter, adjacent to T1). Meter should indicate a typical value of approximately 150 mV rms.

If the 50 MHz amplifier output is correct, proceed to step **2**

If the 50 MHz amplifier is not providing the correct output, check Q1/Q2 and associated components.

#### NOTE

After making repairs to the 50 MHz amplifier circuit proceed to step **4**. If the test procedure in step **4** is satisfactorily concluded, steps **2** and **3** may be omitted. If repair to the 50 MHz amplifier is required the 44 MHz Rejection Adjustments defined in paragraph 5-39 of Section V should be made.

## SERVICE SHEET 3 (cont'd)

### **2** 50 MHz BANDPASS FILTER

The 50 MHz Bandpass Filter consists of four tuned circuits wound on a common coil form. C5, C6, C9 and C10 are adjusted for maximum amplitude and flatness ( $\pm 2$  mV) at least 0.3 MHz on either side of 50 MHz.

#### TEST PROCEDURE **2**

With a 30 MHz, -10 dBm signal applied to the analyzer RF INPUT, and the HP 8405A connected to the bandpass filter output (feedthru capacitor C13 at the output of bandpass filter) tune the analyzer FREQUENCY control for maximum signal. Nominal voltage is 90 mV rms.

If bandpass filter output signal voltage is correct, proceed to step **3**

If bandpass filter output signal is low or missing, first try realignment in accordance with Paragraph 5-38 of Section V. If this does not correct the malfunction, replace the Bandpass Filter.

After bandpass filter replacement and adjustment is completed, proceed to step **4**. If the test results in step **4** are satisfactory, step **3** may be omitted.

#### NOTE

If bandpass filter replacement is necessary, the new filter should be adjusted in accordance with paragraph 5-38 of Section V.

### **3** 47 MHz LOCAL OSCILLATOR

Depending on the RF Section used, the 47 MHz oscillator is operated at a fixed frequency of 47 MHz or is swept. See the appropriate RF Section manual for information on the modes of operation for the oscillator.

#### TEST PROCEDURE **3**

Connect the HP 8405A Channel A probe to the 47 MHz local oscillator output at XA3-14 (use 50 ohm load) and the Channel B probe to the input of T4 (second feedthru from bottom of board on the local oscillator cover). Channel A should read approximately -7 dBm (100 mV into 50 ohms) and Channel B should read approximately 670 mV rms (approximately +10 dBm). Connect the HP 8405A Channel A probe to J8 (47 MHz input to APC Assy A12). Voltmeter should read approximately +10 dBm.

If the meter readings are correct proceed to step **4**

The 47 MHz local oscillator is a sealed unit and field repairs are not practical. If the above readings are not obtained, replace the 47 MHz Local Oscillator Assembly A3A2.

**SERVICE SHEET 3 (cont'd)**

Check the oscillator frequency by connecting the 5245L/5251A to XA3-14. Vary R42 on A5 to adjust the oscillator to 47 MHz.

**NOTE**

If it is necessary to replace the 47 MHz Oscillator Assembly, the checks and adjustments in Paragraph 5-37 of Section V should be performed.

**4 MIXER**

The 50 MHz IF signal mixes with the 47 MHz local oscillator output to produce a 3 MHz IF signal containing all of the modulation components of the 50 MHz signal. The 3 MHz IF is coupled out

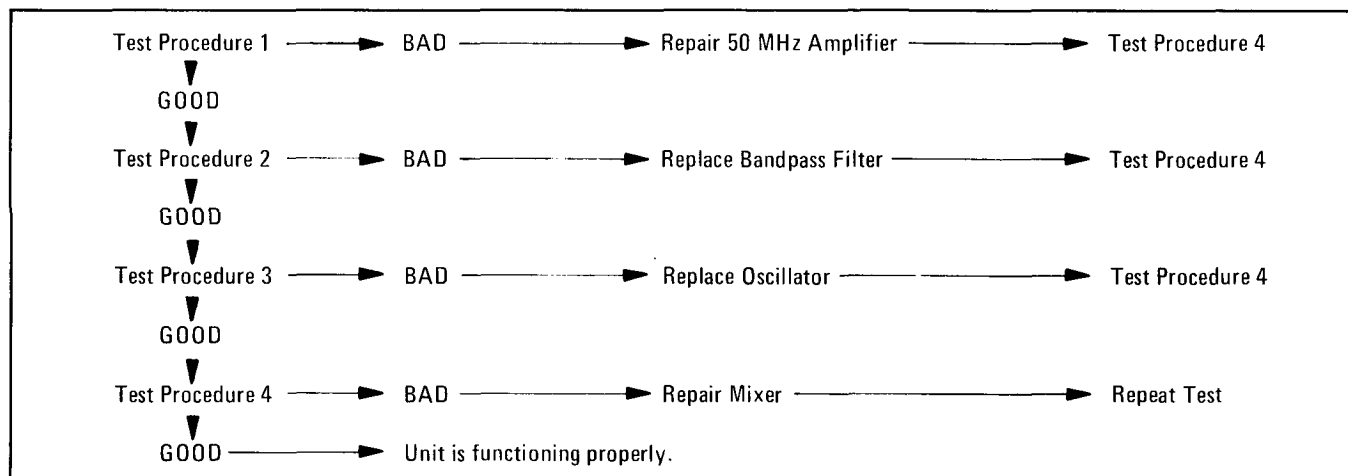
through T2 to the 3 MHz IF Amplifier Assembly. Conversion loss through the mixer is approximately 7 dB.

**TEST PROCEDURE 4**

With a 30 MHz, -10 dBm signal applied to the analyzer RF INPUT, and the HP 8405A connected to the mixer output at 3 MHz feedthru under chassis (C4), tune the analyzer FREQUENCY control for maximum. Typical signal level is 44 mV rms.

If the proper signal level is not present check the mixer circuit.

If the proper signal level is present, the unit is functioning properly.

*Simplified Test Procedure Tree*



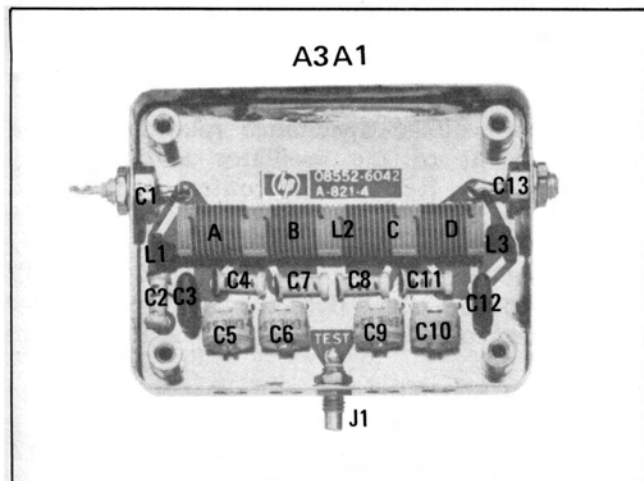


Figure 8-15. 50 MHz Bandpass Filter A3A1  
Component Identification

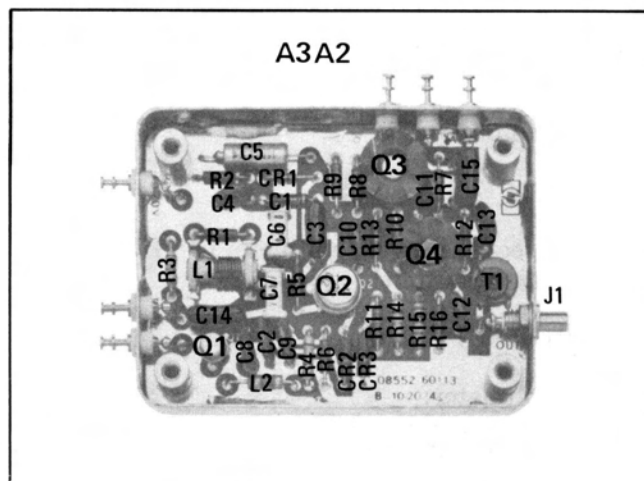


Figure 8-16. 47 MHz LO A3A2  
Component Identification

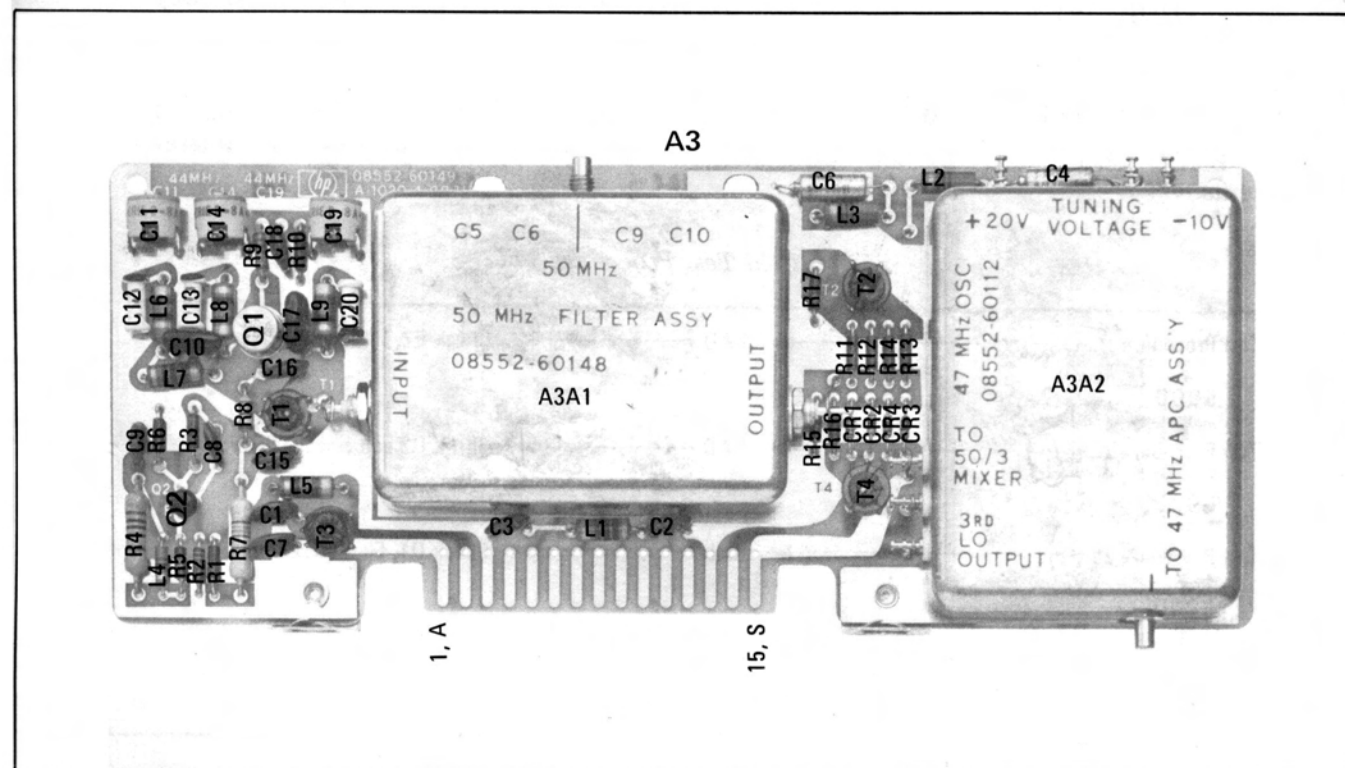
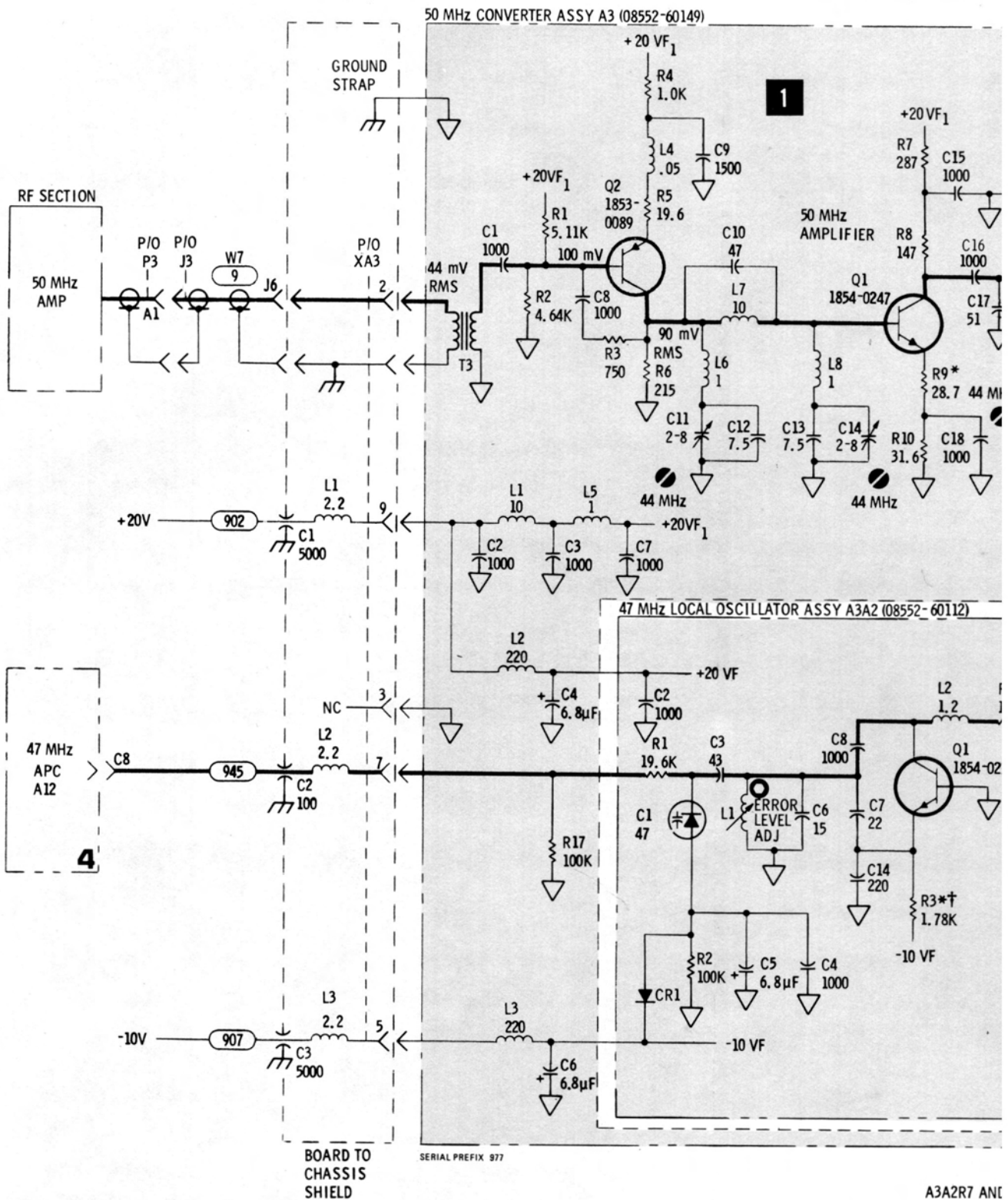
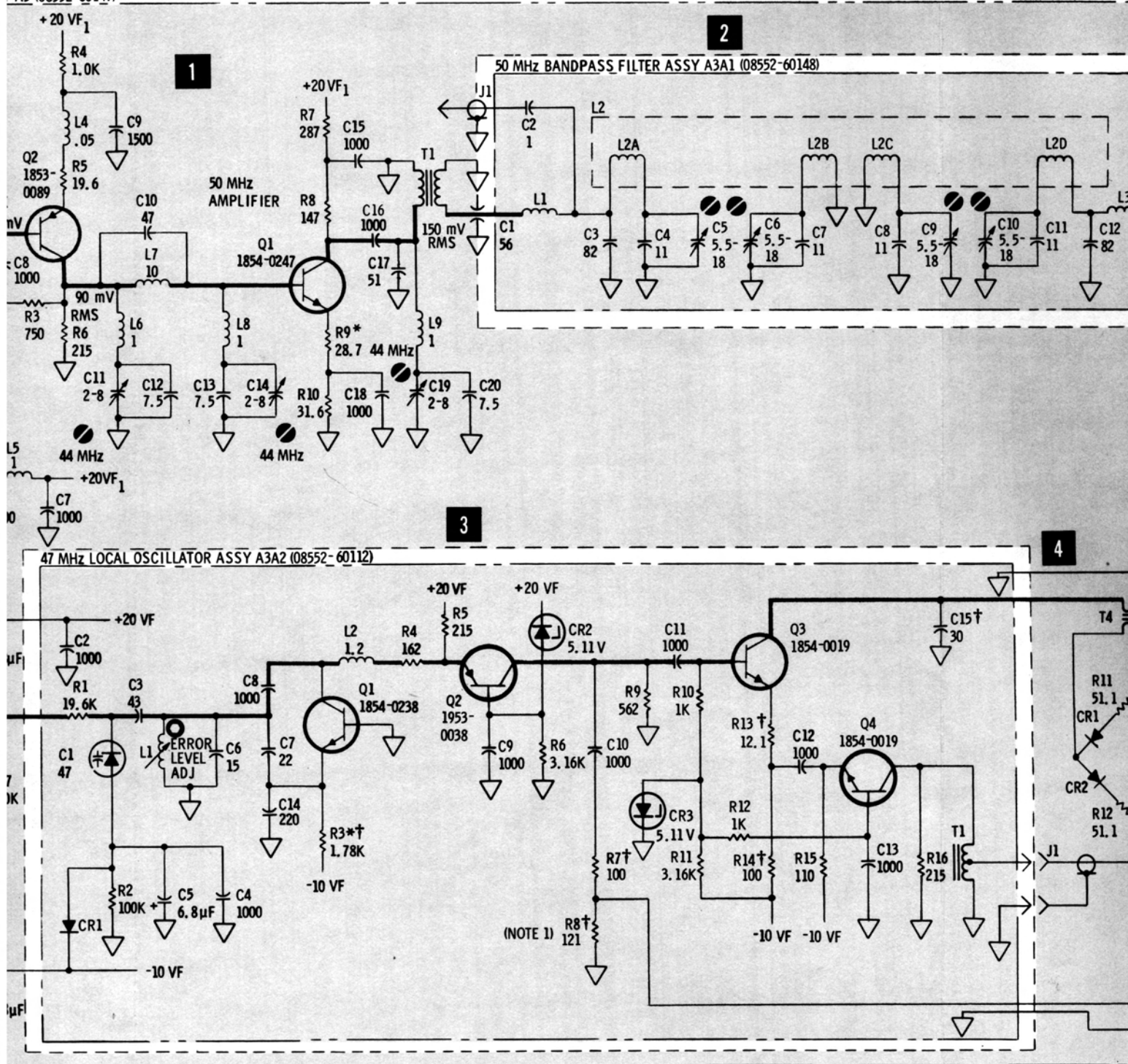


Figure 8-17. 50 MHz Converter A3 Component Identification



A3A2R7 AND  
100 OHMS A  
IF REPLACE  
REPLACE B

A3 (08552-60149)



NOTE 1.

A3A2R7 AND A3A2R8 MAY BE 133 OHMS AND 90.9 OHMS RESPECTIVELY. 100 OHMS AND 121 OHMS, RESPECTIVELY, ARE PREFERRED VALUES. IF REPLACEMENT OF A3A2R7 OR A3A2R8 BECOMES NECESSARY, REPLACE BOTH COMPONENTS WITH PREFERRED VALUES.

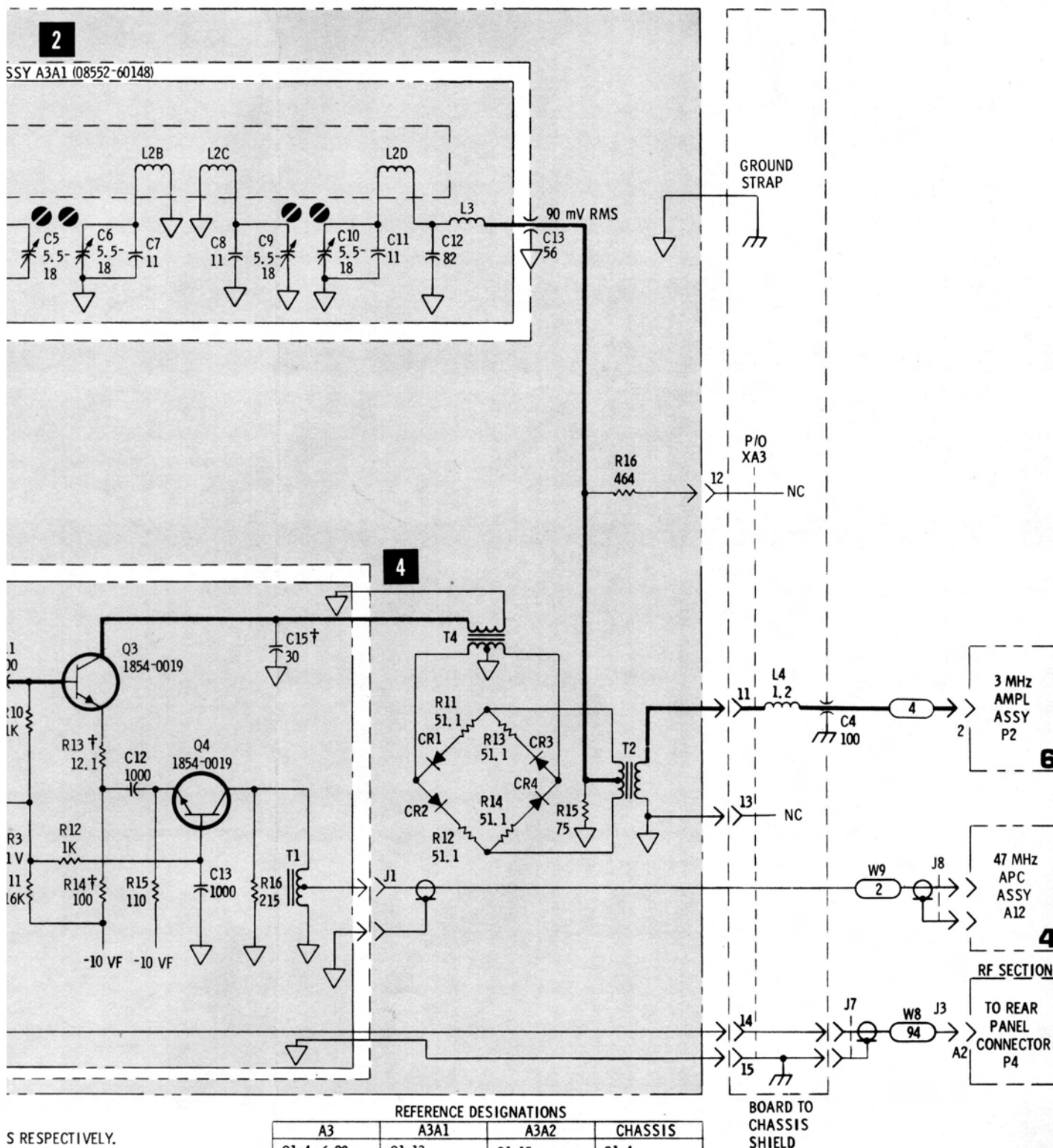
REFERENCE

| A3         | A3A1  |
|------------|-------|
| C1-4, 6-20 | C1-13 |
| CR1-5      | C1-3  |
| L1-9       | J1    |
| Q1-2       |       |
| R1-17      |       |
| T1-4       |       |
| J1         |       |

† REFER TO TABLE 7-2

2

SSY A3A1 (08552-60148)



3

Figure 8-18. 50 MHz Converter

## SERVICE SHEET 4

It is assumed that input DC voltages, the 47 MHz input and the 2 MHz VTO Shaping Circuit input are all correct and present.

### TEST PROCEDURE

When trouble has been isolated to the 47 MHz Automatic Phase Lock Control circuits, remove the cover shield from the A13 and A1/A12 assemblies to provide access to components and test points.

### EQUIPMENT REQUIRED

OSCILLOSCOPE ..... HP 180A/1801A/1821A  
SERVICE KIT ..... HP 11592A  
VECTOR VOLTMETER ..... HP 8405A

### CONTROL SETTINGS

SPECTRUM ANALYZER ..... Any

#### **1** SEARCH OSCILLATOR/AMPLIFIER AND PHASE DETECTOR

The Automatic Phase Control Circuits control the 47 MHz VTO in a phase lock loop. 45 MHz from a crystal oscillator is mixed with the nominal 47 MHz from the 47 MHz VTO to give a nominal 2 MHz difference frequency. This difference frequency is compared with the nominal 2 MHz VTO output in a phase detector. Any phase difference produces a dc error voltage that is amplified by the search oscillator/amplifier and fed back to correct the 47 MHz VTO. If the search oscillator/amplifier loses its lock, it will search at about a 50-Hz rate until it brings the 47 MHz VTO frequency into coincidence with the sum of the frequencies from the 45 MHz oscillator and the 2 MHz VTO.

### TEST PROCEDURE **1**

When the Search Oscillator/Amplifier is locked on and controlling the 47 MHz VTO, its output is approximately steady dc. When the phase loop is broken the Search Oscillator/Amplifier output ( $\approx 50$  Hz) is as shown in waveform. Connect the oscilloscope to TP B (feedthrough C8) and disconnect W9 (red coax) at A3J1.

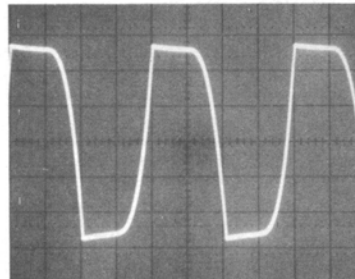
### CONTROL SETTINGS

Oscilloscope:

0.2 V/Div  
5 msec/Div 10:1 probe

Waveform GOOD:  
Reconnect W9 at  
A3J1 and proceed  
to step **2**

Waveform BAD:  
Check E2, U1 and  
associated  
components



A3, A3A1, A3A2  
50 MHz Converter  
◀ SERVICE SHEET 3



**SERVICE SHEET 4 (cont'd)****2 45 MHz CRYSTAL OSCILLATOR AND MIXER**

Q2 and associated components form a crystal oscillator that feeds 45 MHz to mixer E1. Nominal 47 MHz from the 47 MHz VTO is fed to E1 by isolation amplifier Q1.

**TEST PROCEDURE 2**

- 2a. Connect the vector voltmeter to TP2 (45 MHz oscillator output).

**CONTROL SETTINGS**

Vector Voltmeter:

FREQ RANGE — MHz ..... 20–50  
AMPLITUDE (dB) ..... 0

Voltmeter should read about +1 dBm.

Reading GOOD: Proceed to 2b.

Reading BAD: Check Q2 and associated components.

- 2b. Connect the vector voltmeter to TP A (E1 output).

**CONTROL SETTINGS**

Vector Voltmeter:

FREQ RANGE — MHz ..... 1–5  
AMPLITUDE (dB) ..... 0

Voltmeter should read about -2 dBm.

Reading GOOD: proceed to step **3**

Reading BAD: Check Q1, E1 and associated components.

**3 2 MHz VTO ASSY A13**

The exponential control voltage from the 2 MHz VTO Shaping Circuit is fed to varactors C1 and C2. C1, C2, and T1 form a tank circuit that controls the 2 MHz VTO, Q1. Because varactors have an exponential voltage-capacitance relationship, the frequency out of the oscillator is linear with respect to the RF Section control voltage (see Service Sheet 5).

The output frequency is amplified by Q2 and Q3 and fed to the phase detector E2. Q4 provides temperature compensation.

**TEST PROCEDURE**

Attach the vector voltmeter probe to A12 TP1 (2 MHz VTO Assy output).

**CONTROL SETTINGS**

Vector Voltmeter:

FREQ RANGE — MHz ..... 1–5  
AMPLITUDE (dB) ..... +10

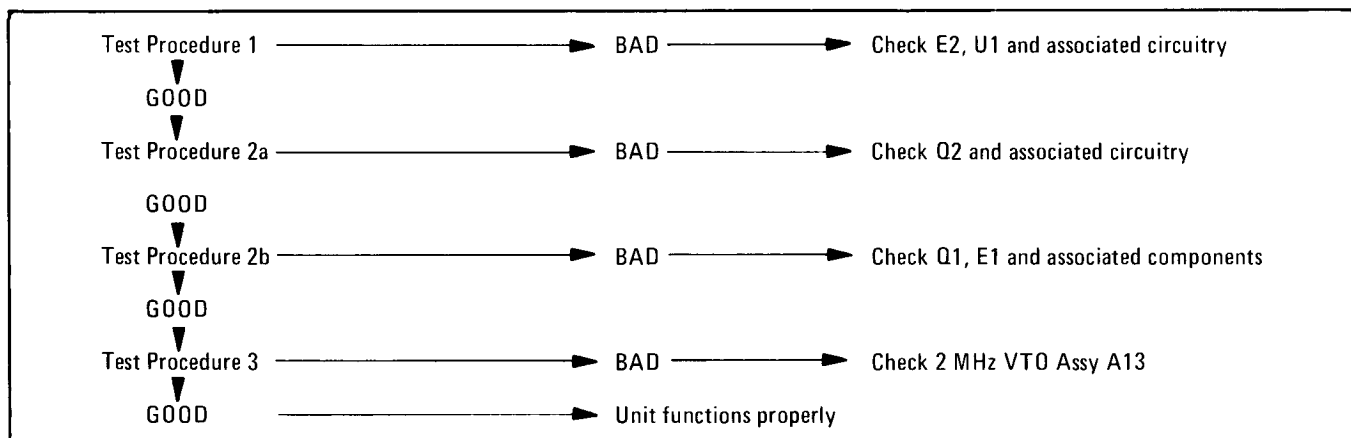
Voltmeter should read about +5 dBm.

Reading GOOD: Assembly functions properly.

Reading BAD: Check 2 MHz VTO Assy A13.

**NOTE**

When repairs are required, the Adjustment specified in paragraph 5-37 should be performed.

*Simplified Test Procedure Tree*

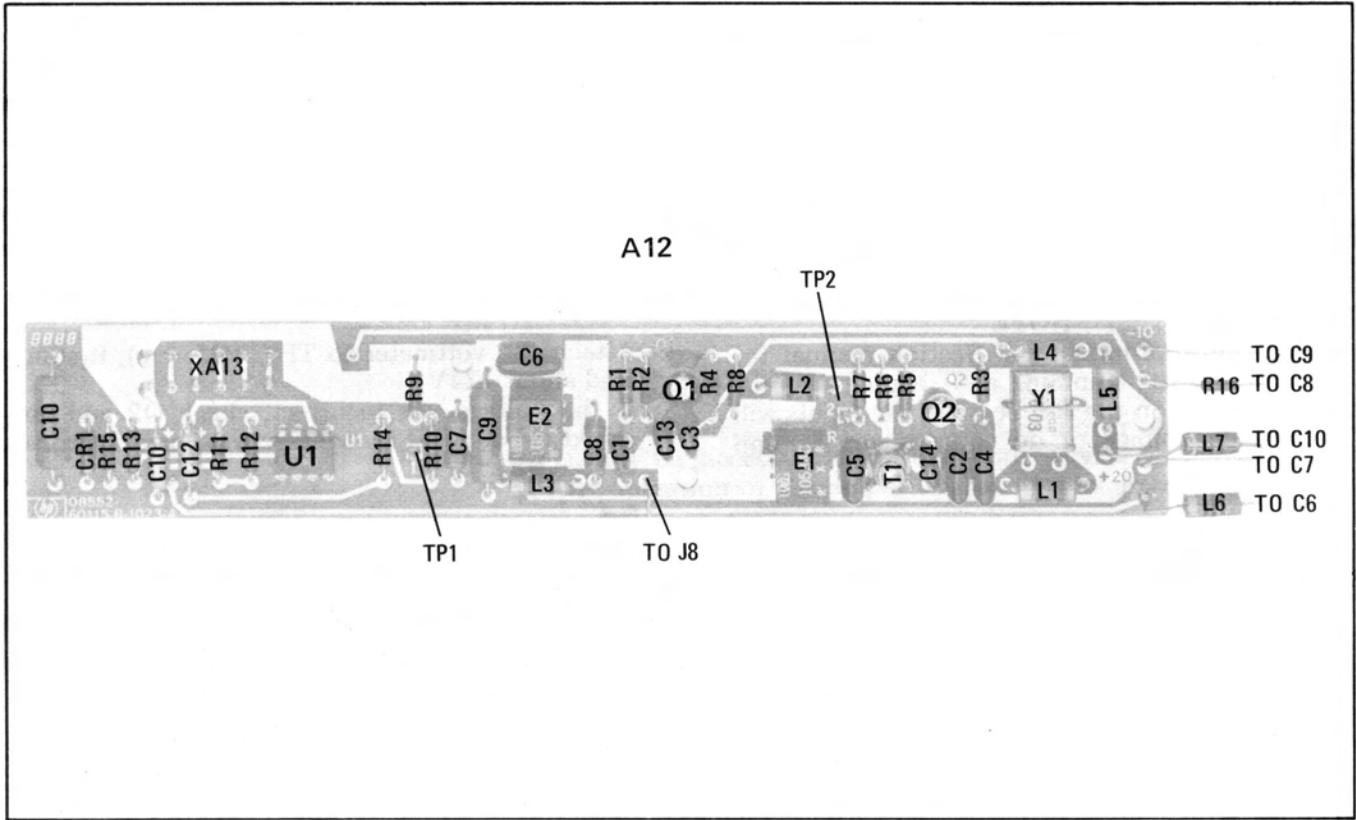


Figure 8-19. 47 MHz APC A12 Component Identification

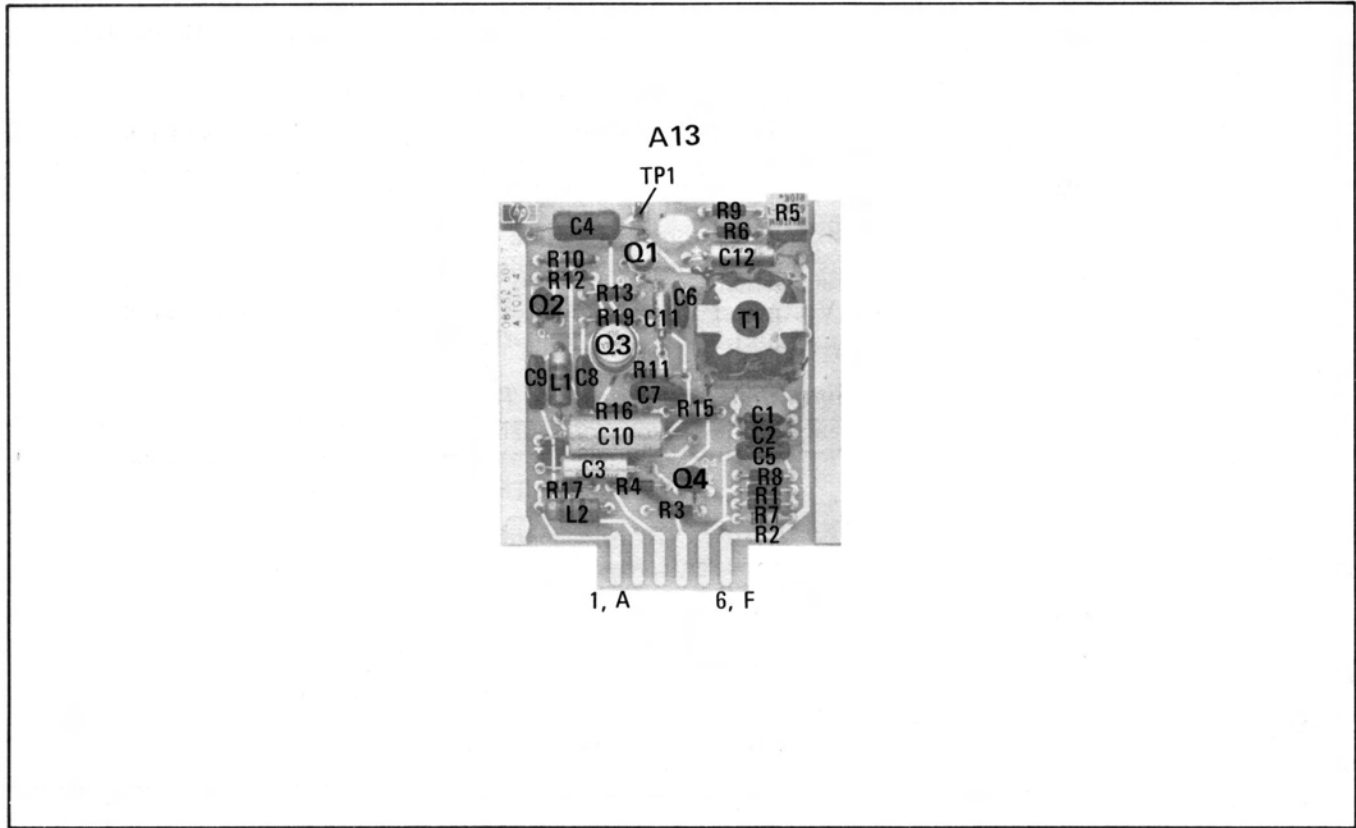
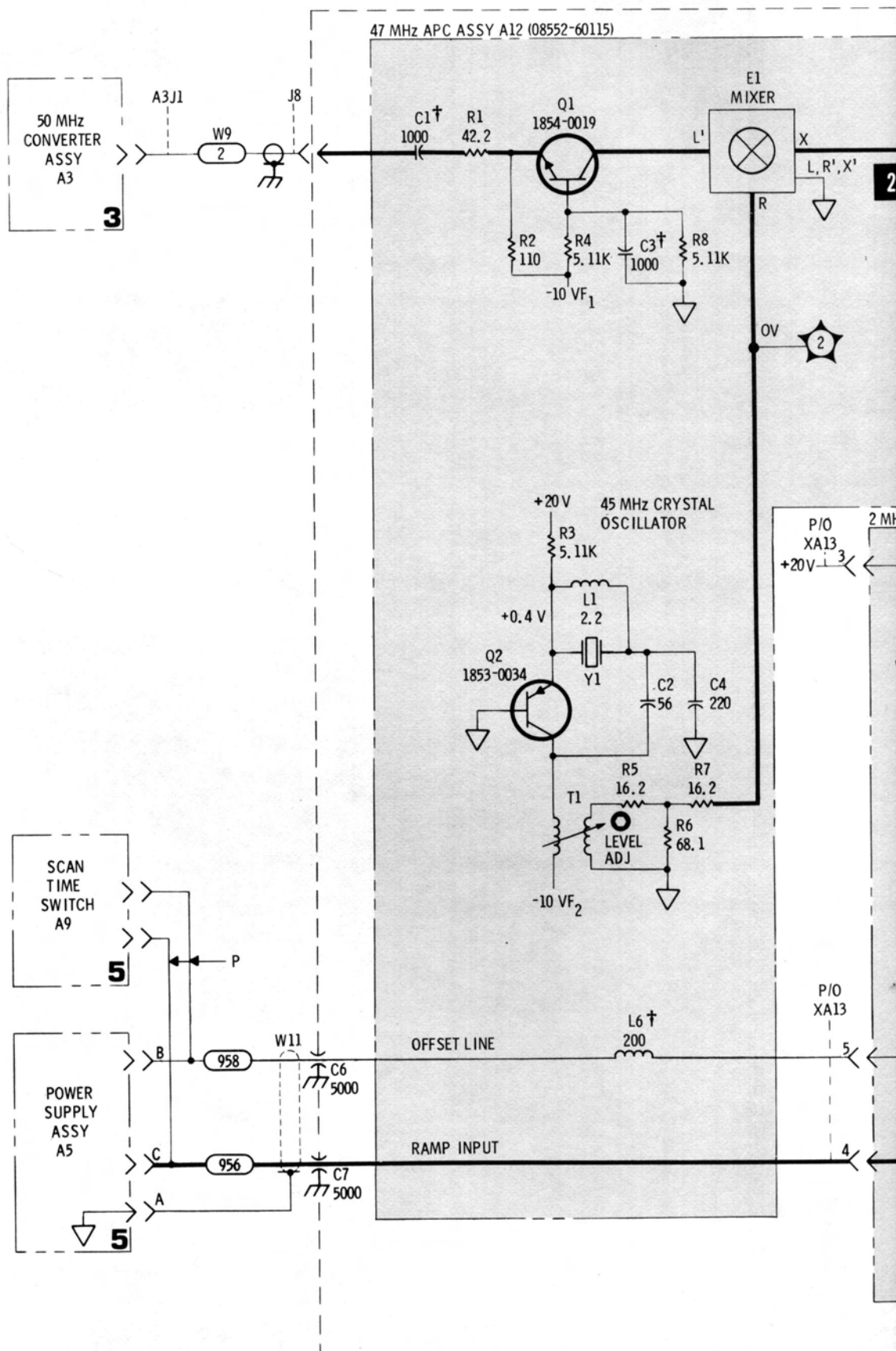


Figure 8-20. 2 MHz VTO A13 Component Identification







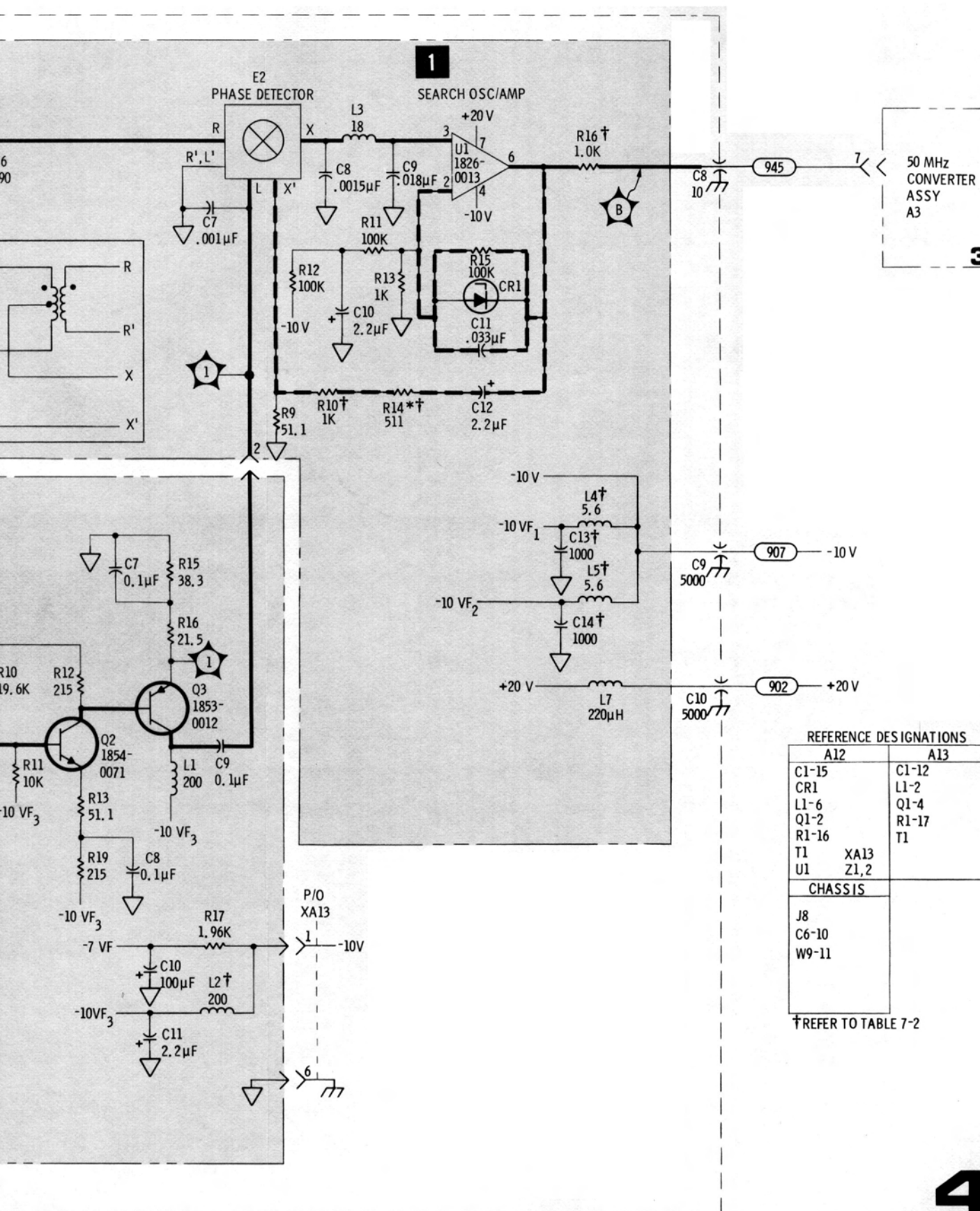


Figure 8-21. 47 MHz Automatic Phase Control and 2 MHz Voltage Tuned Oscillator

**A12, A13**

**47 MHz Automatic Phase Control  
and 2 MHz Voltage Tuned Oscillator**

**◀ SERVICE SHEET 4**

## SERVICE SHEET 5

It is assumed that input voltages are present and correct.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the 2 MHz VTO Shaping Circuit remove power supply assembly A5 and reinstall it on the extender board to provide access to components and test points.

#### NOTE

See the appropriate RF Section manual for inputs to the summing and shaping circuits. Depending on the RF Section, the inputs will be a dc voltage or dc voltages and a ramp voltage.

### EQUIPMENT REQUIRED

DIGITAL VOLTMETER . . . . HP 3440A/3443A

### CONTROL SETTINGS:

Any

#### 1 SUMMING AND COMBINING CIRCUITS

In all 8552B/RF Section combinations, the RF Section, in some way, controls the 47 MHz VTO. The 47 MHz VTO may be just set to some fixed frequency or it may be set to some frequency and swept. In any case, the control inputs from the RF Section are summed and combined by U1, U2 and associated circuitry. U1 is an offset amplifier; U2 is a summing amplifier. U1 and U2 outputs are combined across R43 and R44 and fed to the shaping circuit.

#### TEST PROCEDURE 1

Disconnect the RF Section and the 8552B (but leave both connected to the Display Section). Ground XA5 pin 2 (input to U1) to chassis; attach the voltmeter to TP A (U1, pin 6). Voltmeter should read about +5V. Ground XA5 pins 5 and 3

to chassis; attach voltmeter to TP B. (U2, pin 6). Voltmeter should read about -5.5V.

If the voltage at U1 or U2 was incorrect, check the IC and associated circuitry.

If the voltages were correct, reconnect the 8552B and the RF Section and proceed to step 2

#### 2 CONSTANT CURRENT SOURCE

Q2 and associated circuitry supplies current to the shaping circuit.

#### TEST PROCEDURE 2

Attach the voltmeter to TP C (Q2 — e); it should read about +14V.

If the voltage was incorrect, check Q2 and associated circuitry. If the voltage was correct, proceed to step 3

#### 3 SHAPING CIRCUIT

The shaping circuit converts any linear input into an exponential output. Q21 is always on and provides temperature compensation. Q1, Q3—Q9, Q14 and Q20 are used as diodes (collector-base junctions) and turn on in sequence, from right to left, as the input goes from positive to negative. The exponential output is fed to the 2 MHz VTO. At scan times of 1 second or slower it is filtered by C5 on the Scan Time Switch Assembly A9; this filtering eliminates any low frequency components that might frequency modulate the 2 MHz VTO (and thus modulate the 47 MHz VTO) when narrow bandwidths and slow scan times are being used.

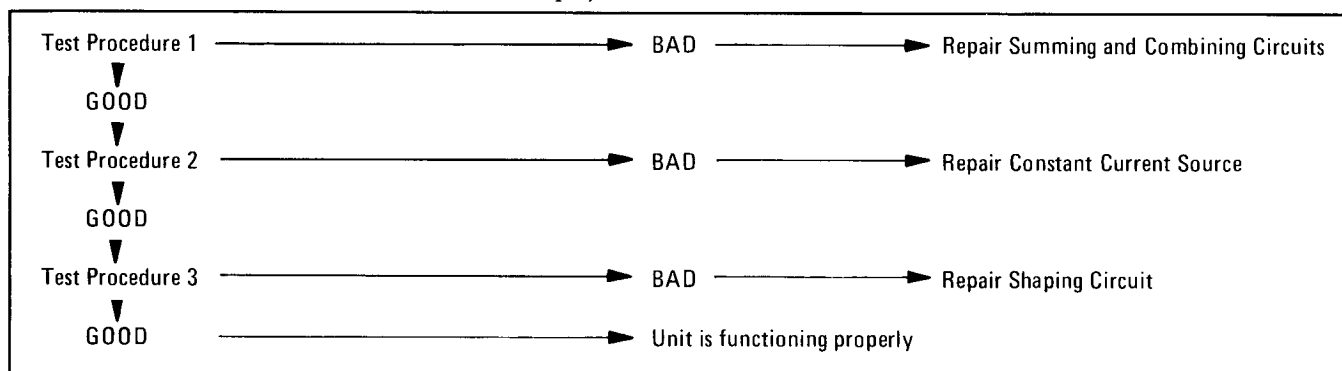
#### TEST PROCEDURE 3

Testing the shaping circuit consists of checking the transistors for proper diode action and checking the resistors for proper resistance.

#### NOTE

When repairs are required, the Adjustments specified in paragraph 5-37 should be performed.

### Simplified Test Procedure Tree



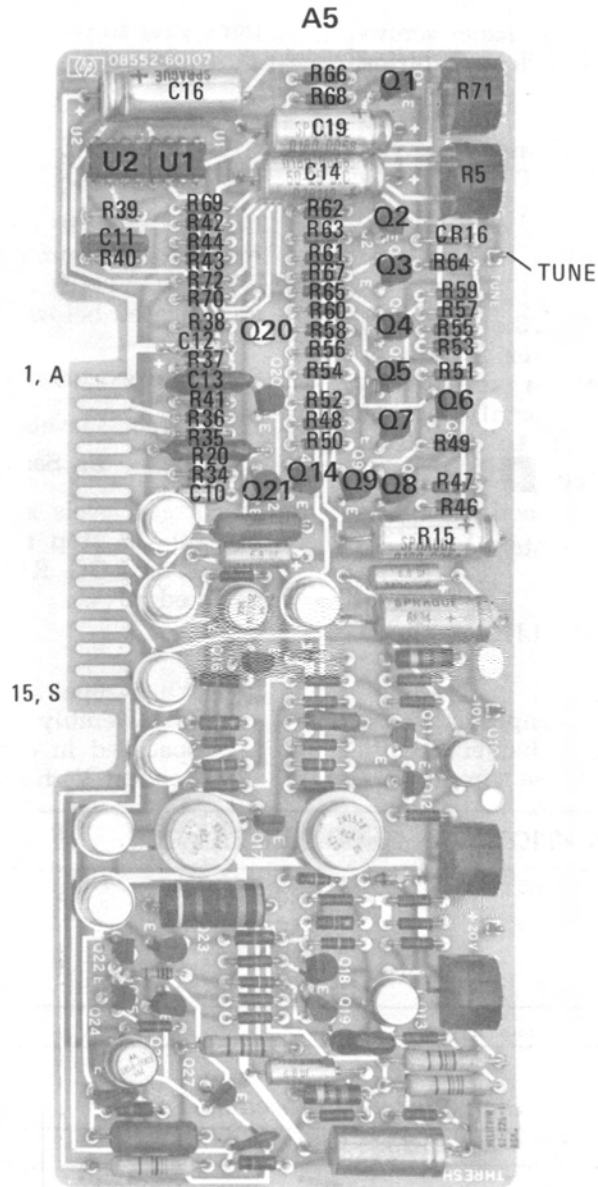
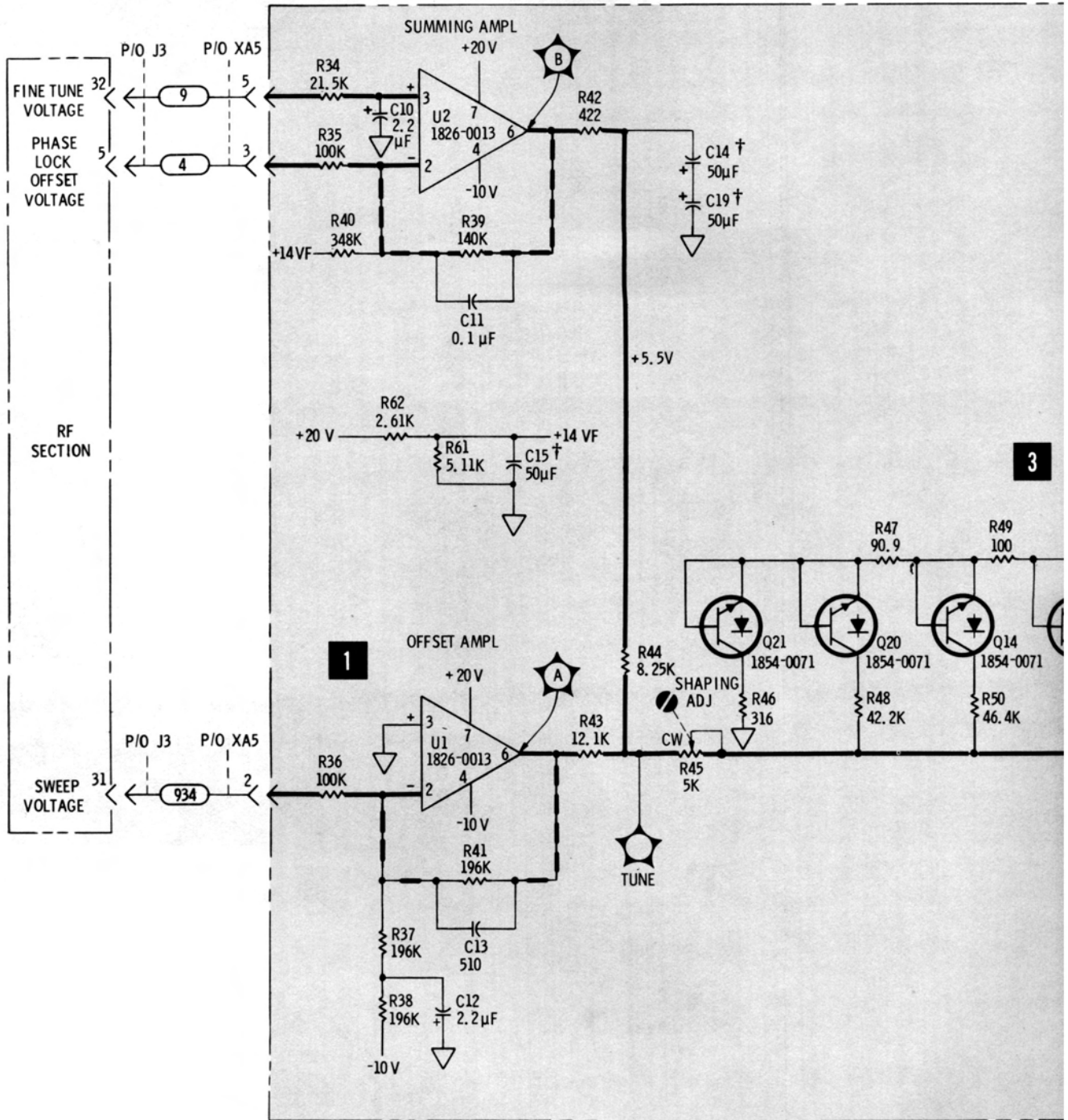


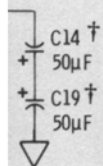
Figure 8-22. P/O Power Supply A5 Component Identification

P/O POWER SUPPLY ASSY A5 (08552-60107)

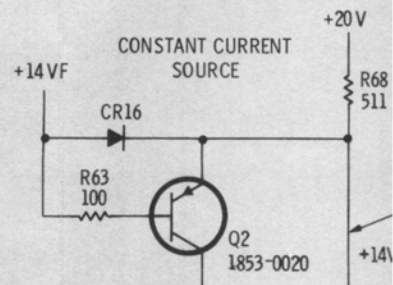


SERIAL PREFIX: 974

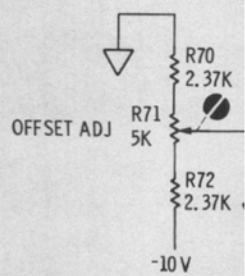
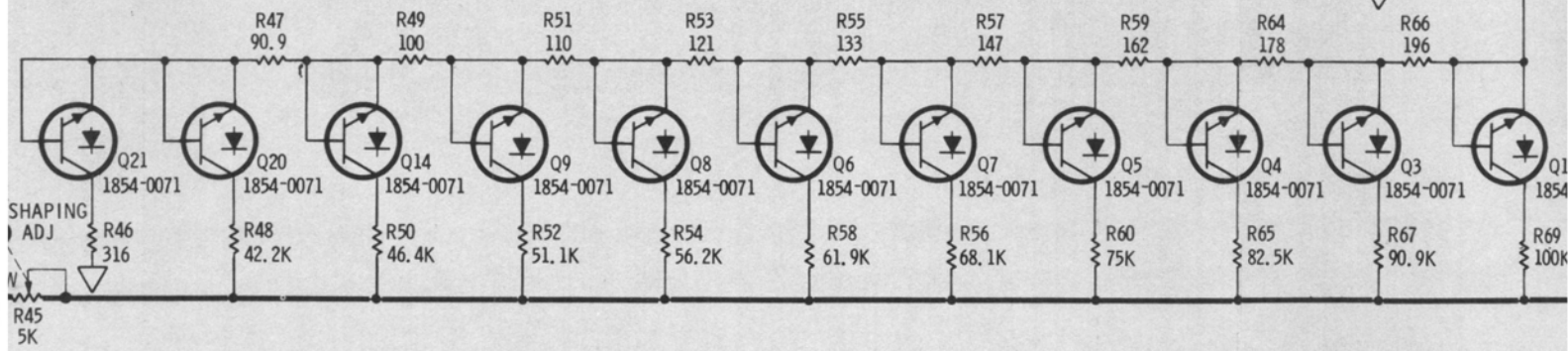


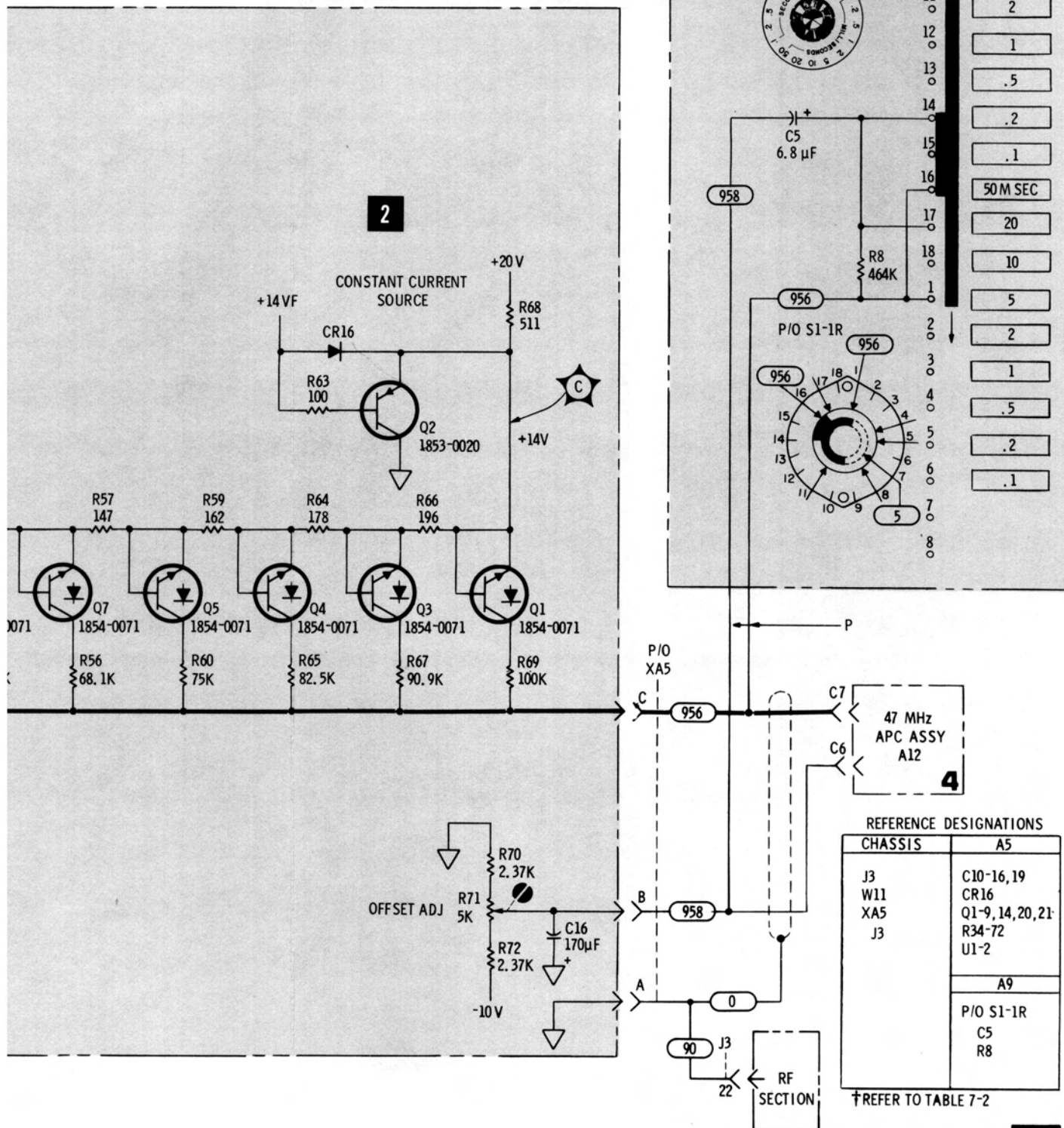


2



3





*Figure 8-23. 2 MHz VTO Shaping Circuit*



## SERVICE SHEET 6

It is assumed that the 3 MHz input signal and the correct dc input voltages are present and that the output signal is missing or out of tolerance.

### TROUBLESHOOTING PROCEDURE

When a malfunction has been isolated to the 3 MHz IF amplifier A2, the board should be removed and reinstalled using the extender board to provide access to components. Connect the CAL OUTPUT to the RF INPUT.

#### NOTE

Part of the 3 MHz IF amplifier circuit is shown on Service Sheet 7. It will be necessary to utilize both service sheets to verify proper operation of the amplifier after repairs are completed.

### EQUIPMENT REQUIRED

VECTOR VOLTMETER . . . . . HP 8405A  
SERVICE KIT . . . . . HP 11592A

### CONTROL SETTINGS

Unless otherwise specified in individual tests.

INPUT ATTENUATION . . . . . 10 dB  
SCAN WIDTH PER DIVISION . . . . . 20 kHz  
LOG REF LEVEL . . . . . -10 dBm  
SCAN WIDTH . . . . . ZERO  
LOG LINEAR . . . . . 10 dB LOG  
FREQUENCY . . . . . 30 MHz

### 3 MHz AMPLIFIER ASSEMBLY (General)

The 3 MHz amplifier assembly consists of a bandpass filter, the amplitude calibration amplifier, the 30, 40, 50 dB step amplifier, a variable 0 to 12 dB amplifier, and an emitter follower output stage. The 0 to 12 dB amplifier and the emitter follower output stage are shown on Service Sheet 7.

#### **1** 3 MHz BANDPASS FILTER

The 3 MHz bandpass filter is a two-section adjustable filter which is adjusted to provide a bandpass of 300 kHz centered at 3 MHz.

### TEST PROCEDURE **1**

Connect the HP 8405A to TP A (Q1-b) and tune the analyzer for maximum signal. Meter should indicate approximately 6.0 mV rms. If the signal level is correct proceed to step **2**. If the signal is low or missing, check the bandpass filter and R1.

#### NOTE

If the bandpass filter circuit required repairs the adjustment procedure specified in paragraph 5-32 of Section V should be performed.

A5, A9

2 MHz VTO Shaping Circuit

◀ SERVICE SHEET 5

## SERVICE SHEET 6 (cont'd)

**2** AMPLITUDE CALIBRATION AMPLIFIER

The gain of the amplitude calibration amplifier, Q1, Q2, and Q3 is controlled by a variable capacitive voltage divider. The variable capacitive elements are varactors which are controlled by a dc level from the RF Section front panel screwdriver adjustment. This circuit is adjusted during the analyzer alignment procedure to compensate for overall gain requirements and to provide absolute amplitude calibration of the displayed signal. Circuit gain is nominally 10 dB and is adjustable by approximately  $\pm 4$  dB.

TEST PROCEDURE **2**

Connect the HP 8405A to TP 1 (Q3-c) and tune analyzer for maximum signal. Meter reading is typically 30 mV rms. If this level is present turn the AMPL CAL adjustment to verify proper operation, return control setting to the level observed first, and proceed to step **3**. If signal is missing or level is not as specified, check Q1/Q2/Q3 and associated components.

**3** 30, 40, 50 dB STEP AMPLIFIER AND CONTROL CIRCUITS

Q4, Q5 and Q6 form a feedback amplifier whose gain is controlled by the feedback divider circuits in the emitter circuit of Q4. These circuits are

controlled by the LOG REF LEVEL switch. When all of the diodes (CR1-6) are reverse biased, the amplifier's gain is unity. When the 30 dB divider is switched into the feedback path, the amplifier's gain is 10 dB; when the 40 dB divider is activated, the gain is 20 dB and when the 50 dB divider is activated, the gain is 30 dB. R21, R24 and R27 are adjusted to calibrate the amplifier's gain steps.

TEST PROCEDURE **3**

Connect the HP 8405A to TP2 and tune the analyzer for maximum signal. Rotate the INPUT ATTENUATION and LOG REF LEVEL controls as indicated below and observe meter readings.

Signal levels shown are typical.

If correct levels are observed proceed to step **1** on Service Sheet 7.

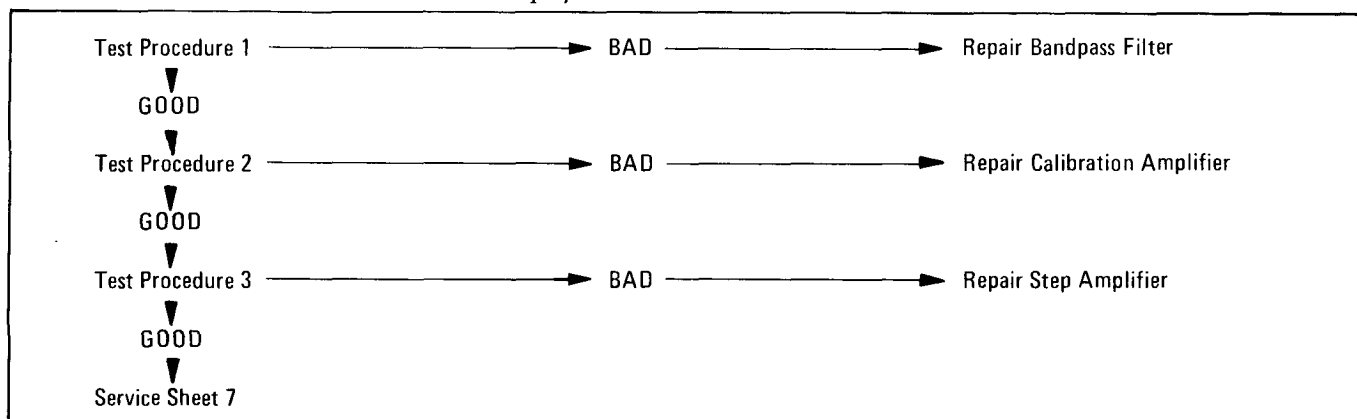
If correct levels are not obtained check the 30, 40, 50 dB step amplifier, feedback divider networks or LOG REF LEVEL switch assembly as required.

## NOTE

When repairs are required to the 3 MHz IF assembly the tests and adjustments specified in paragraphs 5-32 and 5-36 of Section V should be performed.

| INPUT ATTENUATION        | LOG REF LEVEL* | TP 2    |
|--------------------------|----------------|---------|
| 0 dB                     | -30 dBm        | -15 dBm |
| 10 dB                    | -30 dBm        | -15 dBm |
| 20 dB                    | -30 dBm        | -15 dBm |
| 30 dB                    | -30 dBm        | -15 dBm |
| *Read at lit index lamp. |                |         |

## Simplified Test Procedure Tree



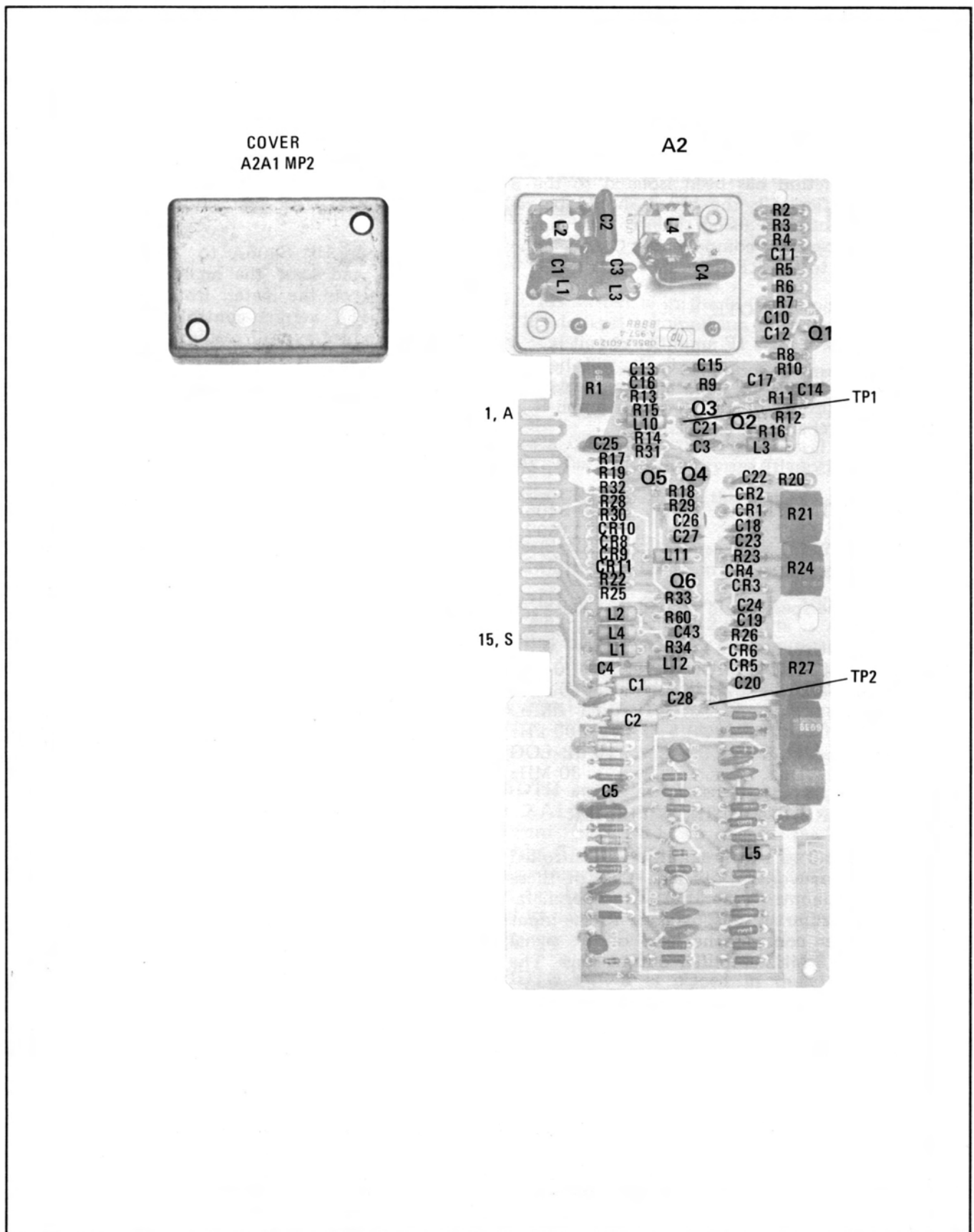
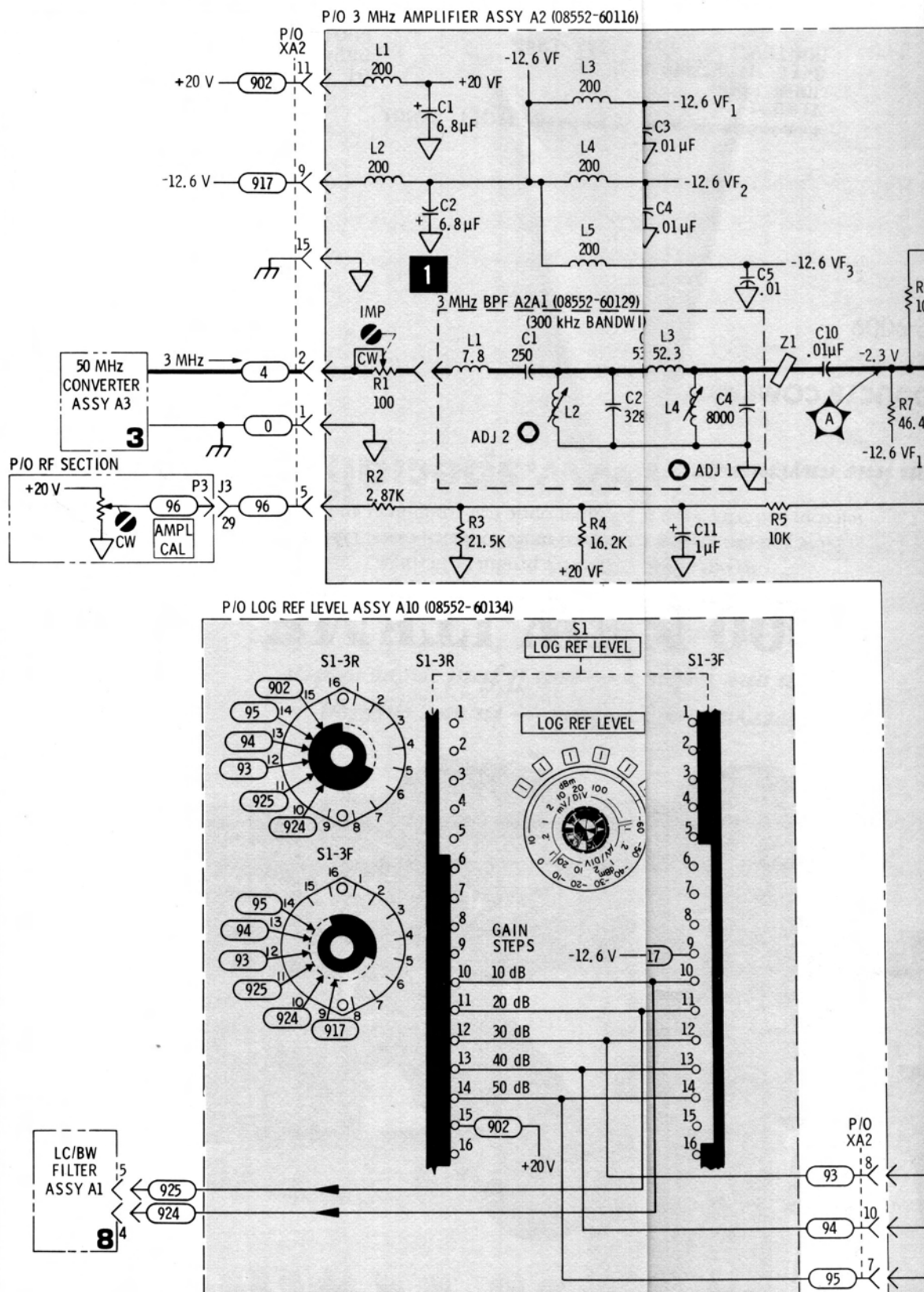
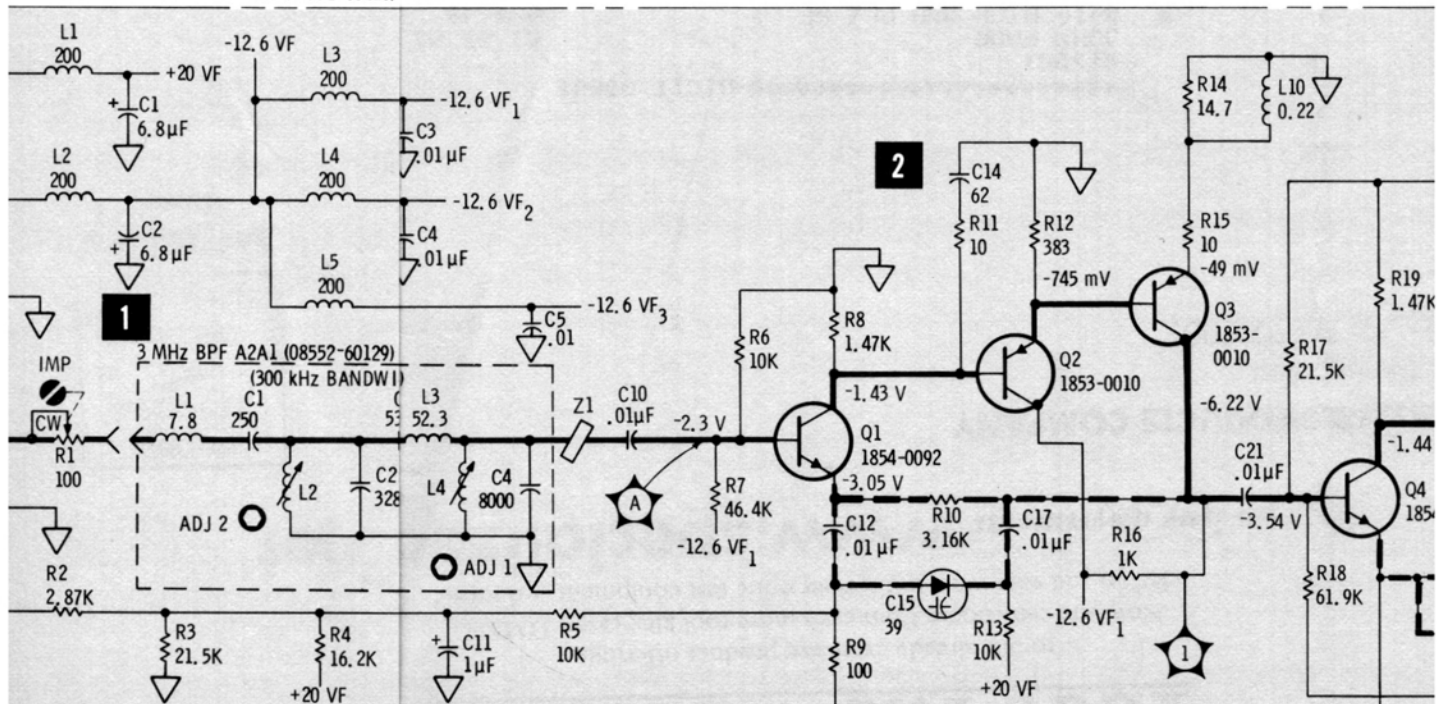


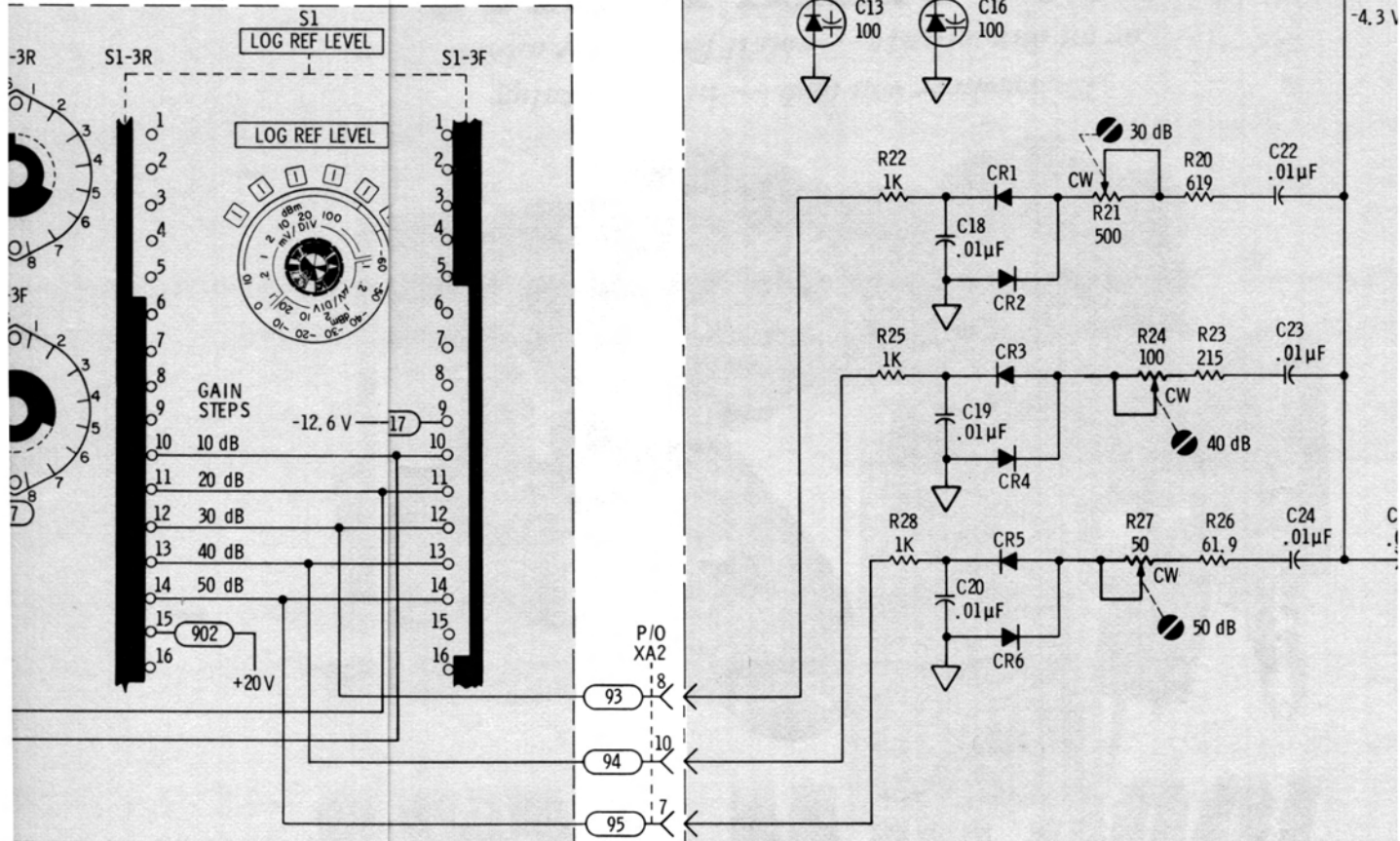
Figure 8-24. P/O 3 MHz Amplifier A2 Component Identification

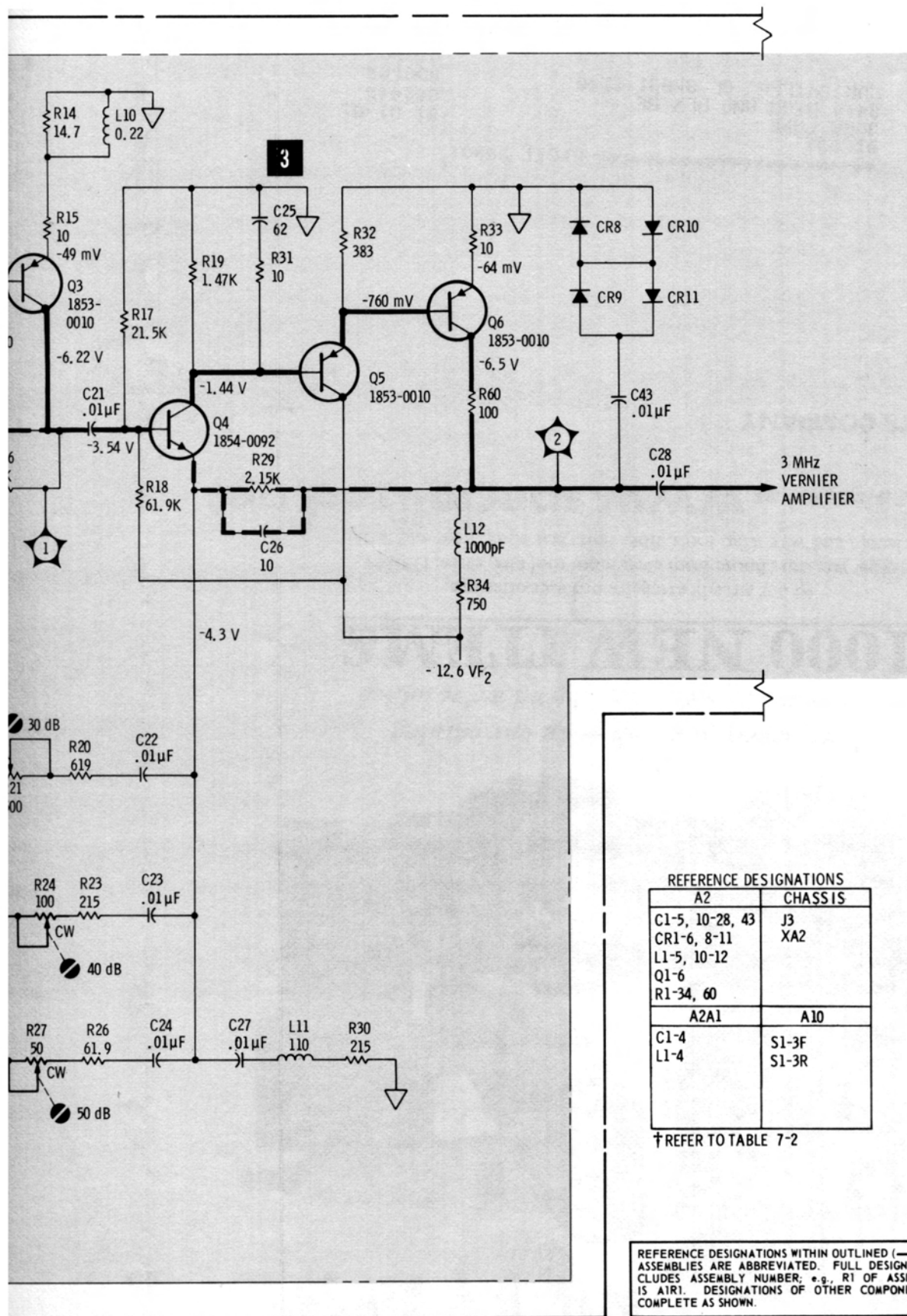


# 3 MHz AMPLIFIER ASSY A2 (08552-60116)



## EL ASSY A10 (08552-60134)





6

Figure 8-25. 3 MHz Amplifier (1 of 2)

A2, A10

3 MHz Amplifier (1 of 2)

◆ SERVICE SHEET 6

## SERVICE SHEET 7

It is assumed that the 3 MHz input signal and the circuit dc input voltages are present and that the output signal is missing or out of tolerance.

### TROUBLESHOOTING

When a malfunction has been isolated to the 3 MHz IF amplifier A2, the board should be removed and reinstalled using the extender board to provide access to components. Connect the CAL OUTPUT to the RF INPUT.

#### NOTE

Part of the 3 MHz IF amplifier circuit is shown on Service Sheet 6. It will be necessary to utilize both service sheets to verify proper operation of the amplifier after repairs are completed.

### EQUIPMENT REQUIRED

VECTOR VOLTMETER ..... HP 8405A  
SERVICE KIT ..... HP 11592A

### CONTROL SETTINGS

Unless otherwise specified in individual tests.

INPUT ATTENUATION ..... 0 dB  
SCAN WIDTH PER DIVISION ..... 20 kHz  
LOG REF LEVEL ..... -10 dBm  
SCAN WIDTH ..... ZERO  
BANDWIDTH ..... 300 kHz  
LOG·LINEAR ..... 10 dB LOG  
FREQUENCY ..... 30 MHz

#### 1 12 dB VARIABLE GAIN AMPLIFIER

The gain of the 0 to 12 dB amplifier is controlled by two varactor voltage dividers. One of these voltage dividers controls the level of the degenerative feedback from the output stage to the input stage; the other controls the level of the signal applied to the 3 MHz amplifier output stage. The

LOG REF LEVEL·LINEAR SENSITIVITY vernier control, R12, on the front panel controls the gain of the variable gain amplifier. R12 is calibrated by adjustments located on the 3 MHz IF amplifier assembly. R44 calibrates the 12 dB maximum and R51 calibrates the 0 dB minimum.

#### TEST PROCEDURE 1

Connect the HP 8405A to TP B (junction of C40/C41) and tune the analyzer for maximum signal level on the meter. Rotating the LINEAR SENSITIVITY vernier control to both extremes should produce typical readings of 30 mV rms to 130 mV rms. If the meter readings are correct proceed to step 2.

If the meter readings are not correct, repair the variable gain amplifier and repeat the test.

#### 2 3 MHz IF AMPLIFIER OUTPUT CIRCUIT

The 3 MHz IF amplifier output circuit consists of an emitter follower. The purpose of this stage is to provide isolation between the variable gain IF amplifier and the LC Filter assembly.

#### TEST PROCEDURE

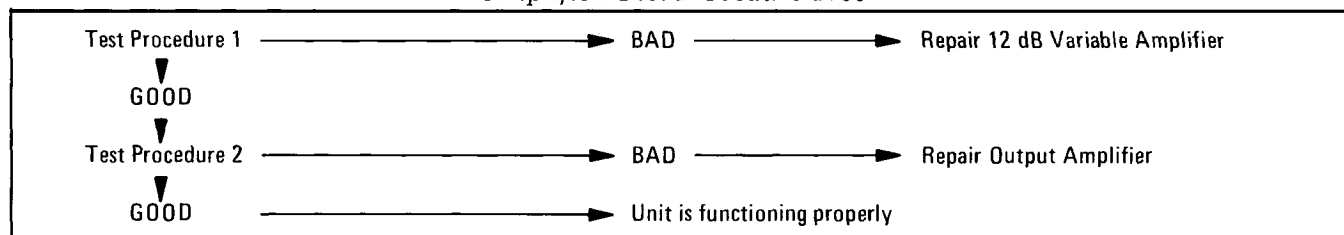
Connect the HP 8405A to TP 4 and tune the analyzer for maximum signal level on the meter. Typical reading is 30 mV rms with LOG/LIN vernier CCW.

If the meter reading is incorrect check Q10 and associated components.

#### NOTE

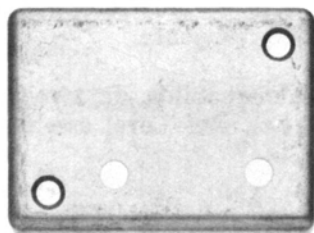
When repairs are required, the tests specified in paragraph 5-36 of Section V should be performed.

#### Simplified Test Procedure Tree





COVER  
A2A1 MP2



A2

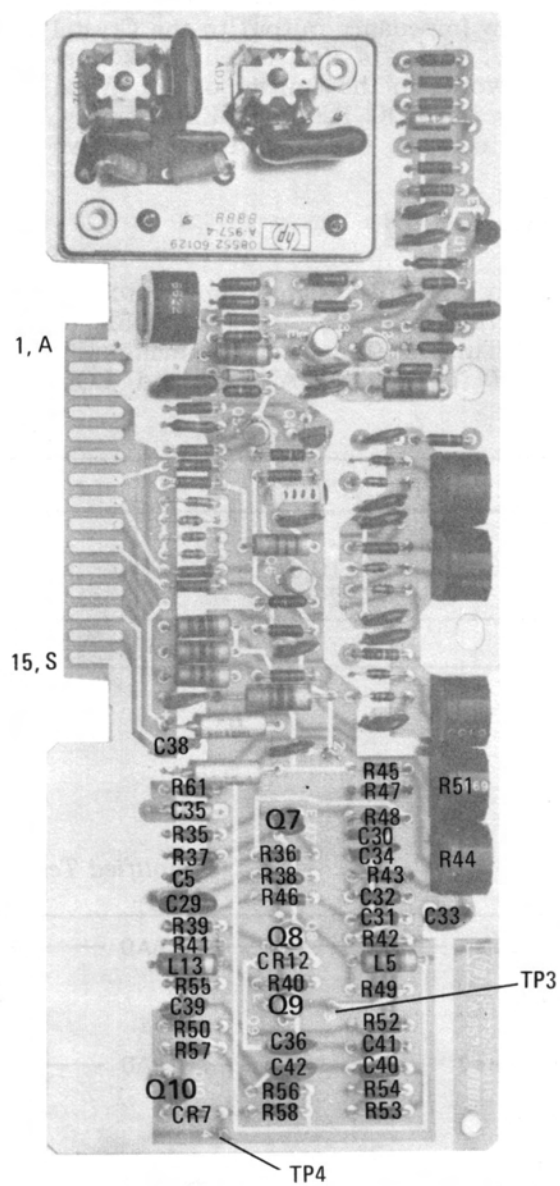
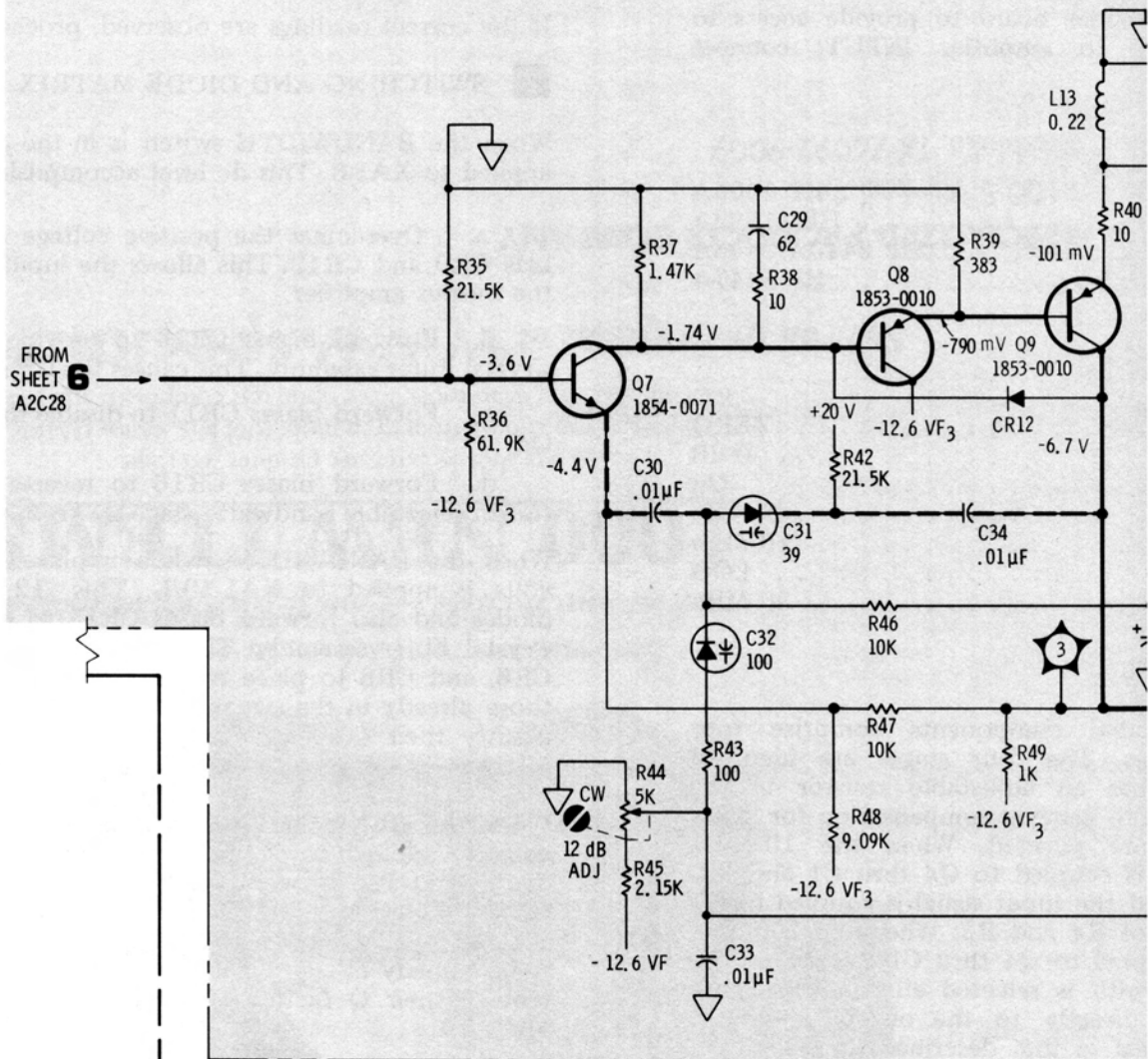
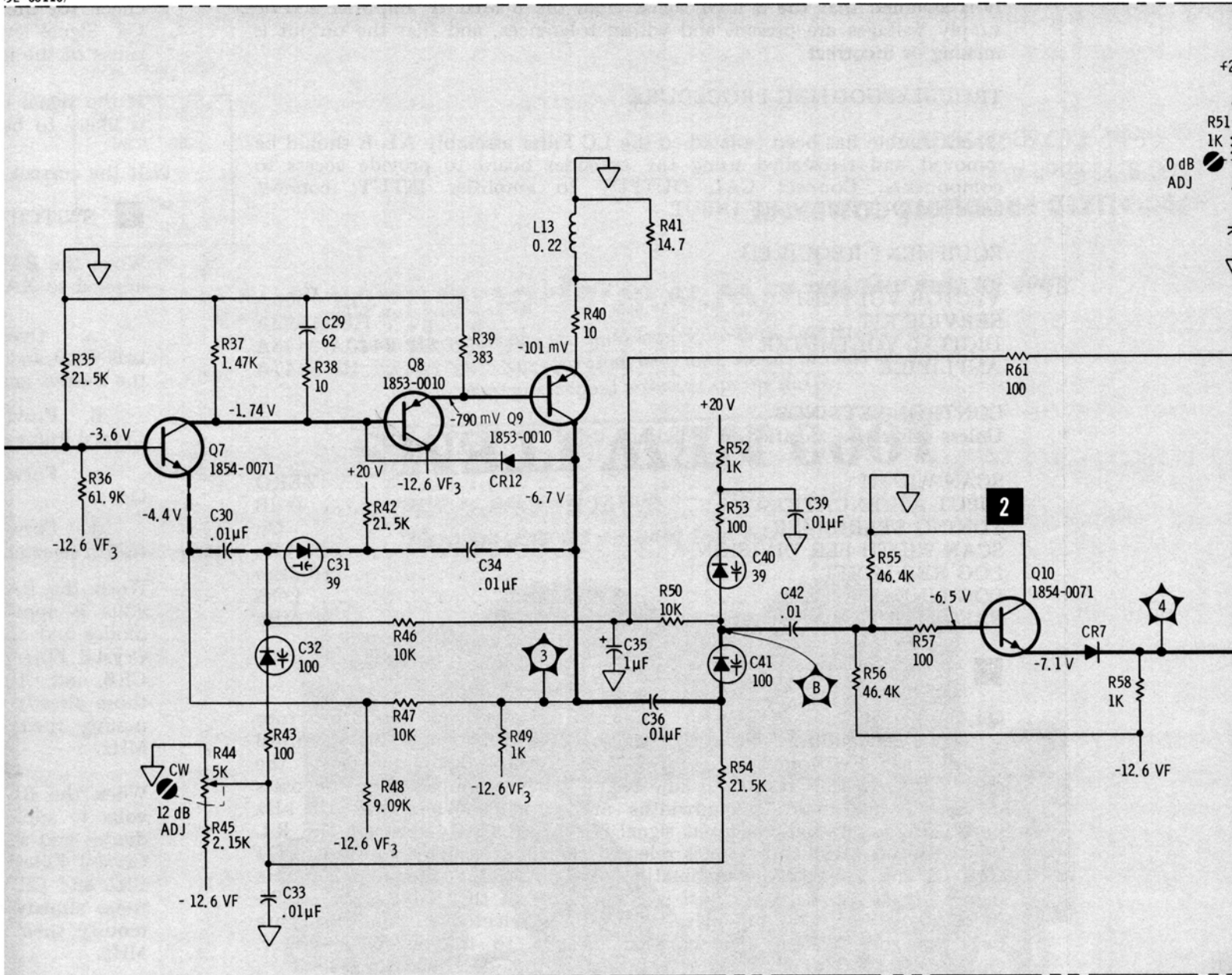


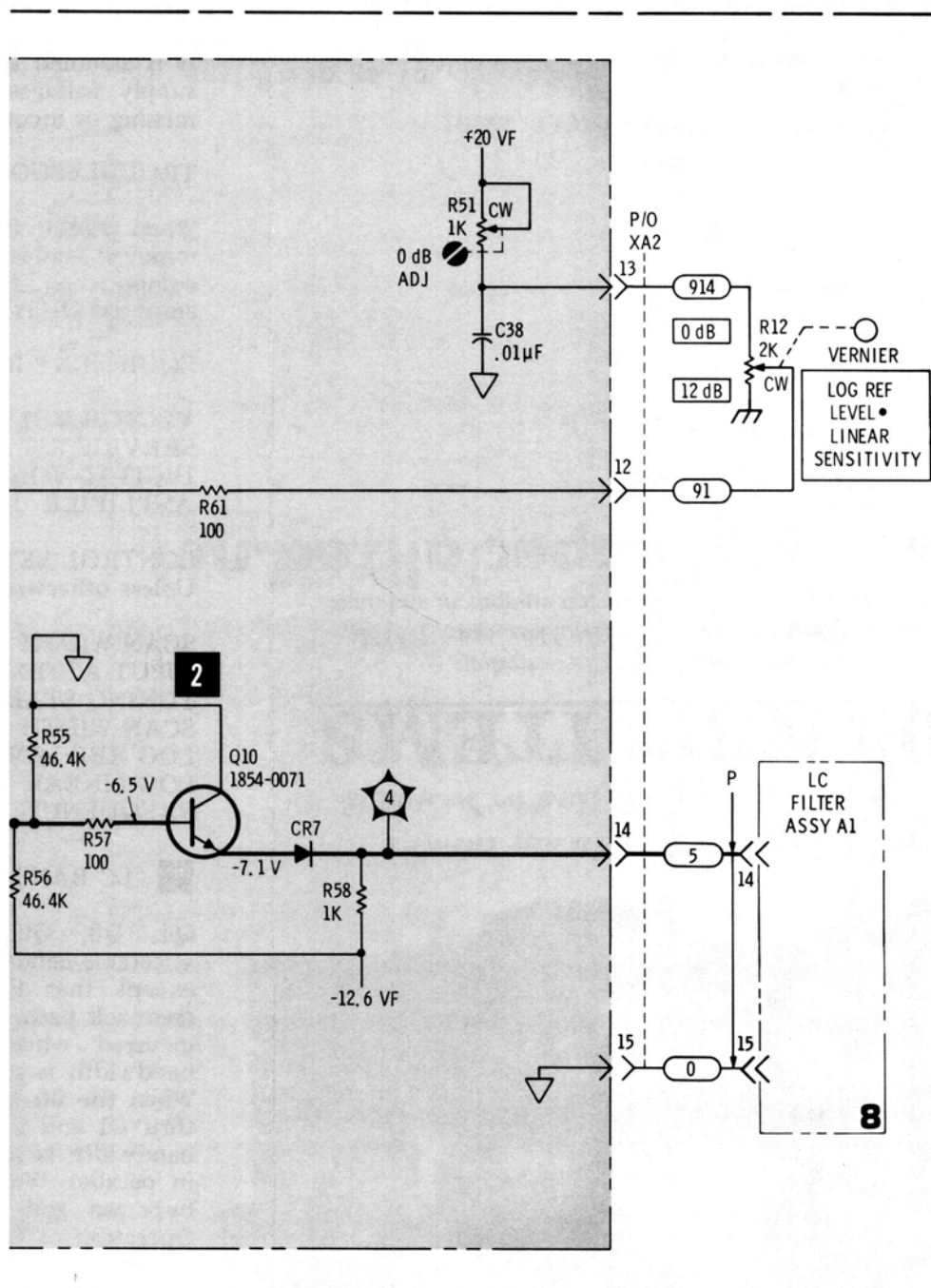
Figure 8-26. P/O 3 MHz Amplifier A2 Component Identification

1





REFERENCE DESIGNATIONS WITHIN OUTLINED (—) ASSEMBLIES ARE ABBREVIATED. FULL DESIGN CLUES ASSEMBLY NUMBER; e.g., R1 OF A55 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS COMPLETE AS SHOWN.



REFERENCE DESIGNATIONS WITHIN OUTLINED (— — —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

| REFERENCE DESIGNATIONS                                         |            |
|----------------------------------------------------------------|------------|
| A2                                                             | CHASSIS    |
| C29-36, 38-42<br>CR7, 12<br>L13, 14<br>Q7 - 10<br>R35 - 58, 61 | R12<br>XA2 |

†REFER TO TABLE 7-2

7

Figure 8-27. 3 MHz Amplifier (2 of 2)

## SERVICE SHEET 8

It is assumed that the 3 MHz signal from the 3 MHz IF amplifier and dc supply voltages are present and within tolerances, and that the output is missing or incorrect.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the LC Filter assembly A1, it should be removed and reinstalled using the extender board to provide access to components. Connect CAL OUTPUT to amplifier INPUT; connect amplifier OUTPUT to RF INPUT.

### EQUIPMENT REQUIRED

VECTOR VOLTMETER . . . . . HP 8405A  
SERVICE KIT . . . . . HP 11592A  
DIGITAL VOLTMETER . . . . . HP 3440A/3443A  
AMPLIFIER . . . . . HP 8447A

### CONTROL SETTINGS

Unless otherwise specified in individual tests.

SCAN WIDTH . . . . . ZERO  
INPUT ATTENUATION . . . . . 0 dB  
TUNING STABILIZER . . . . . On  
SCAN WIDTH PER DIVISION . . . . . 20 kHz  
LOG REF LEVEL . . . . . -10 dBm  
LOG-LINEAR . . . . . LOG  
FREQUENCY . . . . . 30 MHz

### **1** LC BANDWIDTH FILTER STAGES

Q4, Q3, Q2 and Q1 with associated components comprise four selectable-bandwidth, unity gain stages. The four stages are identical except that the fourth stage (Q1) has an adjustable resistor in the feedback path. This resistor is adjusted to provide compensation for losses incurred when narrow bandwidths are selected. When the 10 kHz bandwidth is selected the input signal is coupled to Q4 thru C1 and R4. When the 30 kHz bandwidth is selected the input signal is coupled to Q4 thru C1 and the parallel combination of R4 and R3. When the 100 kHz bandwidth is selected the signal is coupled to Q4 thru C1/R4 and C2/R5 in parallel. When the 300 kHz bandwidth is selected all four stages are bypassed and the signal is coupled directly to the output amplifier. Operation of Q3, Q2 and Q1 is identical to that described for Q4.

### TEST PROCEDURE **1**

With a 30 MHz, -10 dBm signal applied to the analyzer RF INPUT, connect the HP 8405A to TP 1, Q1 emitter. Tune the analyzer for maximum with the BANDWIDTH switch in the 10 kHz position. Typical meter reading is 300 mV rms.

Rotate the BANDWIDTH switch to the 30, 100 and 300 kHz positions. The meter reading should be approximately the same for bandwidths of 10, 30, and 100 kHz, and drop to approximately 0 volt in the 300 kHz BANDWIDTH position.

If the signal is not present at any of the BANDWIDTH settings the trouble is likely to be in one of the four stages. To isolate to a defective stage

## SERVICE SHEET 8 (cont'd)

check for the presence of the signal at the emitter of Q2, then Q3, then Q4. Signal levels should approximate those specified for Q1 emitter. If the cause of the malfunction is not detected, proceed to step **2**

If the signal is correct at some, but not all, bandwidth selections, trouble is likely to be in the switching or diode matrix. Proceed to step **2**

If the correct readings are observed, proceed to step **3**

### **2** SWITCHING AND DIODE MATRIX

When the BANDWIDTH switch is in the 300 kHz position, -12.6 volts are applied to XA1-8. This dc level accomplishes the following:

- a. Overcomes the positive voltage applied through R42 to forward bias CR9 and CR12. This allows the input signal to be coupled directly to the output amplifier.
- b. Forward biases CR13 to provide a dc level to the diodes in the Crystal Filter assembly. This causes the Crystal Filter circuits to be bypassed.
- c. Forward biases CR11 to disable the first selectable bandwidth stage Q4.
- d. Forward biases CR16 to reverse bias CR17 and disconnect the fourth selectable bandwidth stage Q1 from the output stage.

When the BANDWIDTH switch is placed in the 100 kHz position, -12.6 volts is applied to XA1-10/L. This -12.6 volts is applied to LC Filter diodes and also forward biases CR15 to operate the bypass circuit in the Crystal Filter assembly. The diode bias voltage forward biases CR2, CR4, CR6, and CR8 to place resistors R5, R14, R23, and R33 in parallel with those already in the signal path. This effectively swamps the LC circuits to modify their Q factor and provide a bandpass of 100 kHz centered at 3 MHz.

When the BANDWIDTH switch is placed in the 30 kHz position, -12.6 volts is applied to XA1-12/N. This -12.6 volts is applied to LC Filter diodes and also forward biases CR14 to operate the bypass circuit in the Crystal Filter assembly. The diode bias voltage forward biases CR1, CR3, CR5 and CR7 to place resistances R3, R11, R20, and R31 in parallel with those already in the signal path. This effectively swamps the LC circuits to modify their Q factors and provide a bandpass of 30 kHz centered at 3 MHz.

When the BANDWIDTH switch is placed in the 10 kHz position the switching diodes are not used for signal steering and the LC filter provides a 10 kHz bandpass centered at 3 MHz.

### TEST PROCEDURE

Use the HP 3440A/3443A to check for voltages shown in the chart for XA1 contacts on Service Sheet 9, step **2**

If the correct readings are obtained at XA1 pins 6, 12, 10, and 8, check the diode matrix. If correct readings are not obtained, check the BANDWIDTH switch, SCAN WIDTH switch, CR1, CR2, CR3, wiring, etc.

When correct readings are obtained, recheck step **1** then proceed to step **3**

A2

3 MHz Amplifier (2 of 2)

◀ SERVICE SHEET 7

SERVICE SHEET 8 (cont'd)

**3** 0 dB, 10 dB, 20 dB STEP AMPLIFIER

Q5, Q6, Q7 and associated components comprise a feedback amplifier which provides unity gain, 10 dB of gain or 20 dB of gain depending on the position of the LOG REF LEVEL control. When operated as a unity gain amplifier it provides isolation and a low impedance output to the Crystal Filter assembly. Gain of the amplifier is controlled by networks in the emitter of Q5. When switched on by the LOG REF LEVEL assembly, these circuits control the amplifier's negative feedback.

TEST PROCEDURE **3**

With a 30 MHz, -10 dBm signal applied to the analyzer RF INPUT, connect the HP 8405A to TP 6 (Q7-e). Tune the analyzer for maximum, rotate the INPUT ATTENUATION and LOG

REF LEVEL controls as indicated below and observe meter readings. Signal levels shown are typical.

If signal levels are correct, the step amplifier and diode-switched networks are functioning properly.

If signal levels are incorrect, check Q5/Q6/Q7 and associated components.

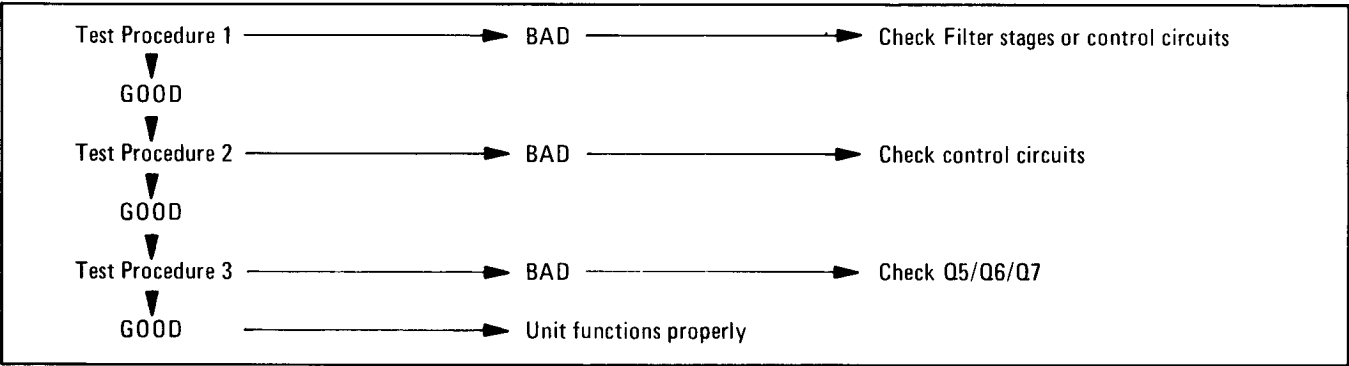
If the diode enabling dc levels are not present, check the Log Ref Level assembly, Service Sheet 9.

NOTE

When repairs are required the tests specified in paragraphs 5-33 and 5-36 of Section V should be performed.

| INPUT ATTENUATION       | LOG REF LEVEL* | TP6   |
|-------------------------|----------------|-------|
| 0 dB                    | -10 dBm        | 0 dBm |
| 10 dB                   | -10 dBm        | 0 dBm |
| 20 dB                   | -10 dBm        | 0 dBm |
| *Read at lit index lamp |                |       |

*Simplified Test Procedure Tree*



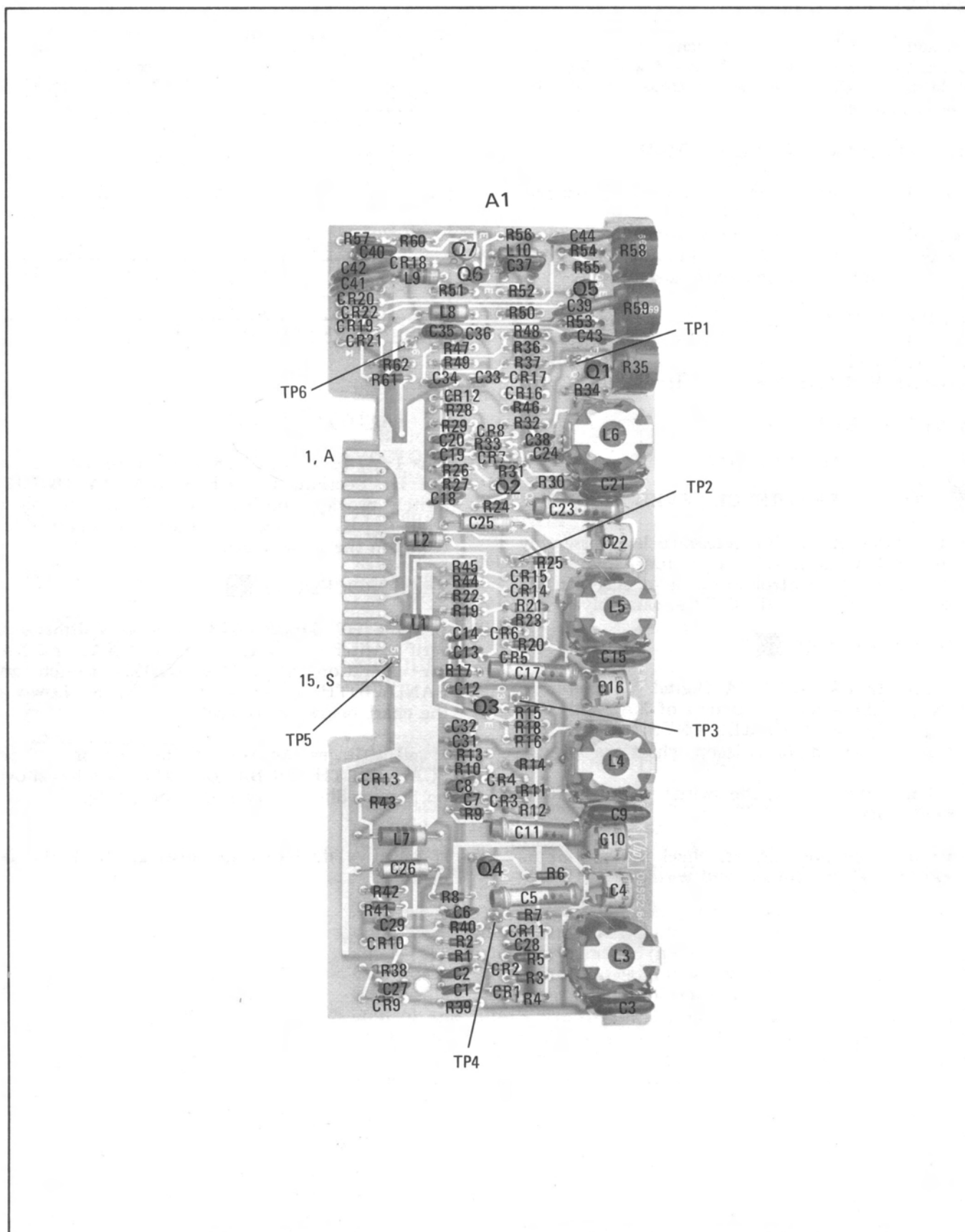
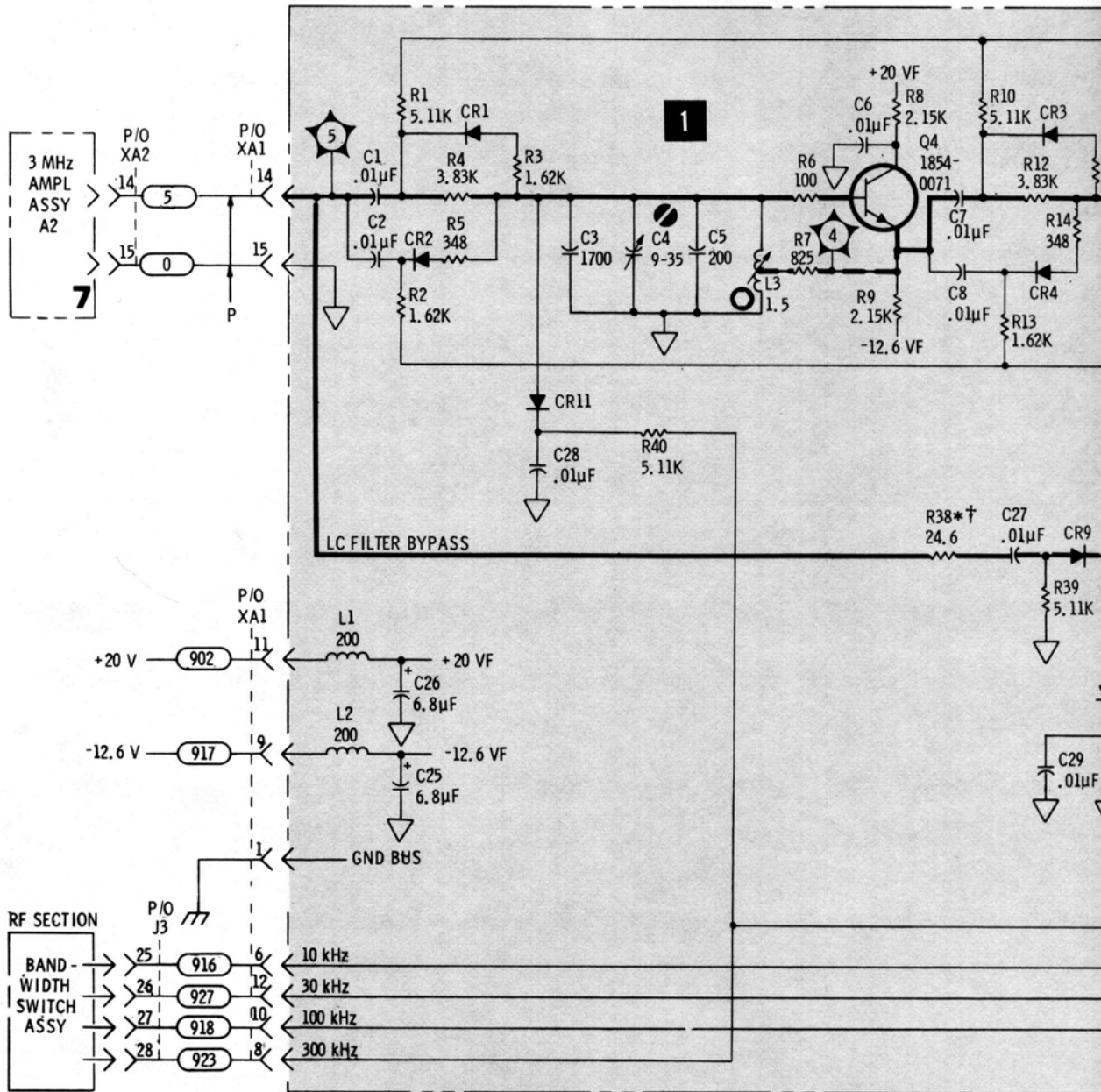


Figure 8-28. LC Filter A1 Component Identification

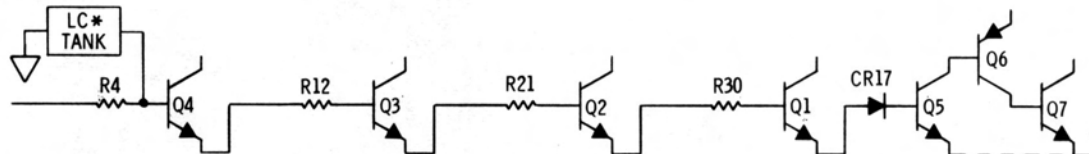


# LC FILTER ASSY A1 (08552-60109)



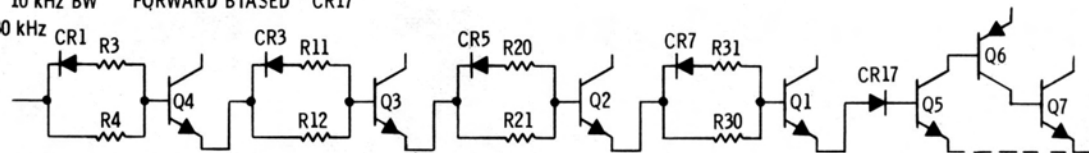
SIGNAL FLOW

SIGNAL FLOW - 10 kHz BW



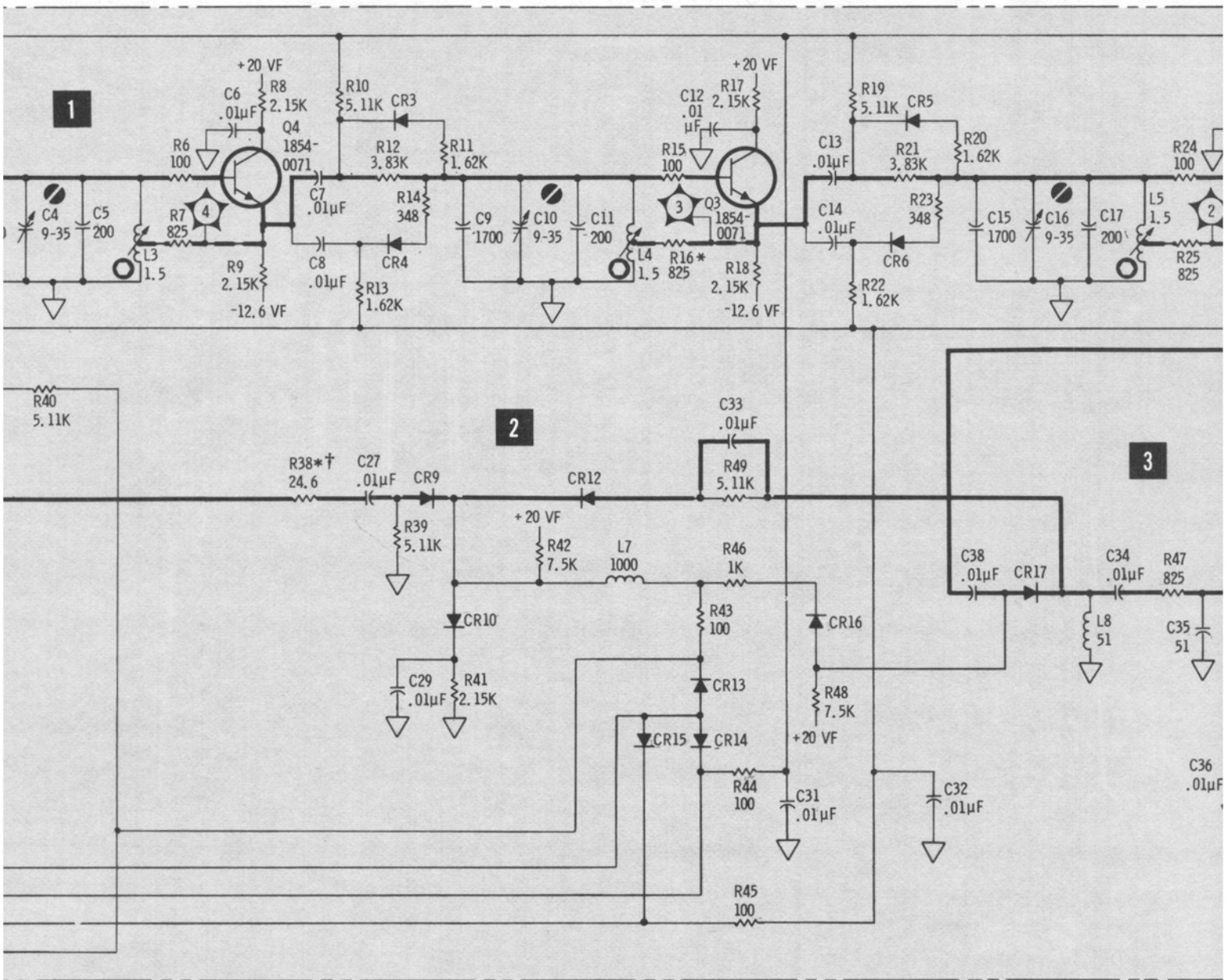
SWITCHING } REVERSE BIASED - CR1-CR9, CR11, 12, 13, 16, ALL BW CHAN OF XTAL FIL ASSY A4 BYPASSED.  
10 kHz BW } FORWARD BIASED - CR17

SIGNAL FLOW - 30 kHz BW



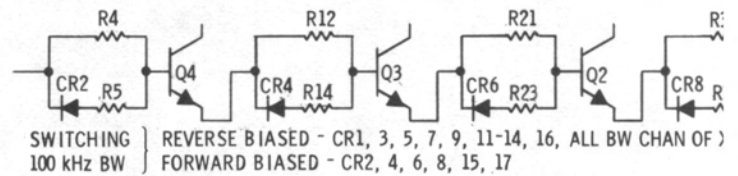
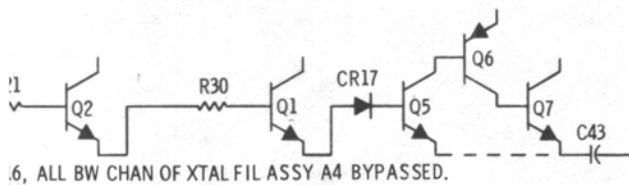
SWITCHING } REVERSE BIASED - CR2, 4, 6, 8, 9, 11, 12, 13, 15, 16, ALL BW CHAN OF XTAL FIL ASSY A4 BYPASSED.  
30 kHz BW } FORWARD BIASED - CR1, 3, 5, 7, 14, 17

\* COMMON TO F

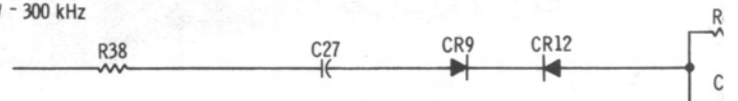
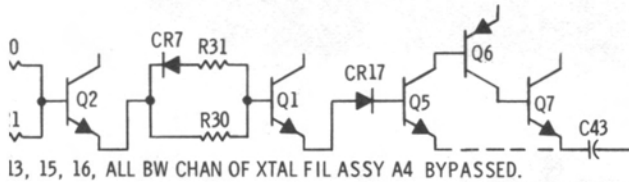


SIGNAL FLOW PATH

SIGNAL FLOW - 100 kHz



SIGNAL FLOW - 300 kHz



SWITCHING } REVERSE BIASED - CR1-CR8, 10, 14, 15,  
300 kHz - BW } FORWARD BIASED - CR9, 11, 12, 13, 16

\*COMMON TO FIRST FOUR STAGES FOR EACH SELECTED BW.

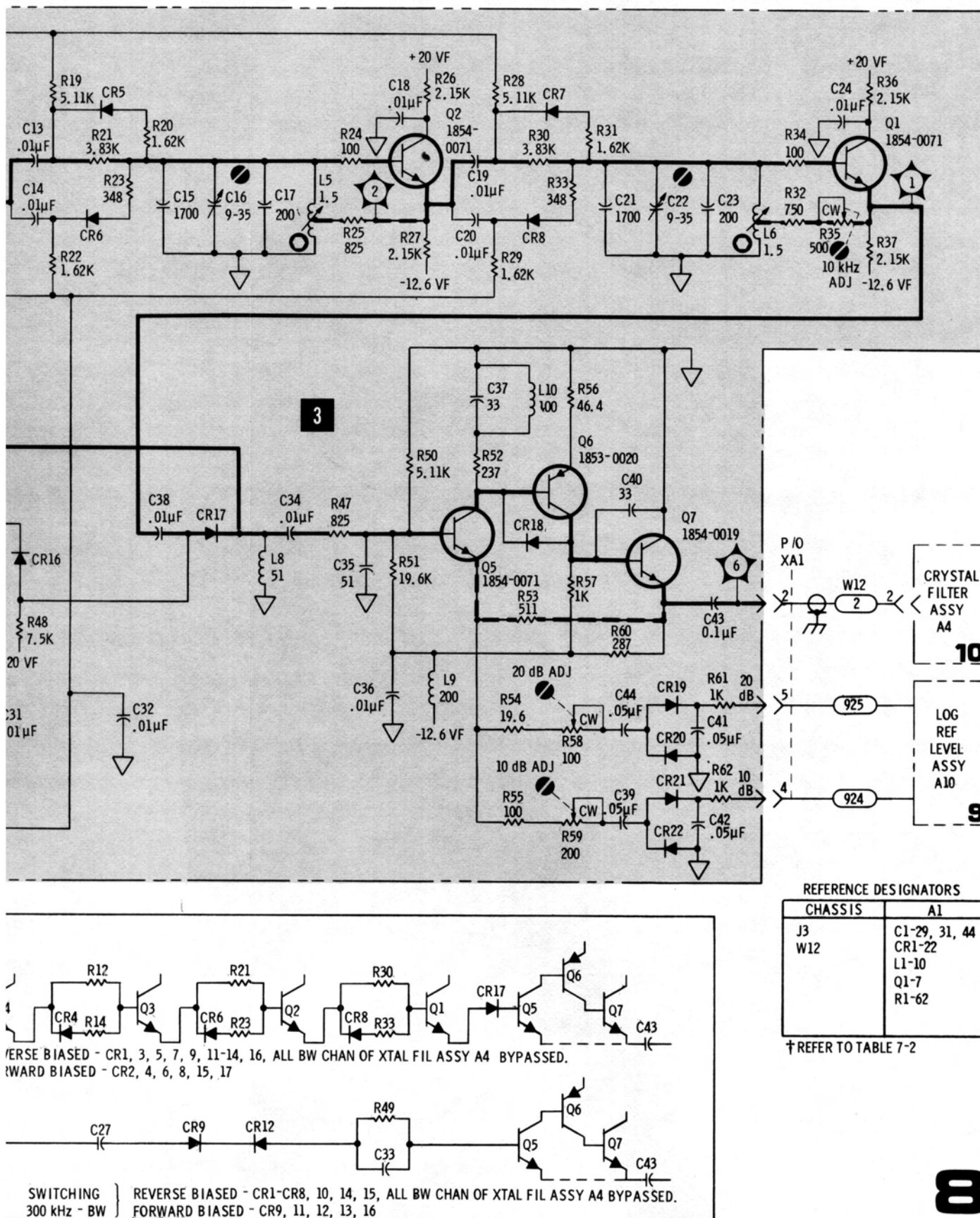


Figure 8-29. LC Bandwidth Filter



## SERVICE SHEET 9

Normally, malfunctions which occur in the switching circuits will be detected and corrected while troubleshooting circuits shown on Service Sheets 6 and 8.

### TROUBLESHOOTING PROCEDURE

Since these switches function for voltage switching only, all components and wiring can be checked by monitoring voltage levels at the input connector to the 3 MHz IF amplifier, LC Filter assembly, and the Crystal Filter assembly.

### EQUIPMENT REQUIRED

SERVICE KIT . . . . . HP 11592A  
DIGITAL VOLTMETER . . . HP 3440A/3443A

### CONTROL SETTINGS

As required to check dc levels

#### 1 P/O LOG REFERENCE LEVEL ASSEMBLY

This portion of the log reference level assembly applies +20 volts or -12.6 volts to enable or disable switches to control the gain of stages in the 3 MHz IF amplifier and LC Filter assembly.

#### TEST PROCEDURE 1

Use the HP 3440A/3443A Digital Voltmeter to verify switching voltages at pins of XA1 and XA2 for operation of LOG REF LEVEL switch. The voltages shown in the adjacent chart are typical.

If voltages are correct, the switch section is functioning properly.

If voltages are not correct, check voltage inputs to switch, switch contacts and wiring.

| Pin<br>of<br>XA2 | Log Ref Level Switch Settings (dBm) * |       |       |       |       |       |
|------------------|---------------------------------------|-------|-------|-------|-------|-------|
|                  | -10                                   | -20   | -30   | -40   | -50   | -60   |
| 8                | +20                                   | +20   | +20   | -12.6 | -12.6 | -12.6 |
| 10               | +20                                   | +20   | +20   | +20   | -12.6 | -12.6 |
| 7                | +20                                   | +20   | +20   | +20   | +20   | -12.6 |
| Pin<br>of<br>XA1 |                                       |       |       |       |       |       |
|                  |                                       |       |       |       |       |       |
| 4                | +20                                   | -12.6 | -12.6 | -12.6 | -12.6 | -12.6 |
| 5                | +20                                   | +20   | -12.6 | -12.6 | -12.6 | -12.6 |

\* Read at left index lamp.

#### 2 BANDWIDTH CONTROL

Pins 1—4, 14, and 25—28 of J3 make contact with the RF Section. The RF Section BANDWIDTH switch provides positive or negative voltages to add, bypass or remove bandwidth shaping elements in the signal path.

#### TEST PROCEDURE 2

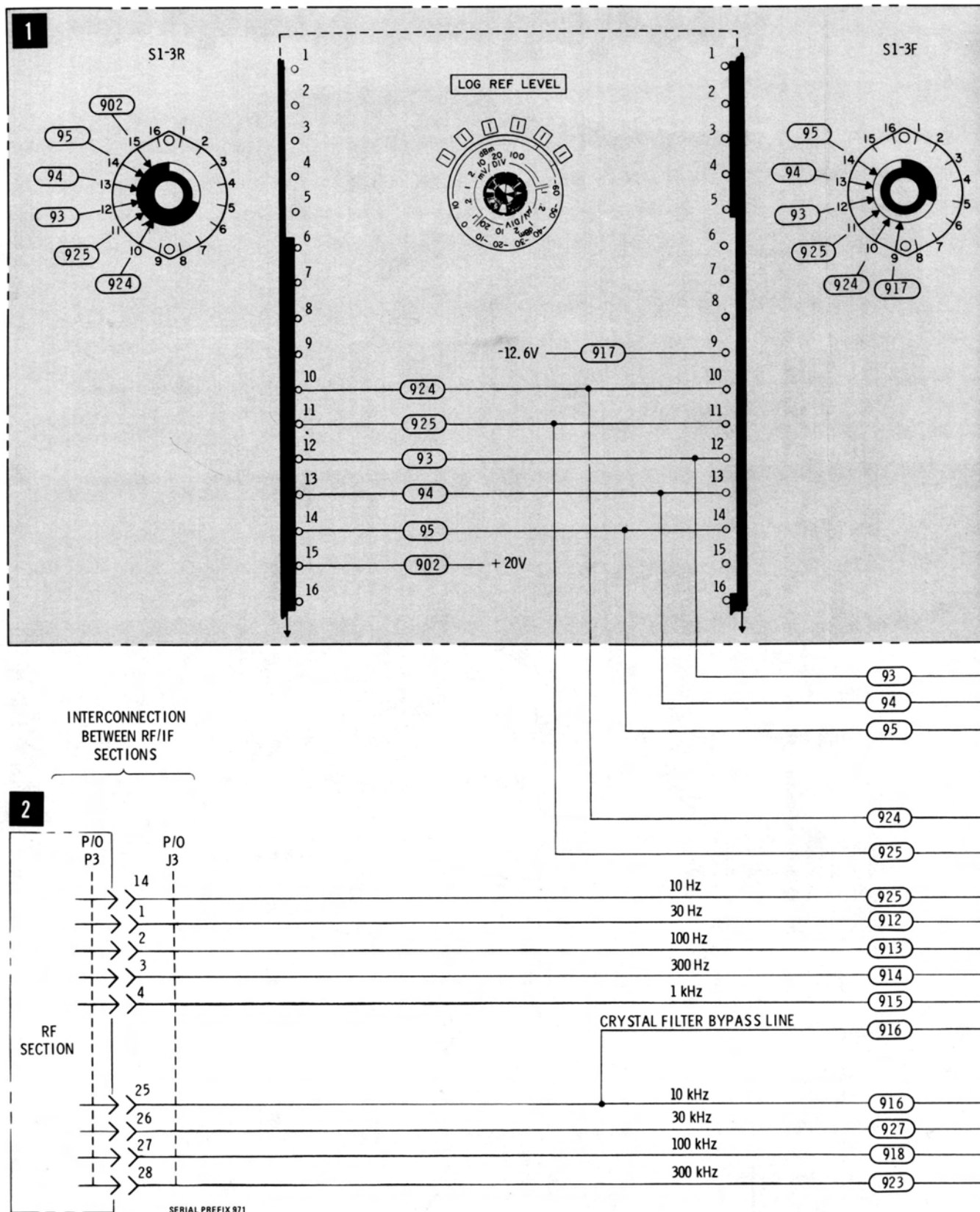
Use the HP 3440A/3443A Digital Voltmeter to verify switching voltages at pins of XA1 and XA4 for operation of SCAN WIDTH switch and BANDWIDTH switches. The voltages shown in the chart below are typical.

If all voltages are correct the portions of the SCAN WIDTH and BANDWIDTH switches shown on Service Sheet 9 are functioning properly.

If negative dc levels are missing, check the RF Section.







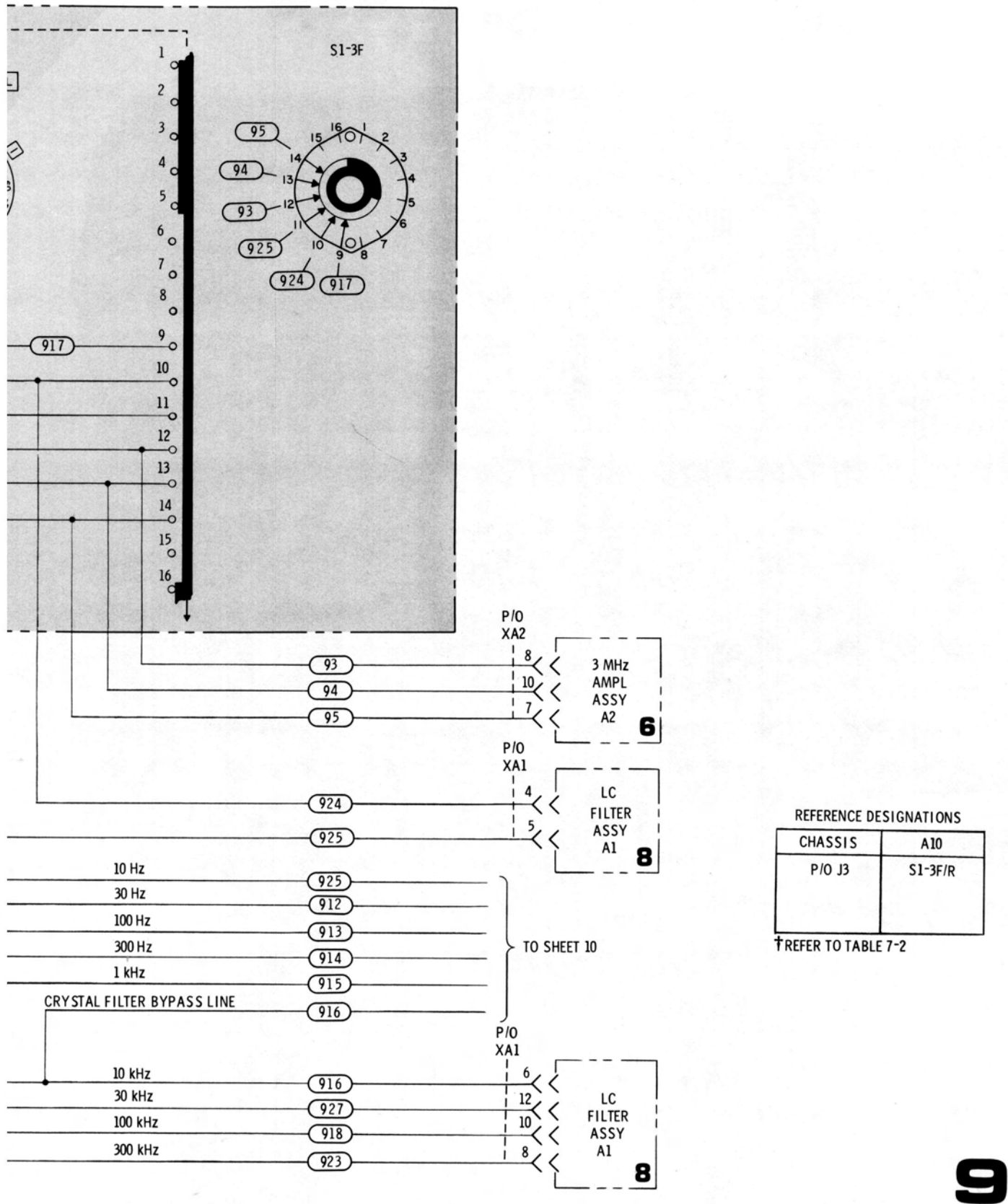


Figure 8-30. Amplifier/Filter Control Circuits



## SERVICE SHEET 10

It is assumed that the 3 MHz IF signal from the LC Filter and the dc operating voltages are present and correct and that the 3 MHz output is missing or out of tolerance.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the 3 MHz Crystal Filter assembly, the assembly should be removed and reinstalled using the extender board to provide access to components. Test procedures follow descriptions of individual circuits.

### NOTE

Some of the Crystal Filter circuits are shown on Service Sheet 11.

### EQUIPMENT REQUIRED

|                   |                |
|-------------------|----------------|
| SERVICE KIT       | HP 11592A      |
| VECTOR VOLTMETER  | HP 8405A       |
| DIGITAL VOLTMETER | HP 3440A/3443A |

### CONTROL SETTINGS

|                   |           |
|-------------------|-----------|
| INPUT ATTENUATION | 0 dB      |
| BANDWIDTH         | 3 kHz     |
| LOG REF LEVEL     | -30 dBm   |
| SCAN WIDTH        | ZERO      |
| LOG LINEAR        | 10 dB LOG |
| FREQUENCY         | 30 MHz    |

## 1 SELECTABLE BANDWIDTH CRYSTAL FILTER STAGES

Filter stages Y1-3 (and Y4 and 5 on Service Sheet 11) are unity gain, selectable bandwidth crystal filters; their basic bandwidth is 3 kHz. Bandwidth can be narrowed in steps (1, 0.3, 0.1, .03 and .01 kHz) by enabling resistive networks that are in parallel with each stage's output.

All five stages are basically the same: Q1, Q2 and Q4 comprise a unity-gain feedback amplifier with high input impedance at 3 MHz. Q3 and C18 null out the parasitic (holder) capacitance of Y1. L11, L12 and C19 form a tank that tunes out stray capacitance to give Y1 a pure resistive load at 3 MHz. The selectable resistive networks at Y1's output control the filter's bandwidth, by decreasing Y1's output load, without drastically effecting the amplitude of the 3 MHz signal. C30 and 43 (and C57 and 70 on Service Sheet 11) tune the center frequency of crystal stages Y2-5 to equal the center frequency of the first stage.

A10

Amplifier Filter Control Circuits

◀ SERVICE SHEET 9

**SERVICE SHEET 10 (cont'd)****TEST PROCEDURE 1**

With CAL OUTPUT connected to RF INPUT, measure the signal level at TP 10 (on Service Sheet 11) at bandwidths of 1 kHz, 0.3 kHz, 0.1 kHz, .03 kHz, and .01 kHz with the HP 8405A. Readjust FINE TUNE for maximum signal during each measurement. Meter readings should be about 150 mV rms.

**NOTE**

FINE TUNE adjustment is very critical at narrow bandwidths and extreme care will be required to obtain correct measurements.

If the signal were correct at all bandwidths, proceed to step **3**. If the signal were incorrect at some, but not all bandwidths, proceed to step **2**.

If the signal were incorrect at all bandwidths, isolate the faulty stage by measuring the signal at TP6 and TP7 (and TP8 and TP9 on Service Sheet 11). Meter readings should be about the same as TP10.

**2 DIODE SWITCHING AND BANDWIDTH CONTROL NETWORKS**

There are five switching and bandwidth control networks, one for each of the five crystal filter

stages. When the analyzer is operated in the 3 kHz BANDWIDTH mode all of the switching diodes are reverse biased and the inherent characteristics of the filter plus the fixed output load determines the filter bandwidth. The bandwidth is decreased as resistive networks are switched in parallel with the output load of each crystal filter stage. For example, R68 and C54 are switched across the output of Y3 when the BANDWIDTH switch is placed in the 1 kHz position; CR25 is forward biased by -12.6 volts.

**TEST PROCEDURE 2**

Using the digital voltmeter, check the five control lines. There should be about -12.6 volts on the line selected by the BANDWIDTH switch and about +20 volts on the unselected lines.

If the voltages are incorrect, see Service Sheet 9.

If the voltages are correct, use step **2** and step **1** to find the faulty stage and resistive network.

**3 CRYSTAL FILTER BYPASS CIRCUIT**

Described on Service Sheet 11.

**NOTE**

After repairing any of the circuits on the Crystal Filter Assembly, the assembly should be adjusted in accordance with Paragraph 5-34 of Section V.

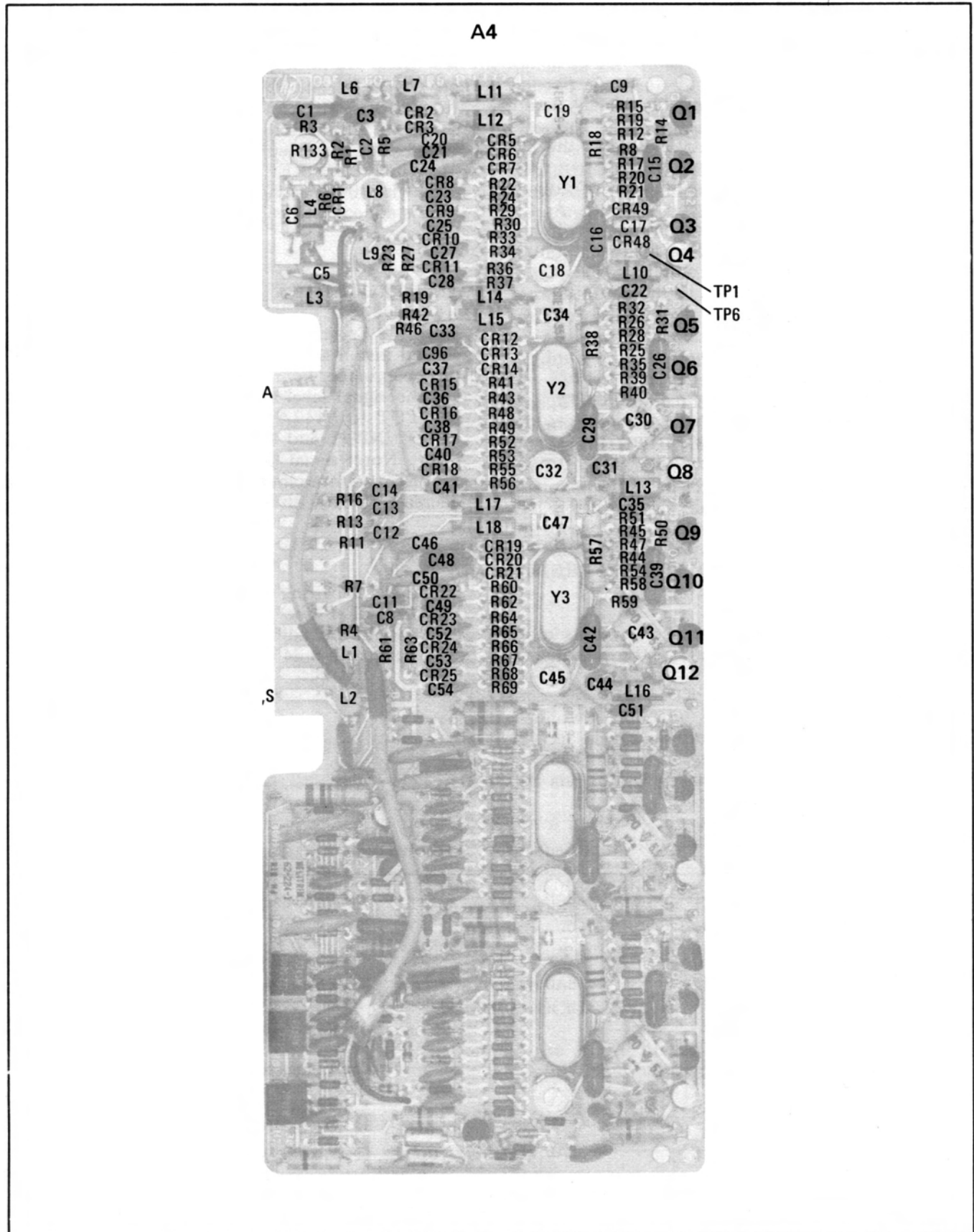
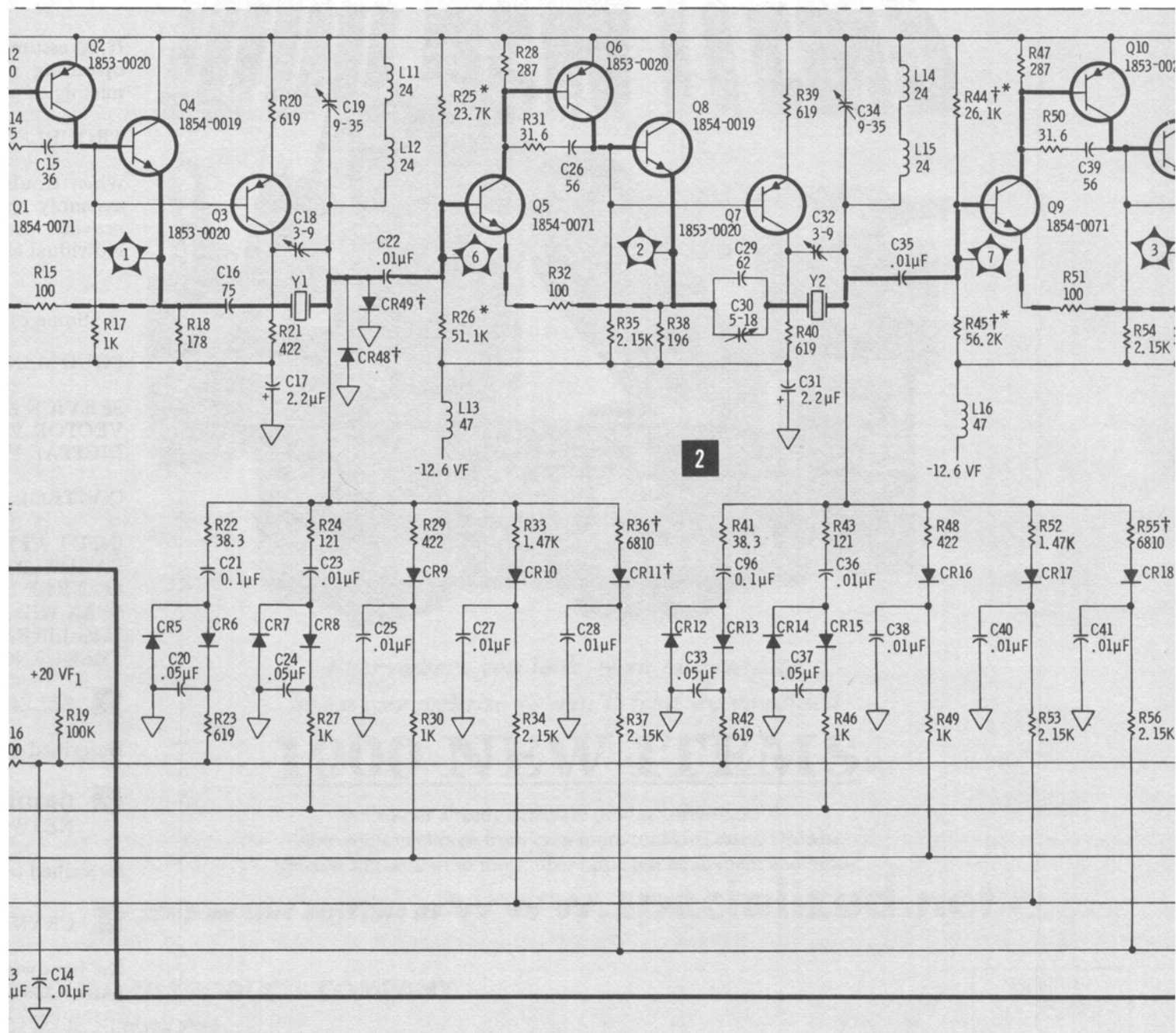
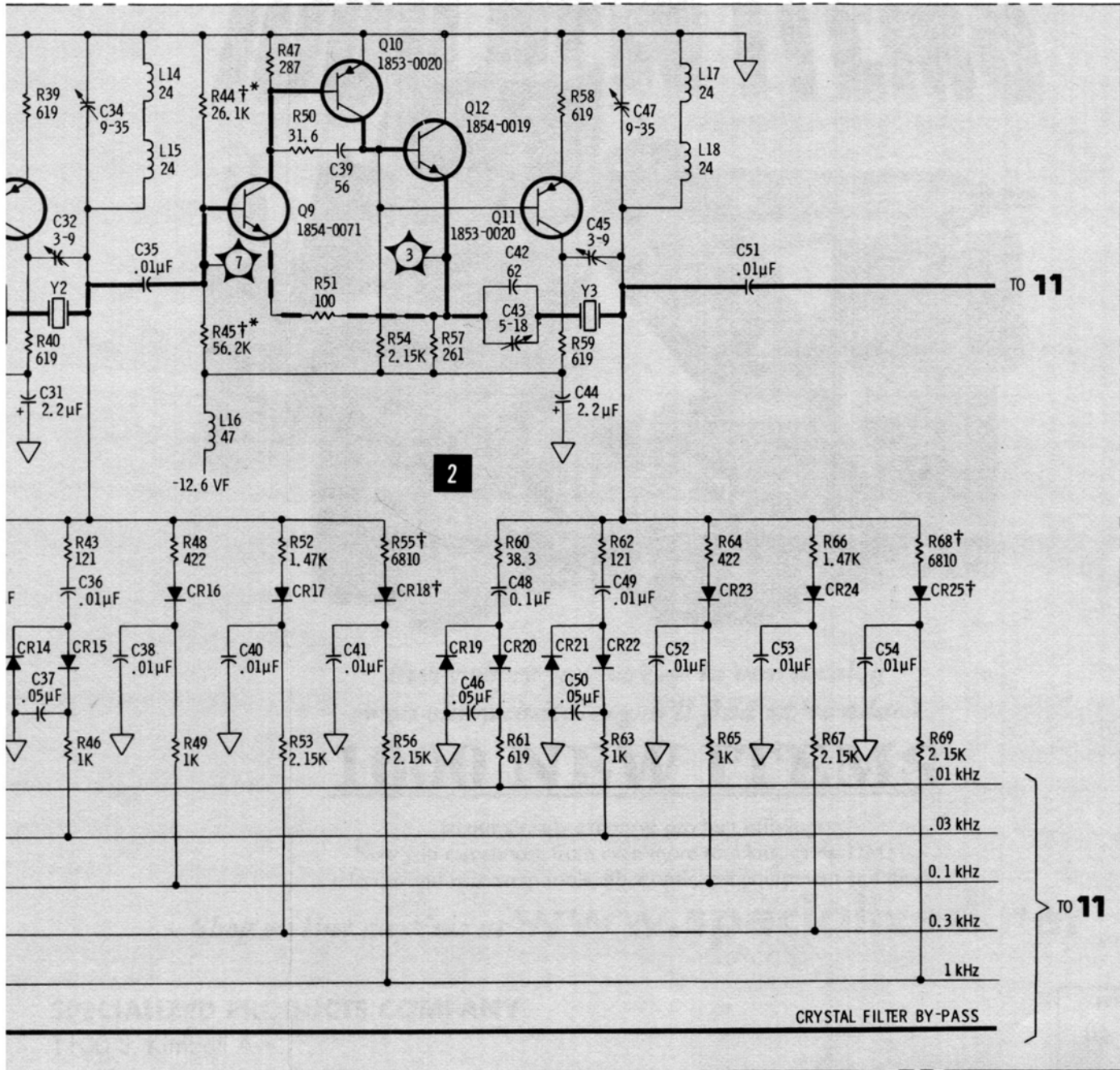


Figure 8-31. P/O Crystal Filter A4 Component Identification

SERIAL PREFIX: 1217A





## REFERENCE DESIGNATIONS

| A4                                                                                              | CHASSIS        |
|-------------------------------------------------------------------------------------------------|----------------|
| C1-6,8,9<br>11-54,96<br>CR1-3,5-25,<br>48,49<br>L1-4, 6-18<br>Q1-12<br>R1-9, 11-69, 133<br>Y1-3 | W12<br>P/O XA4 |

† REFER TO TABLE 7-2

10

Figure 8-32. Crystal Filter (1 of 2)

SERVICE SHEET 11

It is assumed that the 3 MHz IF signal from the LC Filter and the dc operating voltages are present and correct and that the 3 MHz output is missing or out of tolerance.

TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the 3 MHz Crystal Filter assembly, the assembly should be removed and re-installed using the extender board to provide access to components. Test procedures follow descriptions of individual circuits.

NOTE

Some of the Crystal Filter circuits are shown on Service Sheet 10.

EQUIPMENT REQUIRED

|                   |                |
|-------------------|----------------|
| SERVICE KIT       | HP 11592A      |
| VECTOR VOLTMETER  | HP 8405A       |
| DIGITAL VOLTMETER | HP 3440A/3443A |

CONTROL SETTINGS

|                   |           |
|-------------------|-----------|
| INPUT ATTENUATION | 0 dB      |
| BANDWIDTH         | 3 kHz     |
| LOG REF LEVEL     | 0 dBm     |
| SCAN WIDTH        | ZERO      |
| LOG-LINEAR        | 10 dB LOG |
| FREQUENCY         | 30 MHz    |

1 SELECTABLE BANDWIDTH CRYSTAL FILTER STAGES

Described on Service Sheet 10.

2 DIODE SWITCHING AND BANDWIDTH CONTROL NETWORKS

Described on Service Sheet 10.

3 CRYSTAL FILTER BYPASS CIRCUIT

On bandwidths wider than 3 kHz all five crystal filters are bypassed. The path is through R133, R2 and CR1 (on Service Sheet 10) and CR26 to the base of Q21. R133 matches the bypass line's signal amplitude to the filter's signal amplitude. CR2 (on Service Sheet 10) and CR38 isolate the filters during bypass.

TEST PROCEDURE 3

Connect CAL OUTPUT to RF INPUT and set BANDWIDTH to 3 kHz. Measure the signal at TP A (Q21-6) with the HP 8405A; signal level should be about 200 mV rms.

If the signal was correct, go to step 4

If the signal was incorrect, check the bypass circuit.



**SERVICE SHEET 11 (cont'd)****4 OUTPUT AMPLIFIER GAIN AND COMPENSATION CIRCUIT**

The output amplifier compensates for any bandwidth-gain differences in the filter stages for bandwidths 0.3 kHz and below. Q23 isolates the last filter stage from the compensation amplifier, Q21, 22 and 24. The compensation amplifier is feedback controlled and has a basic gain of four. As the narrow bandwidth control networks are switched into the filters, a corresponding feedback control network is switched into the amplifier. The legs of the networks are adjustable and the amplitudes of the narrower bandwidths (0.3, 0.1, .03 and .01 kHz) are referenced to the 3 kHz amplitude.

**TEST PROCEDURE 4**

With CAL OUTPUT connected to RF INPUT, connect the HP 8405A to TP B (XA4-14) and tune the analyzer for maximum with BANDWIDTH set to 3 kHz. Meter should read about 900 mV rms. Check the 0.3, 0.1, .03, and .01 kHz bandwidths; meter should read the same (peak signal with FINE TUNE at each bandwidth).

**5 IF ATTENUATOR (P/O) LOG REFERENCE LEVEL ASSEMBLY A10**

The portion of the Log Reference Level assembly shown on Service Sheet 11 is the IF Attenuator.

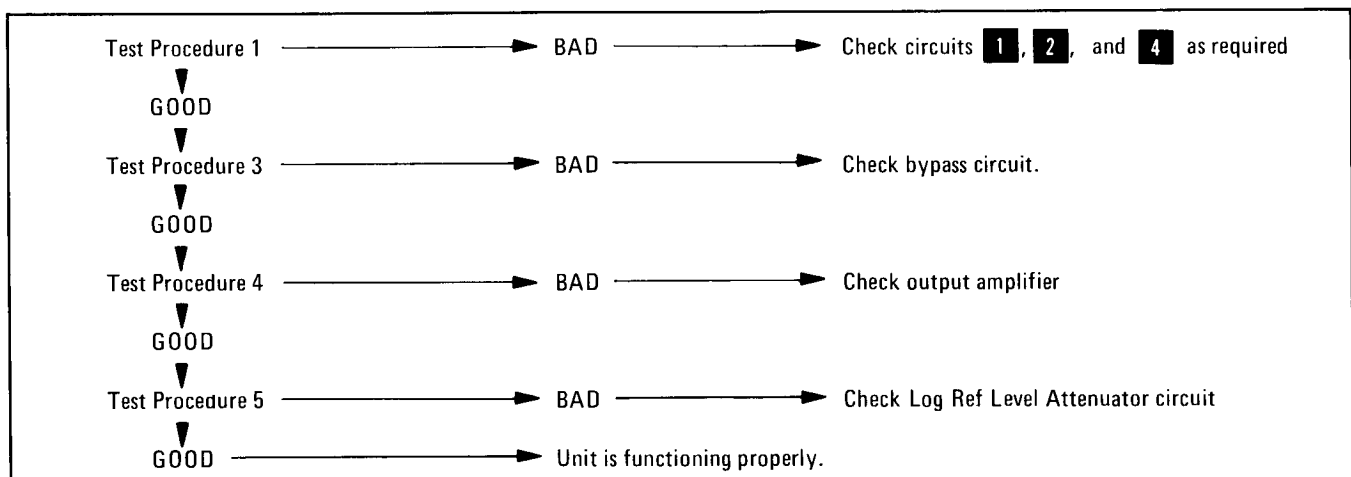
8552B IF signal gain, from the 50 MHz input to the Log Amplifier, is unity when LOG REF LEVEL is set to -10 dBm (read at left index light). When LOG REF LEVEL is rotated clockwise (-20 dBm, -30 dBm, etc.) 10 dB of IF amplification is added with each step (see Service Sheets 6 through 9). When LOG REF LEVEL is rotated counterclockwise (0 dBm, 10 dBm, etc.) 10 dB of attenuation is added with each step by the IF Attenuator.

**TEST PROCEDURE 5**

Place the Crystal Filter assembly back in the chassis and install the Lin/Log Amplifier Assembly A8 on the extender board. Use the HP 8405A to monitor the signal level at TP C (XA8-2). Attach CAL OUTPUT to 8447A INPUT and 8447A OUTPUT to RF INPUT and set LOG REF LEVEL to -10 dBm. Note signal level and rotate LOG REF LEVEL counterclockwise. Signal level should decrease 10 dB with each step.

**NOTE**

After repairing any of the circuits on the Crystal Filter Assembly, the assembly should be adjusted in accordance with paragraph 5-34 of Section V.

*Simplified Test Procedure Tree*



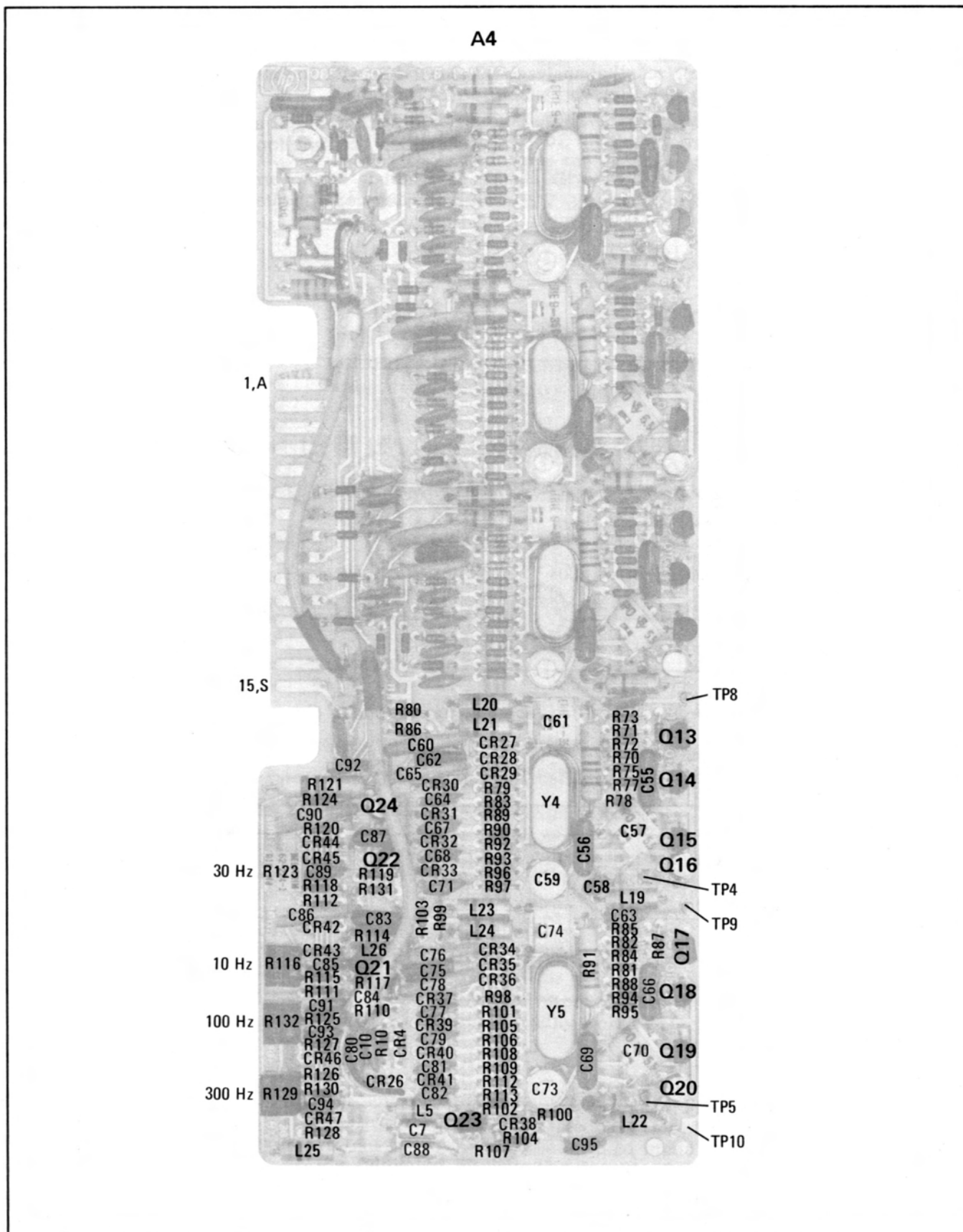
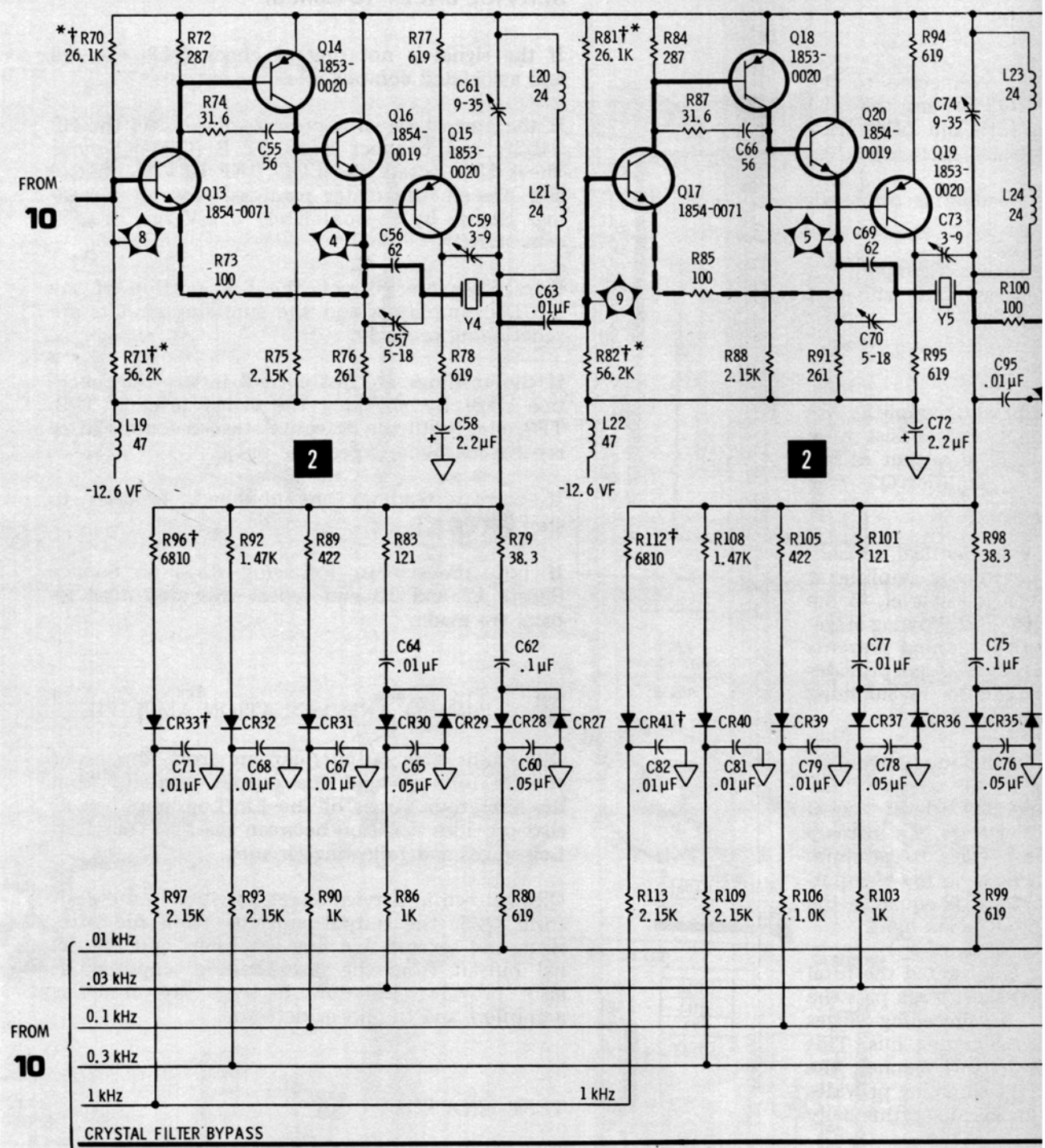
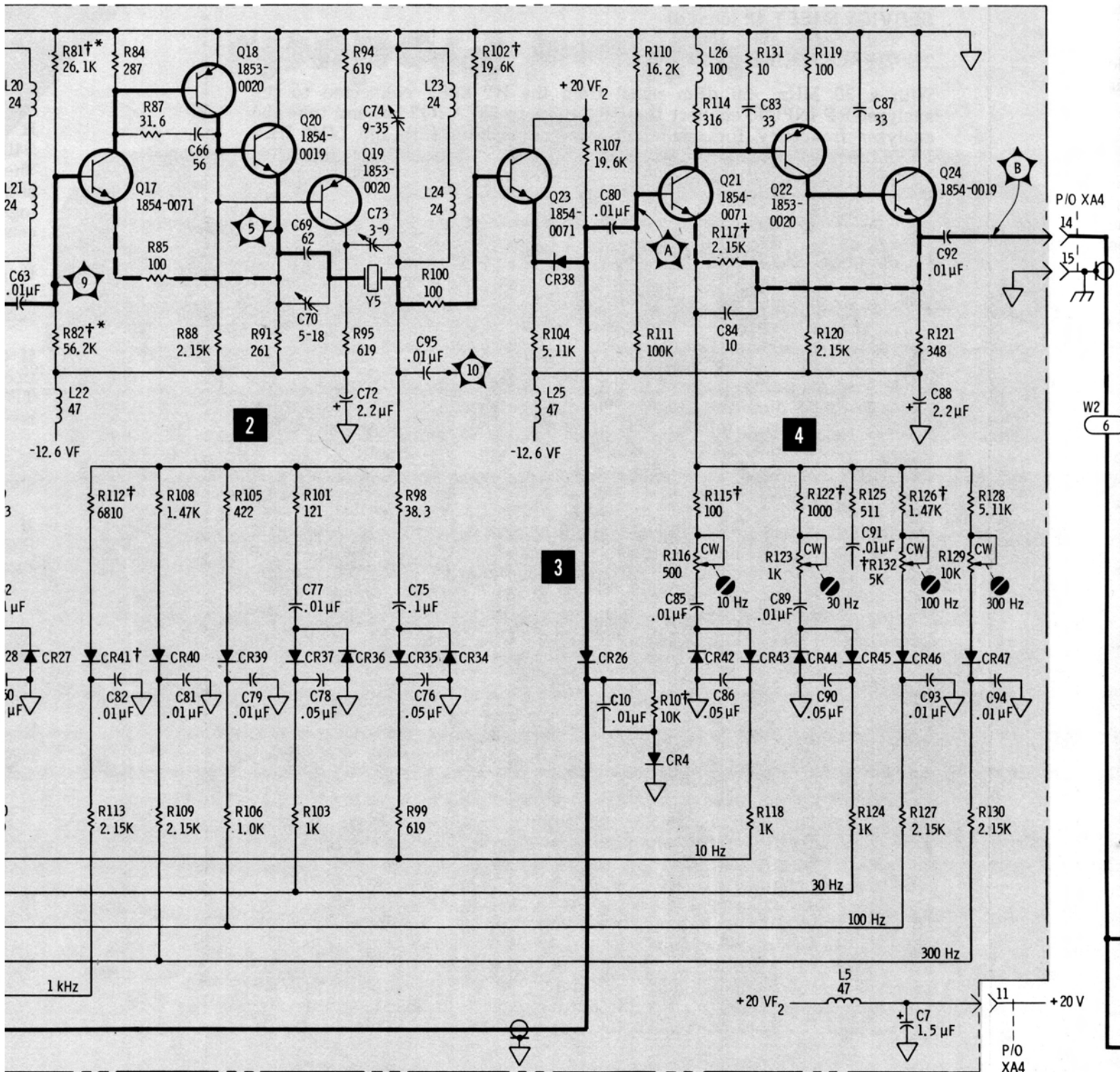


Figure 8-33. P/O Crystal Filter A4 Component Identification

P/O CRYSTAL FILTER ASSY A4 (08552-60111)





## SERVICE SHEET 12

It is assumed that the 3 MHz signal from the crystal filter and dc operating voltages are present and correct, and that the output signal is not present or is out of tolerance.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the Log/Lin Amplifier assembly, A8, it should be removed from the chassis and re-installed on the extender board to provide access to components. After repairing the assembly the procedures specified in paragraphs 5-30 and 5-31 of Section V should be performed.

### NOTE

Since parts of the circuit appear on Service Sheet 13, Service Sheets 12 and 13 should be used jointly in troubleshooting the assembly.

### EQUIPMENT REQUIRED

|                            |           |
|----------------------------|-----------|
| SERVICE KIT . . . . .      | HP 11592A |
| VECTOR VOLTMETER . . . . . | HP 8405A  |
| SIGNAL GENERATOR . . . . . | HP 608F   |

### CONTROL SETTINGS

Unless otherwise specified in individual tests.

|                             |           |
|-----------------------------|-----------|
| SCAN WIDTH . . . . .        | ZERO      |
| INPUT ATTENUATION . . . . . | 0 dB      |
| SCAN MODE . . . . .         | INT       |
| FREQUENCY . . . . .         | 30 MHz    |
| BANDWIDTH . . . . .         | 300 kHz   |
| SCAN TRIGGER . . . . .      | AUTO      |
| LOG LINEAR . . . . .        | 10 dB LOG |

### **1** LIN/LOG AMPLIFIER AND CONTROL CIRCUITS (General)

This general discussion covers operation of circuits shown schematically on Service Sheets 12 and 13. The assembly is designed to provide one of two different types of video outputs. Most of the circuit elements are common to both modes of operation.

When the analyzer is operated in the LINEAR mode the Lin/Log amplifier provides a video output which varies in amplitude in direct proportion to the amplitude of the input rf voltage. The CRT display is calibrated in terms of volts (mV or  $\mu$ V).

When the analyzer is operated in the LOG mode the output video signal has a logarithmic relationship to the input rf signal. The CRT display is calibrated in terms of power (dBm).

### **2** EMITTER FOLLOWER INPUT STAGE Q24

Emitter follower Q24 provides a high impedance input which prevents loading the output of the crystal filter assembly and also provides isolation between the input and the first Lin/Log amplifier.

## SERVICE SHEET 12 (cont'd)

### TEST PROCEDURE 2

With a 30 MHz, -60 dBm signal from the HP 608F connected to the analyzer RF INPUT, connect the HP 8405A to TP A (Q24-e) and tune the analyzer frequency for maximum meter deflection with the LOG REF LEVEL control set to -60 dBm.

Typical meter reading is 608 mV rms. If correct reading is obtained, proceed to step 3.

If correct reading is not obtained, check Q24 and associated components. If Q24 and associated components check good and signal is still not present, check Q25 (see step 3).

### 3 LIN/LOG AMPLIFIERS IN LOG MODE

When the analyzer is operated in the LOG mode the Lin/Log amplifier has eight cascaded amplifier stages. The first seven amplifiers consist of a differential amplifier followed by an emitter follower. The output of the eighth differential amplifier is applied to the summing amplifier Q26 (see step 4 on Service Sheet 13).

Operation of the first seven cascaded amplifier stages is identical, so only the first stage will be described. The output of the differential amplifier is split and applied to the emitter follower and, at a much lower level, to the base of the output half of the differential amplifier in the following stage. A 100 ohm resistor (R5) from the low level signal path to ground prevents parasitic oscillation. The emitter follower output of each stage provides the input signal to the following stage and signal currents to the summing bus.

The logarithmic relationship of the output signal to the input signal is provided by controlled limiting and saturation (in 10 dB steps) of the eight amplifiers in reverse order. A relatively low level signal (approximately -70 dBm) will saturate the last amplifier stage. An increase of 10 dB in the input signal will cause the seventh stage to saturate. Preceding amplifier stages saturate at each 10 dB increase in the rf input. Finally the first amplifier saturates when the input signal is equal to the LOG REF LEVEL control setting as referenced to the lit index light.

The gain of each stage is 9 dB. When the last stage is saturated the total output of the eight stages consists of the output of the last stage plus the summing bus currents from all preceding stages. As preceding stages saturate each supplies a maximum of 3 mA to the summing bus. This corresponds to a 10 dB increase in power input. In this manner, the combination of sequential amplifier limiting and current summing provides amplitude compression to force the output signal to remain logarithmically proportional to the input signal.

The simplified diagram below shows signal paths and major circuit components.

### TEST PROCEDURE 3

Connect the output of the HP 608F to the analyzer RF INPUT and adjust the signal generator for a 30 MHz, -60 dBm signal. Connect the HP 8405A to TP 1, set the analyzer LOG REF LEVEL control to -30 dBm, and tune the analyzer frequency for maximum signal level on the HP 8405A. Typical level is 58 mV rms.

## SERVICE SHEET 12 (cont'd)

If the signal is not present check Q23, Q1, Q2 and associated components.

If the correct signal is present, disconnect the HP 8405A and connect it to TP B (Q26-c Service Sheet 13). Rotate the LOG REF LEVEL control and observe the meter readings. Note that readings change by approximately 6 mV rms at adjacent steps.

If readings are correct, the Log portion of the Lin/Log amplifiers and the summing circuits are functioning properly.

If the readings are not correct isolate the defective stage by checking the signal level at TP2, TP3, etc., until the defective stage is found. After repairs are made, repeat the test.

If correct readings are obtained, proceed to step **4**.

If not, proceed to following steps on Service Sheets 12 and 13 and repeat this step after repairs are made.

### **4** SUMMING AND ISOLATION AMPLIFIERS

Q25 sums the output current from the input emitter follower and the output currents from the first four stages of the Lin/Log amplifier. It also provides isolation between the first four Lin/Log stages and following circuits.

Q26 (shown in Service Sheet 13) sums the output from Q25, the output currents from the fifth, sixth and seventh Lin/Log amplifiers and the signal output from the last Lin/Log amplifier. It also provides isolation between the Lin/Log amplifiers and the linear detector.

### TEST PROCEDURE **4**

Connect the output of the HP 608F to the analyzer RF INPUT and adjust the signal generator for

**SERVICE SHEET 12 (cont'd)**

a 30 MHz, -60 dBm signal output. Connect the HP 8405A to TP C (Q25-e), set the analyzer LOG REF LEVEL control to -60 dBm, and tune the analyzer for maximum signal level on the HP 8405A. Typical level is 9 mV rms.

Check the signal level at TP D (Q25-c) with the HP 8405A. Typical level is 33 mV rms.

Check the signal level at TP B (Q26-c Service Sheet 13) with the HP 8405A. Typical level is 50 mV rms.

If correct readings are obtained the summing amplifiers are functioning properly.

If readings are incorrect, check Q25, Q26 and associated components.

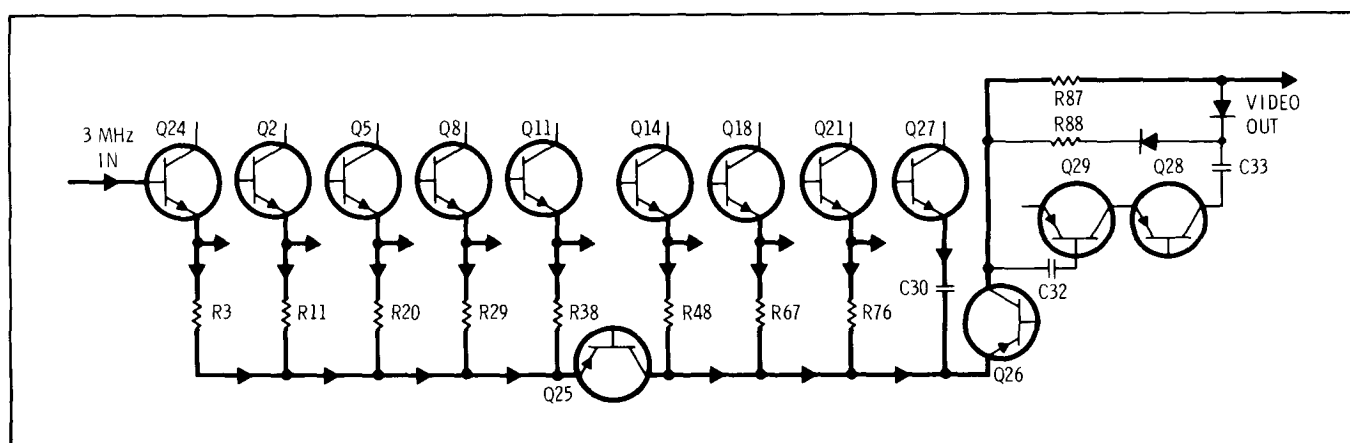
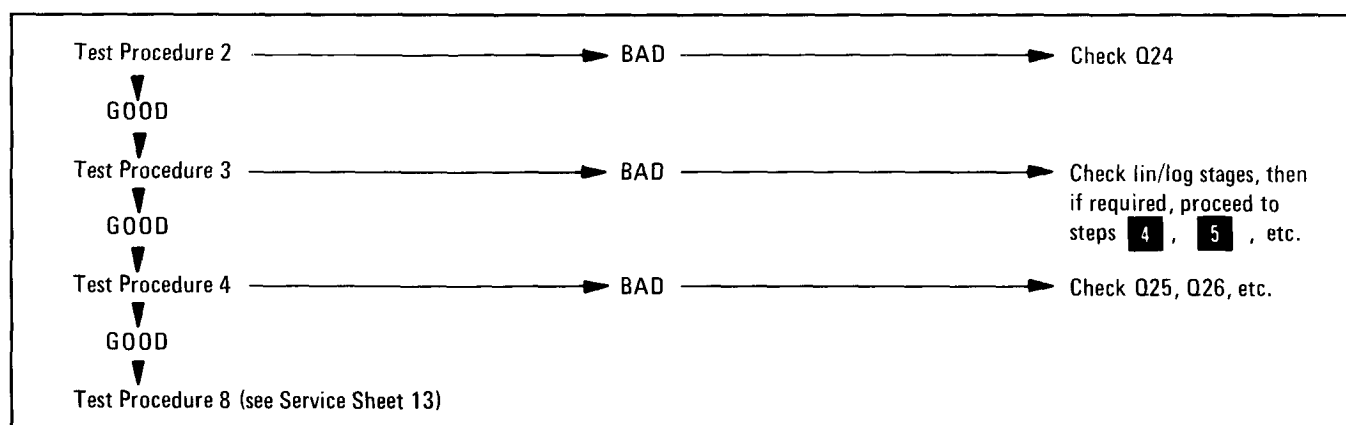


Figure 8-35. Simplified Diagram — Log Mode of Operation

*Simplified Test Procedure Tree*



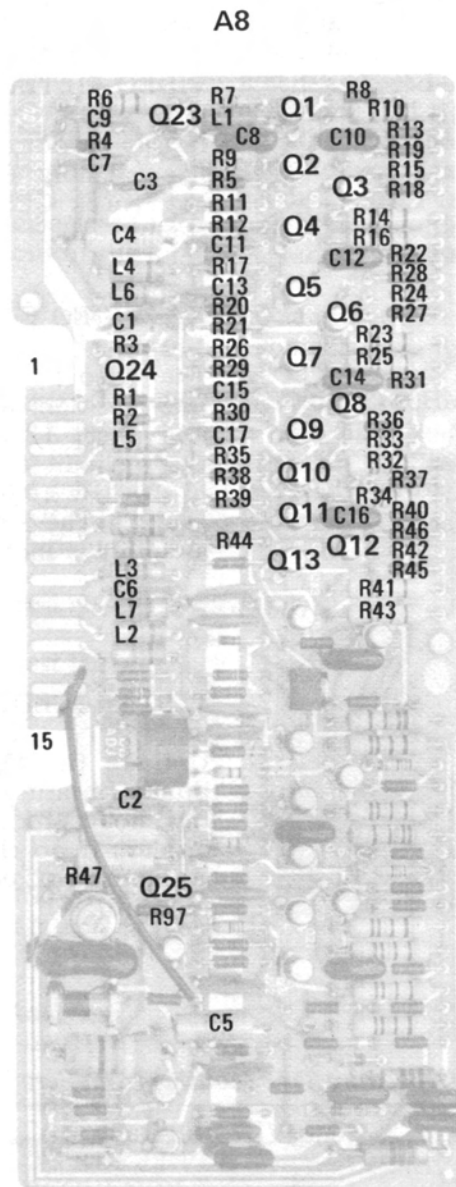
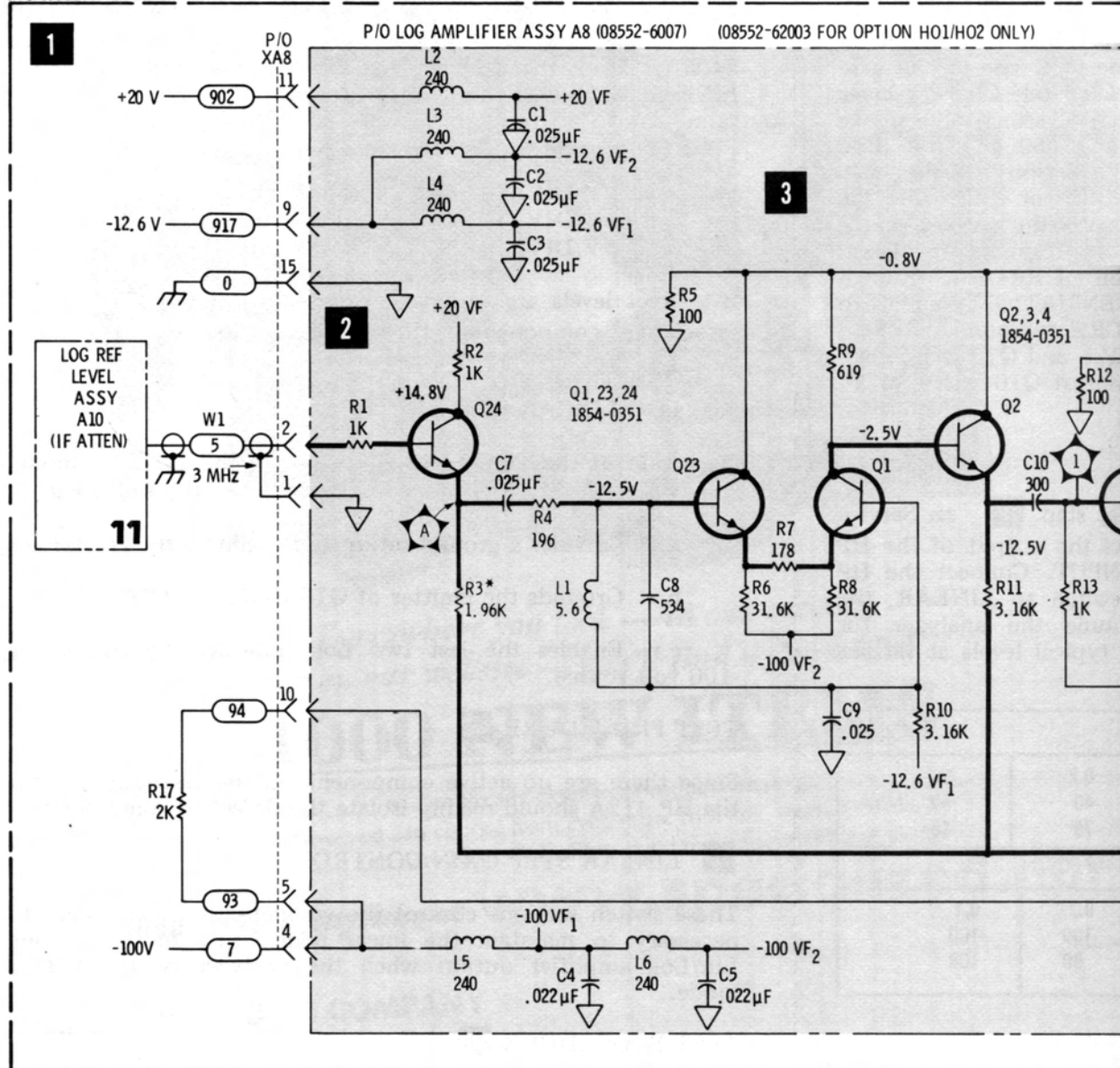
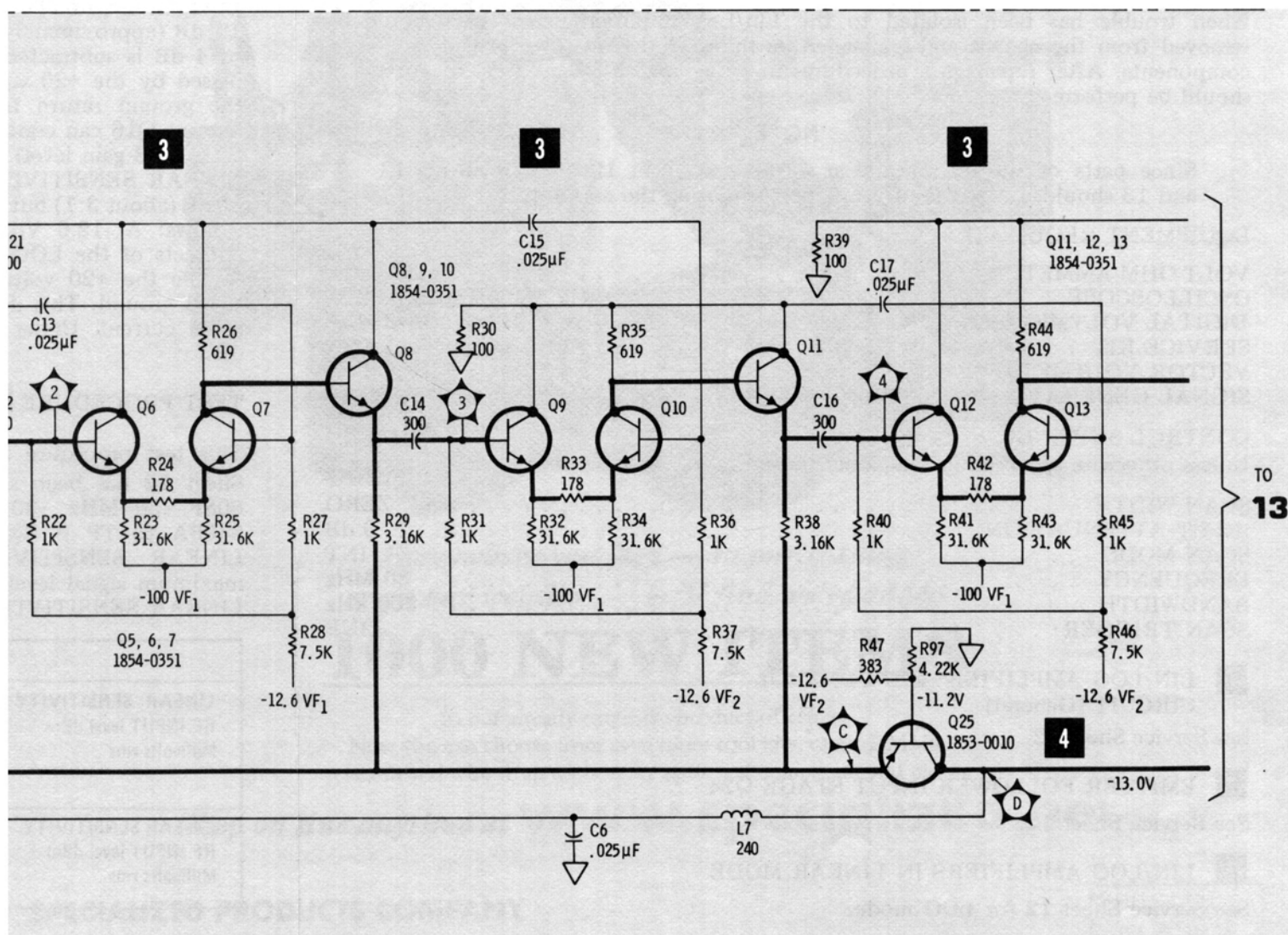


Figure 8-36. P/O Log/Linear Amplifier A8 Component Identification









## REFERENCE DESIGNATIONS

| A8           | CHASSIS |
|--------------|---------|
| C1-17        | R17     |
| L1-7         | W1      |
| R1-47, 97    | XA8     |
| Q1-13, 23-25 |         |

REFERENCE DESIGNATIONS WITHIN OUTLINED (---) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

# 12

Figure 8-37. Log/Linear Amplifier (1 of 2)

## SERVICE SHEET 13

It is assumed that the 3 MHz signal from the crystal filter and dc operating voltages are present and correct, and that the output signal is not present or is out of tolerance.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the Lin/Log amplifier assembly it should be removed from the chassis and reinstalled on the extender board to provide access to components. After repairs the procedures in paragraphs 5-30 and 5-31 of Section V should be performed.

### NOTE

Since parts of the circuit appear on Service Sheet 12, Service Sheets 12 and 13 should be used jointly in troubleshooting the assembly.

### EQUIPMENT REQUIRED

|                   |                     |
|-------------------|---------------------|
| VOLT-OHM-AMMETER  | HP 412A             |
| OSCILLOSCOPE      | HP 180A/1801A/1821A |
| DIGITAL VOLTMETER | HP 3440A/3443A      |
| SERVICE KIT       | HP 11592A           |
| VECTOR VOLTMETER  | HP 8405A            |
| SIGNAL GENERATOR  | HP 608F             |

### CONTROL SETTINGS

Unless otherwise specified in individual tests.

|                   |         |
|-------------------|---------|
| SCAN WIDTH        | ZERO    |
| INPUT ATTENUATION | 0 dB    |
| SCAN MODE         | INT     |
| FREQUENCY         | 30 MHz  |
| BANDWIDTH         | 300 kHz |
| SCAN TRIGGER      | LINE    |

#### **1** LIN/LOG AMPLIFIER AND CONTROL CIRCUIT (General)

See Service Sheet 12.

#### **2** EMITTER FOLLOWER INPUT STAGE Q24

See Service Sheet 12.

#### **3** LIN/LOG AMPLIFIERS IN LINEAR MODE

See Service Sheet 12 for LOG mode.

When the LOG/LINEAR switch is placed in the LINEAR position it accomplishes the following:

- Supplies -12.6 Vdc to illuminate the LINEAR lamp, DS7.
- Disables the last two log amplifiers by removing their -100 volt source.
- Provides an added current source to Q15/Q17 to prevent the stage from saturating.
- Enables Q16, the linear scale factor amplifier.

Operation of the Lin/Log amplifiers for those stages ahead of Q15 is identical for LINEAR and LOG modes of operation. The output of current amplifier Q16 is 180 degrees out of phase with the signals in the summing bus and of sufficient amplitude to cancel them. In the LINEAR mode only the Q16 output drives the summing and isolation stage Q26.

## SERVICE SHEET 13 (cont'd)

Since the analyzer IF amplifier and attenuator are calibrated in 10 dB increments, compensation must be provided to maintain a linear relationship between the input RF signal and the output from the Lin/Log amplifier. The attenuator selector for the linear mode is calibrated in 1/2/10/20 steps so a fixed amount of compensation cannot be used for all steps. When the LINEAR SENSITIVITY control is stepped from 1 to 2, the current gain is 10 dB (approximately 3:1), but only 6 dB (2:1) is required. The surplus gain of 4 dB is subtracted from the gain of Q16 as follows: Diode CR2 is reverse biased by the +20 volts applied through R64 and R65 to effectively remove the ground return from R63. R63 no longer shunts R50 and the total current Q16 can control is decreased 4 dB for a total variation of 8 dB (from the 14 dB gain level). The current gain of Q16 is thus 2:1, or 6 dB. When the LINEAR SENSITIVITY control is stepped from 2 to 10 the current gain is 10 dB (about 3:1) but 14 dB is required. The additional 4 dB gain is provided as follows: A -12.6 Vdc level is applied to the junction of R64/R65 through contacts of the LOG REF LEVEL and INPUT ATTENUATION controls to disable the +20 volts from R65 and forward bias CR2 to connect R63 to signal ground. This decreases the collector load of Q16 and Q16 can deliver more current. Under these conditions the current gain of Q16 is 5:1 or 14 dB.

### TEST PROCEDURE 3

This test procedure is based on the assumption that step 3 on Service Sheet 12 has been satisfactorily conducted. Connect the output of the HP 608F (30 MHz, -30 dBm) to the analyzer RF INPUT. Connect the HP 8405A to TP B (Q26-c), set the LOG·LINEAR switch to LINEAR, the LINEAR SENSITIVITY control fully cw, and tune the analyzer for maximum signal level on the HP 8405A. Below are typical levels at various LINEAR SENSITIVITY and RF INPUT levels.

| Millivolts /Div    |     |     |     |     |      |      |
|--------------------|-----|-----|-----|-----|------|------|
| LINEAR SENSITIVITY | 2   | 1   | 0.2 | 0.1 |      |      |
| RF INPUT level dBm | -30 | -30 | -40 | -50 |      |      |
| Millivolts rms     | 24  | 47  | 78  | 45  |      |      |
| Microvolts/Div     |     |     |     |     |      |      |
| LINEAR SENSITIVITY | 20  | 10  | 2   | 1   | 0.2  | 0.1  |
| RF INPUT level dBm | -70 | -70 | -80 | -90 | -100 | -100 |
| Millivolts rms     | 23  | 45  | 70  | 50  | 90   | 108  |

If correct signal levels are observed, proceed to step 8. If not, check Q15/Q17/Q18 and associated components and proceed to steps 5, 6 and 7, if required. After repairs repeat this test.

4 See Service Sheet 12 for information about Q26.

### 5 LINEAR SCALE FACTOR AMPLIFIER Q16

Operation of Q16 is described as part of step 3

## SERVICE SHEET 13 (cont'd)

### TEST PROCEDURE 5

Connect the output of the HP 608F to the analyzer RF INPUT and adjust the signal generator for a 30 MHz, -80 dBm signal output. Connect the HP 8405A to TP E (Q16-b), set the analyzer LINEAR SENSITIVITY control to 20  $\mu$ V/DIV, and tune the analyzer for maximum signal level on the HP 8405A. Check the 3 MHz signal level at base and emitter of Q16 with the LINEAR SENSITIVITY control set to 20, 10 and 2  $\mu$ V/DIV for the typical values shown below.

| LINEAR SENSITIVITY | Q16 Base  | Q16 Emitter |
|--------------------|-----------|-------------|
| 20 $\mu$ V/DIV     | 6 mV rms  | 4 mV rms    |
| 10 $\mu$ V/DIV     | 38 mV rms | 24 mV rms   |
| 2 $\mu$ V/DIV      | 70 mV rms | 40 mV rms   |

If correct levels are observed, proceed to step 6. If not, check Q16 and associated components, then proceed to step 6 and if required, step 7.

### 6 LOG-LINEAR SWITCH

Operation of the LOG-LINEAR switch in the LINEAR mode is discussed in step 3. In the LOG mode the switch does the following:

- Provides a ground return to illuminate the (LOG) lamp DS8.
- Grounds the emitter of Q16 to disable Q16.
- Enables the last two Log amplifiers by connecting them to the -100 volt source.

### TEST PROCEDURE 6

Since there are no active components in the assembly, continuity tests with the HP 412A should readily isolate the defective components.

### 7 LINEAR STEP GAIN CONTROL

These switch sections control the compensation gain steps of Q16 which are necessary to maintain the linear relationship between input rf signal and Lin/Log amplifier output when the analyzer is operated in the LINEAR mode.

### TEST PROCEDURE 7

Since there are no active components in the assembly, continuity tests with the HP 412A should readily isolate defective components.

### 8 LINEAR DETECTOR

The linear detector includes a high gain amplifier with a high level of negative feedback. The feedback loop ensures that the detected output current is linear in relationship to input current to enhance the accuracy of the calibrated display. The output of Q28 is applied to CR3 and CR4 180

## SERVICE SHEET 13 (cont'd)

degrees out of phase with the signals applied to CR3 and CR4 by the output of Q26. The result is that positive half cycles from the collector of Q26 are cancelled when the inverted signal from Q28 forward biases CR3. When the Q26 output is negative the inverted signal from Q28 reverse biases CR3 and the negative signal from Q26 becomes the video output. Simultaneously CR4 is forward biased and the result is improved linearity of the output signal.

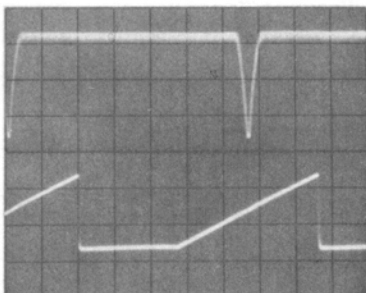
L13/C36 and L14/C37/C38 filter out the rf components of the video output.

## TEST PROCEDURE 8

Connect the HP 608F set for 30 MHz, -30 dBm to the analyzer RF INPUT. Connect the HP 180A/1801A/1821A Channel A input to TP G (XA8-14) and the Channel B input to the SCAN IN/OUT jack on the front of the analyzer and observe the waveform.

## CONTROL SETTINGS:

Oscilloscope:  
Channel A:  
.02 V/Div  
Channel B:  
0.5 V/Div  
TIME/DIV:  
5 msec/DIV



## Analyzer:

SCAN WIDTH ..... PER DIVISION  
PER DIVISION ..... 20 kHz  
BANDWIDTH ..... 30 kHz  
LOG REF LEVEL ..... -10 dBm  
LOG-LINEAR ..... 10 dB LOG  
VIDEO FILTER ..... OFF

If the waveforms are correct the Lin/Log amplifier assembly should be functioning properly. If not, check Q28, Q29, CR3, CR4 and associated components.

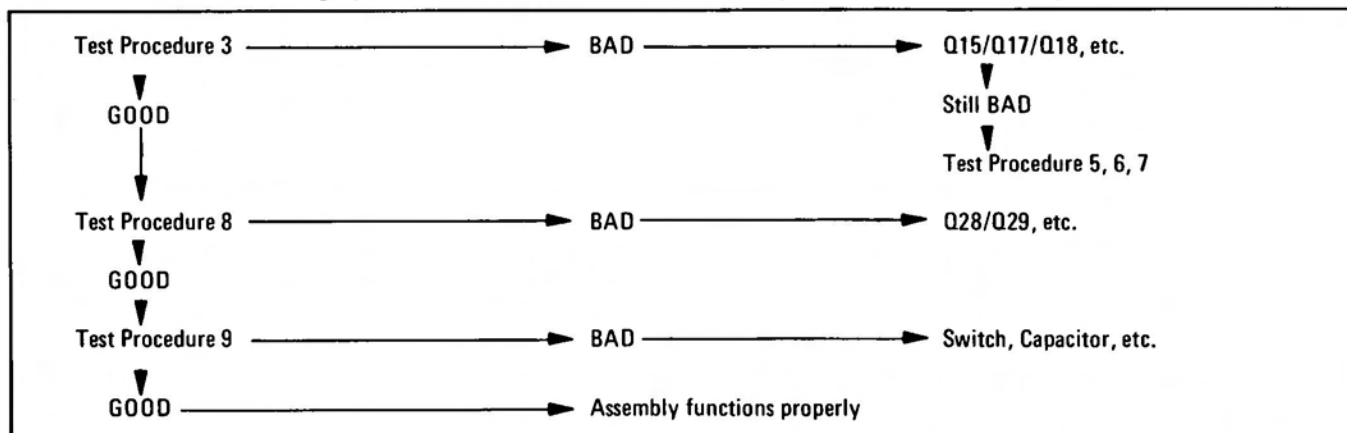
## 9 VIDEO FILTER ASSEMBLY

The video filter switch is a lever type two-pole, four position switch. The section shown on Service Sheet 13 switches bypass capacitors in the video circuit to bypass signal components down to 10 kHz (0.01  $\mu$ f) 100 Hz (1.0  $\mu$ f) or 10 Hz (10  $\mu$ f). The remainder of the video filter switch assembly is shown on Service Sheet 17.

## TEST PROCEDURE 9

Use the HP 412A to make point-to-point continuity measurements. Switching the filters into the circuit produces an obvious change in the CRT display. If no change in display occurs when the switch is used, check for an open circuit or faulty capacitor.

Simplified Test Procedure Tree (cont'd) from Service Sheet 12)



A8

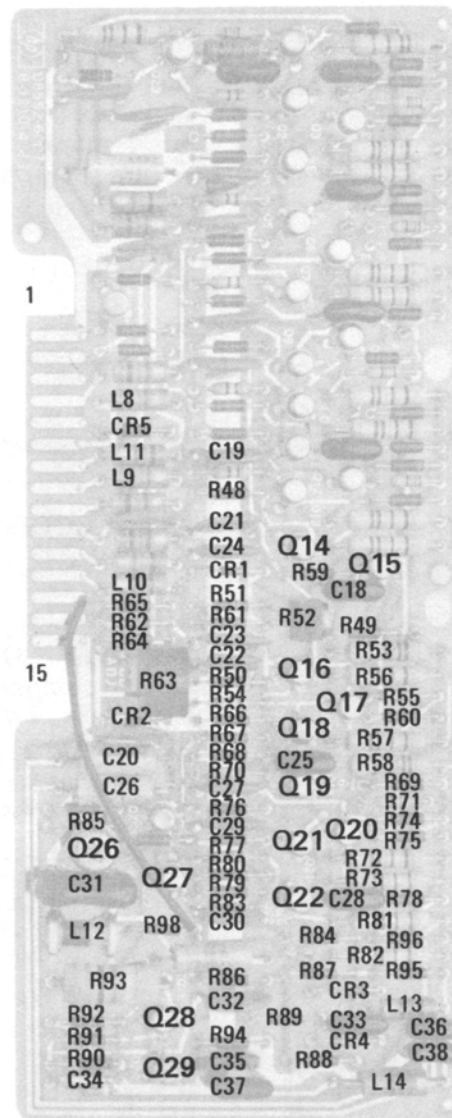


Figure 8-38. P/O Log/Linear Amplifier A8 Component Identification



# REFERENCE DESIGNATIONS

| A8                                                 | A11                               |
|----------------------------------------------------|-----------------------------------|
| C18-38<br>CR1-5<br>L8-14<br>R48-98<br>Q14-22,26-29 | S1-1F<br>C1-3                     |
| A10                                                | CHASSIS                           |
| S1-2R<br>R10                                       | DS7,8<br>R13,14,16<br>S1<br>W5,13 |

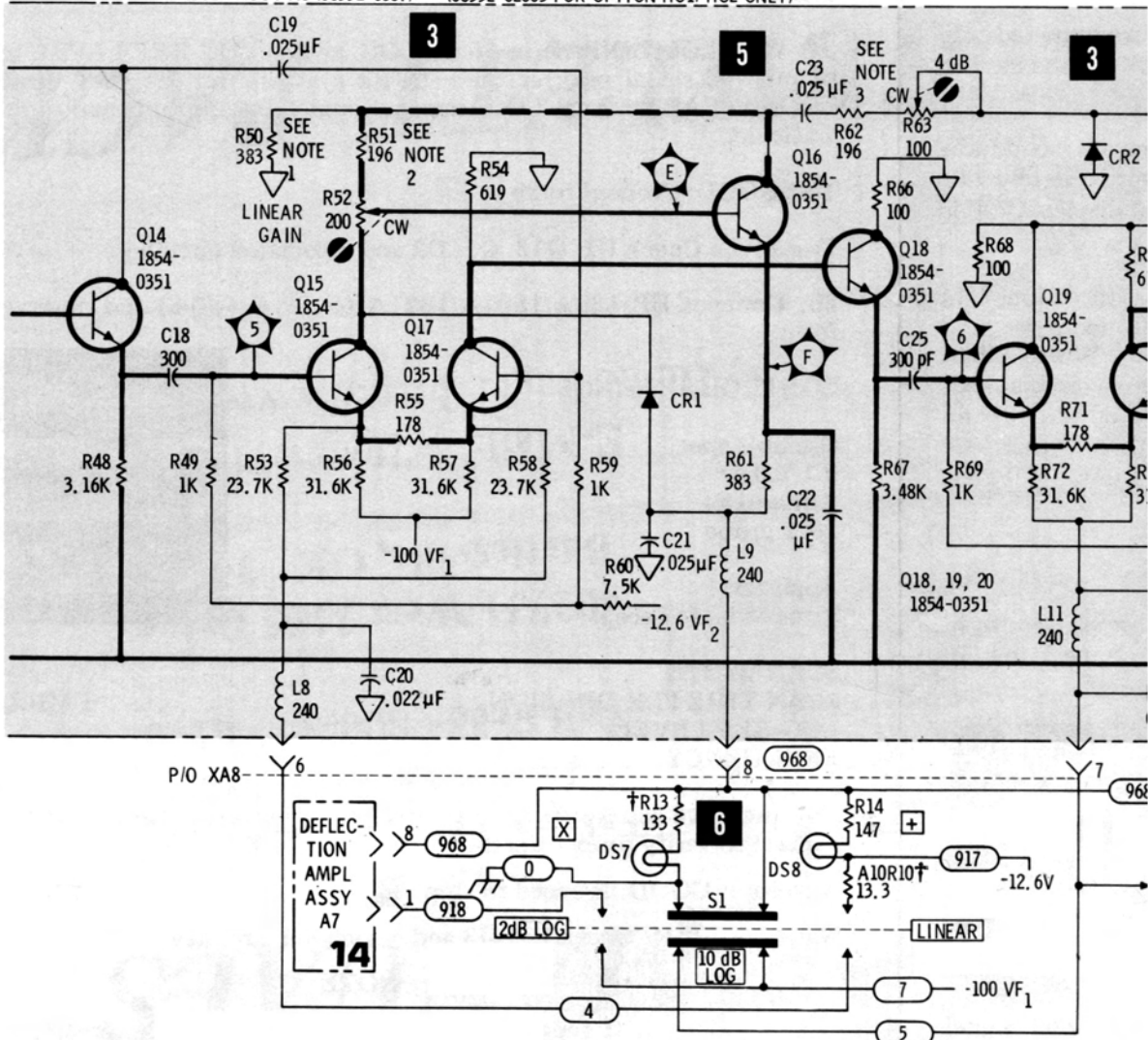
↑REFER TO TABLE 7-2

## NOTES

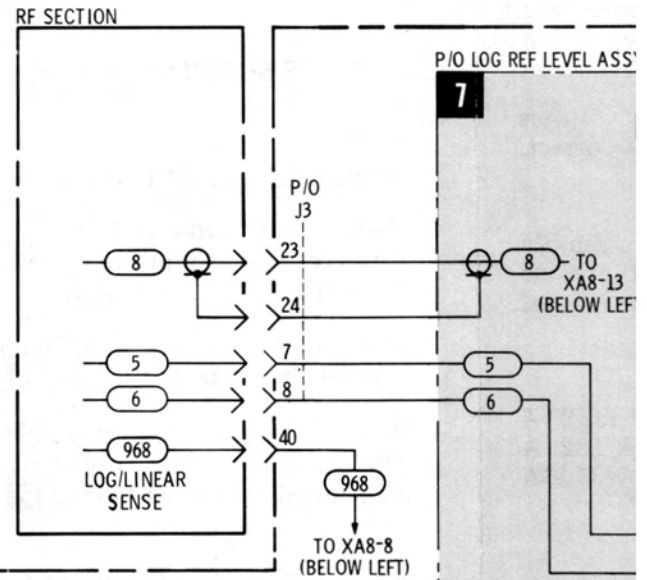
1. R50 IS 261 OHMS FOR OPTIONS HO1/HO2.
2. R51 IS 162 OHMS FOR OPTION HO1/HO2.  
R51 IS 316 OHMS FOR OPTION HO4.
3. R62 IS 133 OM OHMS FOR OPTION HO1/HO2.

P/O 8552B IF SECTION

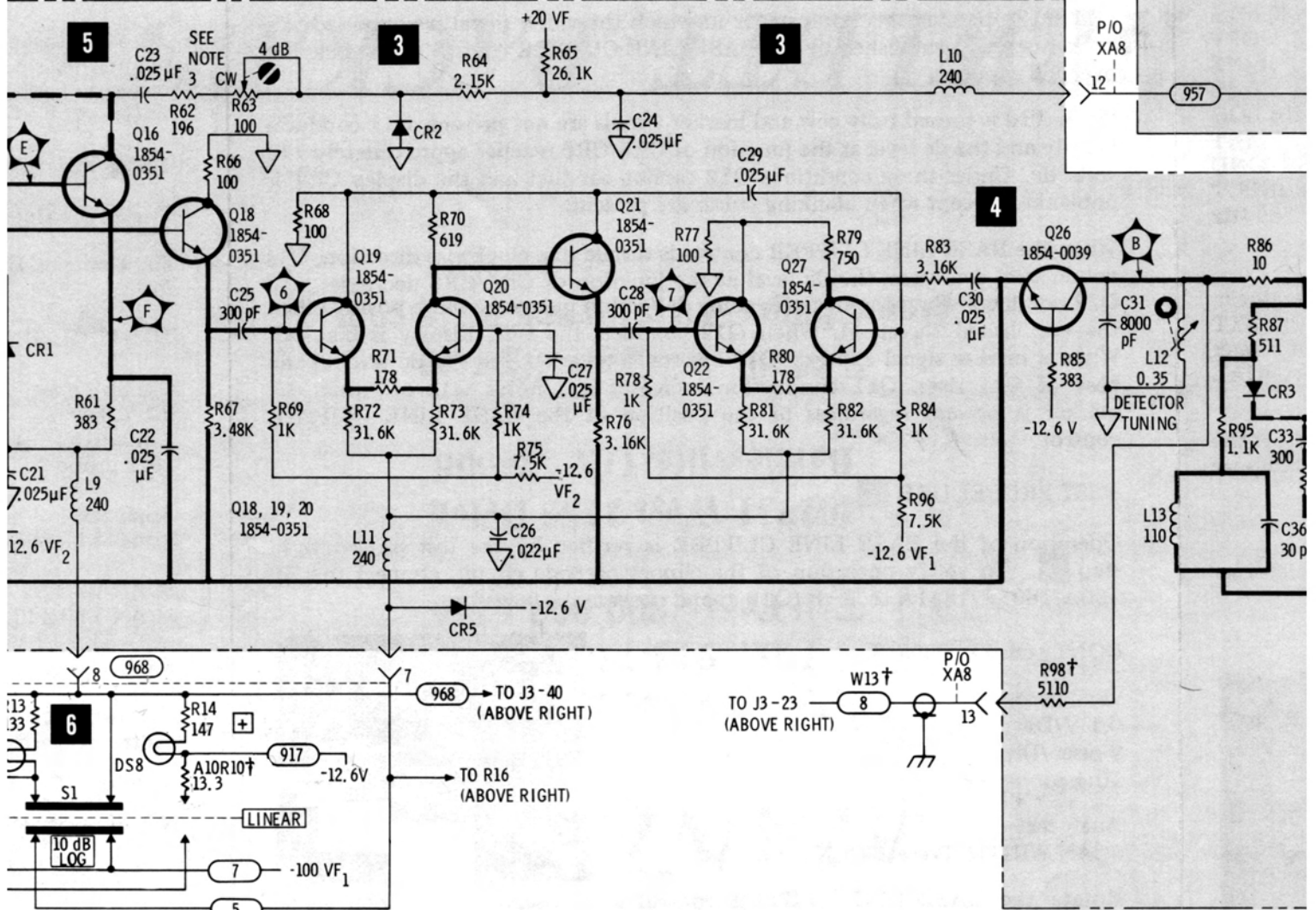
P/O LOG AMPLIFIER ASSY A8 (08552-6007) (08552-62003 FOR OPTION HO1/HO2 ONLY)



261 OHMS FOR OPTIONS HO1/HO2.  
 162 OHMS FOR OPTION HO1/HO2.  
 316 OHMS FOR OPTION HO4.  
 133 OM OHMS FOR OPTION HO1/HO2.



HO1/HO2 ONLY)



REFERENCE DESIGN  
 ASSEMBLIES ARE A  
 CLUDES ASSEMBLY  
 IS A1R1. DESIGN  
 COMPLETE AS SHOWN

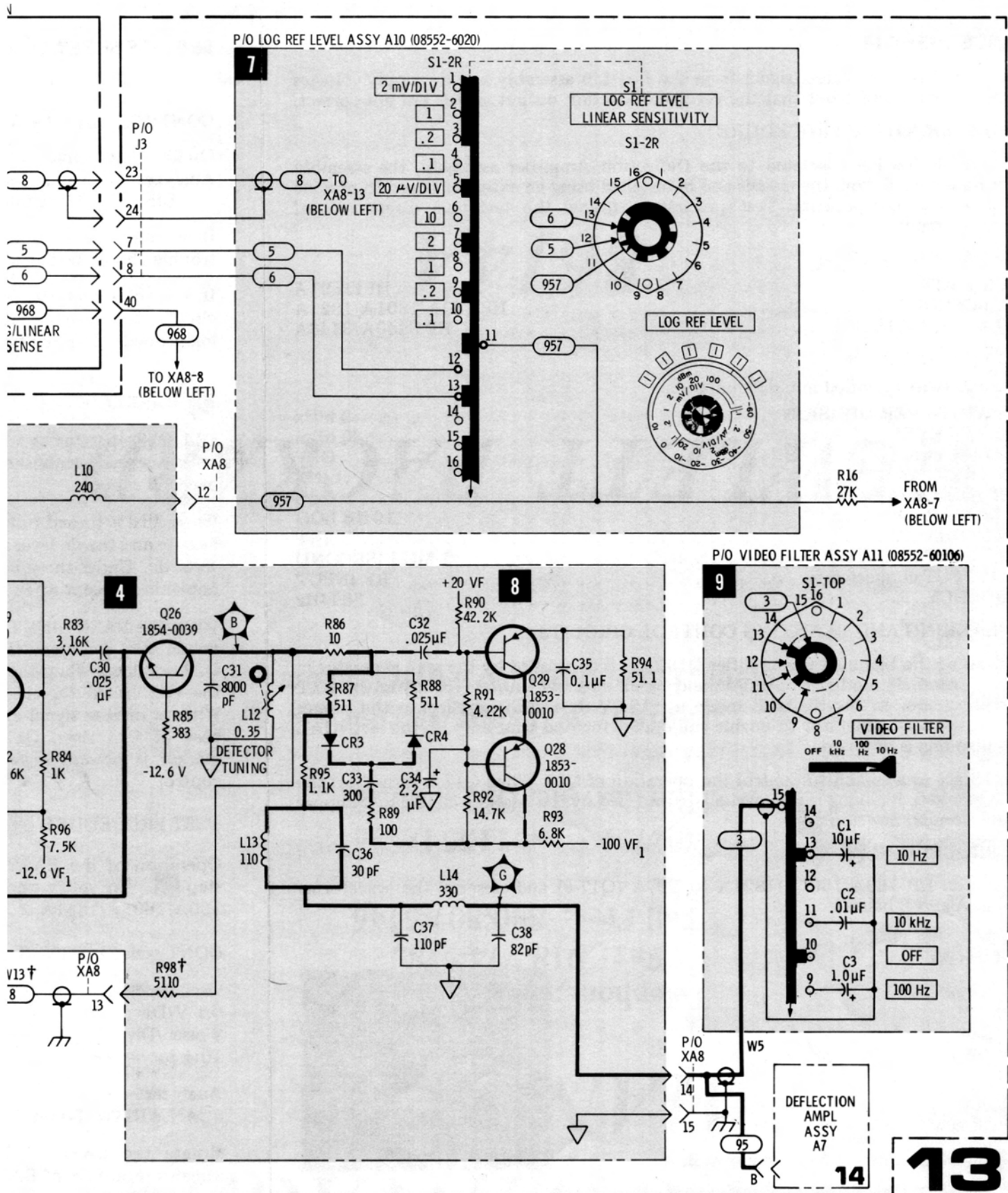


Figure 8-39. Log/Linear Amplifier (2 of 2)

## SERVICE SHEET 14

It is assumed that the video signal from the Log/Lin assembly and dc supply voltages are present and correct but that the vertical deflection output signals are not correct.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the Deflection Amplifier assembly, the assembly should be removed from the chassis and re-installed using an extender board to provide easy access to components. Test procedures follow the technical discussions of individual circuits.

### EQUIPMENT REQUIRED

SERVICE KIT . . . . . HP11591A  
OSCILLOSCOPE . . . . . HP 180A/1801A/1821A  
DIGITAL VOLTMETER . . . . . HP 3440A/3443A

### CONTROL SETTINGS

Unless otherwise specified in individual tests.

SCAN WIDTH PER DIVISION . . . . . 2 MHz  
LOG REF LEVEL . . . . . -30 dBm  
VIDEO FILTER . . . . . OFF  
SCAN TRIGGER . . . . . LINE  
INPUT ATTENUATION . . . . . 0 dB  
LOG-LINEAR . . . . . 10 dB LOG  
SCAN MODE . . . . . INT  
SCAN TIME PER DIVISION . . . . . 1 MILLISECOND  
CAL OUTPUT connected to . . . . . RF INPUT  
FREQUENCY . . . . . 30 MHz

### 1. BLANKING AND BLANKING CONTROL CIRCUITS

Operation of the blanking preamplifier Q19/Q18 is controlled by the scan generator in the INT (internal) mode of operation and by an external source (via J2) in the EXT (external) mode. In the SINGLE mode a -12.6V dc level is applied to the trigger circuit in the scan generator to enable the circuit for one scan only. In the MANUAL mode, blanking is not used.

Q19/Q18 act as a switch to control the operation of Q17. When Q17 is turned off the CRT is blanked. Blanking is also partially controlled by the baseline clipper and clipper override circuits. See step 2

### TEST PROCEDURE 1

Connect the HP 180A/1801A/1821A to TP A (Q17-e) and observe the waveforms shown in A and B below.

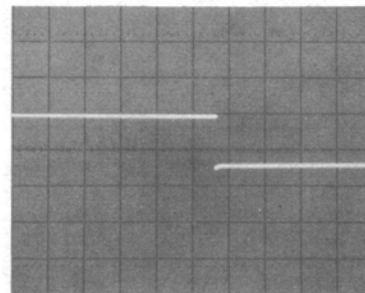
CONTROL SETTINGS:  
(Waveform A)

Oscilloscope:  
5V/Div  
2 msec/Div  
10:1 Probe

Analyzer:  
BASE LINE  
CLIPPER ccw

Waveform GOOD: Proceed to waveform B.

Waveform BAD: Check Q17/Q18/Q19 and associated components.



## SERVICE SHEET 14 (cont'd)

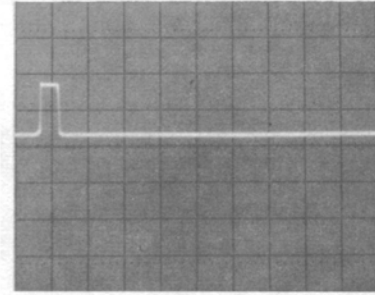
### CONTROL SETTINGS: Waveform B

Oscilloscope: Same as A.

Analyzer: Same as above except rotate BASE  
LINE CLIPPER full cw.

If waveform A was GOOD and B was BAD,  
trouble should be in the baseline clipper circuits.

If correct waveforms were obtained, blanking  
circuits and baseline clipper circuit is function-  
ing properly. Proceed to step **2**



### **2** BASELINE CLIPPER AND CLIPPER CIRCUITS

Q11/Q12 operates as a comparator in which the video signal is compared to a reference level established by the BASE LINE CLIPPER control and the clipper override circuit.

When R10 is turned fully ccw and marker signals are not present, Q11 conducts heavily and the dc level at the junction of CR5/CR6 reaches approximately +14 volts dc. Under these conditions Q12 cannot conduct and the display CRT is unblanked except when blanking pulses are present.

When the BASE LINE CLIPPER control is turned in a clockwise direction, Q11 conduction decreases, the dc level at the junction of CR5/CR6 decreases, and Q12 conducts when the negative-going deflection pulses are more positive than the established threshold. When Q12 conducts the CRT display is blanked. When a marker signal appears, Q10 inverts the marker and the dc level at the base of Q11 rises. Q11 conduction increases and holds Q12 off while the marker is present regardless of the position of the BASE LINE CLIPPER control.

### TEST PROCEDURE **2**

Operation of the BASE LINE CLIPPER is verified by the test procedure in step **1**. To verify operation of the clipper override circuit, connect the HP 180A/1801A/1821A to TP B (Q10-c) and observe the waveform.

### CONTROL SETTINGS:

Oscilloscope:

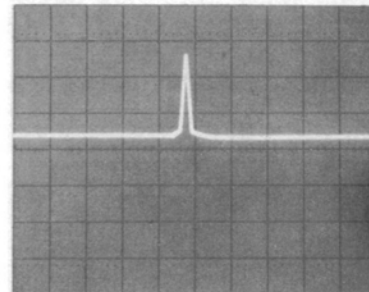
0.1 V/Div

2 msec/Div

10:1 probe

Analyzer:

SCAN WIDTH: Preset SCAN



Rotate the BASE LINE CLIPPER control and observe that marker signal remains regardless of BASE LINE CLIPPER control position.

Waveform GOOD: Clipper override functions properly.

Waveform BAD: Check Q10. (After verifying presence of marker input.)



## SERVICE SHEET 14 (cont'd)

### 3 2 dB LOG AND VERTICAL PREAMPLIFIER CIRCUITS

U1 and associated circuitry comprise an operational amplifier; when S1 (LOG-LINEAR switch) is in the 10 dB LOG position the amplifier's gain is 1. When S1 is in the 2 dB LOG position, K1 is energized by Q3. This adds a feedback divider and an offset to the amplifier to increase its gain to 5 and re-reference the maximum signal point to the CRT LOG REF graticule. The transistor associated with pins 6-8 of U2 is used as a diode to raise the signal level 0.7 V. The transistors associated with pins 1-5 of U2 are used as a clipper to prevent the signal on the CRT from going below the base line. The transistor associated with pins 9-11 drop the clipped signal level to the level of the signal out of the input operational amplifier.

U3 is an operational amplifier that has a gain of approximately 10. VERTICAL GAIN control R11 controls the amplifier's feedback and thus its gain.

### TEST PROCEDURE 3

3a. With LOG-LINEAR in 10 dB LOG, switch LOG REF LEVEL to -20 dBm to put the signal peak at the -10 dB graticule on the CRT display. Switch LOG-LINEAR to 2 dB LOG; signal should drop approximately to the -50 dB graticule.

Test GOOD: Proceed to 3b

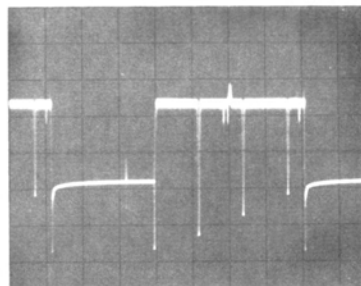
Test BAD: Check U1, Q13, Q1, U2 and associated circuitry.

3b. Connect HP 180A/1801A/1821A to TP C (U3-6) and observe the waveform.

### CONTROL SETTINGS

Oscilloscope:  
0.1 V/Div  
2 msec/Div  
10:1 probe

Analyzer:  
Same as basic except:



|                        |               |
|------------------------|---------------|
| SCAN WIDTH             | 0-100 MHz     |
| SCAN TIME PER DIVISION | 1 MILLISECOND |
| LOG REF LEVEL          | -10 dBm       |
| FREQUENCY              | 50 MHz        |

Note negative-going video and positive-going marker pulses. Rotate vertical gain control to verify proper operation

Waveform GOOD: Proceed to step 4

Waveform BAD: Check U2, U3 and associated circuitry.

### NOTE

If repairs to the 2 dB LOG and vertical preamplifier circuits are required, the adjustments specified in paragraphs 5-30 of Section V should be performed.

A8, A10, A11  
Log/Linear Amplifier (2 of 2)

◀ SERVICE SHEET 13

**SERVICE SHEET 14 (cont'd)****4 VERTICAL DEFLECTION  
POWER AMPLIFIERS**

The negative-going signal from U3 is applied to the vertical driver amplifier. Q4 inverts the signal and applies it to Q6 where it is again inverted and applied to one of the CRT vertical deflection plates. Q4 also applies a non-inverted signal to Q5 which applies it to Q7 where it is inverted and applied to the other CRT vertical deflection plate. Thus, a push-pull signal is applied to the CRT. VERTICAL POSITION control R15 controls the vertical position of the CRT trace by controlling the dc level of the pedestal on which the vertical deflection signals are applied to the CRT deflection plates.

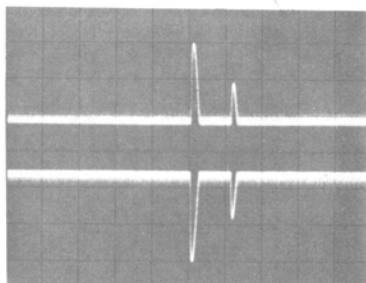
**TEST PROCEDURE 4**

Connect the HP 180A/1801A/1821A Channel A probe to TP D (Q6-b) and the Channel B probe to TP E (Q7-b), and observe the waveforms.

**CONTROL SETTINGS**

Oscilloscope:  
1 V/Div  
2 msec/Div  
10:1 probes

Analyzer:  
Same as basic  
except:



SCAN TIME PER DIVISION 0.5 MILLISECOND  
LOG REF LEVEL . . . . . -10 dBm

Waveform GOOD: Proceed to step **5**

Waveform BAD: Check Q4 through Q9 and associated components.

**5 HORIZONTAL DEFLECTION AMPLIFIER**

Driver stage Q16 inverts the scan ramp and applies it to the base of Q13. Q13 inverts the signal and supplies the positive-going deflection signal. The scan ramp is also emitter coupled to Q14 which supplies the negative-going deflection signal. The signals at the emitters and bases of Q14 and Q13 are in phase but the collector signals are 180 degrees out of phase and provide push-pull deflection signals to the horizontal deflection plates of the CRT. Controls are provided to vary the width and position of the CRT trace.

**TEST PROCEDURE 5**

Connect the HP 180A/1801A/1821A Channel A input to TP F(Q13-c) and the Channel B input to TP G(Q14-c) and observe the waveforms.

**Note**

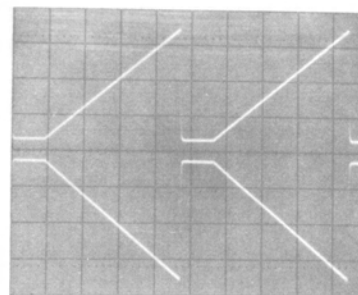
If repairs to the deflection amplifier assembly are required, the Front Panel Check Procedure, paragraph 4-12 of Section IV, should be performed.

**CONTROL SETTINGS**

Oscilloscope:

2V/Div  
5 msec/Div  
10:1 probe

Waveform GOOD:  
Unit functions  
properly



Waveform A GOOD and B BAD check Q14, 15 and associated components.

Both waveforms BAD check A13, 16 and associated components.

A7

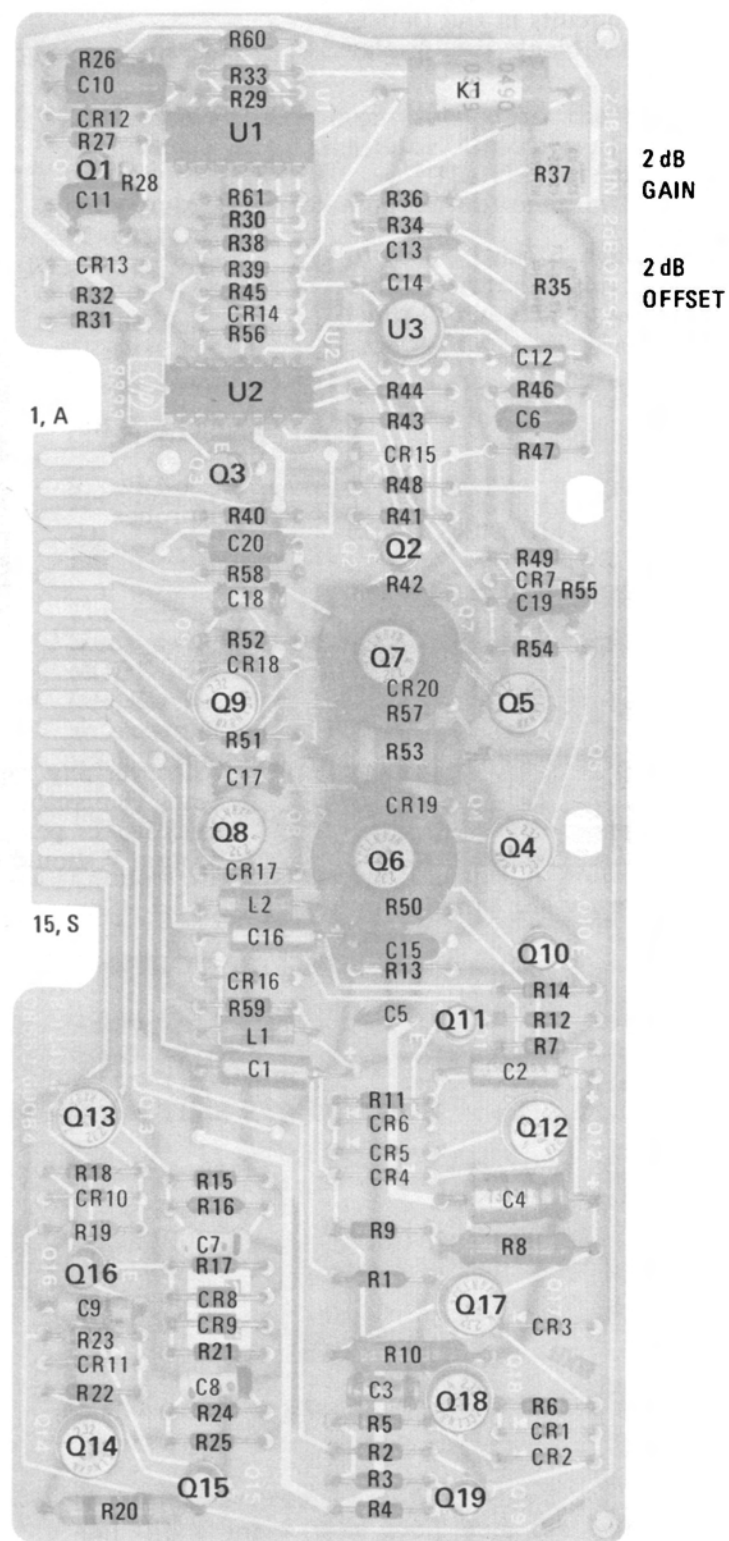
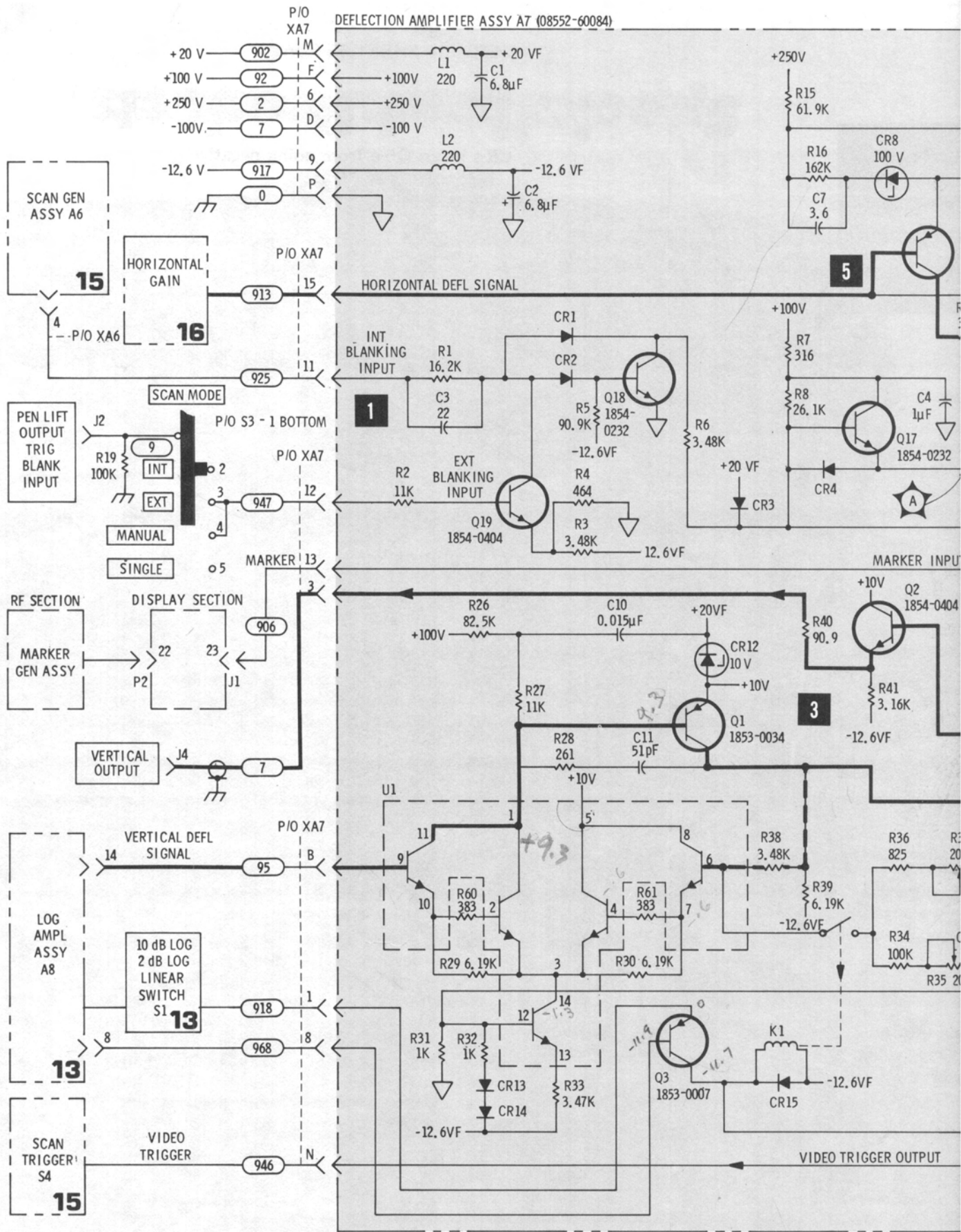


Figure 8-40. Deflection Amplifier A7 Component Identification









## SERVICE SHEET 15

It is assumed that the scan generator is not being triggered properly and that the correct operating voltages are present.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the Scan Generator Assembly A6, it should be removed from the chassis and reinstalled using the extender board to provide easy access to components. Troubleshooting information follows the technical discussion of circuit operation.

#### NOTE

The Scan Generator is a loop circuit and the failure of some components will prevent a scan being generated. If this is the case, set SCAN MODE to SINGLE and use the nominal voltages shown to check the generator.

### EQUIPMENT REQUIRED

|                             |                     |
|-----------------------------|---------------------|
| OSCILLOSCOPE . . . . .      | HP 180A/1801A/1821A |
| SERVICE KIT . . . . .       | HP 11592A           |
| VOLT-OHM-AMMETER . . . . .  | HP 412A             |
| DIGITAL VOLTMETER . . . . . | HP 3440A/3443A      |

### CONTROL SETTINGS

Specified in individual tests.

## 1 TRIGGER GENERATOR

These circuits control the operation of flip-flop Q15 and Q16 in the scan generator. When S3 is in the INT (internal) position and S4 is in the AUTO (automatic) position a dc level (-12.6 Vdc) forward biases CR10 to provide an enable signal to the scan control flip-flop. The trigger generator Q2/Q3 is passive in this mode and the scan generator cycle is controlled by the scan generator circuits only. With either switch in any other position the -12.6 volts is removed from CR10 and a trigger must be provided to initiate the scan cycle. In the SINGLE scan mode closing the SINGLE pushbutton switch applies the -12.6 volts to the junction of R23 and R22. The abrupt change in the dc level at the junction of R23 and R22 is coupled through C22 to enable the scan generator for one scan only, or coupled through C8 to defeat the scan.

When the SCAN MODE switch is in the INT position and the SCAN TRIGGER switch is in the LINE, EXT, or VIDEO positions, Q2/Q3 provides the required triggers to initiate the scan generator cycle. Input triggering to the trigger circuit may be either positive or negative. Input triggers are inverted by Q3 and applied to Q2. Q2 functions as a phase splitter and the output may be taken from collector or emitter. When the input trigger is positive, Q2 is operated as an emitter follower to provide triggers of the right polarity to the scan generator circuit. Q1 disables the trigger circuits during the scan period.

## TEST PROCEDURE 1

Connect the HP 180A/1801A/1821A Channel A probe to Q3-base and the Channel B probe to TP 1 and observe the waveforms. If neither waveform is present first check switching, then Q2 circuit.



## SERVICE SHEET 15 (cont'd)

### CONTROL SETTINGS:

Oscilloscope:

Channel A:

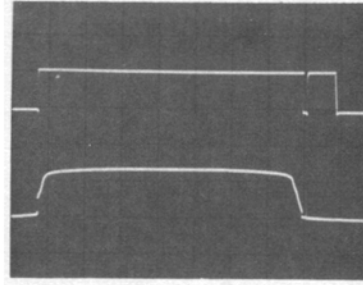
0.1 V/Div

Channel B:

0.5 V/Div

10 msec/Div

10:1 probes



Analyzer:

SCAN TRIGGER: LINE

SCAN MODE: INT

SCAN TIME PER DIVISION: 0.1 msec

If the Channel A waveform is correct and Channel B waveform is not, check Q2 circuit. If both waveforms are present and the scan generator is not being triggered check scan control flip-flop.

Correct operation of Q2 should be verified by momentarily placing the NORM REV switch in the REV position. The Channel B waveform should be reversed in polarity. (180 degrees out of phase with Channel A). All switch contacts and wiring can be checked with the HP 412A Ohmmeter for continuity after removal of A6 and A7 assemblies.

### **2** SCAN CONTROL FLIP-FLOP

The scan control flip-flop controls the scan cycle. Whenever Q15 is on, a scan ramp is being generated. Whenever Q16 is on (Q15 off) the Scan Generator is off. When Q15 is triggered on, it turns off the discharge switch and the R/C network on the Scan Time Switch A9 begins to charge. When the charge (scan ramp) reaches a predetermined level, the level detector turns on and turns Q15 off through the scan reset circuits.

### TEST PROCEDURE **2**

If any circuit in the scan generator loop is faulty, no waveforms will be present at the test points. To troubleshoot, set SCAN MODE to SINGLE and check the loop circuits for the typical voltages shown on the schematic.

### **3** RAMP DISCHARGE SWITCH

When Q15/Q16 is in the rest state (Q15 off), Q9 and Q13 are both conducting and the ramp capacitor discharges through Q9. When Q15/Q16 returns to the scan state Q9 and Q13 are turned

## SERVICE SHEET 15 (cont'd)

off and the ramp capacitor begins to charge and provide the ramp signal to the ramp amplifier.

CR4 keeps Q6-e from going negative.

### TEST PROCEDURE 3

See Step 2

### 4 CONSTANT CURRENT SOURCE AND RAMP CHARGE NETWORK

The R/C network selected by the Scan Time Switch Assembly A9, wafers 1-F, 2F and 2R, determines the ramp slope (or time). Constant current source Q6 keeps the ramp linear by keeping its conduction constant as the voltage on its collector rises.

### TEST PROCEDURE 4

See step 2

### 5 RAMP AMPLIFIER AND RAMP LEVEL DETECTOR CIRCUITS

U1 is a low gain linear amplifier. The high input impedance of the circuit prevents loading of the constant current source, Q6. The output ramp voltage is applied to the SCAN MODE switch. The output ramp from U1 also turns on transistor switch Q7 when the ramp voltage reaches a point high enough to overcome the voltage breakdown point of zener diode CR12 through the base-emitter junction of Q7. When Q7 conducts it turns on Q8 to turn off Q10 in the reset circuit.

### TEST PROCEDURE 5

See Step 2

### 6 SCAN RESET CIRCUIT

When the level detector turns on, it turns off the scan reset circuits which turns off Q15 to stop the scan ramp. When the scan reset circuits turn off, C10 charges up and holds them off until it discharges; the discharge time of C10 is determined by a resistor (or resistors) selected by Scan Time Switch Assembly A9. When C10 has discharged, the scan reset circuits turn on and Q15 turns on (or waits for the next trigger).

A7

Deflection Amplifier

◀ SERVICE SHEET 14

**SERVICE SHEET 15 (cont'd)**

During the scan reset off time, Q15 cannot be triggered on, the ramp capacitor on S1-1F is fully discharged and the blanking circuits in the Deflection Amplifier Assembly A7 blank the display CRT.

**TEST PROCEDURE 6**

See Step **2**.

The waveforms at TP2 through 5 can be used to verify proper Scan Generator operation. Attach the oscilloscope Channel A probe to TP2 and Channel B probe to TP 3.

**CONTROL SETTINGS**

Analyzer:

SCAN TRIGGER ..... LINE  
SCAN MODE ..... INT  
SCAN TIME PER DIVISION 2 MILLISECONDS

Oscilloscope:

Channel A:

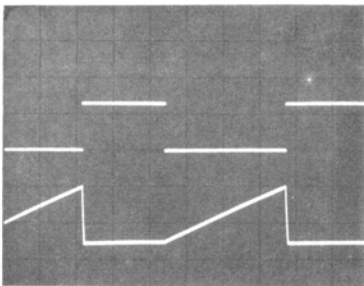
1V/Div

Channel B:

0.5V/Div

5 msec/Div

10:1 probes



Attach Channel A probe to TP4 and Channel B probe to TP5.

**CONTROL SETTINGS**

Analyzer:

SCAN TRIGGER ..... LINE  
SCAN MODE ..... INT  
SCAN TIME  
PER DIVISION ..... 2 MILLISECONDS

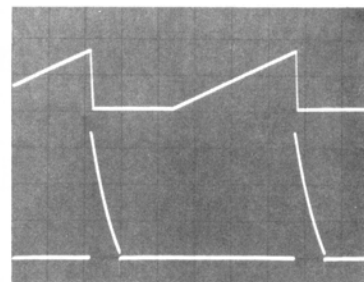
Oscilloscope:

Channel A & B:

0.5 V/Div

5 msec/Div

10:1 probes

**NOTE**

Whenever any repairs are required to the Scan Generator circuits the procedures specified in paragraphs 5-28 and 5-29 of Section V should be performed.

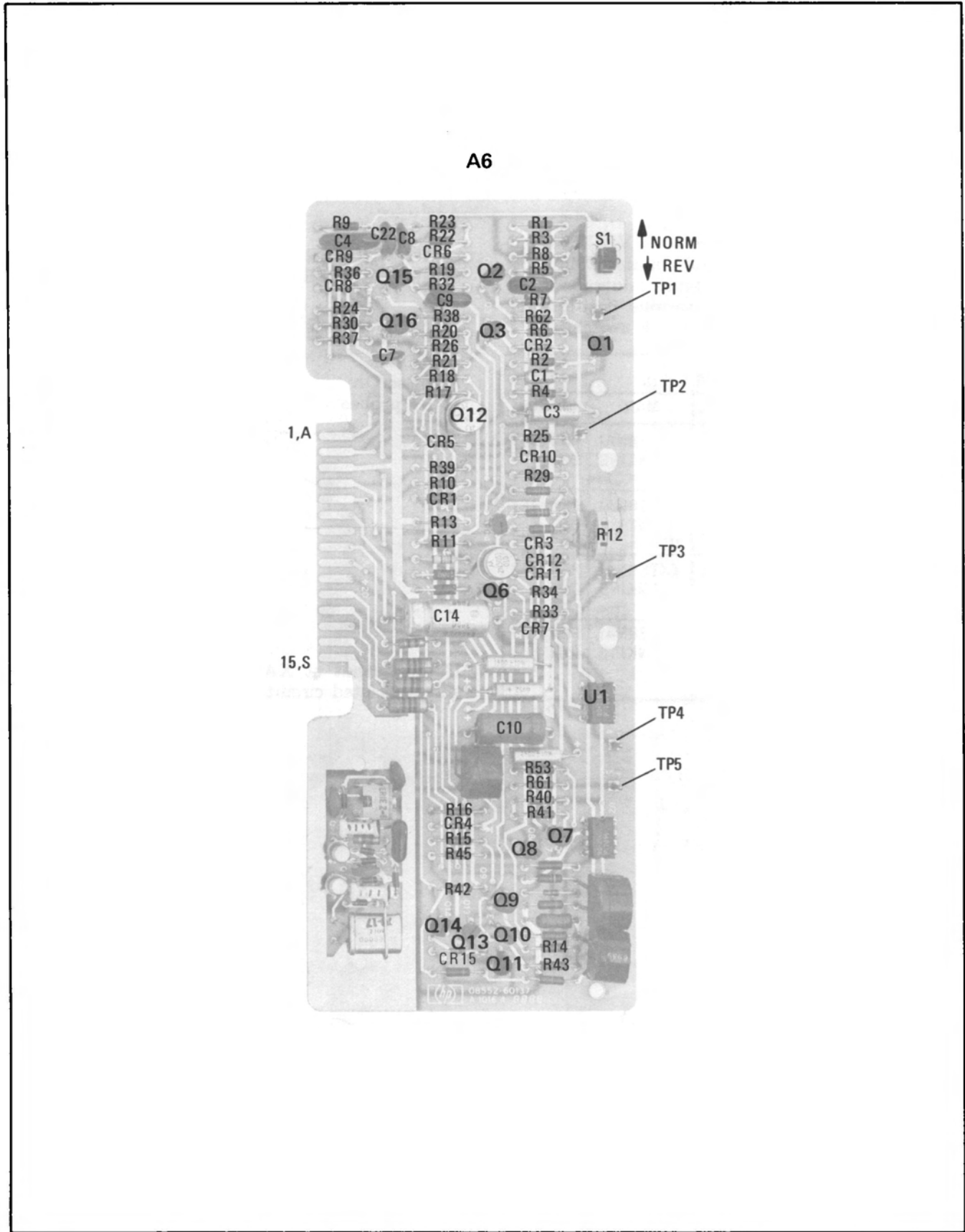


Figure 8-42. P/O Scan Generator A6 Component Identification







REFERENCE DESIGNATIONS

| A9    | CHASSIS    | A6             |
|-------|------------|----------------|
| P/OS1 | C5-7       | C1-4, 7-10     |
| C1-4  | DS9        | 13, 14, 22     |
| R1-7  | J2         | CR1-, 12, 15   |
|       | P/O J3     | Q1-3, 5, 6-16  |
|       | S2, P/O S3 | U1, S1         |
|       | P/O S4     | R1-8, 10-26    |
|       | R9, 19     | 29, 30,        |
|       | P/O XA5    | 32-34, 36-43,  |
|       | P/O XA6    | 45, 53, 61, 62 |
|       | P/O XA7    |                |

†REFER TO TABLE 7-2

**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."

08552-62006 FOR OPTIONS H01/H02)

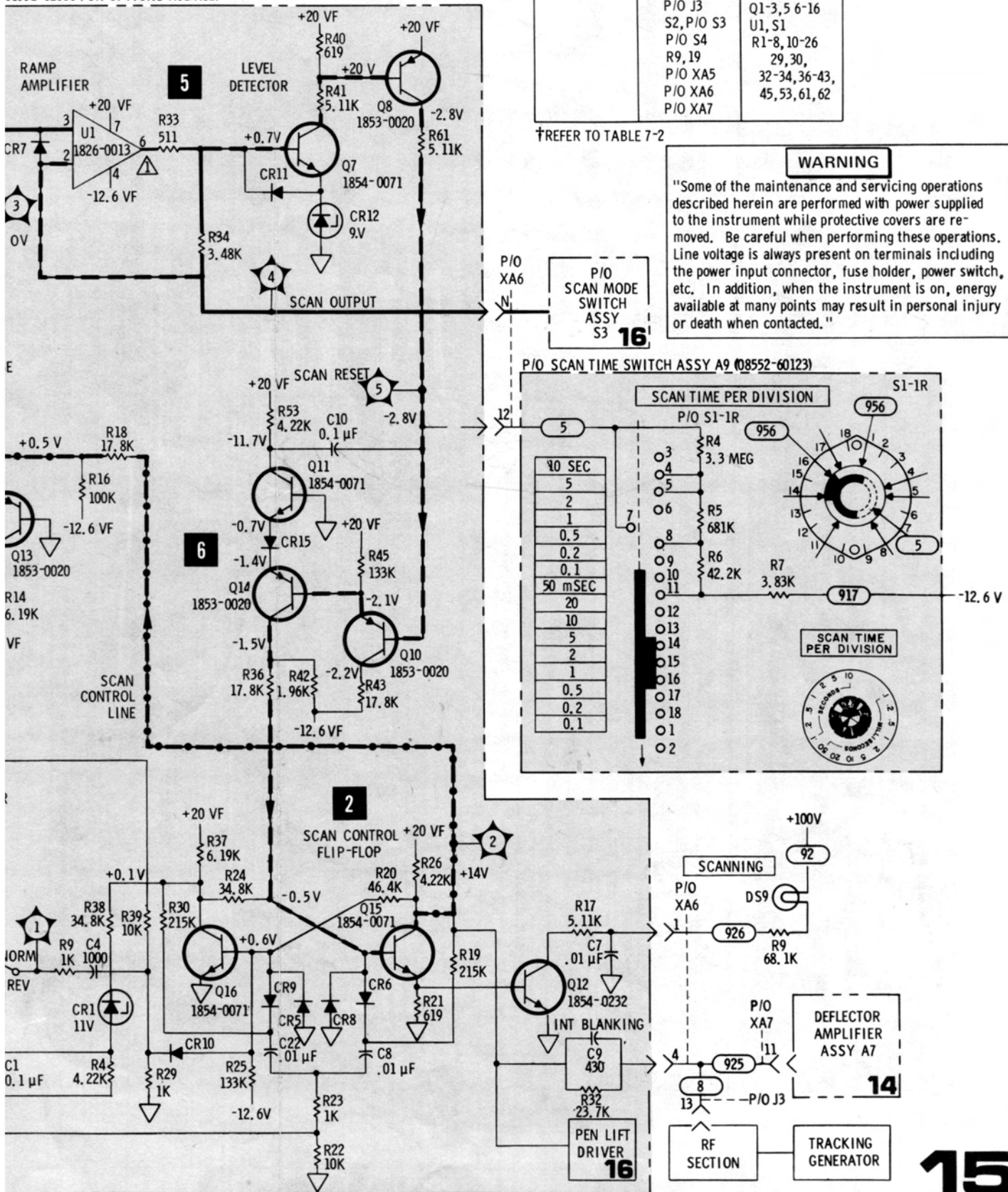


Figure 8-43. Scan Generator and Trigger Circuits

## SERVICE SHEET 16

It is assumed that all dc voltages and the waveforms at TP 2 and 4 (see Service Sheet 15) are present and correct.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated to the scan driver or pen lift driver circuits, the Scan Generator Assembly A6 should be removed from the chassis and reinstalled using the extender board to provide easy access to components. Troubleshooting information follows the technical discussion of circuit operation.

### EQUIPMENT REQUIRED

OSCILLOSCOPE . . . . . HP 180A/1801A/1821A  
SERVICE KIT . . . . . HP 11592A  
DIGITAL VOLTMETER . . . . . HP 3440A/3443A

### CONTROL SETTINGS

Specified in individual tests.

#### **1** SCAN DRIVER

The scan driver, U2, amplifies a generated scan and feeds it to the Scan Mode switch, the RF Section, and the Deflection Amplifier. With SCAN MODE in INT or SINGLE, the scan is generated by the Scan Generator (see Service Sheet 15); with SCAN MODE in EXT, the scan is provided by an external source. When SCAN MODE is in MANUAL, the conduction of U2 is determined by the position of R20, MANUAL SCAN knob.

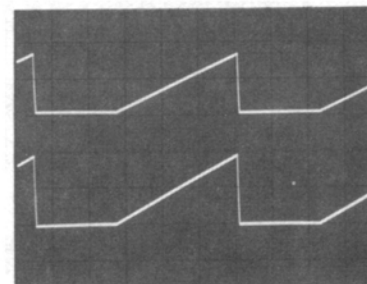
### TEST PROCEDURE **1**

Connect the oscilloscope Channel A probe to XA6 pin P and Channel B probe to XA6 pin 14 and observe the waveforms.

### CONTROL SETTINGS

Analyzer:  
SCAN MODE . . . . . INT  
SCAN TRIGGER . . . . . LINE  
SCAN TIME PER DIVISION . . . . . 2 MILLISECONDS

Oscilloscope:  
Both Channels:  
0.5V/Div  
5 msec/Div  
10:1 probes



If both waveforms are bad, check S3, SCAN MODE switch. If the amplifier's input was good and the output was bad, check U2 and associated circuitry.

A6, A9

Scan Generator and Trigger Circuits

◀ SERVICE SHEET 15

## SERVICE SHEET 16 (cont'd)

**2** PEN LIFT DRIVER

During the scan ramp, Q4 is off and Q5 is on and the pen lift driver's output is approximately 0V. When the scan stops, and as long as Q15 (on Service Sheet 15) is off, Q4 turns on, turning off Q5 which puts approximately +14V at the driver output.

When the driver output goes to 0V, CR13 and CR14 prevent the pen lift coil counter EMF voltage from damaging Q5. The table below describes the function of J2 for the various positions of SCAN MODE and SCAN TRIGGER switches.

| SCAN TRIGGER Switch | SCAN MODE Switch    |                      |                      |              |
|---------------------|---------------------|----------------------|----------------------|--------------|
|                     | INT                 | EXT                  | MAN                  | SINGLE       |
| AUTO                | PEN LIFT OUT        | EXTERNAL BLANKING IN | EXTERNAL BLANKING IN | PEN LIFT OUT |
| LINE                | PEN LIFT OUT        | EXTERNAL BLANKING IN | EXTERNAL BLANKING IN | PEN LIFT OUT |
| EXT                 | EXTERNAL TRIGGER IN | EXTERNAL BLANKING IN | EXTERNAL BLANKING IN | PEN LIFT OUT |
| VIDEO               | PEN LIFT OUT        | EXTERNAL BLANKING IN | EXTERNAL BLANKING IN | PEN LIFT OUT |

TEST PROCEDURE **2**

Connect the oscilloscope Channel A probe to TP 2 and Channel B probe to XA6 pin C and observe the waveforms.

## CONTROL SETTINGS

Analyzer:

SCAN MODE . . . . . INT  
 SCAN TRIGGER . . . . . LINE  
 SCAN TIME PER DIVISION 2 MILLISECONDS

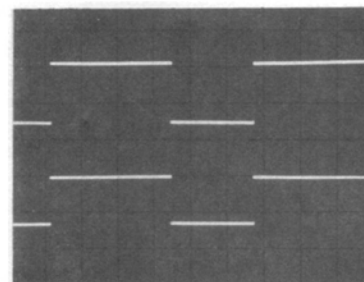
Oscilloscope:

Both channels:

1V/Div

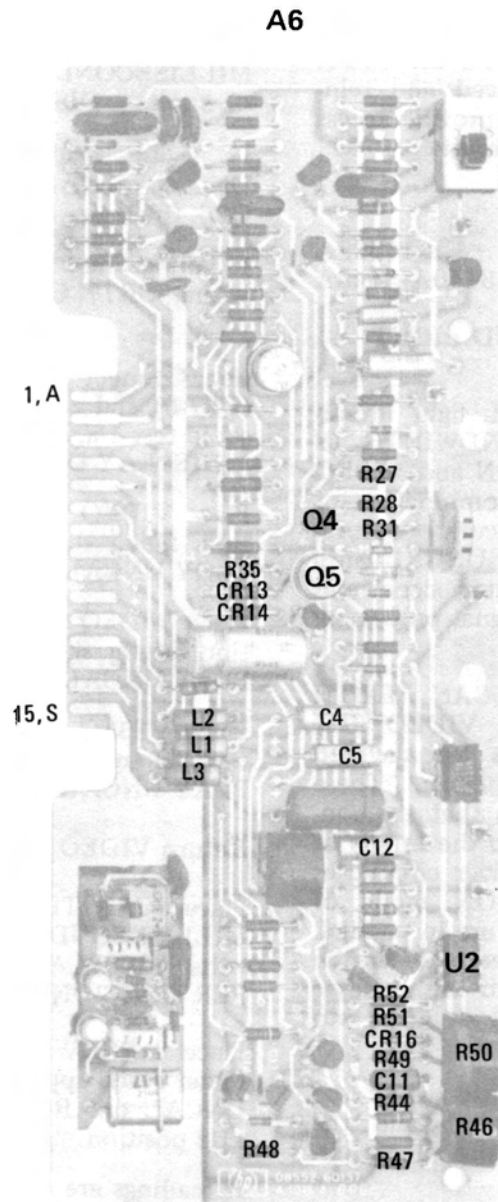
5 msec/Div

10:1 probes



If the output at XA6-C is BAD, check Q4, Q5 and associated circuitry.





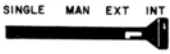
*Figure 8-44. P/O Scan Generator A6 Component Identification*



SCAN IN/OUT

P/O S3

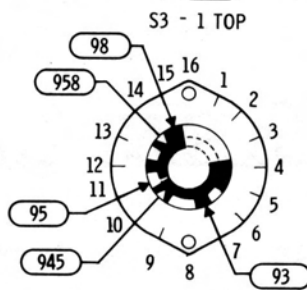
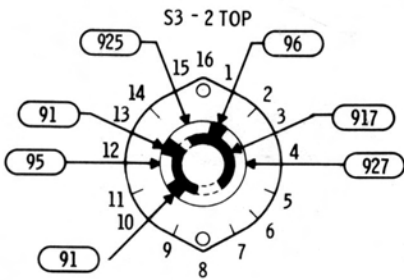
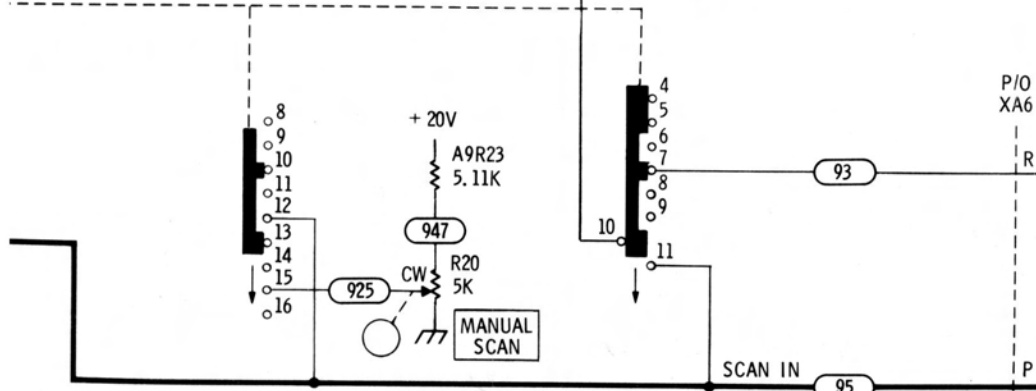
SCAN MODE



3 - 1 BOTTOM

P/O S3 - 2 TOP

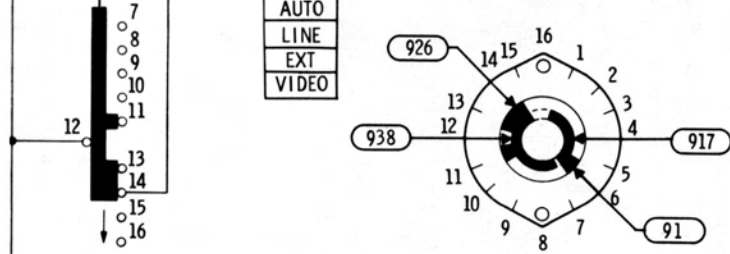
P/O S3 - 1 TOP



P/O S4  
SCAN TRIGGER

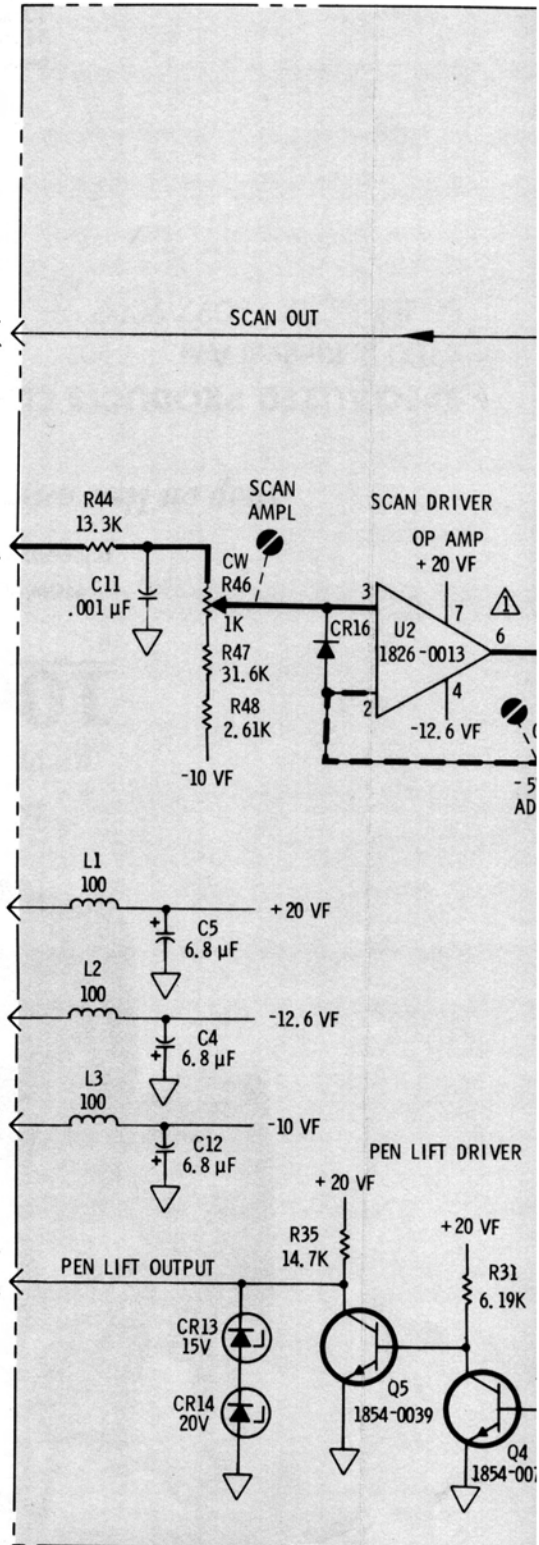
VIDEO EXT LINE AUTO

S4 TOP



PEN LIFT OUTPUT

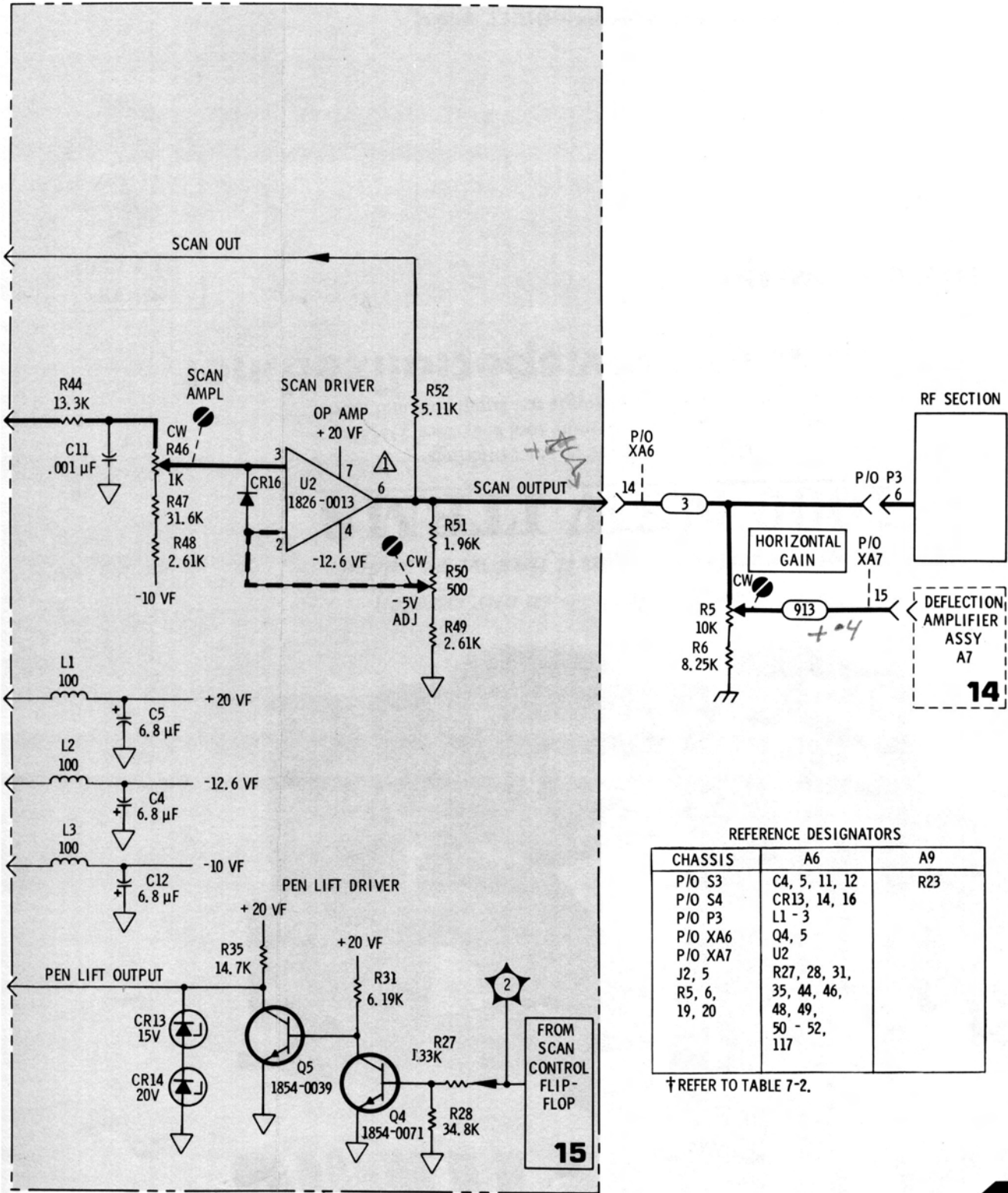
P/O SCAN GENERATOR ASSY A6 (08552-60137) (08552-60138)



SERIAL PREFIX 971-, 974-, 977-



P/O SCAN GENERATOR ASSY A6 (08552-60137) (08552-62006 FOR OPTIONS H01/H02)



16

Figure 8-45. Scan Driver and Pen Lift Driver

**A6**

**Scan Driver and Pen Lift Driver**

**◀ SERVICE SHEET 16**

## SERVICE SHEET 17

It is assumed that the DISPLAY UNCAL lamp is operating erratically or not at all and that the adjustment procedure in paragraph 5-41 of Section V will not correct the problem.

### TROUBLESHOOTING PROCEDURE

When a malfunction has been isolated to the analog light driver or switching matrix, the Power Supply Assembly should be removed and reinstalled using the extender board to provide access to components in the light driver circuit.

### EQUIPMENT REQUIRED

SERVICE KIT . . . . . HP 11592A  
DIGITAL VOLTMETER . . . HP 3440A/3443A

#### **1** ANALOGIC THRESHOLD AND LIGHT DRIVER CIRCUIT

The RF Section DISPLAY UNCAL light illuminates when the SCAN WIDTH, BANDWIDTH, IF Section SCAN TIME PER DIVISION and VIDEO FILTER switches are set at any combination of positions which do not permit accurate calibration of the analyzer. The DISPLAY UNCAL lamp is caused to illuminate by a simulated signal and has no actual connection to the signal processing circuits.

The SCAN TIME switch, the SCAN WIDTH switch, BANDWIDTH switch, and VIDEO FILTER switch all have wafers that are devoted exclusively to the analogic function. These switches control resistive networks that are connected from the -10 Vdc supply to the inputs of the analogic threshold and light driver circuit. In the SCAN WIDTH PER DIVISION mode of operation, these resistive networks are in parallel. At any time that the total resistance between the -10 Vdc supply and either input to the analogic circuit is low enough to bias Q24 or Q27 into conduction the light driver is enabled.

In the preset scan mode of operation only the SCAN TIME PER DIVISION switch and the VIDEO FILTER switch control the analogic circuit.

In the ZERO scan mode the analogic circuit is inoperative. (The VIDEO FILTER switch is still in the circuit but cannot, by itself, bias Q24 into conduction.)

#### TEST PROCEDURE **1**

1a. Connect the HP 3440A/3443A to TP A (Q24-b) and set the analyzer controls as follows:  
SCAN WIDTH . . . . . PER DIVISION  
BANDWIDTH . . . . . 10 kHz  
VIDEO FILTER . . . . . OFF  
SCAN WIDTH PER DIVISION . . . . . 20 kHz  
SCAN TIME PER DIVISION . 1 MILLISECOND

The voltmeter should read about +580 mVdc — DISPLAY UNCAL lamp off.

Place VIDEO FILTER switch in 10 kHz position. Meter should read about +10 mVdc — DISPLAY UNCAL lamp on. Return VIDEO FILTER to OFF.

Place SCAN TIME PER DIVISION switch in 0.5 MILLISECOND position. Meter should read about -2.4 volts — DISPLAY UNCAL lamp on.

If meter readings are correct but DISPLAY UNCAL does not illuminate, check Q22, Q24, Q26, the lamp, and associated components.

If voltages are incorrect, check switches, resistors, wiring, CR17, CR18, etc.

1b. Connect the HP 3440A/3443A to TP B (Q27-b) and set the Analyzer controls as initially set in test 1-a. Meter should read about +265 mVdc — DISPLAY UNCAL off.

Place VIDEO FILTER switch in the 10 kHz position. Meter should read about +50 mVdc — DISPLAY UNCAL on.

Place VIDEO FILTER switch in the 100 Hz position. Meter should read about -163 mVdc — DISPLAY UNCAL on.

Place VIDEO FILTER switch in the 10 Hz position. Meter should read about -300 mVdc — DISPLAY UNCAL on.

Return VIDEO FILTER switch to OFF.

Place SCAN TIME PER DIVISION switch to 0.5 MILLISECOND. Meter should read about -2.0 volts — DISPLAY UNCAL on. Return SCAN TIME PER DIVISION switch to 1 MILLISECOND.

Place BANDWIDTH switch to 3 kHz position. Meter reads approximately -58 mVdc — DISPLAY UNCAL on. Return BANDWIDTH switch to 10 kHz position.

If readings are correct but DISPLAY UNCAL does not illuminate, check Q27, the lamp, and associated components.

If readings are incorrect, check switches, resistors, wiring, etc.

#### NOTE

A further aid to troubleshooting is Table 5-3 of Section V. Using the table in conjunction with the schematic should aid in localizing cause of malfunction to specific components.

A5

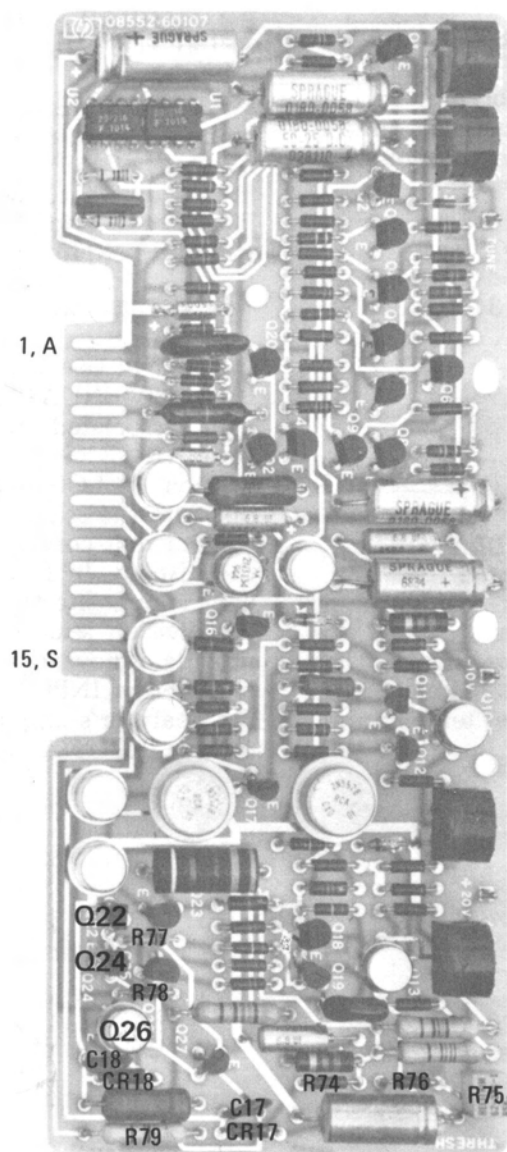


Figure 8-46. P/O Power Supply A5 Component Identification

SCAN TIME  
PER DIVISION

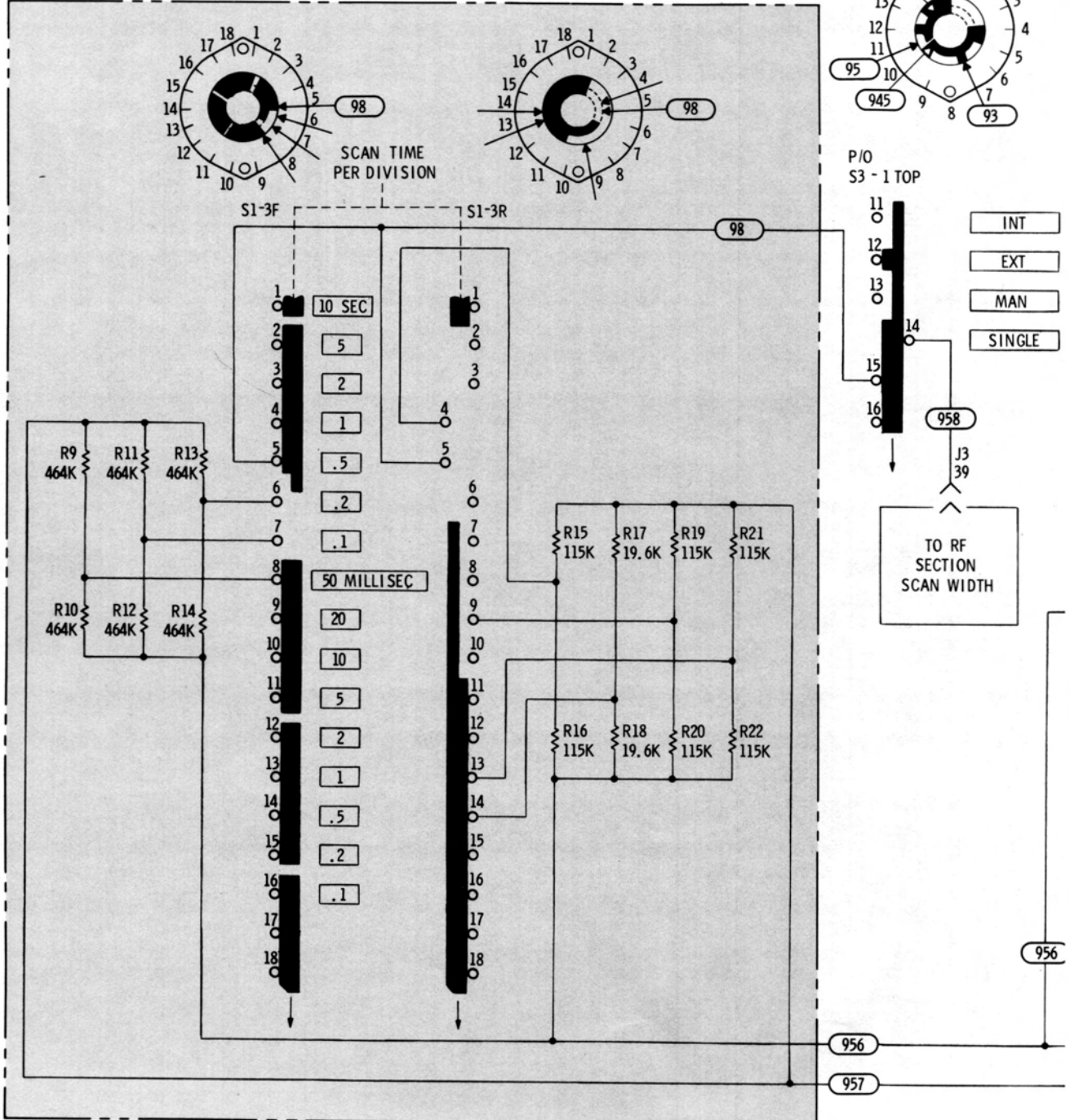


SCAN MODE

SINGLE MAN EXT INT

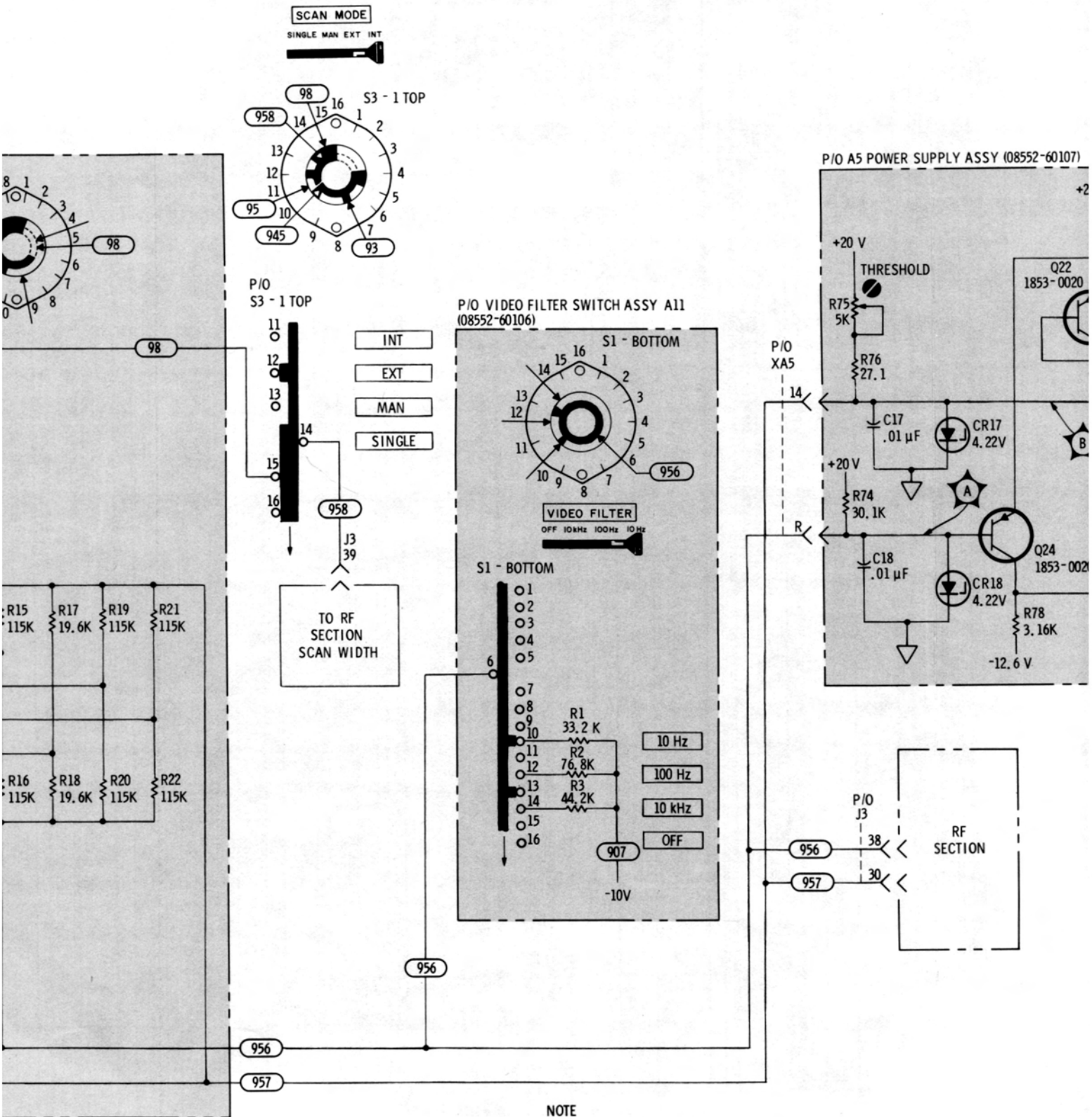


P/O A9 SCAN TIME SWITCH ASSY (08552-60123)



SERIAL PREFIX: 971-1050A

ONL'  
CON  
MOD



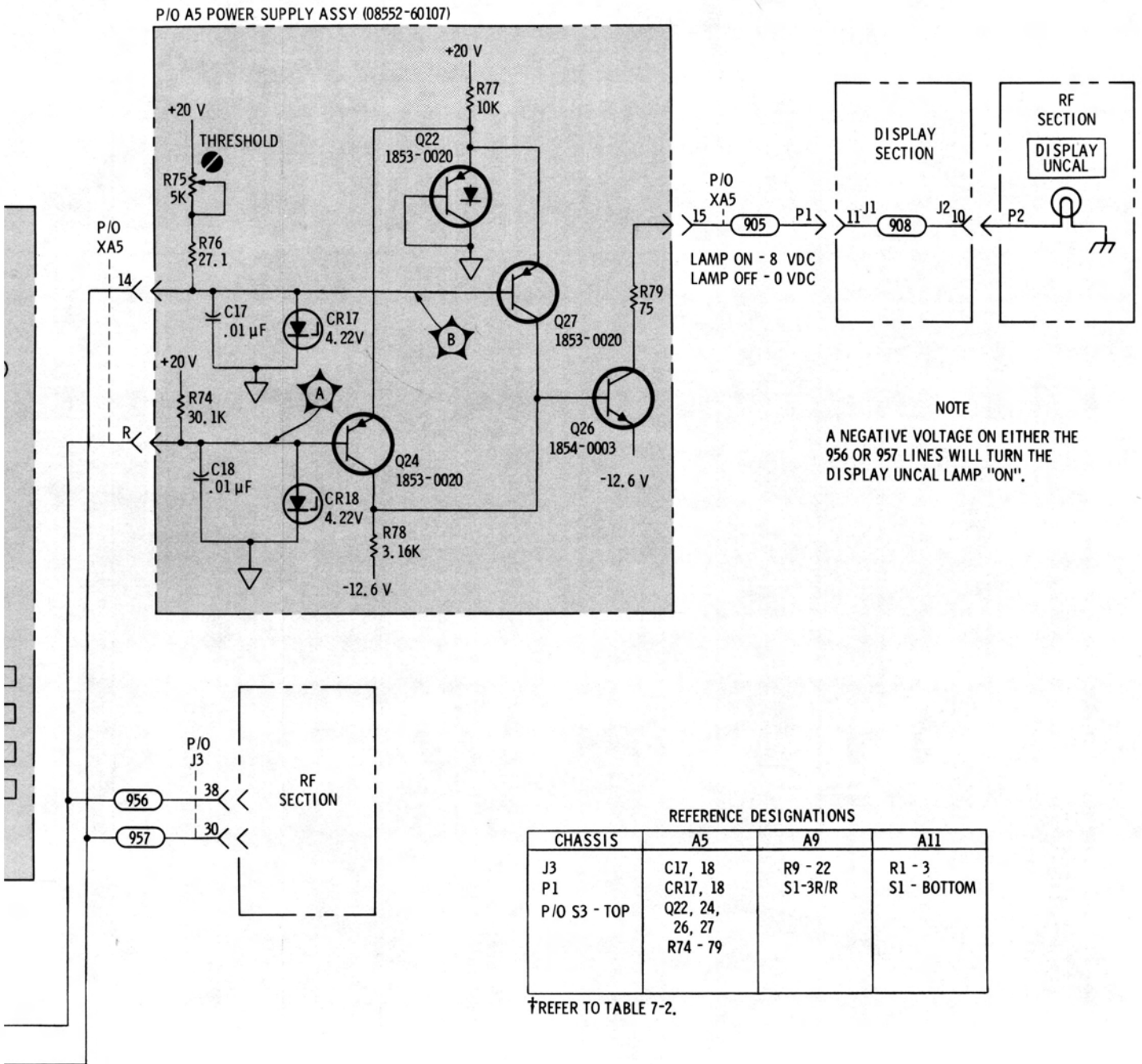


Figure 8-47. Analogic Circuit





## SERVICE SHEET 18

It is assumed that the 30 MHz signal at the CAL OUTPUT jack is out of tolerance (and cannot be brought into tolerance by performing procedures specified in paragraph 5-40 of Section V) or missing.

### TROUBLESHOOTING PROCEDURE

When it has been determined that the 30 MHz CAL OUTPUT signal is out of tolerance or missing the Scan Generator Assembly A6 should be removed from the frame and reinstalled on the extender board to provide access to components.

### EQUIPMENT REQUIRED

SERVICE KIT . . . . . HP 11592A  
DIGITAL VOLTMETER . . . HP 3440A/3443A  
VOLT-OHM-AMMETER . . . . . HP 412A

### CONTROL SETTINGS

Any

## 1 30 MHz CALIBRATION OSCILLATOR

Q17 and associated components comprise a simple, crystal controlled oscillator designed to provide a stable, 30 MHz, -30 dBm signal. The signal and its harmonics are used to calibrate and check the analyzer. Q18 provides temperature compensation.

## TEST PROCEDURE 1

Use the ohmmeter and digital voltmeter to check the oscillator. After repairing the circuit, adjust the oscillator by performing the procedures in paragraph 5-40 of Section V.

## 2 LINEAR AMPLIFIER COMPENSATION SELECTOR S1-R1

RF connections to J3 pin 7 and 8 are part of an amplifier compensation programming circuit for 10 dB steps of INPUT ATTENUATION control when the analyzer is operated in the LINEAR mode. Refer to Service Sheets 12 and 13 for detailed circuit description.

## 3 INDEX LIGHT SELECTOR WAFER

Index light selection wafer on the RF Section INPUT ATTENUATION control selects the index light associated with the LOG REF LEVEL/LINEAR SENSITIVITY control in the analyzer IF Section. In LOG mode, the selected index lamp is opposite the scale factor on the LOG REF LEVEL control that corresponds to full-scale deflection on the display. In LINEAR mode, the selected index light is opposite the LINEAR SENSITIVITY volts per division scale factor. Lights DS1 through DS6 provide a moveable index point, positioned by the RF Section INPUT ATTENUATION control, thus the analyzer's amplitude calibration is maintained for any INPUT ATTENUATION control setting.

A6

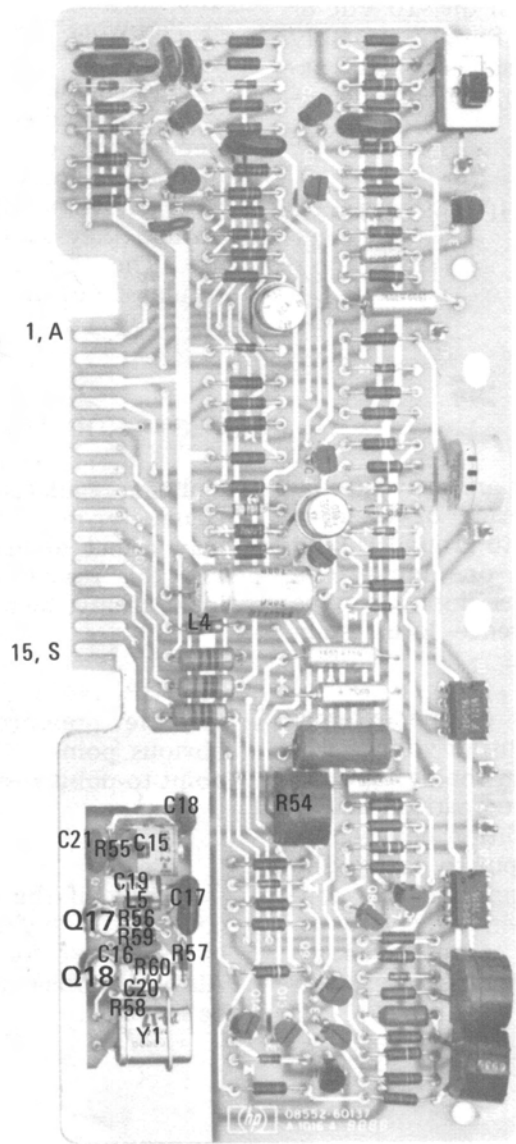
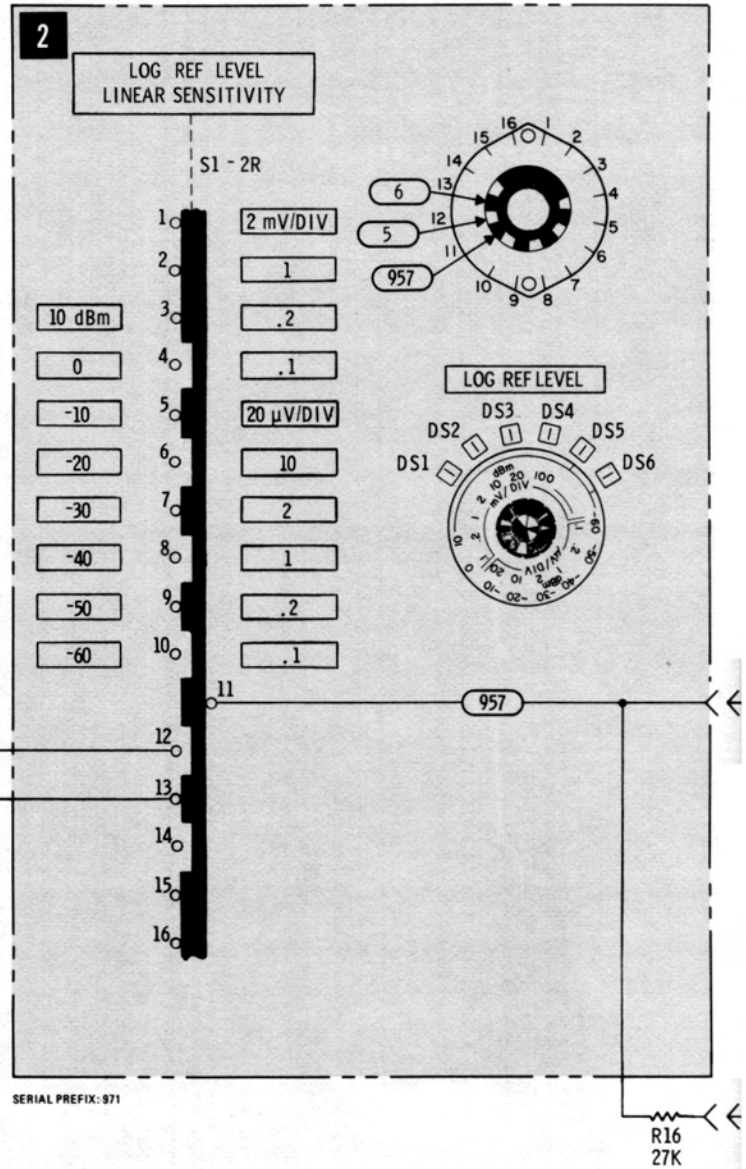
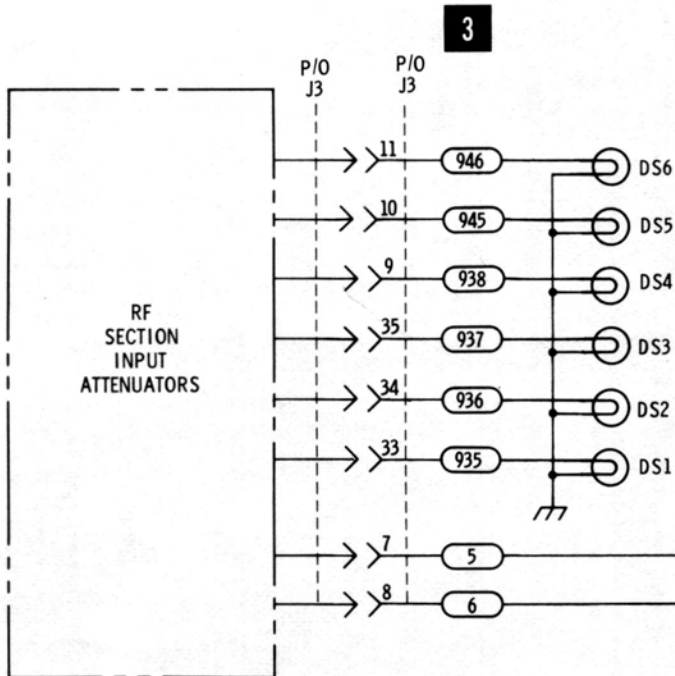


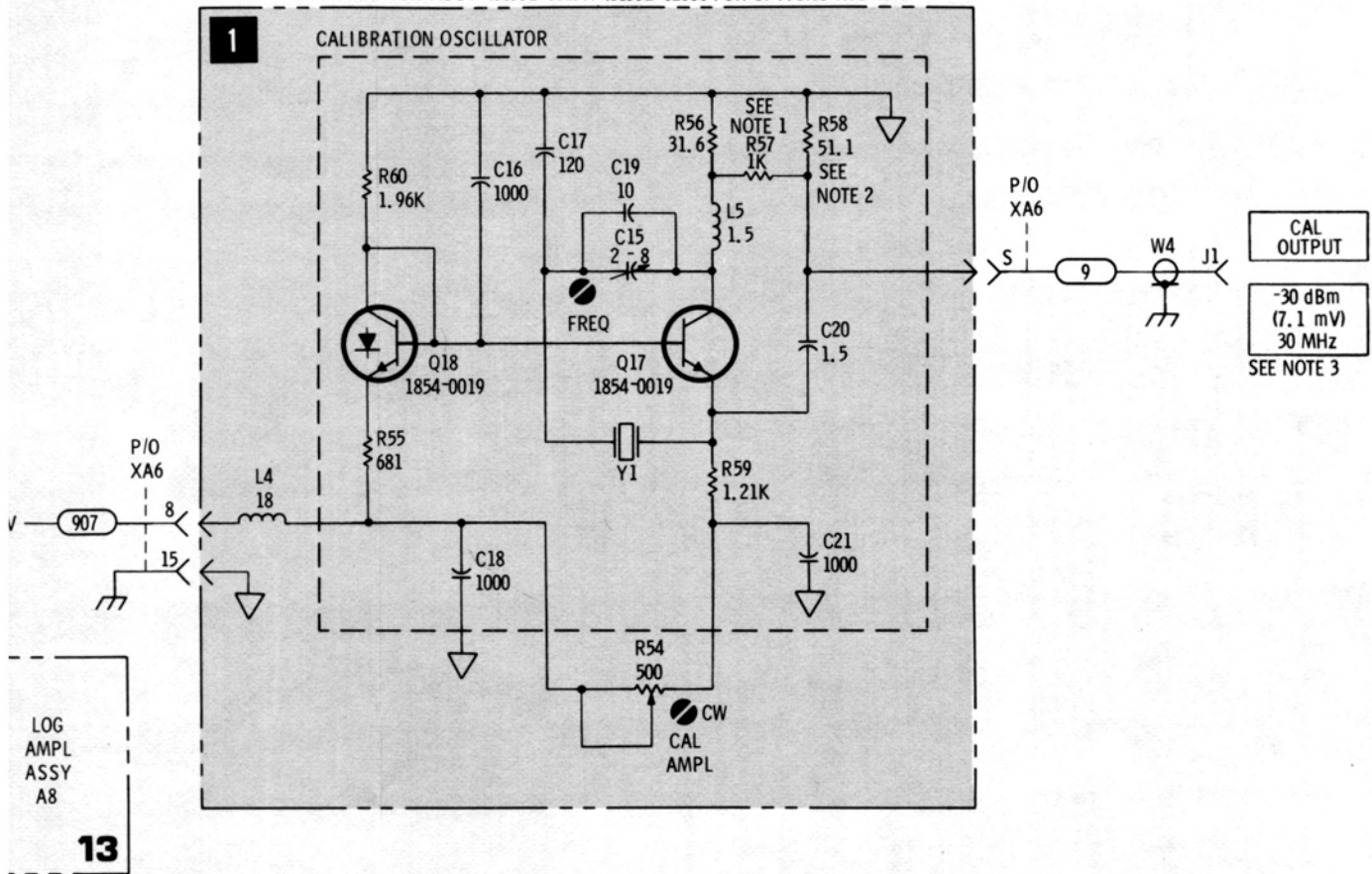
Figure 8-48. P/O Scan Generator A6 Component Identification

P/O A10 LOGIC REF ASSY (08552-60134)



| REFERENCE DESIGNATIONS |                     |         |
|------------------------|---------------------|---------|
| CHASSIS                | A6                  | A10     |
| DS1 - 6                | C15 - 21            | S1 - 2R |
| J1, 3                  | L4, 5               |         |
| P3                     | Q17, 18<br>R54 - 60 |         |
| W4                     | Y1                  |         |
| XA6, 8                 |                     |         |

P/O A6 SCAN GENERATOR ASSY (08552-60137) (08552-62006 FOR OPTIONS H01/H02)



REFERENCE DESIGNATIONS

| CHASSIS | A6       | A10     |
|---------|----------|---------|
| DS1 - 6 | C15 - 21 |         |
| J1, 3   | L4, 5    |         |
| P3      | Q17, 18  |         |
|         | R54 - 60 | S1 - 2R |
| W4      |          |         |
| XA6, 8  | Y1       |         |

NOTES:

1. R57 IS 1.1K OHMS FOR OPTIONS H01/H02.
2. R58 IS 75 OHMS FOR OPTIONS H01/H02.
3. CHANGE 7.1 mV TO 8.7 mV FOR OPTIONS H01/H02.

**18**

Figure 8-49. Reference Oscillator and LOG REFERENCE Index Light Circuit

A6, A10

Reference Oscillator and LOG

REFERENCE Index Light Circuit

◀ SERVICE SHEET 18

## SERVICE SHEET 19

It is assumed that the -12.6 volt, -100 volt, and +100 volt inputs from the display unit are present and that one or more of the outputs (-12.6 volts, -10 volts, and +20 volts) is missing or out of tolerance.

### TROUBLESHOOTING PROCEDURE

When trouble has been isolated in the -10 Vdc or +20 Vdc regulators, the Power Supply assembly A5 should be removed and reinstalled on the extender board to provide access to components.

### EQUIPMENT REQUIRED

DIGITAL VOLTMETER . . . HP 3440A/3443A  
VOLT-OHM-AMMETER . . . . . HP 412A  
SERVICE KIT . . . . . HP 11592A

### CONTROL SETTINGS

Any

#### **1** VOLTAGE REGULATOR

The +20 and -10 volt regulators are conventional voltage regulation circuits. In each of them, a voltage divider from the output to ground is used as a sensing circuit to provide one input to a comparison amplifier. The other input to the comparison amplifier is a reference level established by diode clamping circuits.

When the current requirements of the external circuit increases, the regulated output voltage will decrease and cause a reduction in the dc input to the comparison amplifier. The comparison amplifier detects the unbalanced condition between its two inputs and provides an output to change the operating bias of the control amplifier. The control amplifier then causes the series regulator to conduct more heavily, providing more current to the external circuit to allow the voltage to return to the proper level.

The series regulator acts like a variable resistance in series with the power supply output. When the external circuit requires more current (as evidenced by a decrease in output voltage) the series regulator is caused to present less impedance to the current flow.

The Silicon Control Rectifiers CR4 and CR10 act as "crowbar" protectors to protect external circuits in the event of a shorted series regulator. Should a series regulator short, the output voltage would be limited only by the output of the rectifier and the current in the external circuit would increase in proportion to the increase in output voltage. When this occurs, the SCR's are turned on and they short out the regulator output voltage. The SCR's remain in conduction until the regulator output voltage has reached zero.

#### TEST PROCEDURE **1**

Voltage regulators function as a "closed loop." Generally, malfunction of almost any component may affect dc levels at all points in the circuit. For this reason, typical voltage levels would be little, if any, help in servicing the assembly.

The HP 3440A/3443A should be used to check for the presence or absence of dc levels at obvious points. The HP 412A should be used for point-to-point resistance measurements.

Generally, if the output is completely missing or consistently high, the series regulator should be checked first for an open or shorted condition. Also, if voltage is high the SCR crowbar should be checked.

A5

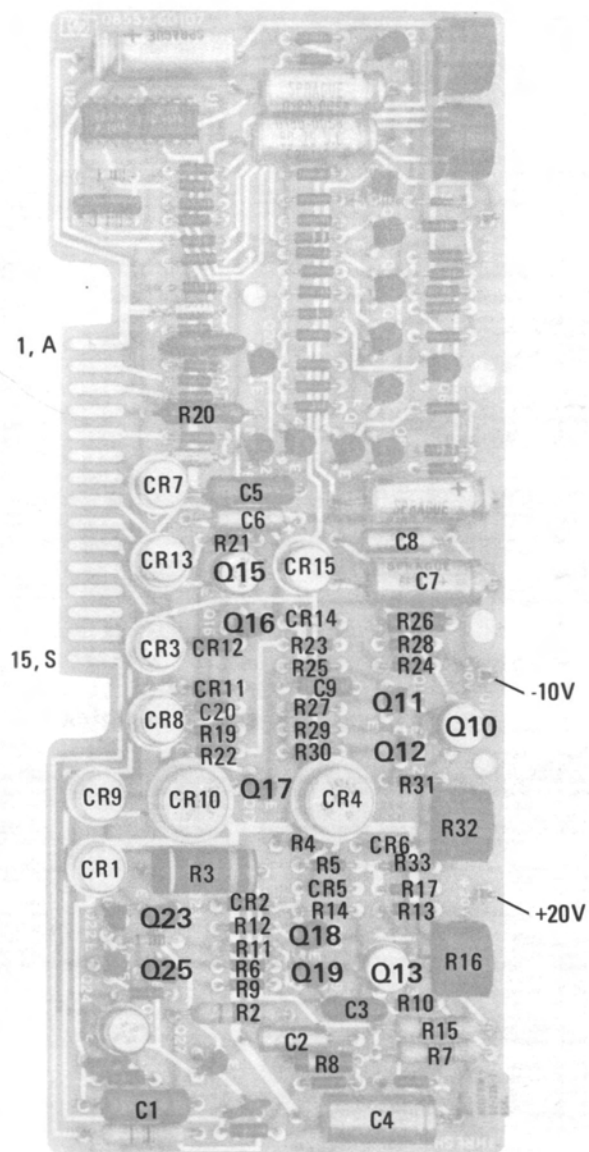


Figure 8-50. P/O Power Supply A5 Component Identification



## 8552B





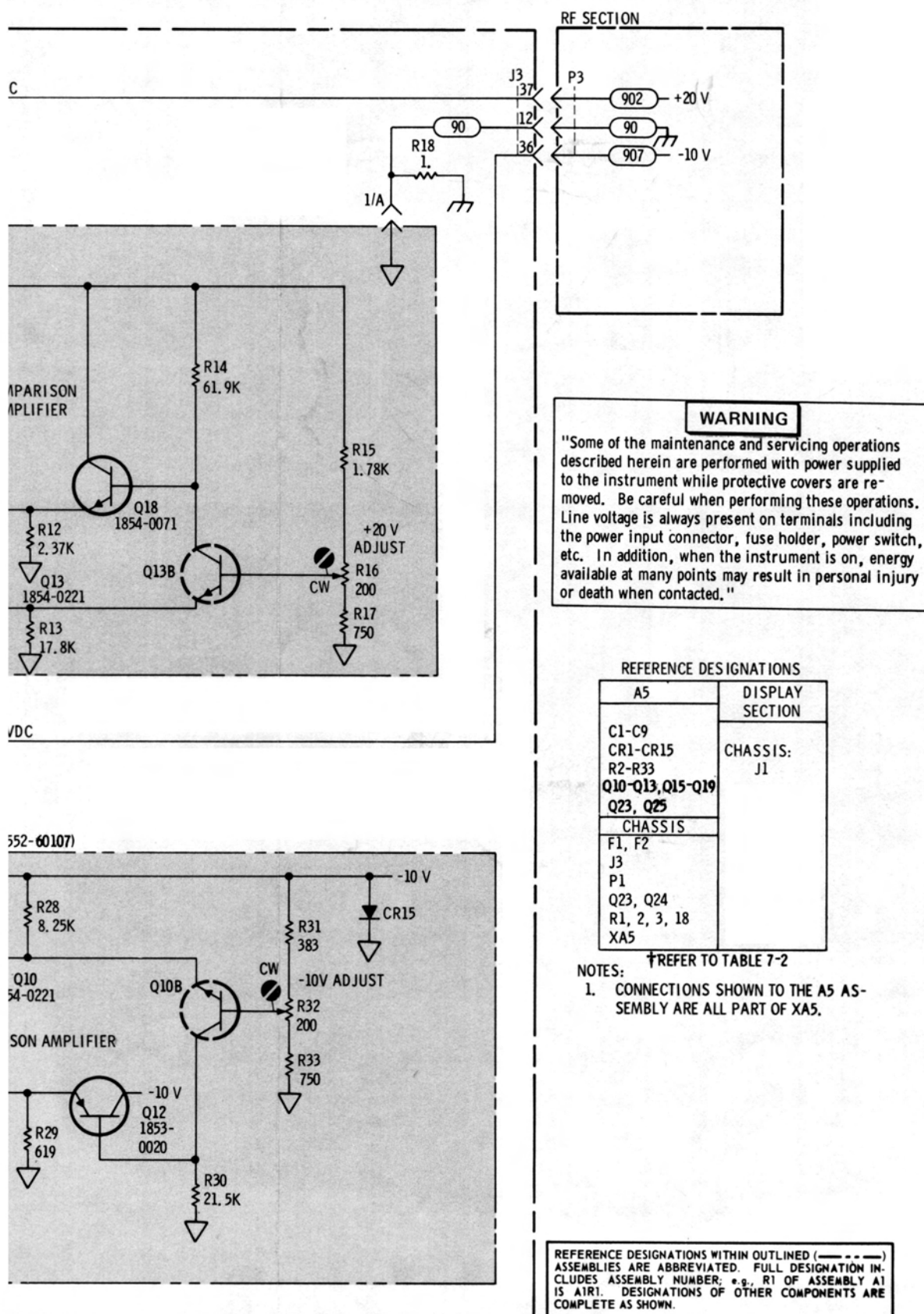


Figure 8-51. Power Supply



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