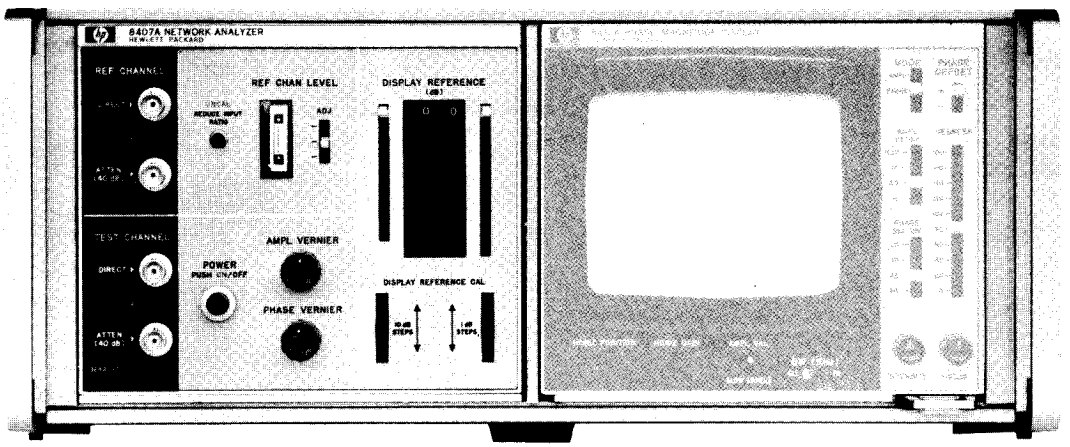
NETWORK ANALYZER
8407A



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SAFETY

This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded.

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP However, warranty service for products installed by HP and certain other products designated by HP will be performed at Buyer's facility at no charge within the HP service travel area. Outside HP service travel areas, warranty service will be performed at Buyer's facility only upon HP's prior agreement and Buyer shall pay HP's round trip travel expenses.

For products returned to HP for warranty service, Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

OPERATING AND SERVICE MANUAL

NETWORK ANALYZER
8407A

Serial Prefix: 1144A

This manual applies directly to HP Model 8407A Network Analyzer having serial prefix number 1144A.

Serial Prefixes Not Listed

For serial prefixes above 1144A, a "Manual Changes" sheet is included with this manual. For serial prefixes below 1144A, see Appendix I.

Manual Part No. 08407-90038
Microfiche Part No. 08407-90039

Printed: DEC 1971

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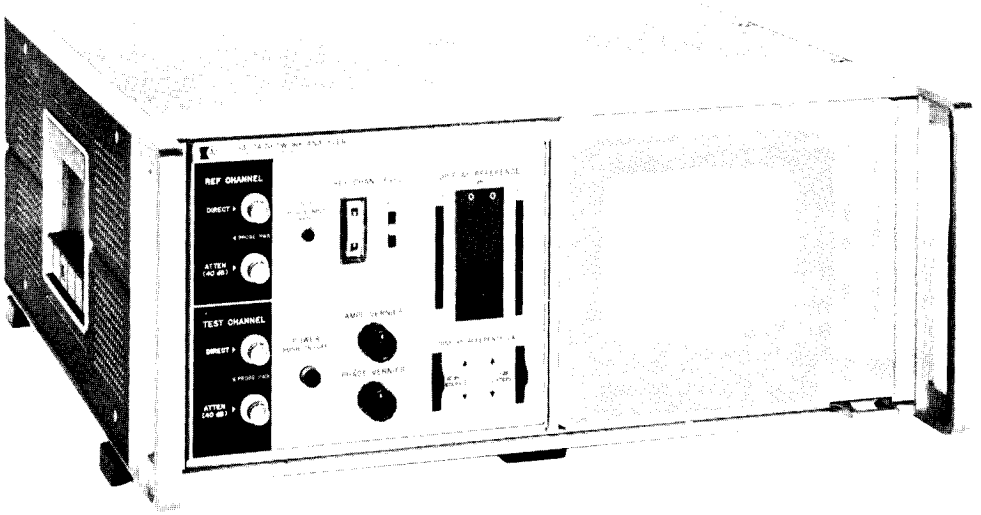
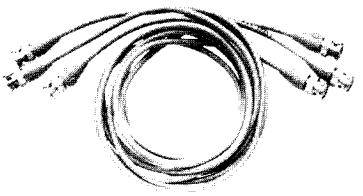


8407A NETWORK ANALYZER



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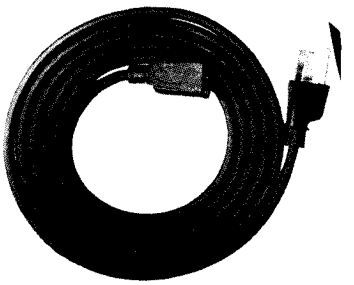

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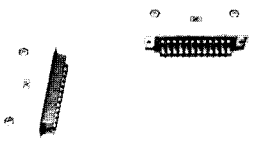

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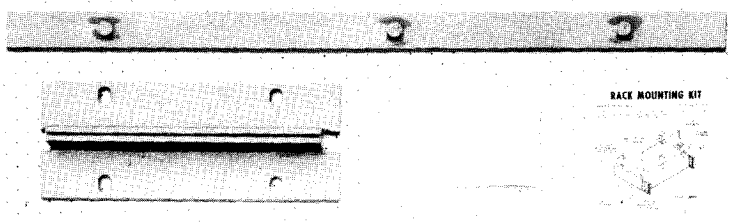


RACK MOUNTING KIT

Figure 1-1. Model 8407A and Accessories

SECTION I
GENERAL INFORMATION

1-1. DESCRIPTION

NOTE

The Model 8407A Network Analyzer may be maintained using the modular exchange program provided by the factory. See Paragraph 5-3 for details.

1-2. The Model 8407A Network Analyzer, together with an appropriate plug-in display unit and swept frequency source, measures the phase and amplitude ratio of RF signals in the 0.1 to 110 MHz range. With appropriate accessories, the instrument may also be used as a reflectometer, measuring phase and magnitude of a reflected signal.

1-3. The 8407A measures phase angles from zero to 360 degrees and amplitude ratios over a dynamic range of 80 dB. These measurements may be made at single frequencies or over swept segments of the operating range.

1-4. Typical measurements possible with the network analyzer include:

1) Swept-frequency response measurements of amplitude and phase through a system, filter, or amplifier.

2) Group delay measurements for communications systems.

3) Antenna testing.

4) Comparison of amplitude and phase of matched amplifiers.

1-5. The Model 8407A converts the two RF signals being measured to two 278-kHz signals that have the same relative amplitude and phase as the original RF signals. These two 278 kHz signals are applied to the plug-in display where the phase and amplitude information is detected and displayed. Operating power for the plug-in display is furnished by the 8407A.

1-6. The network analyzer automatically tracks the reference input signals. In sweep mode, the sweep width is limited only by the RF signal source being used. The 8407A is specifically designed for use with the HP Models 8601A and 8690B/8698B Sweep Oscillators. The 8601A sweeps the range between 0.1 and 110 MHz and the 8690B/8698B sweeps the range between 0.4 and 110 MHz.

1-7. The RF signal applied to the reference input of the 8407A is used to actuate the automatic tuning as well as develop the automatic gain control (AGC) signal for both reference and test channels. A reference channel level meter continuously monitors the reference signal and indicates whether the level is in the range required for making measurements.

1-8. Controls on the Model 8407A include a reference channel level step attenuator, display reference (amplitude offset) attenuator, and amplitude and phase vernier adjustments. The display reference attenuators allow a reference level trace to be placed at a convenient position on the plug-in display.

1-9. The complete list of specifications for the Model 8407A Network Analyzer is given in Table 1-1. Specifications that include the plug-in display unit performance are given in the Operating and Service Manuals for the display units.

1-10. ACCESSORIES FURNISHED

1-11. A detachable power cable, a rack-mounting kit, a servicing cable, two 50-ohm terminations and three BNC cables are supplied with Model 8407A.

1-12. Rack Mounting Kit

1-13. The rack-mounting kit contains all the hardware needed to adapt the Model 8407A cabinet for installation in equipment racks having standard 19-inch spacing. Instructions for conversion to rack-mounting are included with the kit.

1-14. Servicing Cable

1-15. The servicing cable permits all necessary interconnections to be made between the Model 8407A and a plug-in display unit with the unit outside the plug-in compartment.

Table 1-1. Specifications

FREQUENCY RANGE:
0.1 to 110 MHz.

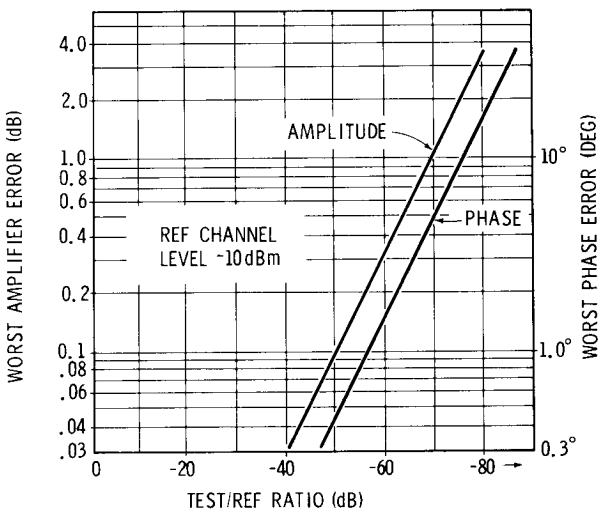
TEST INPUT:
Direct: —10 to —90 dBm, signal range.
Attenuated: +20 to —50 dBm, signal range.
Impedance: 50 ohms, VSWR <1.08.
Option 008: 75 ohm, VSWR <1.08.
Damage Level: +26 dBm/50 Vdc.

REFERENCE INPUT:
Direct: —10 to —60 dBm.
Attenuated: +20 to —20 dBm.
Impedance: 50 ohms, VSWR <1.08.
Option 008: 75 ohms, VSWR <1.08.
Damage Level: +26 dBm/50 Vdc.

AMPLITUDE ACCURACY:
Frequency Response, TEST inputs > — 60 dBm DIRECT (may be calibrated out): ± 0.2 dB, 0.1 to 110 MHz; ±0.05 dB over any 10 MHz portion. Typically ±0.05 dB, 0.1 to 110 MHz for DIRECT inputs (REFERENCE level of —10 dBm).

Display Reference: <0.05 dB/1-dB step, total error does not exceed 0.1 dB; <0.1 dB/10 dB-step, total error does not exceed 0.25 dB.

Crosstalk: When REFERENCE CHANNEL level equals —10 dBm (conditions for best signal-to-noise ratio), amplitude error due to crosstalk and residual low-level signals is ≤ that shown on the graph below.



Common Mode Level Variation (AGC tracking): <0.5 dB/10 dB over 30 dB operating range. For minor source and transducer variations (<0.05 dB), this error is negligible.

PHASE ACCURACY:
(amplitude reading must be on-scale at the 10 dB/division setting on the 8412A)

Frequency Response, TEST inputs >—60 dBm DIRECT (may be calibrated out); ±5 degrees, 0.1 to 110 MHz; ±2 degrees over any 10 MHz portion, 1 to 110 MHz. Typically ±2 degrees, 1 to 110 MHz for DIRECT inputs (REFERENCE level of —10 dBm).

Display Reference: <0.5°/10 dB step; total error does not exceed 3°.

Crosstalk: When REFERENCE CHANNEL level equals —10 dBm (conditions for best signal-to-noise ratio), phase error due to crosstalk and residual low-level signals is ≤ that shown on the graph above.

Common Mode Level Variation (AGC tracking): <0.8 °/10 dB over 30 dB operating range. For minor source and transducer variation (<0.5 dB), this error is negligible.

POWER:
65 watts, 50—60 Hz, 115/230 Vac ±10%.

WEIGHT:
Net, 32 lb (14,6 kg).
Shipping, 39 lb (17,8 kg).

DIMENSIONS:
7-1/4 in. high, 18-3/8 in. deep, 16-3/4 inches wide.

1-16. ACCESSORIES AVAILABLE

1-17. Two accessory kits are designed specifically for the 8407A and are as follows:

1) 11652A Reflection-Transmission Kit

2) 11654A Passive Probe Kit.

1-18. Other accessories available are the 1123A Active Voltage Probe, the 10020A Resistive Divider Probe, and the 1110A Clip-on Current Probe.

1-19. The 11652A Reflection-Transmission Kit facilitates measurement of return loss, VSWR, complex impedance and reflection coefficient, as well as transmission magnitude and phase. Included in the kit are the Model 8721A directional bridge, a precision termination and low-leakage cables.

1-20. The 11654A Passive Probe Kit allows probing directly into circuits with minimum disturbance. Measurements may be made of either voltage or current with the probe kit.

1-21. The 1123A Active Voltage Probe is valuable for probing low-level signals accurately. This probe has a 220 MHz bandwidth (3 dB). Two probes are recommended for the 8407A.

1-22. The 10020A Resistive Divider Probe allows matching various source impedances. Six division ratios from 1:1 to 100:1 are provided. Two probes are required for the 8407A.

1-23. The 1110A Clip-on Current Probe is convenient for simply "clipping on" circuit leads for current measurements. Frequency range of the probe is up to 40 MHz.

1-24. DISPLAY UNITS

1-25. All plug-in display units designed for use with the Model 8407A are completely interchangeable. These units are powered by the Model 8407A with all necessary interconnections made automatically when the unit is properly installed.

1-26. Model 8412A Phase-Magnitude Display

1-27. The Model 8412A is used in either transmission or reflection measurements to display phase and magnitude characteristics of a unit under test. Two traces, one magnitude and the other phase, are shown simultaneously on a built-in cathode ray tube. Magnitude is calibrated in dB and phase in degrees. The 8412A also supplies simultaneous external output voltages proportional to the magnitude and phase for use with a graphic recorder. Marker signals spot-intensify the trace for frequency reference and blanking signals eliminate the trace between sweep intervals.

1-28. Model 8413A Phase-Gain Indicator

1-29. The Model 8413A is intended for fixed- and swept-frequency transmission or reflection measurements, providing phase and amplitude information in two forms: meter indication and analog voltage. The meter indicates phase or amplitude according to the function selected, while the analog voltages are continuously produced by both phase and amplitude circuits. The meter has center-zero scales with phase ranges of ±6°, ±18°, ±60°, and ±180° and amplitude ranges of ±3, ±10, and ±30 dB. Calibrated phase offset in 10° steps allows any phase angle to be read on the best-resolution range of ±6°. The analog voltages can be used to obtain calibrated plots of phase angle and amplitude ratio against frequency on a conventional dual-trace oscilloscope or graphic recorder.

1-30. Model 8414A Polar Display

1-31. The Model 8414A displays reflection measurements (impedance, admittance, reflection coefficient, return loss). It displays amplitude and phase in polar form on a built-in cathode ray tube, and provides simultaneous voltages proportional to the amplitude and phase components of the display. Frequency marker and blanking signals can be applied to the Model 8414A. Marker signals spot-intensify the trace for frequency reference, while blanking signals eliminate the trace between sweep intervals when there is no RF power. Supplied Smith Chart graticule overlays permit impedance and admittance to be read directly from the display.

1-32. SIGNAL SOURCE REQUIREMENTS

1-33. The Model 8407A Network Analyzer is specifically designed to be used with the HP Model 8601A and 8690B/8698B Sweep Generators. The 8601A sweeper covers the RF band between 0.1 and 110 MHz and the 8690B/8698B has a range between 0.4 and 110 MHz. A signal from the internal voltage-tuned oscillator (VTO) in the sweeper is used as an integral part of the 8407A phase-lock system. The VTO sweeps between 200.1 MHz and 310 MHz and is frequency- locked to the sweeper RF output signal. The power levels from the sweeper are +20 dBm maximum at the RF output and −3 to −15 dBm minimum at the VTO output. Flatness of the RF output should be at least 0.5 dB over the full range, harmonics should be at least 30 dB below the carrier and spurious signals at least 35 dB below the carrier.

1-34. INSTRUMENTS COVERED BY MANUAL

1-35. This manual applies directly to instruments having a serial prefix number listed on the title page (first three numbers of serial number). If the serial prefix of your instrument is other than those listed, there are differences between the instrument described in this manual and your instrument. These differences are described in Appendix I at the rear of this manual or in a Manual Changes Sheet supplied with this manual. If the Manual Changes sheet is missing, the information can be obtained from your nearest Hewlett-Packard Sales and Service Office. (See lists at the back of this manual.) The Manual Changes Sheet may also include an errata section which describes manual correction information which applies to the manual for all instruments.

SECTION II
INSTALLATION

2-1. INITIAL MECHANICAL INSPECTION

2-2. The Network Analyzer was carefully inspected, both mechanically and electrically, prior to shipment. If external damage to the shipping carton is evident, ask the carrier's agent to be present when the instrument is unpacked. Check the instrument for external damage such as broken controls or connectors and dents or scratches on the panel surface. If damage is evident, refer to Paragraph 2-5 for recommended claim procedure and Paragraph 2-7 for repackaging information. If the shipping carton is not damaged, check the cushioning material and note any signs of severe stress as an indication of rough handling in transit. If the instrument appears undamaged, check for all supplied accessories, then perform the electrical check (Paragraph 2-3).

2-3. INITIAL ELECTRICAL INSPECTION

2-4. Check the electrical performance of the Network Analyzer as soon as possible after receipt by performing the Performance Test (Paragraph 5-8 through 5-21). The Performance Test procedure compares the electrical performance to the specifications of Table 1-1. This test is also suitable for incoming quality control inspection. If the Network Analyzer does not perform within the specifications, refer to Paragraph 2-5 for recommended claim procedure and Paragraph 2-7 for repackaging information.

2-5. CLAIMS

2-6. If physical damage is evident, or if the instrument does not meet specifications when received, notify the carrier and the nearest Hewlett-Packard Sales and Service Office. (See list at back of manual.) The sales and service office will arrange for repair or replacement without waiting for settlement of a claim with the carrier.

2-7. REPACKAGING FOR SHIPMENT

2-8. Using Original Packaging

2-9. The same containers and materials used in factory packaging can be obtained through the Hewlett-Packard sales and service offices listed at the back of this manual. If the Model 8407A is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also mark the container FRAGILE to assure careful handling. In any correspondence refer to the instrument by model number and full serial number.

2-10. Using Other Packaging

2-11. 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 (3 to 4" layer) around all sides of instrument to provide firm cushioning and prevent movement inside the container. Protect control panel with cardboard.

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

e. In any correspondence, refer to instrument by model number and full serial number.

2-12. PREPARATION FOR USE

2-13. Power Requirements

2-14. The 8407A Network Analyzer requires a power source of 115 or 230 Vac ±10%, 50 to 60 Hz single phase. Power required is approximately 65 watts.

2-15. Selecting 115- or 230-Volt Operation

2-16. A rear panel two-position slide switch permits operation from either a 115 or 230 volt ac power source. The number visible on the switch indicates the line voltage to which the instrument

should be connected. To prepare the Model 8407A for operation, position the 115/230 volt slide switch so that the number visible on the slider corresponds to the line voltage.

CAUTION

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

2-17. Power Cable

2-18. To protect operating personnel, the National Electrical Manufacturers' Association (NEMA) recommends that instrument panels and cabinets be grounded. Accordingly, the network analyzer is equipped with a three-conductor power cable which grounds the panel and cabinet when plugged into an appropriate receptacle. The offset pin of the three-prong connector is the ground pin. To preserve the protection feature when operating the Network Analyzer from a two-contact outlet, use a three-prong to two-prong adapter (HP Stock No. 1251-0048) and connect the green pigtail on the adapter to ground.

2-19. Cooling

2-20. Clearances for ventilation should be 3 to 4 inches at the rear of the cabinet and 2 to 3 inches at the sides. The clearances provided by the plastic feet in bench stacking and the filler strips in rack mounting are adequate for the top and bottom cabinet surfaces.

2-21. Bench Operation

2-22. The Model 8407A cabinet has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand inclines the instrument for ease in reading the meter. The plastic feet provide clearance for air circulation and make the Model 8407A self-aligning when stacked on other Hewlett-Packard full rack-width modular instruments.

2-23. Rack Mounting

2-24. The rack-mounting kit contains all the hardware needed for adapting the Model 8407A cabinet for installation in equipment racks having standard 19-inch spacing. Preparation for rack mounting is illustrated in Figure 2-1.

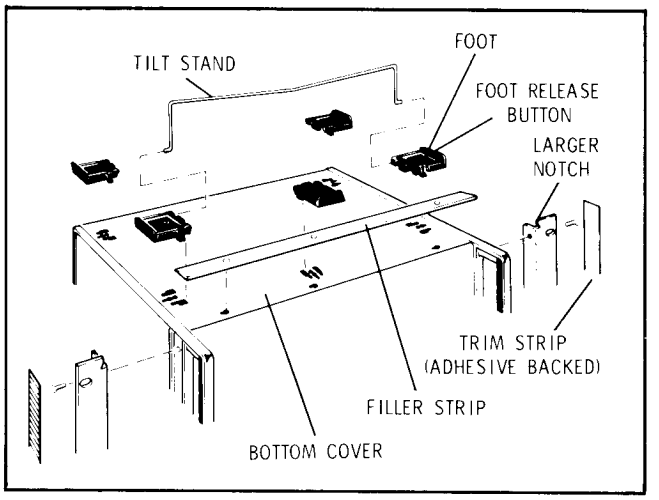


Figure 2-1. Preparation for Rack Mounting

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This operating section explains the function of the controls and indicators of the Model 8407A Network Analyzer and describes typical test setups for making transmission and reflection measurements. More detailed test setups are contained in the Operating and Service Manuals covering the individual plug-in display units such as the Model 8412A Phase-Magnitude Display or the Model 8414A Polar Display.

3-3. OPERATING PRECAUTIONS

3-4. Maximum Input Power

3-5. Do not apply more than +26 dBm or 50 Vdc to the front-panel reference or test channel DIRECT or ATTEN. input connectors or damage to the input circuits may occur.

3-6. Over-Voltage and Transient Protection

3-7. Transients may trigger the ±20V power supplies over-voltage protection. This condition can occur if the power is on when a display unit is either removed or installed in the mainframe. The over-voltage protection can also be triggered when turning 8407A power on and off very rapidly. To reset the ±20V supplies, turn the 8407A power off and allow a minimum of ten seconds, turn the power on and resume operation. If the over-voltage protection has been triggered for an extended period it may be necessary to turn the 8407A power off for about five minutes.

3-8. PANEL FEATURES

3-9. Front and rear panel features are described in Figures 3-1 and 3-2. Description numbers match the numbers on the illustration.

3-10. INSTRUCTIONS FOR MAKING MEASUREMENTS

3-11. A general operating procedure is given to show the principles of operating the network analyzer. Since a number of input transducers may be used and a number of plug-in displays are available, no attempt has been made to cover all combinations of instruments. However, the general test procedure given may be adapted for use with any input or display equipment. For step-by-step instructions, using any specific plug-in display, refer to the Operating and Service Manual for that plug-in. Additional operating information for the Network Analyzer, as well as error analyses of measurements, is contained in the HP manual "RF Network Analysis with the HP 8407A", available upon request.

3-12. TRANSMISSION MEASUREMENTS

3-13. To perform a typical transmission measurement, use the following general procedure:

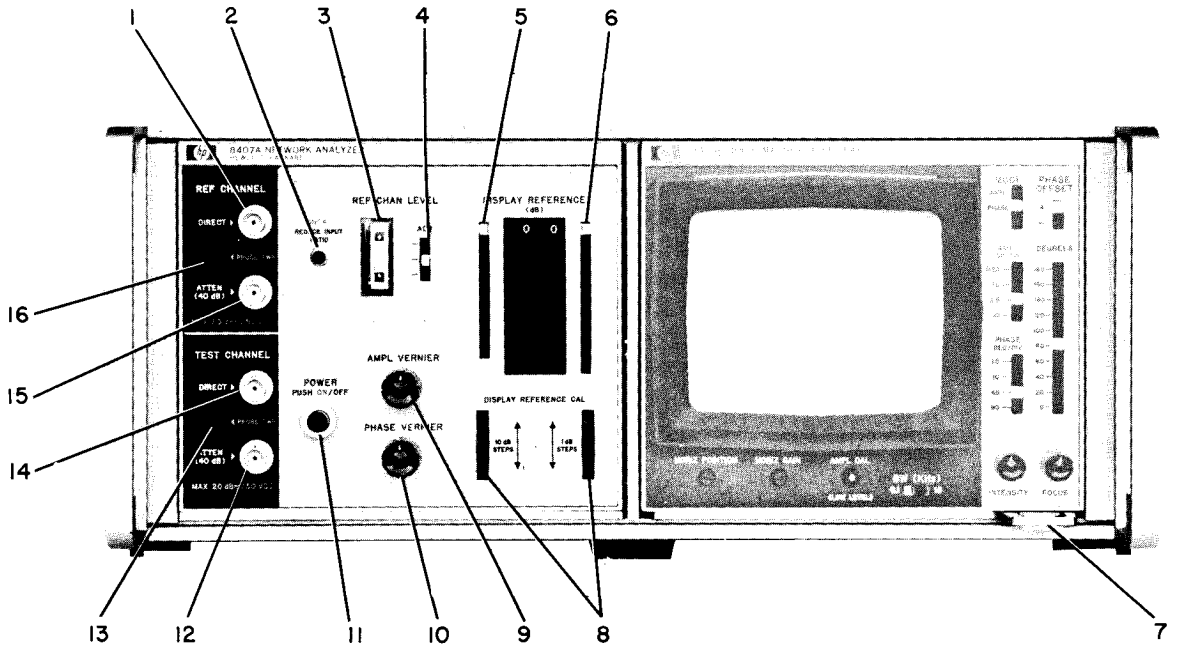
1. Connect equipment as shown in Figure 3-3, selecting one of the alternate test setups. Determine the approximate signal levels at the reference and test channel inputs and select either the DIRECT or ATTEN input connector for each channel.

2. Remove the unit or units under test and connect both reference and test cables to the signal source for initial calibration. If alternate test setup No. 1 or 2 is used, connect the 8407A inputs to the outputs of the power splitter. If test setup No. 3 or 4 is used, connect both of the 8407A probes to the input of the unit under test.

3. Adjust the signal source rf output level for an indication in the OPERATE range of the REF CHAN LEVEL meter. Be sure that the UNCAL REDUCE INPUT RATIO light is not lit. If it is lit, the ratio between the test channel and the reference channel signals must be changed. The reference channel signal level may be increased either by the REF CHAN LEVEL ADJ switch or by changing the rf input cable from the ATTEN (40 dB) connector to DIRECT input. If the REF CHAN LEVEL meter indicates above the OPERATE range, reduce the rf signal level from the sweeper. The signal ratio between channels may also be reduced by reducing the signal level into the test channel. This may be done by changing the input rf cable from the test channel DIRECT connector to the ATTEN (40 dB) input or by reducing the rf signal level from the sweeper.

4. Adjust the plug-in display unit (8412A, 8413A, or 8414A) for a convenient zero reference. If an 8412A is used, adjust for center screen. The 8407A DISPLAY REFERENCE CAL thumbwheel controls should be set to

FRONT PANEL FEATURES



1. REF CHANNEL DIRECT Input Connector. Reference channel RF input for signal inputs in the range of −10 to −90 dBm. If the input RF signal is greater than −10 dBm, the ATTEN input should be used. In this case a 50-ohm termination must be connected to DIRECT input.
2. UNCAL REDUCE INPUT RATIO light. This is an overload indicator that monitors signal levels of the test channel within the instrument. When an overload occurs, either the reference channel signal must be increased, or the test channel signal must be decreased. The reference channel signal may be increased by either adjusting the REF CHANNEL LEVEL ADJ attenuator switch or by changing the RF input cable from ATTEN to DIRECT input. The test channel signal may be decreased by changing the RF input cable from DIRECT to ATTEN input, or by reducing the RF signal level from the sweep oscillator.
3. REF CHAN LEVEL Meter. An indication in the OPERATE range of the meter shows that the reference-channel input signal level is in the correct range to make signal measurements.
4. REF CHAN LEVEL ADJ Switch. The Switch is a three-position attenuator in the reference channel. Each step is 20 dB. The switch allows the reference channel signal to be adjusted to produce a REF CHAN LEVEL meter indication in the OPERATE range.
5. DISPLAY REFERENCE (dB) Ten dB/Step Switch. This switch offsets the amplitude trace on the plug-in display by adding or reducing gain of the test channel in 10 dB steps.
6. DISPLAY REFERENCE (dB) One dB/Step Switch. This switch offsets the amplitude

Figure 3-1. Front Panel Features (1 of 2)

FRONT PANEL FEATURES

trace on the plug-in display by adding or reducing gain of the test channel in 1 dB steps.

7. Pivoting lever installs, retains, and extracts the plug-in display units.

8. DISPLAY REFERENCE CAL Thumbwheels. These thumbwheels set the scales for the DISPLAY REFERENCE 10 dB/step and 1 dB/step switches. This allows the scales to be set at zero dB for the calibration position of the switches. When measuring gain or attenuation, the displayed magnitude trace may be returned to the calibration point on the graticule with the DISPLAY REFERENCE switches. This allows the total gain or attenuation of the unit under test to be read directly from the DISPLAY REFERENCE scales.

9. AMPL VERNIER Control. Uncalibrated test channel gain vernier with at least 2 dB of continuous range. Gain increases with clockwise rotation.

10. PHASE VERNIER Control. Uncalibrated vernier adjustments of the phase between reference and test channel signals. Range is at least 50 degrees.

11. POWER ON/OFF Switch. Combination line power switch and power indicator. Switch lights when instrument is on.

12. TEST CHANNEL ATTEN (40 dB) Input Connector. Test channel RF input that attenuates the RF input signal by 40 dB greater than the TEST CHANNEL DIRECT input. Signal input range for the ATTEN input is between +20 and −50 dBm. If the input RF signal is less than −50 dBm, the DIRECT input should be used. Damage level is above +26 dBm and 50 Vdc.

13. TEST CHANNEL PROBE POWER Connector. Provides power for active test-channel accessory probe.

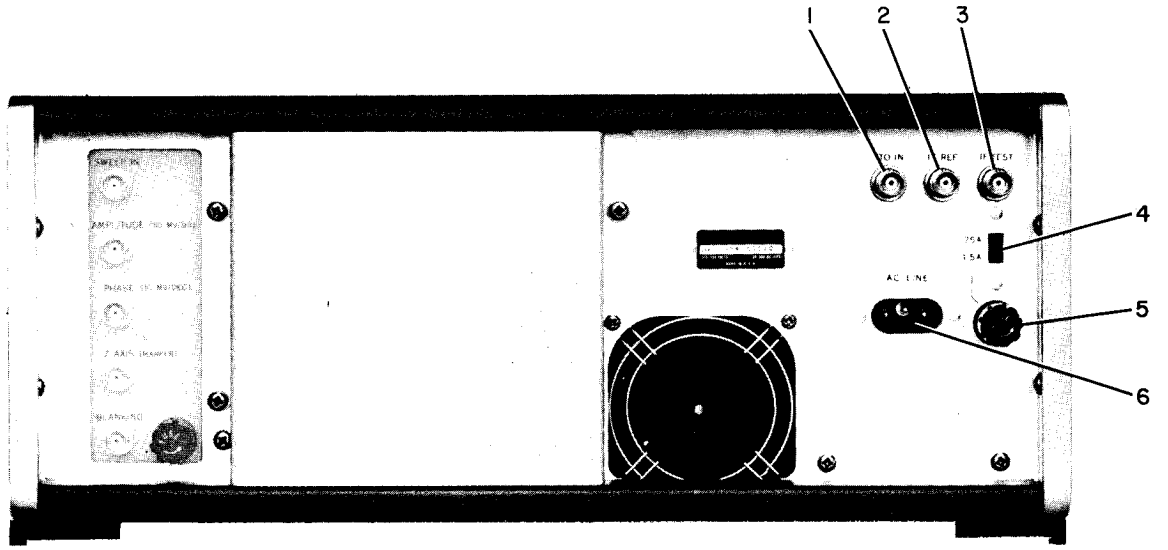
14. TEST CHANNEL DIRECT Input Connector. Test channel RF input that is used for signal inputs in the range of −10 to −90 dBm. If the input RF signal is greater than −10 dBm, the ATTEN input should be used. In this case, a 50-ohm termination must be connected to DIRECT input. Damage level is above +26 dBm and 50 Vdc.

15. REF CHANNEL ATTEN (40 dB) Input Connector. Reference channel RF input that attenuates the RF input signal by 40 dB greater than the REF CHANNEL DIRECT input. Signal input range for the ATTEN input is between +20 and −50 dBm. Damage level is above +26 dBm and 50 Vdc.

16. REF CHANNEL PROBE POWER connector. Provides power for active reference-channel accessory probe.

Figure 3-1. Front Panel Features (2 of 2)

REAR PANEL FEATURES



1. VTO IN Connector. Input for voltage tuned oscillator (VTO) signal from sweeper. VTO signal frequency should be in the range of 200.1 to 310 MHz and power level should be between −5 and −15 dBm nominal. The VTO signal is frequency locked to the sweeper RF output signal. The HP 8601A or 8690B/8698B Sweep Oscillator VTO output provides the proper signal.

2. IF REF Connector. IF reference channel signal output. This signal is a 278 kHz sine wave with fixed amplitude at about 1 volt p-p.

3. IF TEST Connector. IF test channel signal output. This is a 278 kHz sine wave signal containing all the amplitude and phase information present on the RF input signal. Amplitude range is 0 to about 1 volt p-p.

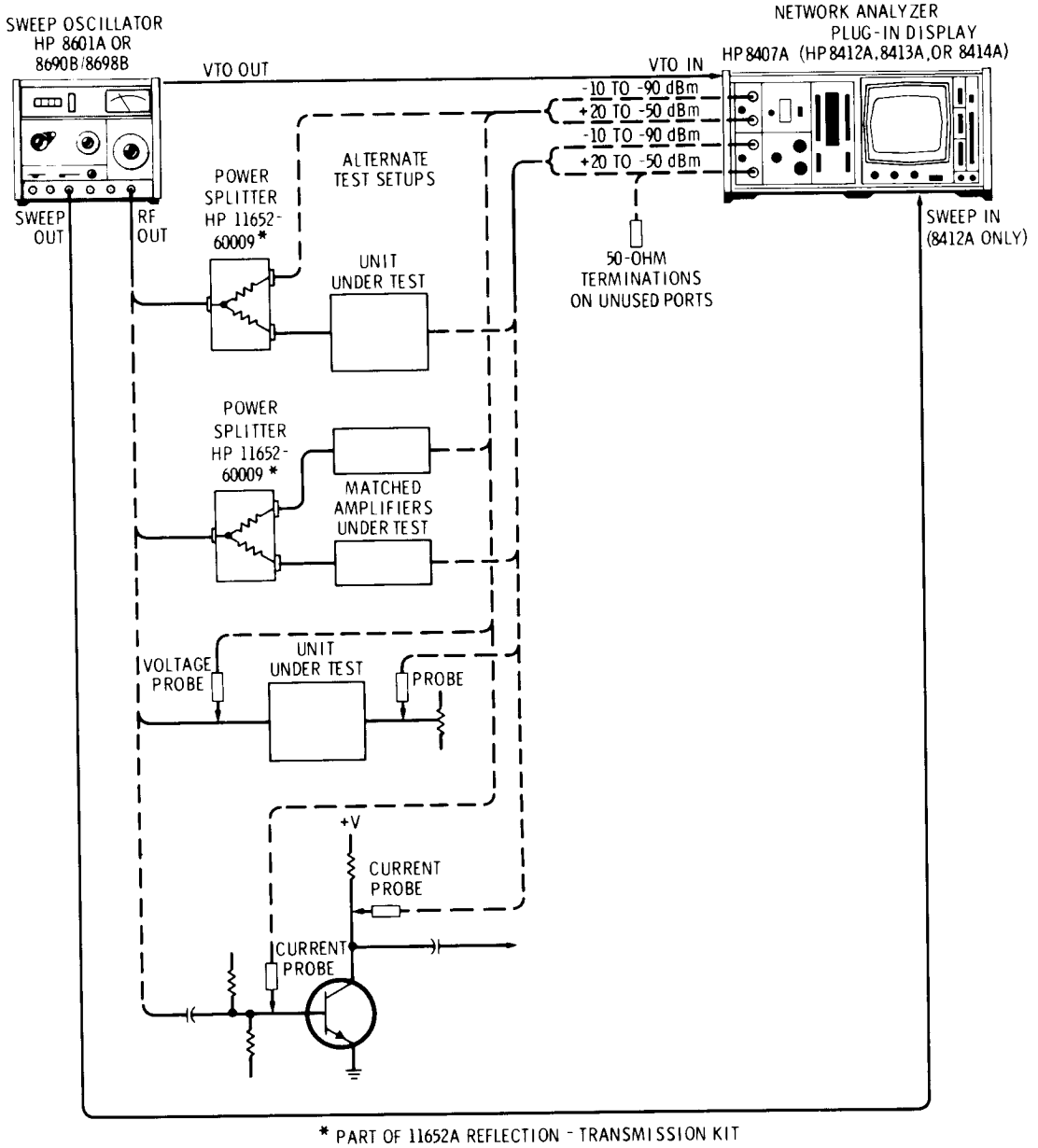
4. Line Voltage Selector. Permits operation from 115 or 230 Vac. Number showing on the slider is the selected operating voltage. Adjacent number on the panel is the correct line fuse rating.

5. Power Line Fuseholder. Fuse should have rating shown adjacent to the number on line voltage selector.

6. AC LINE Power Cable Connector. NEMA type with offset pin connected to 8407A cabinet. Power requirements: 115 or 230 Vac ±10%, 50 to 60 Hz, approximately 85 watts.

Figure 3-2. Rear Panel Features

TRANSMISSION TEST SETUP



* PART OF 11652A REFLECTION - TRANSMISSION KIT

Figure 3-3. Transmission Test Setup

zero dB for the calibraton setting of the DISPLAY REFERENCE switches.

5. Reconnect the unit under test into the test setup and make a transmission measurement. The attenuation or gain may be determined by adjusting the DISPLAY REFERENCE switches to place a selected section of the trace on the calibration graticule. The attenuation or gain of the unit under test may then be read directly from the DISPLAY REFERENCE switch setting.

3-14. REFLECTION MEASUREMENTS.

3-15. To perform a typical reflection measurement, use the following general procedure:

1. Connect equipment as shown in Figure 3-4. Connect the RF short to the LOAD port of the directional bridge. Set the REF CHAN LEVEL ADJ switch to the middle position.

2. Adjust the signal source RF output level for an indication in the OPERATE range of the REF CHAN LEVEL meter. Be sure the test channel UNCAL REDUCE INPUT RATIO light is not lit. If it is lit, reduce the RF power from the signal source or change the REF CHAN LEVEL ADJ switch position until the light goes out.

3. With the RF short installed on the LOAD port, the reflection coefficient is 1.0 at 180 degrees and the return loss is zero dB. Adjust the plug-in display unit (8412A, 8413A, or 8414A) for a convenient zero reference. If an 8412A is used, adjust the 8407A DISPLAY REFERENCE and AMPL VERNIER controls for a magnitude trace on the top graticule line of the 8412A CRT and adjust 8407A PHASE VERNIER to position the phase trace on a convenient graticule line. If an 8413A is used with an oscilloscope for swept operation, adjust the oscilloscope amplitude trace to the top graticule on the CRT and the phase trace at a convenient center scale position. If an 8414A is used, adjust the 8407A DISPLAY REFERENCE, AMPL VERNIER controls to adjust the dot to the center left edge of the CRT.

4. Remove the RF short from the LOAD port of the directional bridge and connect the unit under test to the port. Make the reflection measurement.

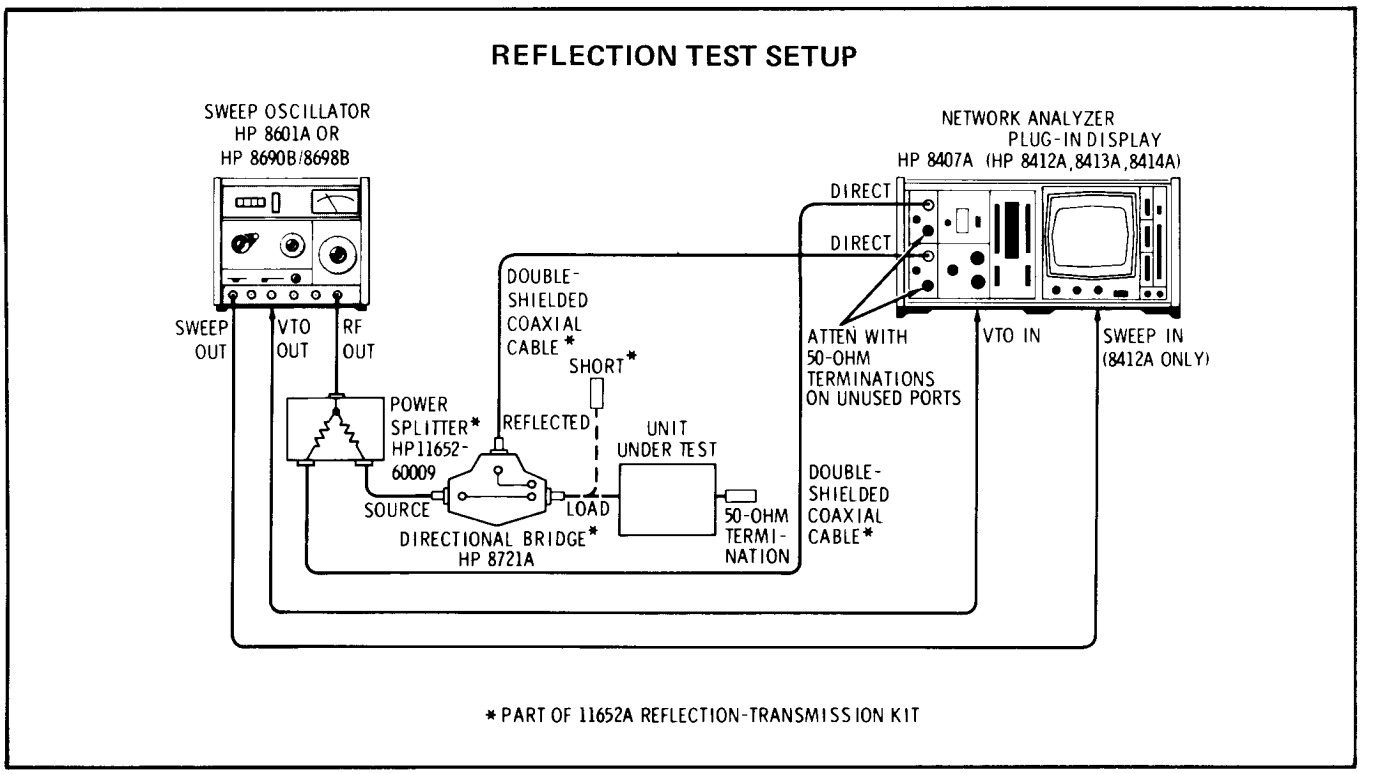


Figure 3-4. Reflection Test Setup

SECTION IV
PRINCIPLES OF OPERATION

4-1. GENERAL.

4-2. The Model 8407A Network Analyzer converts rf input signals to 278 kHz IF signals, while retaining the amplitude and phase information of the original rf input signals. An automatic gain control circuit levels the common-mode signal variations, allowing accurate measurements of amplitude and phase difference between the reference and test channels. The 278 kHz IF signals are applied to the input of a plug-in display, where the signals are detected and displayed on a CRT or meter as phase and magnitude information.

4-3. The 8407A contains precision attenuators in the test channel to facilitate amplitude measurements. Built-in input signal attenuators in both test and reference channels allow a wide range of rf input signal levels.

4-4. A simplified block diagram of the 8407A is shown in Figure 4-1. A more detailed block diagram is shown in Figure 7-7 and detailed theory of operation is presented in Section VII opposite the individual schematic diagrams.

4-5. SIMPLIFIED BLOCK DIAGRAM DESCRIPTION.

4-6. As shown in Figure 4-1, the reference and the test signals may be applied to either an attenuated or a direct input. The direct inputs are for rf signals in the range of −10 dBm to −90 dBm and the attenuated inputs accomodate signal inputs of +20 to −50 dBm. The 0.1 to 110 MHz rf test and reference signals are each mixed in separate IF mixer circuits that are driven by a common local oscillator signal. The output of the two IF mixers is a 278 kHz reference and a test IF signal.

4-7. The local oscillator signal applied to the IF mixers is derived from the difference between the 199.722 MHz oscillator and the VTO signal from the sweeper. The VTO signal from the sweeper is 200 MHz away from the rf input test and reference signals. In order to hold the 199.722 MHz oscillator on frequency, the 278 kHz IF signal is compared to a 278 kHz crystal oscillator in a phase detector circuit, and a resultant correction voltage is applied to the 199.722 MHz oscillator. These circuits form a phase-lock loop to hold the IF at 278 kHz. When the IF signal is not at 278 kHz, the 199.722 MHz oscillator searches above and below that frequency to attempt to phase lock the incoming rf signal. When 278 kHz is sensed from the IF, the oscillator stops searching and locks with the incoming rf signal.

4-8. An automatic level control circuit maintains a constant local oscillator (LO) signal level to the IF mixers. Holding the LO signal constant is necessary to obtain high-accuracy amplitude measurements.

4-9. The reference channel IF signal passes through a step attenuator that provides 20 dB/step of attenuation. This accomodates a wide range of reference channel signals without overloading the reference channel IF amplifier. The setting of the reference channel step attenuator does, however, affect the test channel amplitude, since the gain of the test channel AGC IF amplifier is controlled by the common AGC feedback amplifier which operates from the reference channel signal.

4-10. The AGC IF amplifiers in the reference and test channels, together with the AGC feedback amplifier, level the IF signals to eliminate common-mode signal-level variations. This allows precise amplitude measurements with an unleveled rf sweep oscillator source.

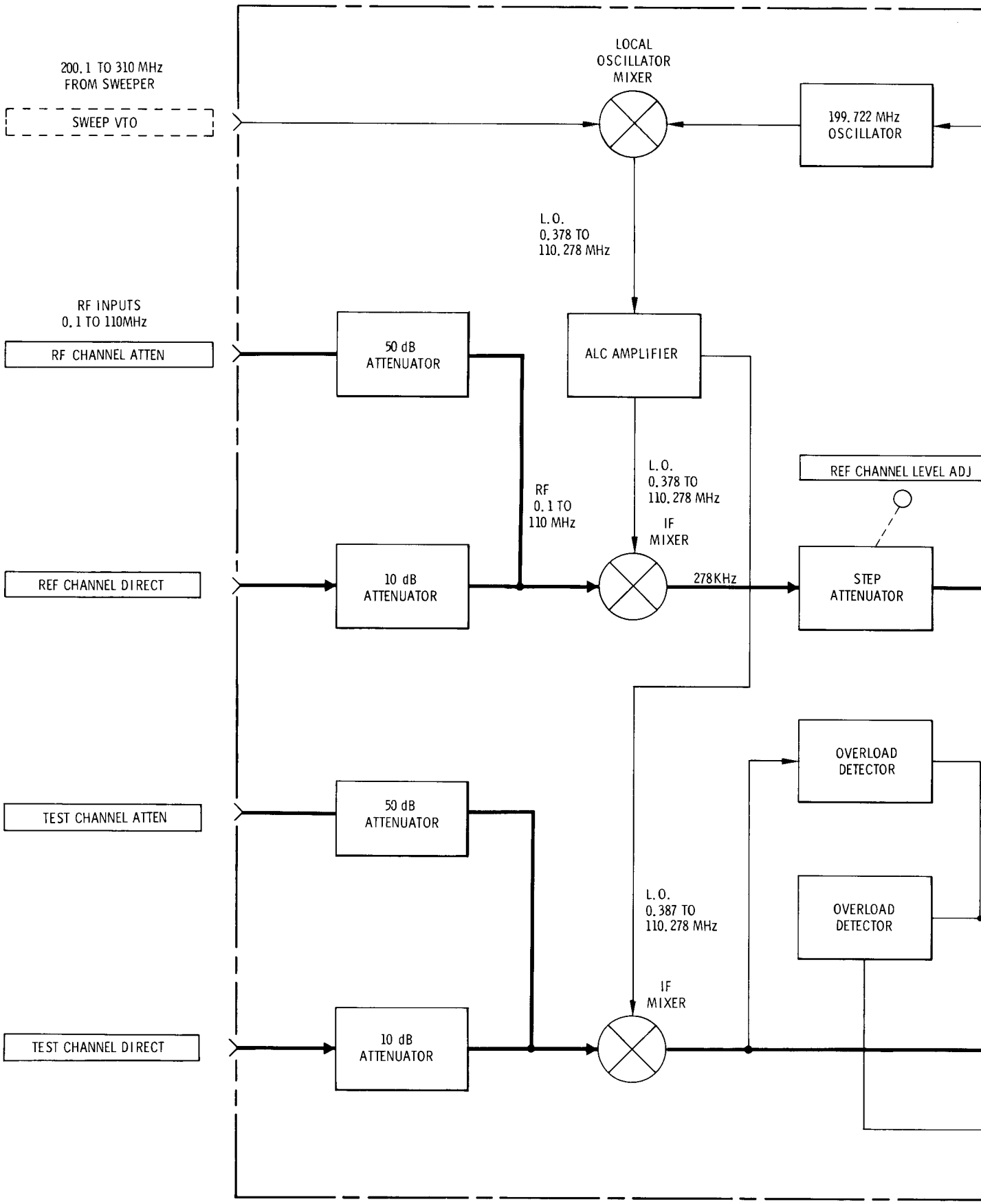
4-11. The reference channel contains a phase shift network that allows the phase of the reference channel to be changed approximately 50 degrees by the front panel PHASE VERNIER control. The output from the phase shift circuit is applied to the plug-in display and to the rear panel IF REF OUT connector.

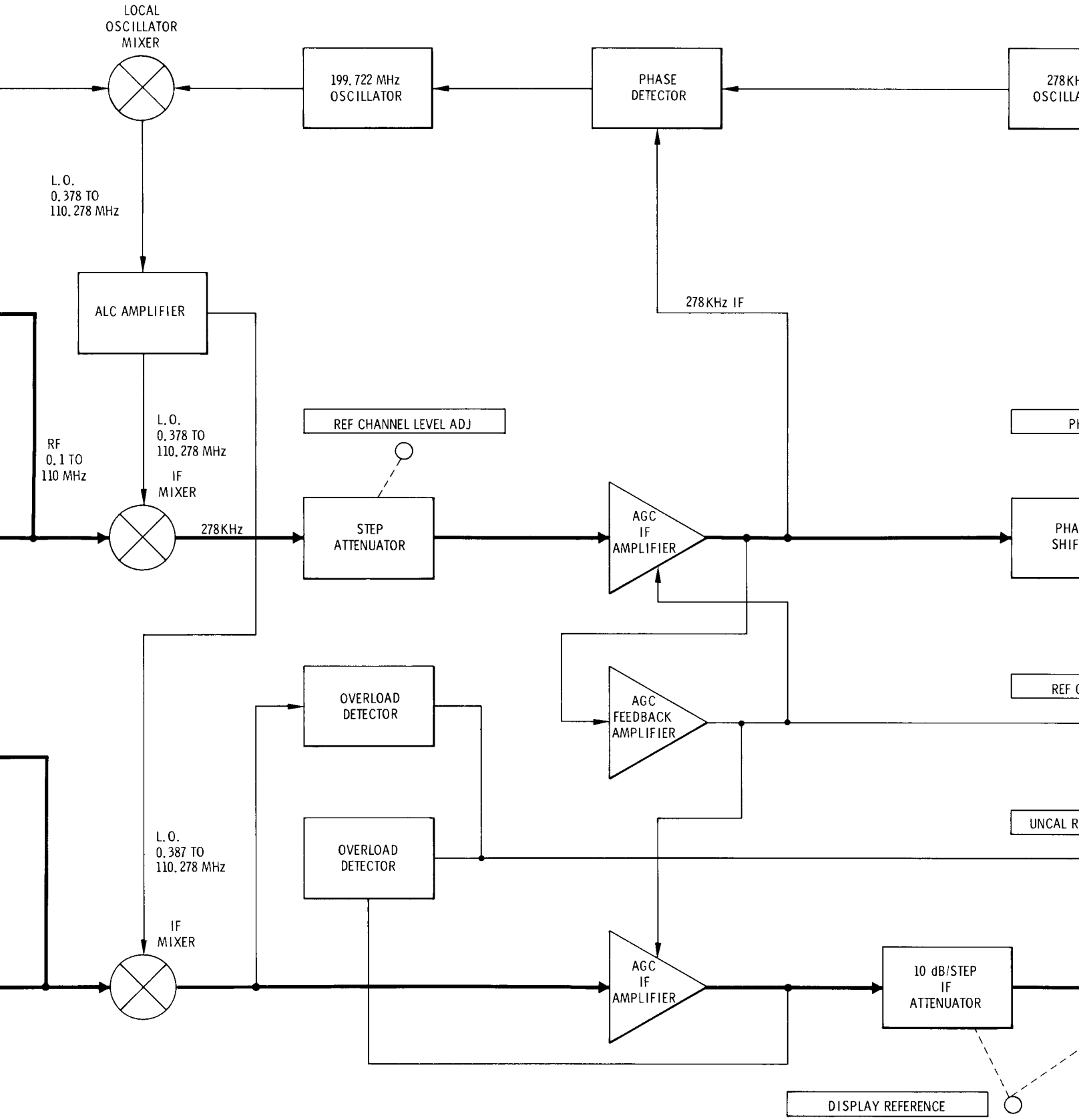
4-12. The test channel signal from the IF mixer passes through the AGC IF amplifier, leveling the common mode variations in signal level. The output of the test channel IF mixer and the output of the AGC IF amplifier both are monitored by overload detector circuits. These circuits detect signal levels that are above a preset level and light the UNCAL REDUCE INPUT RATIO light. When this light is lit, the signal level passing through the test

channel IF stages is too high to make accurate measurements. If the overload occurs in the IF mixer, the test channel rf input signal must be reduced to eliminate the overload. However, if the overload occurs in the test channel AGC IF amplifier, the overload may be eliminated either by reducing the rf input signal to the test channel or by obtaining a higher AGC voltage into the test channel AGC IF amplifier. Increasing the AGC voltage will reduce the gain of the IF amplifier and eliminate overload in that stage. Higher AGC voltage is obtained by increasing the signal level through the reference channel IF amplifier. This may be accomplished either by changing the REF CHAN LEVEL ADJ to a higher position or by increasing the RF input signal level at the reference channel input.

4-13. The 278 kHz test channel IF signal from the AGC IF amplifier passes through a 10 dB/step and a 1 dB/step attenuator controlled from the front panel DISPLAY REFERENCE switches. These switches allow up to 89 dB of amplitude offset for convenience in setting amplitude reference levels and making amplitude measurements. The AMPL VERNIER control also works through the 1 dB/step IF attenuator for fine adjustment of the amplitude trace on the plug-in display.

4-14. The output from the 1 dB/step IF attenuator is the test channel amplitude and phase signals for the plug-in display. The test channel signal is also applied to the rear panel IF TEST OUT connector.


200.1 TO 310 MHz
FROM SWEEPER
SWEEP VTO
LOCAL
OSCILLATOR
MIXER
199.722 MHz
OSCILLATOR
L.O.
0.378 TO
110.278 MHz
RF INPUTS
0.1 TO 110MHz
RF CHANNEL ATTEN
50 dB
ATTENUATOR
ALC AMPLIFIER
REF CHANNEL LEVEL ADJ
RF
0.1 TO
110 MHz
L.O.
0.378 TO
110.278 MHz
IF
MIXER
REF CHANNEL DIRECT
10 dB
ATTENUATOR
278KHz
STEP
ATTENUATOR
OVERLOAD
DETECTOR
TEST CHANNEL ATTEN
50 dB
ATTENUATOR
L.O.
0.387 TO
110.278 MHz
OVERLOAD
DETECTOR
IF
MIXER
TEST CHANNEL DIRECT
10 dB
ATTENUATOR


LOCAL
OSCILLATOR
MIXER
199.722 MHz
OSCILLATOR
PHASE
DETECTOR
278KH
OSCILLA
L.O.
0.378 TO
110.278 MHz
ALC AMPLIFIER
278KHz IF
REF CHANNEL LEVEL ADJ
L.O.
0.378 TO
110.278 MHz
RF
0.1 TO
110 MHz
IF
MIXER
278KHz
STEP
ATTENUATOR
AGC
IF
AMPLIFIER
PHA
SHIF
OVERLOAD
DETECTOR
AGC
FEEDBACK
AMPLIFIER
REF C
UNCAL R
L.O.
0.387 TO
110.278 MHz
OVERLOAD
DETECTOR
IF
MIXER
AGC
IF
AMPLIFIER
10 dB/STEP
IF
ATTENUATOR
DISPLAY REFERENCE

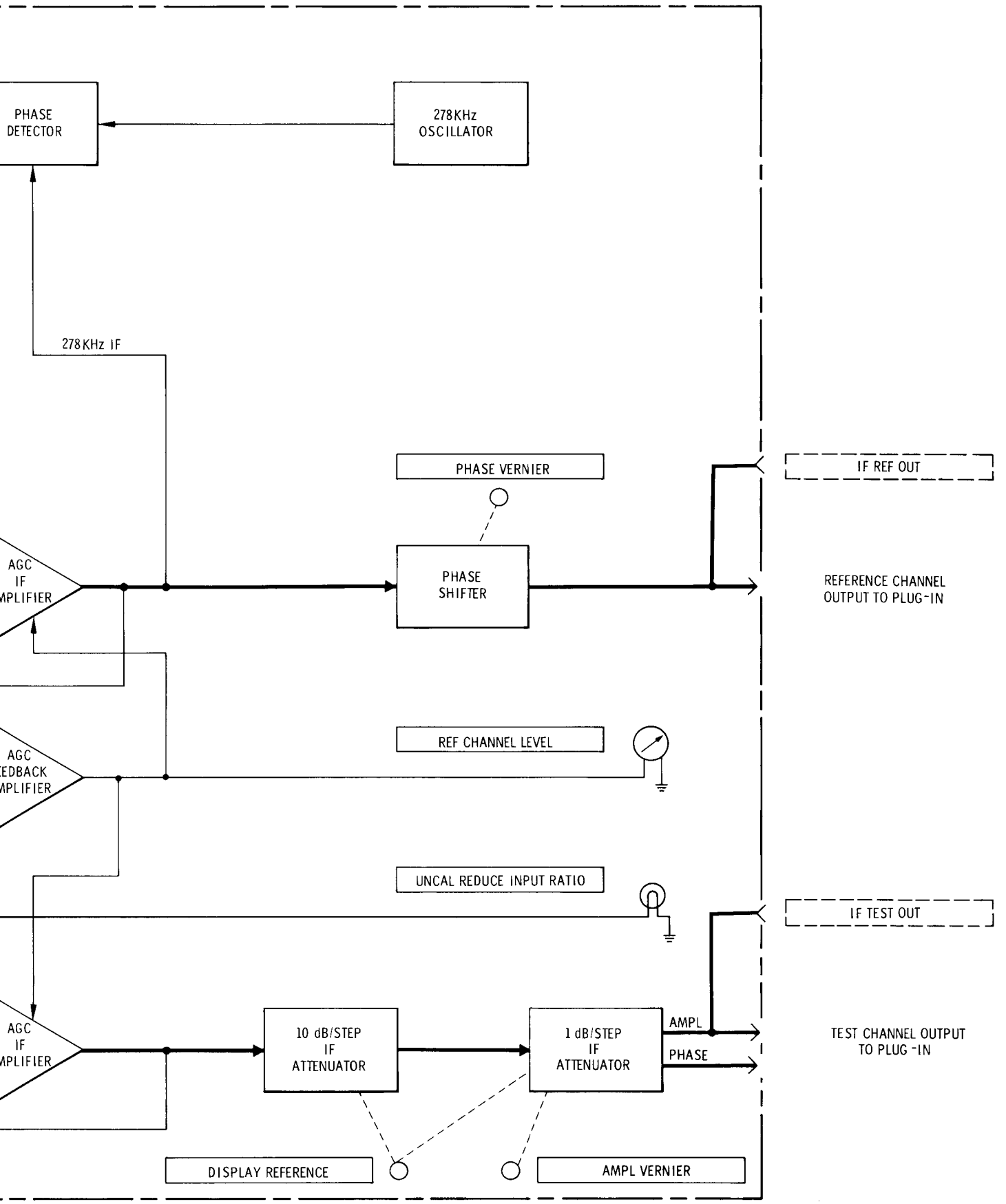


Figure 4-1. Simplified Block Diagram

SECTION V
MAINTENANCE

5-1. INTRODUCTION

5-2. This section provides instructions for performance testing, calibration, and troubleshooting of the HP8407A Network Analyzer. Test equipment required for these procedures is listed in Table 5-2. If the test equipment recommended is not available, other equipment may be used if its performance meets the "Critical Specifications" listed in the table.

5-3. PRINTED CIRCUIT BOARD EXCHANGE

5-4. The 8407A is unique in that the printed circuit boards of the instrument have been carefully designed to be independent of each other so that problems can be easily isolated to the board level. HP encourages the use of the troubleshooting tree in Section VII for isolating problems to the board level and has made rebuilt-exchange printed circuit boards available to complement this repair approach. The rebuilt-exchange boards are available at a much reduced cost from a new board. The lower price is dependent on the return of the defective board to HP. A replacement board should be ordered by the rebuilt-exchange stock number listed in Table 5-1. The board can be ordered through the nearest Hewlett-Packard Sales and Service office listed in the back of this manual. The exchange board will immediately be sent directly from our stock of service parts. Upon receiving the replacement board, the faulty board should be returned in the same special carton in which the new board was received. Do not return a defective board to HP until the replacement board has been received.

5-5. If a defective exchange board will not be returned to HP and the ordered board is for spare parts stock, etc., a new board should be ordered, using the new assembly stock number listed in Table 5-1 or 6-1.

5-6. MAINTENANCE PRECAUTIONS

CAUTION

Do not apply greater than +26 dBm RF power or 50 Vdc at the RF input connectors of the 8407A or damage to the internal components may result.

5-7. PERFORMANCE TESTS

5-8. The procedures in Table 5-3 test the performance of the 8407A. These procedures may be used during incoming inspection, periodic evaluation, or after repair or alignment. The test may be performed without access to the instrument interior. The specifications of Table 1-1 are the performance standards.

5-9. ALIGNMENT PROCEDURES

5-10. Alignment procedures are given in Table 5-5. These procedures should not be performed as a routine maintenance procedure but should be used (1) after replacement of a part or component, (2) when the performance test shows that the specifications of Table 1-1 cannot be met, or (3) when instructed to do so in the troubleshooting tree (Figure 7-5). Before attempting any adjustment, allow 30 minutes warm-up time for the 8407A and plug-in.

5-11. Table 5-2 lists the test equipment required for alignment, Table 5-4 lists the alignment controls, and Figure 7-4 shows the location of the controls.

5-12. TROUBLESHOOTING

5-13. The troubleshooting procedures are given in Figure 7-5. They should be performed in the order given, since each step presumes the proper readout in preceding steps. The troubleshooting tree should isolate trouble to a defective printed circuit board or chassis-mounted part. If further fault isolation is desired, use the individual schematic diagram for the defective board and troubleshoot, using the waveforms and voltages on the schematic diagram. The troubleshooting tree assumes that chassis wiring and cabling is not defective. If this type of trouble occurs, use standard troubleshooting techniques to locate trouble.

5-14. SELECTED COMPONENTS

5-15. Some component values are selected during manufacturing in order to achieve a desired circuit performance. The typical value used in a circuit is shown on the schematic, along with a star after the

value. These components are listed in the parts list as "factory selected."

5-16. In the 8407A, A4R58, A8R20, A11R24, and A14R47 are factory selected. A4R58 is selected to produce an overload indication when a signal above a predetermined level passes through the test channel converter. A8R20 is selected to obtain the correct I.F. test channel output. A11R24 is selected to obtain a specific IF reference channel output signal. A14R47 is selected for a specific phase-locked oscillator output.

Table 5-1. Rebuilt-Exchange Assembly Part Numbers

Assembly	New Part No.	Rebuilt-Exchange Assy Part No.
A1 Front Panel Switch Assembly	08407-60014	08407-60143
A2 Front Panel Assembly	08407-60022	08407-60144
A2A1 Phase Vernier	08407-60052	08407-60115
A2A2 Amplitude Vernier	08407-60053	08407-60116
A3 Ref Channel Converter	08407-60093	08407-60101 (A3 and A4 Matched Set and W10 Cable)
A4 Test Channel Converter	08407-60092	
A5 Rectifier Assembly	08407-60026	08407-60117
A6 Master Board	08407-60015	None
A7 Programmable IF Attenuator	08407-60011	08407-60103
A8 Test Channel AGC Amplifier	08407-60005	08407-60104 (A8 & A11 Matched Pair)
A9 Test IF Bandpass Filter	08407-60006	08407-60105
A10 AGC Feedback Amplifier	08407-60010	08407-60106
A11 Reference Channel AGC Amplifier	08407-60004	08407-60104 (A8 & A11 Matched Pair)
A12 Reference IF Bandpass Filter	08407-60006	08407-60105
A13 Automatic Level Control	08407-60002	08407-60102
A14 Phase-Lock Oscillator	08407-60123	08407-60107
A15 Local Oscillator Mixer	08407-60012	08407-60110
A16 VTO Amplifier	08407-60001	08407-60112
A17 Power Supply	08407-60013	08407-60113

Table 5-2. Recommended Test Equipment

Instrument	Critical Specifications	Recommended HP Model
Dual Trace Oscilloscope with 10 pF 10:1 probes	Vertical Amplifier: Dual trace Bandwidth: 50 MHz minimum Horizontal Sweep Rate: 0.1 μS/cm Vertical Sensitivity: 5 mV/cm	180A/1801A/1820A
DC Digital Voltmeter	Accuracy: 0.05% Input Impedance: 10 megohms minimum Automatic Range Selection: Range to 150V	3439A/3443A
Sweep Oscillator	Range: 0.1 to 110 MHz RF Output: +13 dBm VTO Output: Tracks 200 MHz from RF Output signal.	8601A (0.1—110 MHz) 8690B/8698B (0.4—110 MHz)
Spectrum Analyzer	Frequency: 500 kHz to 350 MHz	8554L/8552A/141S
Plug-In Indicator	No substitute	8412A
0—120 dB Step Attenuator (calibrated)	Attenuation: 0 to 80 dB in 10 dB steps Input and Output Impedance: 50 ohms Calibration: Amplitude at each 10-dB step to 80 dB, Phase at 80 dB referenced from 0 dB position. Calibration Accuracy: ±0.3 dB, ±1 degree Calibration Frequency: 10 MHz and 40 MHz	355D, calibrated by Standards Laboratory
0—12 dB Step Attenuator (calibrated)	Attenuation: 0 to 10 dB in 1-dB steps Input and Output Impedance: 50 ohms Calibration: Amplitude at each 1-dB step to 10 dB, referenced from 0-dB position. Calibration Accuracy: ±0.1 dB Calibration Frequency: 40 MHz	355C, calibrated by Standards Laboratory
Transmission—Reflection Accessory Kit	Includes: Power Splitter, HP 11652-60009 Directional Bridge, HP 8721A BNC Short, HP 1250-0929 3 Double-Shielded coaxial cables BNC 50-ohm load, HP 11652-60001 Plug-Plug Adapter, HP 1250-0080 BNC Elbow, HP 1250-0076	11652A
BNC Tee	Impedance: 50 ohms Connectors: BNC	1250-0781 (UG274 B/U)
50-ohm Termination (2 required)	Impedance: 50 ohms Connector: BNC	1250-0207
Subminiature RF Tee Adapter, Jack-Plug-Jack	Impedance: 50 ohms Type: Subminiature coaxial	1250-0838
Subminiature RF Adapter, Plug-Plug	Impedance: 50 ohms Type: Subminiature coaxial	1250-1113
Subminiature RF to BNC Adapter	Impedance: 50 ohms Type: Subminiature coaxial and BNC	1250-0831

Table 5-3. Performance Test

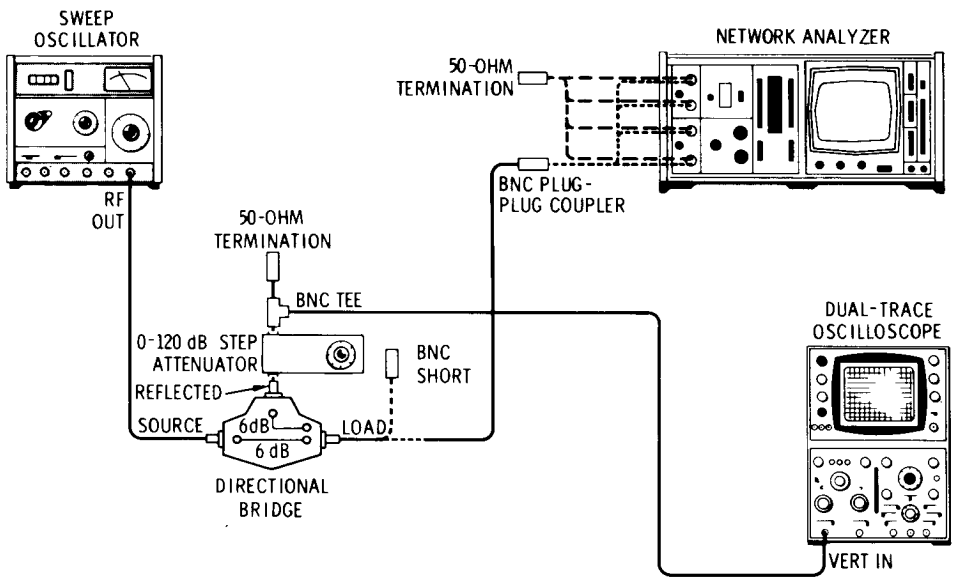
TEST	PROCEDURE
	NOTE The sweep oscillator RF blanking should be off for all performance tests. CAUTION Do not apply greater than +26 dBm RF signal or 50 Vdc to any of the 8407A input connectors or damage to the internal components may result.
1	**RF INPUT CONNECTOR VSWR** SPECIFICATIONS: Test and reference channel input connectors have VSWR <1.08. DESCRIPTION: A reference level is obtained by applying a signal at the SOURCE input of the directional bridge that will produce a +20 dBm RF signal at the LOAD output of the bridge. This signal is reflected back to the oscilloscope through the REFLECTED arm of the bridge. With a BNC short connected to the LOAD connector of the bridge, the reflection coefficient of the LOAD port is 1.0 and all of the signal is reflected. This reference signal is noted at the oscilloscope as a reference. The short is then removed, the directional bridge connected to one of the 8407A input ports, and the reflected signal from the input port is noted. The reflection coefficient (ρ) may be calculated by dividing the reflected value by the reference value. The reflection coefficient is easily converted to VSWR mathematically. TEST SETUP: 

Table 5-3. Performance Test (cont'd)

TEST 1 (cont'd) — **PROCEDURE**

EQUIPMENT REQUIRED:

Sweep Oscillator, HP 8601A or 8690B/8698B
Directional Bridge, HP 8721A (Part of Kit) *
Oscilloscope, HP 180A/1801A/1820A
Two 50-Ohm Terminations (inc. with 8407A)
BNC Tee, HP Stock No. 1250-0781 (UG274 B/U)
BNC Short*
BNC Plug-Plug Coupler, HP Stock No. 1250-0216 (UG 491)*
0—120 dB Step Attenuator, HP 355D

*Part of Reflection-Transmission Accessory Kit, HP 11652A

PROCEDURE:

CAUTION

Do not apply greater than +26 dBm RF signal or 50 Vdc to any of the 8407A input connectors or damage to the internal components may result.

a. Turn 8407A on. Set sweep oscillator at 40 MHz for CW operation. Connect BNC short to directional bridge LOAD connector. Set 0—120 dB step attenuator to 30 dB. Set oscilloscope to most sensitive range. Adjust sweep oscillator RF output for a four centimeter P-P trace on oscilloscope. This is the reference level and represents a reflection coefficient at the bridge LOAD port of 1.0.

b. Set 0-120 dB step attenuator to zero dB. Disconnect the BNC short from bridge LOAD port and connect LOAD port of bridge to 8407A input ports, one at a time. When measuring VSWR of one port, connect a 50-ohm termination to the other port of the same channel. The table below gives the oscilloscope indication limits for a VSWR of 1.08 with the uncertainty due to the 40 dB directivity of the directional bridge.

Oscilloscope Indication (P-P)	VSWR of Port is Within Tolerance
Less than 4 cm	Yes
4 to 8 cm	Uncertain
Greater than 8 cm	No

2 CROSSTALK

SPECIFICATION: Crosstalk and residual low-level signals are below —90 dBm.

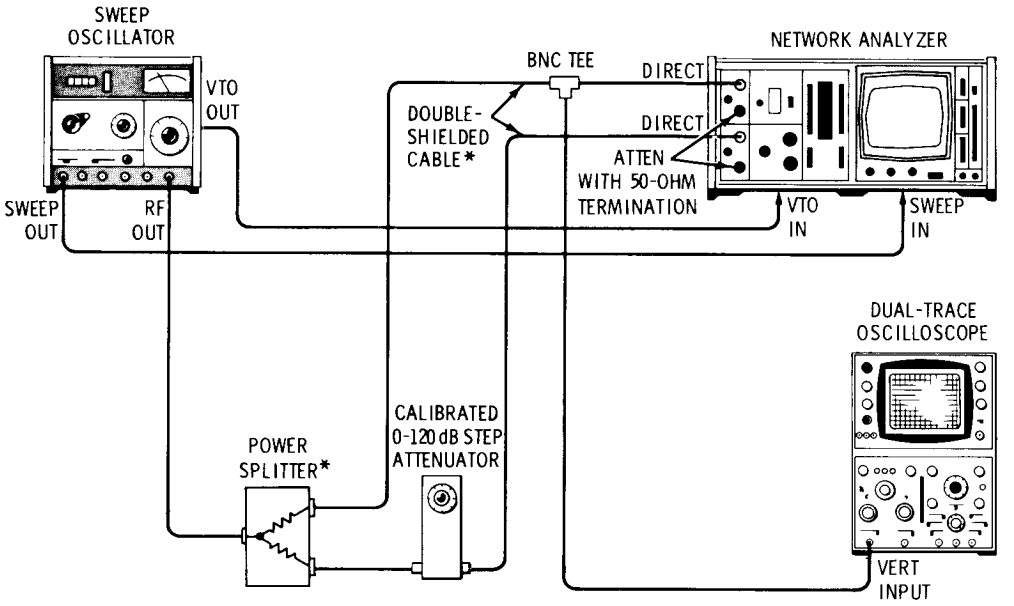
NOTE

The amplitude and phase error due to crosstalk and residual low-level signals will be less than or equal to that shown on the graph in the table of specifications when the level measured in this test is below —90 dBm.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
2 (cont'd)	DESCRIPTION: The input level to both channels is set to —10 dBm. A reference level is obtained on the display unit and the test channel input signal is disconnected. With RF signal applied only to the reference channel, any signal present in the test channel is due to signal leakage between channels (crosstalk) and test channel residual low-level signals. The test channel signal with the input disconnected is measured on the display unit.

TEST SETUP:



EQUIPMENT REQUIRED:

Sweep Oscillator, HP 8601A or 8690B/8698B
Plug-In Indicator, HP 8412A
Oscilloscope, HP 180A/1801A/1820A
Power Splitter, HP 11652-60009 Part of Accessory Kit*)
0 — 120 dB Step Attenuator, HP 355D (calibrated in amplitude & phase at 40 MHz)
Two Double Shielded Cables (Part of Accessory Kit*)
Two 50-Ohm Terminations (inc. with 8407A)
BNC Tee, HP Stock No. 1250-0781 (UG274 B/U)

*Part of HP 11652A Accessory Kit

PROCEDURE:

a. Connect equipment as shown in test setup. Adjust the sweep oscillator output level for —4 dBm. (Minus 4 dBm less the power splitter insertion loss of 6 dB = —10 dBm at 8407A input). Connect both power splitter outputs to the 8407A DIRECT inputs.

b. Set sweep oscillator for full bandwidth sweep between 1 and 110 MHz. Set RF blanking and markers off. Set 8407A REF CHAN LEVEL ADJ switch to lower position. Set 8412A BW(kHz) switch to 0.1 , MODE switch to AMPL, and AMPL

Table 5-3. Performance Test (cont'd)

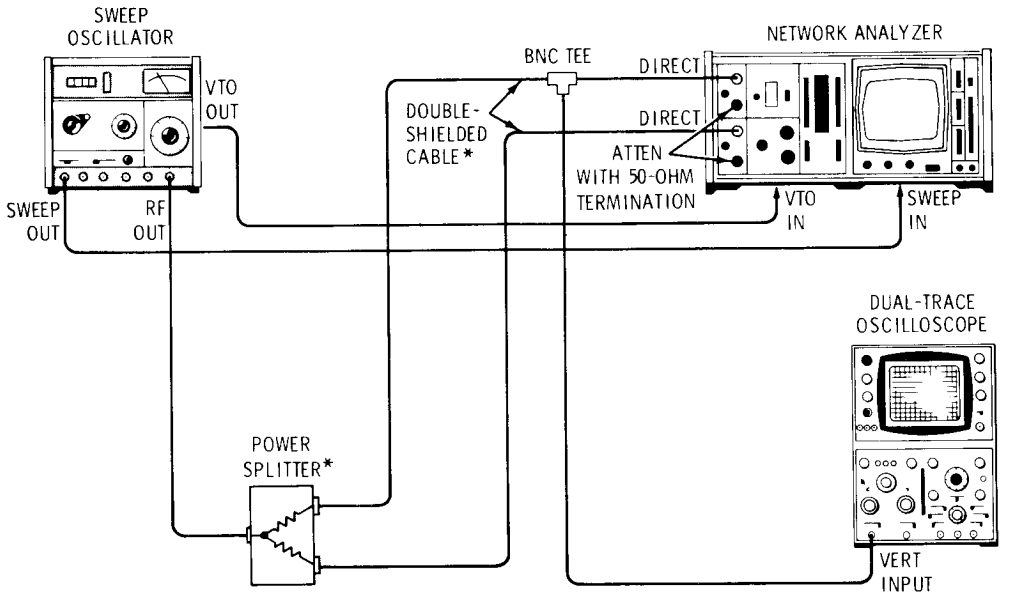
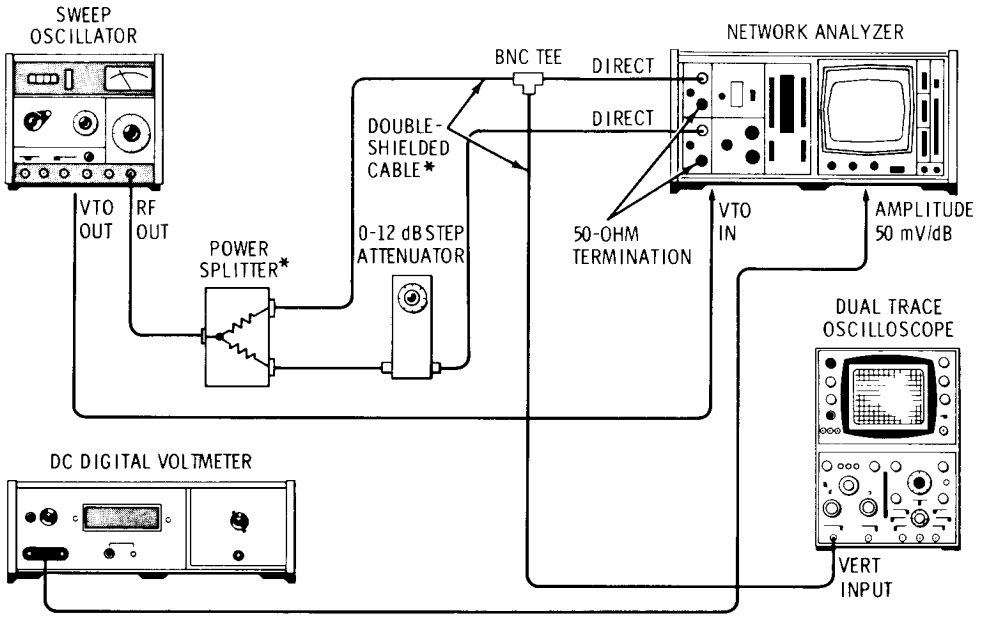
TEST	PROCEDURE
2 (cont'd)	DB/DIV switch to 10. Adjust 8407A DISPLAY REFERENCE switches and AMPL VERNIER control to place the 8412A amplitude trace on the top graticule line. The displayed trace is the −10 dBm reference. c. Disconnect the test channel input signal. Move the 10 dB/step DISPLAY REFERENCE switch one position up. The bottom 8412A graticule line is now −100 dBm. The displayed trace should be below the −90 dBm graticule line.
3	**COMMON MODE LEVEL VARIATIONS (AGC TRACKING)** SPECIFICATIONS: Amplitude change is <0.5 dB/10 dB step and phase change is <0.8 degrees/10 dB step over 30 dB operating range. DESCRIPTION: The common-mode sweep oscillator signal is adjusted through a 30-dB range and the accompanying change in the amplitude and phase trace is observed on the display unit. TEST SETUP:  EQUIPMENT REQUIRED: Sweep Oscillator, HP 8601A or 8690B/8698B Plug-In Indicator, HP 8412A Oscilloscope, HP 180A/1801A/1820A Power Splitter, HP 11652-60009 (Part of Accessory Kit*) Two double Shielded Cables (Part of Accessory Kit*) Two 50-Ohm Terminations (included with 8407A) BNC Tee, HP Stock No. 1250-0781 (UG 274 B/U) *Part of HP 11652A Accessory Kit

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
3 (cont'd)	PROCEDURE: a. Connect equipment as shown in test setup. Adjust the sweep oscillator output level for −4 dBm. (Minus 4 dBm less power splitter insertion loss of 6 dB = −10 dBm at 8407A input.) Connect both power splitter outputs to the 8407A DIRECT inputs. b. Set sweep oscillator for minimum sweep width at any frequency in the 8407A operating range. Set 8407A REF CHAN LEVEL ADJ switch to lower position. Set 8412A BW(kHz) switch to 0.1, MODE switch to DUAL, AMPL DB/DIV switch to 0.25, and PHASE DEG/DIV switch to 1.0. c. Adjust the 8407A DISPLAY REFERENCE switches and AMPLITUDE VERNIER control to place the amplitude trace on a major graticule line. Adjust the PHASE VERNIER control to place the phase trace on a major graticule line. d. Reduce the RF output from the sweep oscillator by 30 dB, one 10 dB step at a time, and note change in phase and amplitude trace position at each 10 dB step. The amplitude trace should not move more than 0.5 dB and the phase trace should not move more than 0.8 degrees for each 10 dB step.
4	**DISPLAY REFERENCE 1 dB/STEP AMPLITUDE ACCURACY** SPECIFICATION: Amplitude Accuracy is <0.05 dB/1 dB step, total error does not exceed 0.1 dB. DESCRIPTION: The equipment is set up to obtain a zero dB indication (zero volts on DVM) with the 8407A 1 dB/step DISPLAY REFERENCE switch at the top position. The accuracy of each 1 dB step is measured separately using the display unit 50 mV/dB output. The test channel input level, 8407A 10 dB/step DISPLAY REFERENCE switch and AMPLITUDE VERNIER control are used to establish a new zero dB reference after each 1 dB step. By making each measurement over the same 1 dB range of the display unit, any error in the display unit will appear as a constant error for each DISPLAY REFERENCE step and may be calculated out.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
4 (cont'd)	TEST SETUP:



EQUIPMENT REQUIRED:

Sweep Oscillator, HP 8601A or 8690B/8698B
Plug-In Indicator, HP 8412A
Oscilloscope, HP 180A/1801A/1820A
DC Digital Voltmeter, HP 3439A/3443A
Power Splitter, HP 11652-60009 (Part of Accessory Kit*)
Two Double Shielded Cables (Part of Accessory Kit*)
Two 50-Ohm Terminations (included with 8407A)
BNC Tee, HP Stock No. 1250-0781 (UG 274 B/U)
0 — 12 dB Step Attenuator, HP 355C

*Part of HP 11652A Accessory Kit.

PROCEDURE:

NOTE

When using an 8412A Phase Magnitude Display Unit, perform the low-level adjustment as follows. Make this adjustment with as much precision as possible. Adjust the input power level from the sweeper and the 8407A REF CHANNEL LEVEL ADJ., DISPLAY REFERENCE 1 dB/step, and AMPLITUDE VERNIER control to obtain a zero-volt indication on the DVM with the 10dB/step DISPLAY REFERENCE switch at four positions down from the top (+40). Move the 10 dB/step DISPLAY REFERENCE switch to the bottom position. Adjust 8412A front panel AMPL CAL (LOW LEVEL) control for —2V on DVM. Repeat this adjustment until the zero and —2V indications are as precise as possible.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
4 (cont'd)	a. Connect equipment as shown in the test setup. Connect the step attenuator between the power splitter and 8407A test channel DIRECT input. b. Set the 8407A REF CHAN LEVEL ADJ to the middle position. Set the sweep oscillator for minimum sweep width at any frequency in the 8407A operating range. Adjust the RF output level for an 8407A REF CHAN LEVEL meter indication in the middle of the OPERATE range. c. Set the 8407A DISPLAY REFERENCE 1 dB/step switch to the top position and adjust the DISPLAY REFERENCE CAL thumbwheel for 0. d. Adjust the test channel input level (zero to 12 dB step attenuator at the test channel input), 8407A DISPLAY REFERENCE 10 dB/step switch, and AMPLITUDE VERNIER for zero ±0.5 mV on DVM. e. Check each DISPLAY REFERENCE 1 dB step as follows: (1) Set the DISPLAY REFERENCE 1 dB/step switch one position down. (2) The DVM indication should be −50 mV. Record the difference between −50 mV and the measured voltage as shown in the table below. (3) Adjust the test channel input level (1 dB step attenuator at the test channel input), 8407A DISPLAY REFERENCE 10 dB/step switch, and AMPLITUDE VERNIER control for zero ±0.5 mV on DVM. (4) Repeat the above steps to check the remaining 1 dB/step positions. (5) If the DVM indications are all out of tolerance on one side of −50 mV, the difference between −50 mV and the mean of all the readings may be the display unit error. Repeat this test using a second display unit, calculate the mean and correct each reading to the difference between the mean and the measured value.

Table 5-3. Performance Test (cont'd)

TEST 4 (cont'd) — **PROCEDURE**

Example of DISPLAY REFERENCE 1 dB/step Accuracy Table

Step/dB	DVM Indication	Error in mV	Error in dB*
0/0	Zero	Reference	
1/1	—49.7	—0.3	—0.006
2/2	—50.7	+0.07	< +0.002
3/3	—49.85	—0.15	—0.003
4/4	—50.1	+0.1	+0.002
5/5	—49.75	—0.25	—0.005
6/6	—50	Zero	Zero
7/7	—50.16	+0.16	< +0.004
8/8	—49.9	—0.1	—0.002
9/9	—50	Zero	Zero

*The error in mV is converted to dB by the calibration factor of the output connector: 50 mV/dB.

f. Add algebraically the error of each 1 dB step to the total of previous steps. For the example above: —0.006 + (+0.002) = —0.004 + (—0.003) = —0.007 + (+0.002) = —0.005 + (—0.005) = —0.01 + (+0.004) = —0.006 + (—0.002) = —0.008 dB. The total error is the difference between the maximum and minimum values. In this case total error is —0.01 — (—0.004) = —0.006 dB.

The maximum error allowable is < 0.05 dB/1 dB step and a total error of < 0.1 dB.

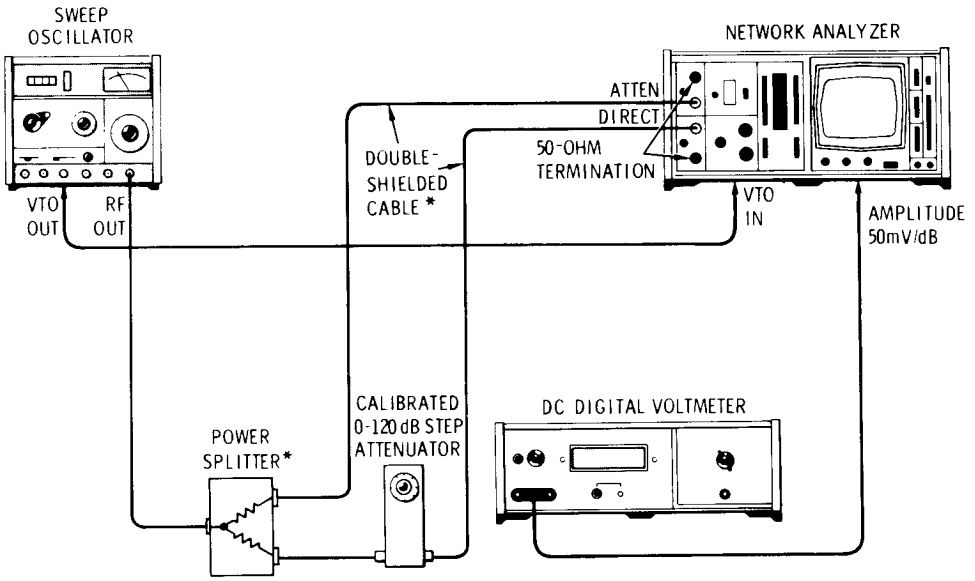
5 — **DISPLAY REFERENCE 10 dB/STEP ACCURACY**

SPECIFICATION: Amplitude accuracy is <0.1 dB/10 dB step, total error does not exceed 0.25 dB. Phase accuracy is <0.5°/10 dB step, total error does not exceed 3 degrees.

DESCRIPTION: The equipment is set up to obtain a zero dB indication (zero volts on DVM) and zero phase indication (on display unit) with the 8407A 10 dB step DISPLAY REFERENCE switch at the top position. The accuracy of each 10 dB step is measured separately. The test channel input level and 8407A AMPLITUDE VERNIER control are used to establish a new zero dB reference and the 8407A PHASE VERNIER is used to establish a new phase reference after each 10 dB step. By making each measurement over the same 10 dB range of the display unit, any error in the display unit will appear as a constant error for each DISPLAY REFERENCE step and may be calculated out.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
5 (cont'd)	TEST SETUP:



EQUIPMENT REQUIRED:

Sweep Oscillator, HP 8601A or 8690B/8698B
Plug-In Indicator, HP 8412A
Dc Digital Voltmeter, HP 3439A/3443A
Power Splitter, HP 11652-60009 (Part of Accessory Kit*)
Two Double Shielded Cables (Part of Accessory Kit*)
Two 50-Ohm Terminations (included with 8407A)
0 — 120 dB Step Attenuator, HP 355D

*Part of HP 11652A Accessory Kit.

PROCEDURE:

NOTE

When using an 8412A Phase Magnitude Display Unit, perform the low-level adjustment as follows. Make this adjustment with as much precision as possible. Adjust the output power level from the sweep oscillator and the 8407A REF CHANNEL LEVEL ADJ., DISPLAY REFERENCE 1 dB/step, and AMPLITUDE VERNIER control to obtain a zero-volt indication on the DVM with the 10 dB/step DISPLAY REFERENCE switch at four positions down from the top (+40 dB). Move the 10 dB/step DISPLAY REFERENCE switch to the bottom position (+80 dB). Adjust 8412A front panel AMPL CAL (LOW LEVEL) control for —2.00 Vdc on DVM. Repeat this adjustment until the zero and —2V indications are as precise as possible.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
5 (cont'd)	a. Connect equipment as shown in test setup. Connect the reference channel input to the 8407A REF CHANNEL ATTEN input. Connect the step attenuator between the power splitter and 8407A TEST CHANNEL DIRECT input. Set the 0—120 dB attenuator to 80 dB. Set the 8407A REF CHAN LEVEL ADJ switch to the middle position. b. Set the 8407A DISPLAY REFERENCE 10 dB/step switch to the top position and adjust the DISPLAY REFERENCE CAL thumbwheel for 0. c. Set the sweep oscillator for minimum sweep width at any frequency in the 8407A operating range. Adjust the RF output level for maximum power out or until the 8407A REF CHAN LEVEL meter indicates slightly above the OPERATE region, whichever comes first. d. Adjust the 8407A DISPLAY REFERENCE 1 dB/step switch and AMPLITUDE VERNIER control for zero ±0.5 mV on DVM. Adjust the display unit PHASE OFFSET and 8407A PHASE VERNIER for a zero degree phase reference on the display unit. e. Check each DISPLAY REFERENCE 10 dB step as follows: (1) Set the DISPLAY REFERENCE 10 dB/step switch one position down. (2) The DVM indication should be —500 mV. Record the difference between —500 mV and the measured voltage as shown in the table below. Record the phase shift indication of the display unit. (3) Increase the test channel input power by 10 dB by removing 10 dB from the step attenuator at the test channel input. Adjust the 8407A AMPLITUDE VERNIER control for a zero ±0.5 mV DVM indication and adjust the PHASE VERNIER for a zero degree phase indication. (4) Repeat the above steps to check the remaining 10 dB/step positions. Note: The 8407A REDUCE INPUT RATIO light may come on at high test channel input levels. If so, reduce the sweep oscillator output power to extinguish the light. (5) If the DVM indications are all out of tolerance on one side of —500 mV, the difference between —500 mV and the mean of all the readings may be the display unit error. Repeat this test using a second display unit or calculate the mean and correct each reading to the difference between the mean and the measured value.

Table 5-3. Performance Test (cont'd)

TEST 5 (cont'd) — **PROCEDURE**

Example of DISPLAY REFERENCE 10 dB/Step Accuracy Table

Step/dB	DVM Indication	Error in mV	Error in dB	Phase Error
0/0	Zero	Reference		
1/10	−504	+4	+.08	−0.2°
2/20	−499	−1	−.02	−0.4°
3/30	−497.5	−2.5	−.05	−0.3°
4/40	−502	+2	+.04	−0.1°
5/50	−499.5	−0.5	−.01	−0.2°
6/60	−501	+1	+.02	−0.15°
7/70	−503	+3	+.06	−0.2°
8/80	−498	−2	−.04	−0.4°

f. Add algebraically the error of each 10 dB step to the total of previous steps. For the example above:

+ .08 + (−.02) = +.06
+ .06 + (−.05) = +.01 minimum
+ .01 + (+.04) = +.05
+ .05 + (−.01) = +.04
+ .04 + (+.02) = +.06
+ .06 + (+.06) = +.12 maximum
+ .12 + (−.04) = +.08

The total error is the difference between the maximum and minimum values. In this case total amplitude error is +0.12 −(+.01) = 0.11 dB, and the total phase is −0.2° −(−1.95°) = 1.75°. The error per dB step should be less than 0.1 dB and 0.5°. The total error should be less than 0.25 dB and 3°.

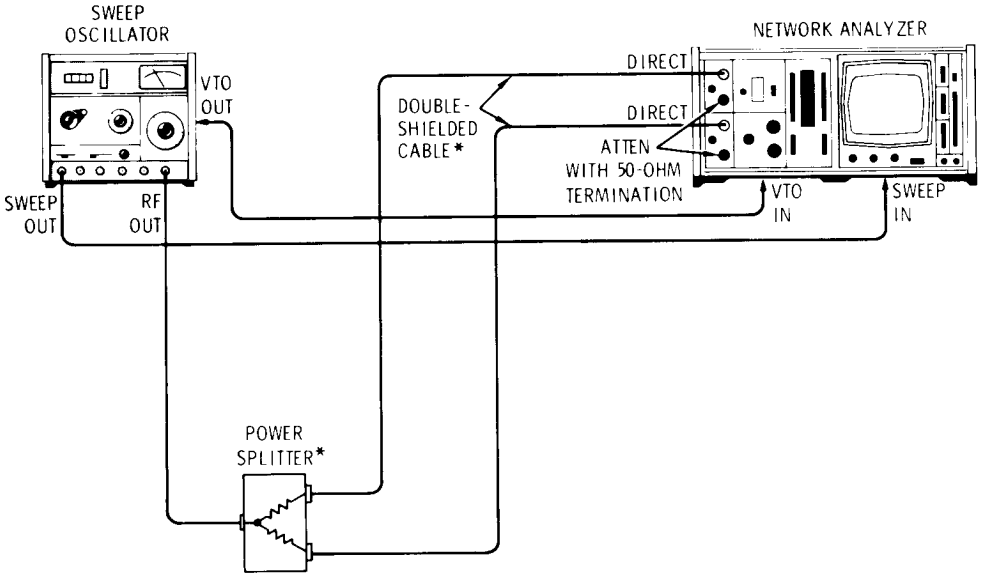
6 — **FREQUENCY RESPONSE (REFERENCE input −10 dBm, TEST input >−60 dBm DIRECT)**

SPECIFICATION: Frequency response is ±0.2 dB and ±5 degrees, 0.1 to 110 MHz; ±0.05 dB and ±2 degrees over any 10 MHz portion.

DESCRIPTION: The equipment is set up for a calibration trace. The frequency response is checked over the operating range of 0.1 to 110 MHz in two bands. Both the amplitude and phase response is observed in each band. A 10 MHz portion of the operating range is selected and the amplitude and phase response is observed over this 10 MHz portion.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
6 (cont'd)	TEST SETUP:



EQUIPMENT REQUIRED:

Sweep Oscillator, HP 8601A or 8690B/8698B
Plug-In Indicator, HP 8412A
Power Splitter, HP 11652-60009 (Part of Accessory Kit*)
Two double shielded Cables (Part of Accessory Kit*)
Two 50-Ohm Terminations (included with 8407A)

*Part of HP 11652A Accessory Kit.

PROCEDURE:

a. Connect equipment as shown in the test setup. Adjust the sweep oscillator output level for −4 dBm. (Minus 4 dBm less the power splitter loss of 6 dB = −10 dBm at 8407A input.)

b. Set sweep oscillator for full bandwidth sweep between 0.1 and 11 MHz. Set RF blanking and markers off. Set 8407A REF CHAN LEVEL ADJ switch to lower position. Set 8412A BW(kHz) switch to 0.1, MODE switch to AMPL, and AMPL DB/DIV switch to 0.25.

c. Adjust 8407A DISPLAY REFERENCE switches and AMPL VERNIER control to place the 8412A amplitude trace on the center graticule line. Slow sweep repetition rate until good trace detail is present. The trace should be within ±4 small graticule divisions (±0.2 dB) of the center graticule line.

Table 5-3. Performance Test (cont'd)

TEST	PROCEDURE
6 (cont'd)	d. Set 8412A MODE switch to PHASE and PHASE DEG/DIV switch to 10. Adjust 8407A PHASE VERNIER to place 8412A phase trace over center graticule line. If the overall trace slopes one way, the coaxial cables between the power splitter and the 8407A input connectors should be changed to equal length to eliminate this linear phase shift. The phase trace should be within ±2.5 small graticule divisions (±5 degrees) of the center graticule line. e. Set the sweep oscillator to sweep between 1 and 110 MHz. f. Adjust 8407A PHASE VERNIER to place 8412A trace over center graticule line. The phase trace should be within ±2.5 small graticule divisions (±5 degrees) of the center graticule line. g. Set 8412A MODE switch to AMPL. Adjust 8407A AMPL VERNIER control to place the 8412A amplitude trace on the center graticule line. The trace should be within ±4 small graticule divisions (±0.2 dB) of the center graticule line. h. Select any 10 MHz portion between 0.1 and 110 MHz (portion with worst frequency response). Set the sweep oscillator to sweep this 10 MHz portion. i. Adjust 8407A AMPL VERNIER control to place the 8412A amplitude trace on the center graticule line. The trace should be within ±1 small graticule division (±0.05 dB) of the center line. j. Set 8412A MODE switch to PHASE and PHASE DEG/DIV switch to 1. Adjust 8407A PHASE VERNIER to place 8412A phase trace over center graticule line. The phase trace should be within two major graticule divisions (±2 degrees) of the center line.

Table 5-4. Performance Check Test Card

Hewlett-Packard Model 8407A Network Analyzer Tests Performed by _____
Serial No. _____–_____ Date: _____

Test	Description	Upper Limit	Test Value	Lower Limit
1	**RF INPUT CONNECTOR VSWR**			
	REF CHANNEL DIRECT	8 cm	_____	
	REF CHANNEL ATTEN	8 cm	_____	
	TEST CHANNEL DIRECT	8 cm	_____	
	TEST CHANNEL ATTEN	8 cm	_____	
2	**CROSSTALK**			
	Signal Level	Below –90 dBm	_____	
3	**COMMON MODE LEVEL VARIATIONS (AGC TRACKING)**	10 dB steps		
	Amplitude	0.5 dB	_____	
		0.5 dB	_____	
		0.5 dB	_____	
	Phase	10 dB steps		
		0.8 deg.	_____	
		0.8 deg.	_____	
		0.8 deg.	_____	
4	**DISPLAY REFERENCE 1 dB/STEP ATTENUATOR ACCURACY**	1 dB step		
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		0.05 dB	_____	
		Overall 0.1 dB	_____	
5	**DISPLAY REFERENCE 10 dB/STEP ACCURACY**	10 dB steps		
		Ampl. / Phase		
	10 dB	0.1 dB / 0.5°	_____ _____	
	20 dB	0.1 dB / 0.5°	_____ _____	
	30 dB	0.1 dB / 0.5°	_____ _____	
	40 dB	0.1 dB / 0.5°	_____ _____	
	50 dB	0.1 dB / 0.5°	_____ _____	
	60 dB	0.1 dB / 0.5°	_____ _____	
	70 dB	0.1 dB / 0.5°	_____ _____	
	80 dB	0.1 dB / 0.5°	_____ _____	
		Overall 0.25 dB/3°	_____	

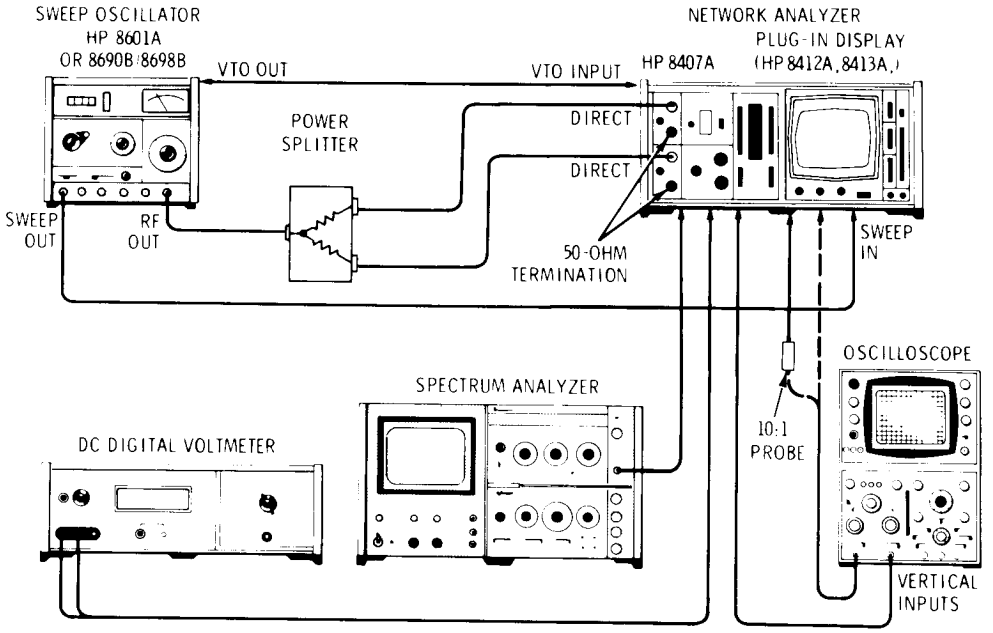
Table 5-4. Performance Check Test Card (cont'd)

Test	Description		Upper Limit	Test Value	Lower Limit
6	**FREQUENCY RESPONSE**				
	0.1 — 11 MHz	Amplitude	±4 small divisions (±0.2 dB)	_____	
		Phase	±2.5 small divisions (± 5 deg.)	_____	
	1 — 110 MHz	Phase	±2.5 small divisions (± 5 deg.)	_____	
		Amplitude	±4 small divisions (±0.2 dB)	_____	
	10 MHz Segment	Amplitude	±1 small division (± 0.05 dB)	_____	
		Phase	±2 major divisions (±2 deg.)	_____	

Table 5-5. Alignment Controls and Selected Components

Align. Test (Table 5-6)	Reference Designator	Name	Function Adjusted
2	A17R7	+20V	+20 Vdc Power Supply output
2	A17R16	−20V	−20 Vdc Power Supply output
3	A14L7	PLO	Adjusts frequency of phase-locked oscillator for best swept-frequency phase lock
4	A13R27	LO LEVEL	Adjusts local oscillator signal level at reference and test channel converters
4	A14R47 (Selected value)	PLO output	Adjusts PLO output level
5	A3L1	PHASE	Adjusts phase tracking of reference channel converter
5	A3L2	AMPLITUDE	Adjusts amplitude tracking of reference channel converter
5	A4L1	PHASE	Adjusts phase tracking of test channel converter
5	A4L2	AMPLITUDE	Adjusts amplitude tracking of test channel converter
6	A8R20 (Selected value)	IF TEST output	Adjusts IF test channel output level
6	A11R24 (Selected value)	IF REF output	Adjusts IF Reference channel output level
7	A4R58 (Selected value)	OVERLOAD LEVEL	Adjusts overload circuit of test channel converter to switch on at a selected signal level

SETUP FOR ALIGNMENT



EQUIPMENT REQUIRED:

Sweep Oscillator, HP Model 8601A or 8690B/8698B
Power Splitter, HP Part No. 11652-60009*
Oscilloscope (500 kHz/50 mV) with
10:1 Divider Probe, HP Model 180A/1802A/1820A
Spectrum Analyzer, HP Model 8552A/8554L/141S
DC Digital Voltmeter, HP Model 3439A/3433A
Adapter (subm-to-BNC) ,HP Part No. 1250-0831.

*Part of HP Model 11652A Accessory Kit.

Figure 5-1. Equipment Setup for Alignment Procedures

Table 5-6. Alignment Procedure

TEST	PROCEDURE AND DESCRIPTION
1	**INITIAL SETUP** DESCRIPTION: Set up and adjust instrument for phase-locked condition. PROCEDURE: a. Connect equipment as shown in Figure 5-1. Remove 8407A top and bottom covers. Place the 8407A on its side and loosen the two screws securing the converter assemblies and swing the casting out away from the chassis. b. Set 8407A controls as follows: DISPLAY REFERENCE CAL . . . . . Zero dB at top switch position DISPLAY REFERENCE . . . . . 10 dB/step switch and 1 dB/step switch at top position (0 dB) REF CHAN LEVEL ADJ . . . . . Middle position AMPL VERNIER . . . . . Midrange PHASE VERNIER . . . . . Midrange c. Set sweep oscillator controls for single-frequency (CW) operation at 1 MHz. d. Adjust sweep oscillator RF output for a REF CHANNEL LEVEL meter indication near the top of the OPERATE range.
2	**POWER SUPPLY (A17R7 and A17R16)** DESCRIPTION: the ±20 Volt power supplies are adjusted for correct output. NOTE If an overvoltage of >22 Vdc occurs at either the +20 or −20 Vdc power supply output, the power supply will turn off (approximately 1.5 Vdc output). To clear the condition, turn power off and set A17R7 and A17R16 to midrange. Apply power and adjust for ±20 Vdc. PROCEDURE: a. Check for +20 Vdc ±0.1 Vdc at A17TP3 with DVM. If out of tolerance, adjust A17R7. b. Check for −20 Vdc ±0.1 Vdc at A17TP2 with DVM. If out of tolerance adjust A17R16.

Table 5-6. Alignment Procedure (cont'd)

TEST	PROCEDURE AND DESCRIPTION
3	**PHASE LOCKED OSCILLATOR ADJUSTMENT (A14L7)** DESCRIPTION: The output of A16 is first checked to be sure the RF output is sufficient for proper phase-lock operation. The phase-locked oscillator is then adjusted to produce a 278 kHz IF signal from the test and reference converters A3 and A4. When the phase-locked oscillator is adjusted near the correct frequency (199.722 MHz), a phase detector locks and holds the oscillator, producing a constant 278 kHz IF signal. The oscillator frequency is adjusted for a correction voltage of approximately 9 Vdc. This places the natural frequency of the oscillator in the middle of the capture range. PROCEDURE: a. Check output of A16 VTO Amplifier Assembly as follows: (1) Disconnect coax cable from A6 Assembly connector labeled VTO OUT (accessible under swing out converter casting). Connect Spectrum Analyzer input to VTO OUT connector. (2) Set Sweep Oscillator for single frequency operation and slowly tune across high range to 110 MHz. The signal level at VTO OUT connector should be greater than +2 dBm across VTO range to 310 MHz. Note: Signal levels below 0 dBm may cause phase-lock problems. (3) Reconnect coax cable to A16 Assembly VTO OUT connector. b. Set 8407A controls as follows: (1) REF CHAN LEVEL to bottom position. (2) DISPLAY REFERENCE 10 dB switch two steps from bottom position. (3) DISPLAY REFERENCE 1 dB switch five steps from bottom position. c. Set Sweep Oscillator for single frequency operation with output level of −4 dBm (−10 dBm into 8407A). d. Connect one oscilloscope input to 8407A rear panel IF REF connector. Connect the other oscilloscope input (using 10:1 divider probe) to A14 Assembly PLO TUN pin on A6 Master Board. Note: If dual trace oscilloscope is not available, connect DC voltmeter to PLO TUN pin. e. Adjust A14L7 tuning slug to top of coil form. Slowly adjust tuning slug in until signal at IF REF output is a 278 kHz (3.6 microsecond period) sinewave and dc voltage level at PLO TUN pin is −9 Vdc ±0.5 Vdc. NOTE Once A14L7 is adjusted, it is important that the tuning slug remain fixed. Therefore apply a small amount of glue (such as "Q-dope") on the tuning slug. f. Glue tuning slug A14L7 in position.

Table 5-6. Alignment Procedure (cont'd)

TEST	PROCEDURE AND DESCRIPTION
4	**LOCAL OSCILLATOR SIGNAL LEVEL ADJUST (A13R27, A14R47)** DESCRIPTION: Phase-locked oscillator A14 and ALC amplifier A13 are adjusted to obtain the correct level of Local Oscillator signal to converters A3 and A4. PROCEDURE: a. Check output of A15 LO Mixer Assembly as follows: (1) Disconnect coax cable from A6 Master Board Assembly connector labeled LO-OUT-TO-ALC. Connect Spectrum Analyzer input to LO-OUT-TO-ALC connector. (This is the output of A15.) (2) Set Sweep Oscillator for single frequency operation and slowly tune across high range to 110 MHz. The signal level at LO-OUT-TO-ALC connector should be −30 to −40 dBm from about 1.3 to 110.2 MHz. If necessary, check A14 Assembly output at A6 Master Board Assembly connector labeled PLO OUT. PLO output should be −13 dBm ± 4 dB. Select value for A14R47 to obtain −13 dBm signal level. (See Figure 7-14 for component location.) Typical range of values for A14R47 is 511 to 750 ohms. Reconnect PLO OUT and check again for −30 to −40 dBm at LO-OUT-TO-ALC connector. (3) Reconnect coax cable to LO-OUT-TO-ALC connector. b. Disconnect coax cable from A6 Assembly connector labeled LO-TO-CONV. (This is the output of A13.) Connect Spectrum Analyzer input to LO-TO-CONV connector. c. With Sweep Oscillator set for single frequency operation, slowly tune across high range to 110 MHz. The signal level at LO-TO-CONV connector should be 0 dBm ±2 dB from 1.3 to 110.2 MHz. If necessary, adjust A13R27 for signal level of 0 dBm ±2 dB. d. Reconnect coax cable to LO-TO-CONV connector.
5	**CONVERTER AMPLITUDE AND PHASE TRACKING (A3L1, A3L2, A4L1 and A4L2)** DESCRIPTION: The reference and test converters are adjusted for best amplitude and phase tracking over the entire band. Correct tracking is indicated by horizontal amplitude and phase traces on the 8412A. PROCEDURE: NOTE If the display plug-in used is an 8413A, connect oscilloscope vertical inputs to 8413A front panel AMPL 50 MV/DB and PHASE 10 MV/DEG connectors. Also connect Sweep Oscillator SWEEP OUT to oscilloscope external horizontal input.

Table 5-6. Alignment Procedure (cont'd)

TEST	PROCEDURE AND DESCRIPTION
5 (cont'd)	a. Adjust amplitude tracking as follows: (1) Set Sweep Oscillator for widest (FULL) sweep width on high frequency range with an output level of −35 dBm. (2) Swept amplitude display should not vary more than 0.2 dB across range. If necessary, adjust A4L2 and A3L2 for desired response. (3) Set Sweep Oscillator for widest sweep width on low frequency range. (4) Swept amplitude display should vary less than 0.2 dB across frequency range. If necessary, adjust A4L2 and A3L2 for desired response. If adjustment is made, repeat amplitude tracking adjustments until no further adjustment is required. If unable to obtain less than 0.2 dB variation, adjust A13R27 slightly and repeat amplitude tracking adjustment. If A13R27 is adjusted, recheck Local Oscillator Signal Level Adjustment, Test 4. b. Adjust phase tracking as follows: (1) With Sweep Oscillator set for widest sweep width on low frequency range, the swept phase display should not vary more than four degrees across frequency range. If necessary adjust A4L1 and A3L1 for desired response. (2) Set Sweep Oscillator for widest sweep width on high frequency range. (3) The swept phase display should not vary more than four degrees across frequency range. If necessary, adjust A4L1 and A3L1 for desired response. If adjustment is made, repeat phase tracking adjustments until no further adjustment is required. NOTE If unable to obtain less than four degrees variation on high frequency range, adjust A13R27 slightly and repeat both amplitude and phase tracking adjustments. If A13R27 is adjusted, recheck Local Oscillator Signal Level Adjustment, Test 4.

Table 5-6. Alignment Procedure (cont'd)

TEST	PROCEDURE AND DESCRIPTION
6	**REFERENCE AND TEST CHANNEL LEVEL ADJUSTMENT (A8R20 and A11R24)** DESCRIPTION: The reference channel IF output is adjusted by selecting the value of the feedback resistor in the reference channel AGC amplifier. PROCEDURE: a. Adjust 8407A controls as follows: (1) REF CHAN LEVEL ADJ to middle position. (2) DISPLAY REFERENCE 10 dB switch to top position. (3) DISPLAY REFERENCE 1 dB switch four steps down from top position. b. Adjust Sweep Oscillator for single frequency operation with an output level of −35 dBm. c. Connect oscilloscope to 8407A rear panel IF REF OUTPUT. The signal amplitude should be 1.4 ±0.3V peak-to-peak. If necessary, select value for A11R24 to obtain the desired signal level. Typical range of values for A11R24 is 16.2K to 121K ohms. d. Connect Oscilloscope to 8407A rear panel IF TEST OUTPUT. The signal amplitude should be 320 mV ±40 mV. If necessary, select value for A8R20 to obtain the desired signal level. Typical range of values for A8R20 is 10K to 29K ohms.
7	**OVERLOAD LIGHT ADJUSTMENT (A4R58)** DESCRIPTION: The signal level that causes the overload light to go from off to on is checked. A resistor in overload amplifier is changed to obtain the correct switching range. PROCEDURE: a. Install a BNC tee in test channel between Power Splitter and 8407A TEST CHANNEL DIRECT input. Connect Oscilloscope to BNC tee. b. Set Sweep Oscillator for single frequency operation on the low frequency range. Adjust output level for 200 mV peak-to-peak signal on oscilloscope and then 250 mV. The UNCAL REDUCE INPUT RATIO light should be off with 200 mV input and on with 250 mV input. If necessary select value for A4R58 to obtain desired indications. Typical range of values for A4R58 is 10K to 42.2K ohms.

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replacement parts and assemblies. Table 6-1 provides an index of reference designations and abbreviations used in the replaceable parts list. Table 6-2 is the replaceable parts list in reference designator order. This list contains component description, part number, and other information necessary for ordering parts. Table 6-3 provides code number identification of manufacturers.

6-3. ORDERING INFORMATION

6-4. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office (see list at rear of this manual for addresses). Identify parts by their Hewlett-Packard part numbers.

6-5. To obtain a part that is not listed, include:

a. Instrument model number.
b. Instrument serial number.
c. Description of the part.
d. Function and location of the part.

Table 6-1. Reference Designators and Abbreviations Used in Parts List

REFERENCE DESIGNATORS

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

ABBREVIATIONS

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

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08407-60014	2	FRONT PANEL SWITCH ASSY	28480	08407-60014
A1	08407-60143	1	REBUILT 08407-60014, REQUIRES EXCHANGE	28480	08407-60143
A1C1	0160-2242	1	C:FXD CER 2.4 PF 500VDCW	72982	301-NPO-2.4 PF
A1C2	0160-2250	4	C:FXD CER 5.1 PF 500VDCW	72982	301-000-COHO-519E
A1C3	0160-2255	1	C:FXD CER 8.2 PF 500VDCW	72982	301-000-COHO-829C
A1C4	0160-2259	3	C:FXD CER 12 PF 5% 500VDCW	72982	301-000-COGO-120J
A1C5	0160-2262	1	C:FXD CER 16 PF 5% 500VDCW	72982	301-000 COGO 160J
A1C6	0160-2264	4	C:FXD CER 20 PF 5% 500VDCW	72982	301-000-COGO-200J
A1C7	0160-2266	3	C:FXD CER 24 PF 5% 500VDCW	72982	301-000-COGO-240J
A1C8	0160-2679	1	C:FXD CER 30 PF 5% 500VDCW	72982	308-000-COGO-300J
A1C9	0160-2667	1	C:FXD CER 36 PF 5% 500VDCW	72982	308-000-COGO-360J
A1CR1	1901-0025	7	DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR2	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR3	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1CR4	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A1R1	0698-7400	1	R:FXD FLM 8.195K OHM 0.1% 1/8W	28480	0698-7400
A1R2	0698-7405	1	R:FXD FLM 3.862K OHM 0.1% 1/8W	28480	0698-7405
A1R3	0698-7402	1	R:FXD FLM 2.424K OHM 0.1% 1/8W	28480	0698-7402
A1R4	0698-7401	1	R:FXD FLM 1.710K OHM 0.1% 1/8W	28480	0698-7401
A1R5	0698-7403	1	R:FXD FLM 1.285K OHM 0.1% 1/8W	28480	0698-7403
A1R6	0698-7404	1	R:FXD FLM 1.005K OHM 0.1% 1/8W	28480	0698-7404
A1R7	0698-7500	1	R:FXD FLM 807.3 OHM 0.1% 1/8W	28480	0698-7500
A1R8	0698-7406	1	R:FXD FLM 661.4 OHM 0.1% 1/8W	28480	0698-7406
A1R9	0698-7399	1	R:FXD FLM 549.9 OHM 0.1% 1/8W	28480	0698-7399
A1XA2	5060-0112	1	CONNECTOR:15 CONTACTS	28480	5060-0112
	05330-80003	1	CONNECTOR:PC 15 PIN	28480	05330-80003
A2	08407-60022	1	FRONT PANEL ASSY, (LESS A2A1 AND A2A2)	28480	08407-60022
A2	08407-60144	1	REBUILT 08407-60022, REQUIRES EXCHANGE	28480	08407-60144
A2C1	0180-0291	41	C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A2CR1	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A2CR2	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A2CR3	1902-0041	3	DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A2J1	1251-1604	2	CONNECTOR:PC EDGE 1 ROW 22 CONTACT	71785	252-22-30-310
	1251-1636	1	CONNECTOR:SINGLE MALE CONTACT	28480	1251-1636
A2Q1	1853-0020	13	TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A2Q2	1853-0001	1	TSTR:SI PNP(SELECTED FROM 2N1132)	28480	1853-0001
A2Q3	1854-0071	36	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A2R1	0757-0442	12	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R2	0757-0465	2	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A2R3	0698-3443	1	R:FXD MET FLM 287 OHM 1% 1/8W RECOMMENDED REPLACEMENT	28480	0698-3443
A2R4	0757-0416	10	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A2R5	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R6	0698-0083	17	R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A2R7	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R8	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A2R9	0698-3628	1	R:FXD MET OX 220 OHM 5% 2W	28480	0698-3628
A2R10	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R11	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2U1	1826-0007	1	IC:LINEAR, RECOMMENDED REPLACEMENT	28480	1826-0007
A2A1	08407-60052	1	PHASE VERNIER ASSY	28480	08407-60052
A2A1	08407-60115	1	REBUILT 08407-60052, REQUIRES EXCHANGE	28480	08407-60115
A2A1C1	0140-0200	2	C:FXD MICA 390 PF 5%	72136	RDM15F391-J3C
A2A1C2	0140-0200		C:FXD MICA 390 PF 5%	72136	RDM15F391-J3C
A2A1C3	0160-3060	43	C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A2A1C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A2A1C5	0160-2207	1	C:FXD MICA 300 PF 5%	28480	0160-2207
A2A1C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A2A1J1	1250-0828	9	CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A2A1J2	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A2A1J3	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A2A1MP1	08407-00031	1	SHIELD:CAN	28480	08407-00031
A2A1Q1	1853-0050	1	TSTR:SI PNP	28480	1853-0050
A2A1Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A2A1Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A2A1R1	0698-3450	3	R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A2A1R2	0698-3451	1	R:FXD MET FLM 133K OHM 1% 1/8W	28480	0698-3451
A2A1R3	0757-0401	5	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R4	0757-0280	40	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R5	0757-0428	5	R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A2A1R6	0757-0424	5	R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A2A1R7	0757-0199	4	R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A2A1R8	0698-0084	5	R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A1R9	0698-3440	7	R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A2A1R10	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R11	0757-0279	5	R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A2A2	08407-60053	1	AMPLITUDE VERNIER ASSY	28480	08407-60053
A2A2	08407-60116	1	REBUILT 08407-60053, REQUIRES EXCHANGE	28480	08407-60116
A2A2C1	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A2A2C2	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A2A2C3	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A2A2C4	0160-3490	8	C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A2A2C5	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A2A2C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A2A2J1	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A2A2J2	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A2A2J3	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A2A2MP1	08407-00056	1	SHIELD:CAN	28480	08407-00056
A2A2Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A2A2Q2	1854-0345	12	TSTR:SI NPN	80131	2N5179
A2A2Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A2A2R1	0757-0443	1	R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A2A2R2	0757-0290	5	R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A2A2R3	0698-3154	4	R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A2A2R4	0757-0398	4	R:FXD MET FLM 75 OHM 1% 1/8W	28480	0757-0398
A2A2R5	0698-3445	6	R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A2A2R6	0698-3491	1	R:FXD MET FLM 1K OHM 0.1% 1/8W	28480	0698-3491
A2A2R7	0698-0082	3	R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A2A2R8	0698-0082		R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A2A2R9	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A2A2R10	0757-0398		R:FXD MET FLM 75 OHM 1% 1/8W	28480	0757-0398
A2A2R11	0698-3449	1	R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A3	08407-60093	1	BOARD ASSY:REFERENCE CHANNEL CONVERTER ORDER 08407-60154 A3,A4, & W10 MATCHED PAIR(WITHOUT EXCHANGE)	28480	08407-60093
A3	08407-60101	2	REBUILT 08407-60092 & 08407-60093(A3-4) MATCHED PAIR(INCLUDES W10, 08407-60040 MATCHED L.O. TEST CABLE,REQUIRES EXCHANGE	28480	08407-60101
A3C1	0160-3491	5	C:FXD CER 0.47 UF 20% 50VDCW	72982	8131-050-651-474M
A3C2	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C3	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-COGO-200J
A3C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C5	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A3C7	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A3C8	0160-3491		C:FXD CER 0.47 UF 20% 50VDCW	72982	8131-050-651-474M
A3C9	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C10	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A3C11	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A3C12	0160-2259		C:FXD CER 12 PF 5% 500VDCW	72982	301-000-COGO-120J
A3C13	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C14	0160-0134	3	C:FXD MICA 220PF 5% 300VDCW	14655	RDM15F221J3C
A3C15	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C16	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C17	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A3C18	0160-2219	2	C:FXD MICA 1100 PF 5%	28480	0160-2219
A3C19	0180-0197	9	C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A3C20	0160-3076	3	C:FXD CER 470 PF 5% 200VDCW	71590	OBD
A3C21	0140-0184	3	C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A3C22	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C23	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C24	0160-0174	20	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A3C25	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C26	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A3C27	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C28	0140-0210	1	C:FXD MICA 270 PF 5%	28480	0140-0210
A3C29	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A3C30	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3C31	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A3C32	0160-2437	6	C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A3C33	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A3C34	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A3CR1	1901-0450	2	DIODE:SILICON	28480	1901-0450
A3CR2	1901-0044	1	DIODE:SILICON 20MA/1V	28480	1901-0044
A3J1	1250-1205	12	CONNECTOR:PC RT ANGLE	28480	1250-1205
A3J2	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A3J3	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A3J4	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3L1	08407-60029	4	COIL ASSY:LO RF AM	28480	08407-60029
A3L2	08407-60029		COIL ASSY:LO RF AM	28480	08407-60029
A3L3	9100-2209	3	INDUCTOR:37.8 UH 1%	28480	9100-2209
A3L4	9140-0180	2	COIL/CHOKE 2.70 UH 10%	28480	9140-0180
A3Q1	1854-0431	6	TSTR:SI NPN (REPLACEABLE BY RCA 2N5179)	28480	1854-0431
A3Q2	1854-0431		TSTR:SI NPN (REPLACEABLE BY RCA 2N5179)	28480	1854-0431
A3Q3	1854-0431		TSTR:SI NPN (REPLACEABLE BY RCA 2N5179)	28480	1854-0431
A3Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3Q7	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A3Q8	1853-0034	3	TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A3Q9	1854-0471	8	TSTR:SI NPN	28480	1854-0471
A3Q10	1854-0471		TSTR:SI NPN	28480	1854-0471
A3Q11	1854-0471		TSTR:SI NPN	28480	1854-0471
A3Q12	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3R1	0757-0419	8	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A3R2	0698-3445		R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A3R3	0698-3435	15	R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A3R4	0757-0418	2	R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A3R5	0757-0317	8	R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A3R6	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A3R7	0698-3442	9	R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A3R8	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A3R9	0757-1094	8	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A3R10	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A3R11	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A3R12	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A3R13	0757-0400	4	R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A3R14	0757-0400		R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A3R15	0698-7608	4	R:FXD FLM 192.5 OHM 0.5% 1/8W	28480	0698-7608
A3R16	0698-7607	8	R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A3R17	0698-7608		R:FXD FLM 192.5 OHM 0.5% 1/8W	28480	0698-7608
A3R18	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A3R19	0698-5194	4	R:FXD MET FLM 71.15 OHM 0.25% 1/8W	28480	0698-5194
A3R20	0698-5401	4	R:FXD MET FLM 247.50 OHM 0.25% 1/8W	28480	0698-5401
A3R21	0698-5196	6	R:FXD MET FLM 96.25 OHM 0.25% 1/8W	28480	0698-5196
A3R22	0698-5192	4	R:FXD MET FLM 61.11 OHM 0.25% 1/8W	28480	0698-5192
A3R23	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A3R24	0698-5196		R:FXD MET FLM 96.25 OHM 0.25% 1/8W	28480	0698-5196
A3R25	0698-5194		R:FXD MET FLM 71.15 OHM 0.25% 1/8W	28480	0698-5194
A3R26	0698-5196		R:FXD MET FLM 96.25 OHM 0.25% 1/8W	28480	0698-5196
A3R27	0698-5192		R:FXD MET FLM 61.11 OHM 0.25% 1/8W	28480	0698-5192
A3R28	0698-5401		R:FXD MET FLM 247.50 OHM 0.25% 1/8W	28480	0698-5401
A3R29	0698-3445		R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A3R30	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A3R31	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A3R32	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A3R33	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A3R34	0698-0085	4	R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A3R35	0757-0274	3	R:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A3R36	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3R37	0757-0421	2	R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A3R38	0698-3428	2	R:FXD MET FLM 14.7 OHM 1% 1/8W	28480	0698-3428
A3R39	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A3R40	0757-0420	5	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A3R41	0757-0316	9	R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A3R42	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A3R43	0757-0394	8	R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A3R44	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A3R45	0698-3151	3	R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A3R46	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3R47	0698-7250	8	R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A3R48	0698-3132	4	R:FXD FLM 261 OHM 1% 1/8W	28480	0698-3132
A3R49	0698-3450		R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A3R50	0757-0438	14	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A3R51	0698-3132		R:FXD FLM 261 OHM 1% 1/8W	28480	0698-3132
A3R52	0757-0288	3	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A3R53	0757-0403	2	R:FXD MET FLM 121 OHM 1% 1/8W	28480	0757-0403
A3R54	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A3R55	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A3R56	0757-0288		R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A3R57	0698-3447	3	R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A3R58	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A3R59	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3R60	0757-0459	1	R:FXD MET FLM 56.2K OHM 1% 1/8W	28480	0757-0459
A3R61	0698-3450		R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A3R62	0757-0422	3	R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A3R63	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3R64	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A3R65	0698-3159	3	R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A3R66	0757-0290		R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A3R67	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A3Z1	9170-0847		BEAD:SHIELDING, RECOMMEND REPLACEMENT	02114	56-590-65-3B
A3Z2	9170-0847		BEAD:SHIELDING	02114	56-590-65-3B
A3Z3	9170-0847		BEAD:SHIELDING RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A3A1	10514B	2	MIXER:DOUBLE BALANCED	28480	10514B
A4	08407-60092	1	TEST CHANNEL CONVERTER ASSY ORDER 08407-60154 A3,A4, & W10 MATCHED PAIR(WITHOUT EXCHANGE)	28480	08407-60092
A4	08407-60101		REBUILT 08407-60092 & 08407-60093(A3-4) MATCHED PR.(INCL. W10, 08407-60040 MATCHED L.O. TEST CABLE)REQUIRES EXCHANGE	28480	08407-60101
A4C1	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C2	0160-3491		C:FXD CER 0.47 UF 20% 50VDCW	72982	8131-050-651-474M
A4C3	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-COGD-200J
A4C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C5	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A4C7	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A4C8	0160-3491		C:FXD CER 0.47 UF 20% 50VDCW	72982	8131-050-651-474M
A4C9	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C10	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A4C11	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A4C12	0160-2259		C:FXD CER 12 PF 5% 500VDCW	72982	301-000-COGD-120J
A4C13	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C14	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C15	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A4C16	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C17	0160-0134		C:FXD MICA 220PF 5% 300VDCW	14655	RDM15F221J3C
A4C18	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A4C19	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A4C20	0160-2219		C:FXD MICA 1100 PF 5%	28480	0160-2219
A4C21	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A4C22	0160-3076		C:FXD CER 470 PF 5% 200VDCW	71590	OBD
A4C23	0140-0184		C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A4C24	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C25	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C26	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A4C27	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A4C28	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C29	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A4C30	0160-3491		C:FXD CER 0.47 UF 20% 50VDCW	72982	8131-050-651-474M
A4C31	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A4CR1	1901-0450		DIODE:SILICON	28480	1901-0450
A4J1	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A4J2	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A4J3	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A4J4	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A4L1	08407-60029		COIL ASSY:LO RF AM	28480	08407-60029
A4L2	08407-60029		COIL ASSY:LO RF AM	28480	08407-60029
A4L3	9100-2209		INDUCTOR:37.8 UH 1%	28480	9100-2209
A4L4	9140-0180		COIL/CHOKE 2.70 UH 10%	28480	9140-0180
A4Q1	1854-0431		TSTR:SI NPN (REPLACEABLE BY RCA 2N5179)	28480	1854-0431
A4Q2	1854-0431		TSTR:SI NPN (REPLACEABLE BY RCA 2N5179)	28480	1854-0431
A4Q3	1854-0431		TSTR:SI NPN (REPLACEABLE BY RCA 2N5179)	28480	1854-0431
A4Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q8	1853-0034		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A4Q9	1854-0471		TSTR:SI NPN	28480	1854-0471
A4Q10	1854-0471		TSTR:SI NPN	28480	1854-0471
A4Q11	1854-0471		TSTR:SI NPN	28480	1854-0471
A4R1	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A4R2	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A4R3	0698-3445		R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A4R4	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R5	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A4R6	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A4R7	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A4R8	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A4R9	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A4R10	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A4R11	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A4R12	0757-0400		R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A4R13	0757-0400		R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A4R14	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A4R15	0698-7608		R:FXD FLM 192.5 OHM 0.5% 1/8W	28480	0698-7608
A4R16	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A4R17	0698-7608		R:FXD FLM 192.5 OHM 0.5% 1/8W	28480	0698-7608
A4R18	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A4R19	0698-5194		R:FXD MET FLM 71.15 OHM 0.25% 1/8W	28480	0698-5194
A4R20	0698-5401		R:FXD MET FLM 247.50 OHM 0.25% 1/8W	28480	0698-5401
A4R21	0698-5196		R:FXD MET FLM 96.25 OHM 0.25% 1/8W	28480	0698-5196
A4R22	0698-5192		R:FXD MET FLM 61.11 OHM 0.25% 1/8W	28480	0698-5192
A4R23	0698-5196		R:FXD MET FLM 96.25 OHM 0.25% 1/8W	28480	0698-5196
A4R24	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A4R25	0698-5194		R:FXD MET FLM 71.15 OHM 0.25% 1/8W	28480	0698-5194
A4R26	0698-5196		R:FXD MET FLM 96.25 OHM 0.25% 1/8W	28480	0698-5196
A4R27	0698-5192		R:FXD MET FLM 61.11 OHM 0.25% 1/8W	28480	0698-5192
A4R28	0698-5401		R:FXD MET FLM 247.50 OHM 0.25% 1/8W	28480	0698-5401
A4R29	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A4R30	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A4R31	0698-7607		R:FXD FLM 122.2 OHM 0.25% 1/8W	28480	0698-7607
A4R32	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A4R33	0757-0274		R:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A4R34	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R35	0698-3445		R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A4R36	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4R37	0757-0421		R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A4R38	0698-3428		R:FXD MET FLM 14.7 OHM 1% 1/8W	28480	0698-3428
A4R39	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A4R40	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A4R41	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A4R42	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A4R43	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4R44	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A4R45	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A4R46	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R47	0698-3153	8	R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A4R48	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A4R49	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A4R50	0757-0440	3	R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A4R51	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A4R52	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4R53	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R54	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A4R55	0757-0463	2	R:FXD MET FLM 82.5K OHM 1% 1/8W	28480	0757-0463
A4R56	0698-3160	1	R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A4R57	0698-3150	2	R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A4R58	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A4R58			FACTORY SELECTED PART		
A4R59	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R60	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4R61	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A4Z1	9170-0847		BEAD:SHIELDING RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A4Z2	9170-0847		BEAD:SHIELDING RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A4Z3	9170-0847		BEAD:SHIELDING RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A4Z4	9170-0847		BEAD:SHIELDING RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A4A1	105148		MIXER:DOUBLE BALANCED	28480	105148
A5	08407-60026	1	RECTIFIER BOARD ASSY	28480	08407-60026
A5	08407-60117	1	REBUILT 08407-60026, REQUIRES EXCHANGE	28480	08407-60117
A5C1	0160-0168	3	C:FXD MY 0.1 UF 10% 200VDCW RECOMMENDED REPLACEMENT	56289	192P10492-PTS
A5C2	0160-0168		C:FXD MY 0.1 UF 10% 200VDCW RECOMMENDED REPLACEMENT	56289	192P10492-PTS
A5CR1	1901-0200	4	DIODE:SILICON 100 PIV 3A	02735	1N4998
A5CR2	1901-0200		DIODE:SILICON 100 PIV 3A	02735	1N4998

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5CR3	1901-0200		DIODE:SILICON 100 PIV 3A	02735	1N4998
A5CR4	1901-0200		DIODE:SILICON 100 PIV 3A	02735	1N4998
A6	08407-60014		FRONT PANEL SWITCH ASSY	28480	08407-60014
A6C1	0160-3036	2	C:FXD CER 5000 PF +80-20% 200VDCW	28480	0160-3036
A6C2	0160-3036		C:FXD CER 5000 PF +80-20% 200VDCW	28480	0160-3036
A6J1	1251-1604		CONNECTOR:PC EDGE 1 ROW 22 CONTACT	71785	252-22-30-310
A6J2	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A6J3	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A6J4	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A6R1	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A6XA1 THRU A6XA6			NOT ASSIGNED		
A6XA7 A	1251-2283	4	CONNECTOR:PC 6 TUNING TYPE CONTACTS	95354	190-221-00
A6XA7 B	1251-2282	3	CONNECTOR:PC EDGE 6 FORK CONTACT	95354	190-220-00
A6XA8 A	1251-2283		CONNECTOR:PC 6 TUNING TYPE CONTACTS	95354	190-221-00
A6XA8 B	1251-2282		CONNECTOR:PC EDGE 6 FORK CONTACT	95354	190-220-00
A6XA9	1251-2337	2	CONNECTOR:PC 6 TUNING TYPE CONTACTS	95354	190-230-00
A6XA10 A	1251-1283	2	CONNECTOR:PC 6 TUNING TYPE CONTACTS	02660	143-006-07-1158
A6XA10 B	1251-1283		CONNECTOR:PC 6 TUNING TYPE CONTACTS	02660	143-006-07-1158
A6XA11 A	1251-2283		CONNECTOR:PC 6 TUNING TYPE CONTACTS	95354	190-221-00
A6XA11 B	1251-2282		CONNECTOR:PC EDGE 6 FORK CONTACT	95354	190-220-00
A6XA12	1251-2337		CONNECTOR:PC 6 TUNING TYPE CONTACTS	95354	190-230-00
A6XA13 A	1251-2283		CONNECTOR:PC 6 TUNING TYPE CONTACTS	95354	190-221-00
A6XA13 B	1251-2281	1	CONNECTOR:PC EDGE 6 FORK CONTACT	95354	190-219-00
A6XA14 A	1251-0478	6	CONNECTOR:PC (2 X 6) 12 CONTACTS	71785	252-06-30-340
A6XA14 B	1251-0478		CONNECTOR:PC (2 X 6) 12 CONTACTS	71785	252-06-30-340
A6XA15			NOT ASSIGNED		
A6XA16 A	1251-2397	1	CONNECTOR:PC EDGE 6 FORK CONTACT	95354	190-237-00
A6XA16 B	1251-2396	1	CONNECTOR:PC EDGE 6 FORK CONTACT	95354	190-238-00
A6XA17 A	1251-0478		CONNECTOR:PC (2 X 6) 12 CONTACTS	71785	252-06-30-340
A6XA17 B	1251-0478		CONNECTOR:PC (2 X 6) 12 CONTACTS	71785	252-06-30-340
A6XA18 A	1251-0478		CONNECTOR:PC (2 X 6) 12 CONTACTS	71785	252-06-30-340
A6XA18 B	1251-0478		CONNECTOR:PC (2 X 6) 12 CONTACTS	71785	252-06-30-340
A7	08407-60011	1	PROGRAMMABLE IF ATTENUATOR ASSY	28480	08407-60011
A7	08407-60103	1	REBUILT 08407-60011, REQUIRES EXCHANGE	28480	08407-60103
A7C1	0180-2206	3	C:FXD ELECT 60 UF 10% 6VDCW	56289	150D606X9006B2
A7C2	0180-1746	13	C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C3	0180-0228	1	C:FXD ELECT 22 UF 10% 15VDCW	56289	150D226X9015B2-DYS
A7C4	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C5	0180-1743	8	C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C6	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C7	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C8	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C9	0180-2206		C:FXD ELECT 60 UF 10% 6VDCW	56289	150D606X9006B2
A7C10	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C11	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C12	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C13	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C14	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C15	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A7C16	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C17	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C18	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C19	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C20	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A7C21	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C22	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C23	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A7C24	0140-0193	1	C:FXD MICA 82 PF 5%	28480	0140-0193
A7C25	0180-2206		C:FXD ELECT 60 UF 10% 6VDCW	56289	150D606X9006B2
A7C26	0160-2249	4	C:FXD CER 4.7 PF 500VDCW	72982	301-NPO-4.7 PF
A7C27	0160-2201	3	C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A7C28	0160-2249		C:FXD CER 4.7 PF 500VDCW	72982	301-NPO-4.7 PF
A7C29	0160-2201		C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A7C30	0140-0205	1	C:FXD MICA 62 PF 5% 300VDCW	00853	RDM15E620J3C
A7C31	0160-2199	2	C:FXD MICA 30 PF 5% 300VDCW	28480	0160-2199
A7C32	0160-2249		C:FXD CER 4.7 PF 500VDCW	72982	301-NPO-4.7 PF
A7C33	0160-2249		C:FXD CER 4.7 PF 500VDCW	72982	301-NPO-4.7 PF
A7CR1	1901-0039	9	DIODE:SILICON 200MA 50WV	28480	1901-0039
A7CR2	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A7CR3	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A7CR4	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A7CR5	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A7CR6	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A7K1	0490-0884	4	RELAY:REED, RECOMMENDED REPLACEMENT	28480	0490-0884

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7K2	0490-0884		RELAY:REED, RECOMMENDED REPLACEMENT	28480	0490-0884
A7K3	0490-0884		RELAY:REED, RECOMMENDED REPLACEMENT	28480	0490-0884
A7K4	0490-0884		RELAY:REED, RECOMMENDED REPLACEMENT	28480	0490-0884
A7Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q2	1854-0023	1	TSTR:SI NPN(SELECTED FROM 2N2484)	28480	1854-0023
A7Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q4	1853-0010	4	TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A7Q5	1854-0053	2	TSTR:SI NPN	80131	2N2218
A7Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7Q7	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A7Q8	1854-0053		TSTR:SI NPN	80131	2N2218
A7Q9	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A7R1	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A7R2	0698-3438	15	R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R3	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A7R4	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A7R5	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A7R6	0698-0024	1	R:FXD MET FLM 2.61K OHM 1% 1/2W	28480	0698-0024
A7R7	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A7R8	0698-7395	1	R:FXD FLM 3.8K OHM 0.1% 1/8W	28480	0698-7395
A7R9	0698-7396	1	R:FXD FLM 1.474K OHM 0.1% 1/8W	28480	0698-7396
A7R10	0698-7397	1	R:FXD FLM 211.1 OHM 0.1% 1/8W	28480	0698-7397
A7R11	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R12	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R13	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R14	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R15	0698-6996	3	R:FXD FLM 200 OHM 0.1% 1/8W	28480	0698-6996
A7R16	0698-3157	4	R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A7R17	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A7R18	0698-3161	4	R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161
A7R19	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A7R20	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A7R21	0757-0200	3	R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A7R22	0698-3447		R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A7R23	0698-3444	3	R:FXD MET FLM 316 OHM 1% 1/8W	28480	0698-3444
A7R24	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A7R25	0698-7398	2	R:FXD FLM 6.124K OHM 0.1% 1/8W	28480	0698-7398
A7R26	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A7R27	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R28	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R29	0698-6996		R:FXD FLM 200 OHM 0.1% 1/8W	28480	0698-6996
A7R30	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A7R31	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A7R32	0698-3161		R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161
A7R33	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A7R34	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A7R35	0757-0200		R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A7R36	0698-3447		R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A7R37	0698-3444		R:FXD MET FLM 316 OHM 1% 1/8W	28480	0698-3444
A7R38	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A7R39	0698-7398		R:FXD FLM 6.124K OHM 0.1% 1/8W	28480	0698-7398
A7R40	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A7R41	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R42	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A7R43	0698-6996		R:FXD FLM 200 OHM 0.1% 1/8W	28480	0698-6996
A7R44	0698-3155	5	R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A7R45	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A7R46	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A7R47	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A8	08407-60005	1	TEST CHANNEL AGC AMPLIFIER ASSY, ORDER 08407-60036 A8 & A11 MATCHED PAIR (WITHOUT EXCHANGE)	28480	08407-60005
A8	08407-60104	2	REBUILT 08407-60004 & 08407-60005(A8-11 MATCHED PAIR) REQUIRES EXCHANGE.	28480	08407-60104
A8C1	0180-0116	25	C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C2	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C3	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C4	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C5	0160-2930	5	C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A8C6	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A8C7	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8C8	0160-2257	6	C:FXD CER 10 PF 5% 500VDCW	72982	301-000-COH0-100J
A8C9	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A8C10	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A8C11	0160-2250		C:FXD CER 5.1 PF 500VDCW	72982	301-000-COH0-519E
A8C12	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C13	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C14	0170-0040	4	C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A8C15	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A8C16	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A8C17	0160-3460	1	C:FXD CER 0.05 UF +80-20% 100VDCW	56289	C023E101L503ZS22-CDM
A8CR1	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A8CR2	1902-0041		DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A8CR3	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A8Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A8Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A8Q3	1854-0295	2	TSTR:SI NPN	28480	1854-0295
A8Q4	08407-80004	1	TRANSISTOR:MATCHED QUAD	28480	08407-80004
A8Q4			(A8Q4,5 & A11Q4,5)REPLACE IN MATCHED 4		
A8Q4	1205-0207	1	HEAT DISSIPATOR:SEMICON DUAL TO-5	13103	3207A
A8Q5			PART OF A8Q4		
A8Q6	1854-0221	3	TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A8Q7	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A8Q8	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A8R1	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A8R2	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A8R3	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A8R4	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A8R5	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A8R6	0757-0441	1	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A8R7	0757-0278	3	R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A8R8	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A8R9	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A8R10	0698-3151		R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A8R11	0757-0439	2	R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A8R12	0757-0398		R:FXD MET FLM 75 OHM 1% 1/8W	28480	0757-0398
A8R13	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A8R14	0757-0817	4	R:FXD MET FLM 750 OHM 1% 1/2W	28480	0757-0817
A8R15	0698-3404	3	R:FXD MET FLM 383 OHM 1% 1/2W	28480	0698-3404
A8R16	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A8R17	0757-0817		R:FXD MET FLM 750 OHM 1% 1/2W	28480	0757-0817
A8R18	0698-3161		R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161
A8R19	0698-3161		R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161
A8R20	0757-0447	1	R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A8R20			FACTORY SELECTED PART		
A8R21	0698-3152	1	R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A8R22	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A8R23	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A8R24	0757-0839	1	R:FXD MET FLM 10K OHM 1% 1/2W	28480	0757-0839
A8R25	0757-0398		R:FXD MET FLM 75 OHM 1% 1/8W	28480	0757-0398
A8R26	0757-0461	1	R:FXD MET FLM 68.1K OHM 1% 1/8W	28480	0757-0461
A8R27	0757-0346	2	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A8T1	9100-2870	2	TRANSFORMER	28480	9100-2870
A8T2	9100-2869	2	TRANSFORMER	28480	9100-2869
A9	08407-60006	1	BAND PASS FILTER ASSY	28480	08407-60006
A9	08407-60105	2	REBUILT 08407-60006, REQUIRES EXCHANGE	28480	08407-60105
A9C1	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A9C2	0140-0184		C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A9C3	0160-3076		C:FXD CER 470 PF 5% 200VDCW	71590	OBD
A9C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A9C5	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A9C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A9C7	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A9J1	1250-1195	4	CONNECTOR:RF SUB-MINIATURE SERIES	98291	52-053-0000
A9J2	1250-1195		CONNECTOR:RF SUB-MINIATURE SERIES	98291	52-053-0000
A9J3	1250-1195		CONNECTOR:RF SUB-MINIATURE SERIES	98291	52-053-0000
A9J4	1250-1195		CONNECTOR:RF SUB-MINIATURE SERIES	98291	52-053-0000
A9L1	9100-2209		INDUCTOR:37.8 UH 1%	28480	9100-2209
A9Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9R1	0698-7236	7	R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A9R2	0698-7260	8	R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A9R3	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A9R4	0698-7219	2	R:FXD FLM 196 OHM 2% 1/8W	28480	0698-7219
A9R5	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A9R6	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9R7	0698-7219		R:FXD FLM 196 OHM 2% 1/8W	28480	0698-7219
A10	08407-60010	1	AGC FEEDBACK AMPLIFIER ASSY	28480	08407-60010
A10	08407-60106	1	REBUILT 08407-60010, REQUIRES EXCHANGE	28480	08407-60106
A10C1	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C2	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C3	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C4	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A10C5	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A10C6	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C7	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A10C8	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C9	0140-0196	1	C:FXD MICA 150 PF 5%	72136	RDM15F151J3C
A10C10	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C11	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10C12	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A10C13	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C14	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C15	0160-0134		C:FXD MICA 220PF 5% 300VDCW	14655	RDM15F221J3C
A10C16	0160-2200	1	C:FXD MICA 43 PF 5%	72136	RDM15E430J3C
A10C17	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A10C18	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A10C19	0160-0153	1	C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
A10C20	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C21	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-COH0-100J
A10C22	0160-0167	1	C:FXD MY .082 UF 10% 200VDCW	56289	192P82392-PTS
A10C23	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C24	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10C25	0160-2201		C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A10C26	0160-0158	1	C:FXD MY 0.0056 UF 10% 200VDCW	56289	192P56292-PTS
A10C27	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-COH0-100J
A10C28	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-COH0-100J
A10C29	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A10CR1	1901-0050	12	DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR2	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR3	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR4	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR5	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR6	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR7	1902-3182	1	DIODE BREAKDOWN:SILICON 12.1V 5%	28480	1902-3182
A10CR8	1902-0048	1	DIODE:BREAKDOWN 6.81V 5%	04713	SZ10939-134
A10CR9	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR10	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR11	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR12	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR13	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A10CR14	1910-0016	1	DIODE:GERMANIUM 100MA/0.85V 60PIV	93332	D2361
A10L1	9100-2573	1	INDUCTOR:SHIELDED 1 MH 10%	82142	15S-102K
A10L2	9140-0137	3	COIL:FXD RF 1000 UH 5%	28480	9140-0137
A10L3	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A10Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A10Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A10Q4	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A10Q5	1855-0050	1	TSTR:SI FET DUAL	28480	1855-0050
A10Q6	1855-0332	1	TSTR:SI	80131	3N138
A10Q7	1854-0009	3	TSTR:SI NPN	80131	2N709
A10Q8	1854-0009		TSTR:SI NPN	80131	2N709
A10Q9	1854-0009		TSTR:SI NPN	80131	2N709
A10Q10	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10Q12	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10R1	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R2	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10R3	0757-1078	1	R:FXD MET FLM 1.47K OHM 1% 1/2W	28480	0757-1078
A10R4	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A10R5	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R6	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R7	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A10R8	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A10R9	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A10R10	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R11	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A10R12	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A10R13	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10R14	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10R15	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10R16	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R17	0698-0082		R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A10R18	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10R19	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A10R20	0698-3404		R:FXD MET FLM 383 OHM 1% 1/2W	28480	0698-3404
A10R21	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A10R22	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A10R23	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10R24	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R25	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A10R26	0698-3154		R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A10R27	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A10R28	0683-3055	1	R:FXD COMP 3 MEGOHM 5% 1/4W	01121	CB 3055
A10R29	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10R30	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R31	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A10R32	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A10R33	0757-0274		R:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A10R34	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A10R35	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A10R36	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10R37	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A10R38	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A10R39	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A10R40	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A10R41	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A10R42	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R43	0698-3439	1	R:FXD MET FLM 178 OHM 1% 1/8W	28480	0698-3439
A10R44	0698-3136	1	R:FXD MET FLM 17.8K OHM 1% 1/8W	28480	0698-3136
A10R45	0698-3132		R:FXD FLM 261 OHM 1% 1/8W	28480	0698-3132
A10R46	0757-0821	1	R:FXD MET FLM 1.21K OHM 1% 1/2W	28480	0757-0821
A10R47	0757-0289	1	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A10R48	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A10R49	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A10U1	1820-0321	1	INTEGRATED CIRCUIT:HI-SPEED COMPARATOR	01295	SN72 710L
A11	08407-60004	1	REFERENCE CHANNEL AGC AMPLIFIER ASSY, ORDER 08407-60036 A8 & A11 MATCHED PAIR (WITHOUT EXCHANGE)	28480	08407-60004
A11	08407-60104		REBUILT 08407-60004 & 08407-60005(A8-11 MATCHED PAIR)REQUIRES EXCHANGE	28480	08407-60104
A11C1	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A11C2	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A11C3	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A11C4	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A11C5	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A11C6	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A11C7	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A11C8	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A11C9	0160-2214	1	C:FXD MICA 680 PF 5%	28480	0160-2214
A11C10	0160-2306	1	C:FXD MICA 27 PF 5%	28480	0160-2306
A11C11	0160-2234	1	C:FXD CER 0.51 PF 500VDCW	72982	301-000-COKO-518C
A11C12	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A11C13	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A11C14	0170-0040		C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A11CR1	1901-0039		DIODE:SILICON 200MA 50WV	28480	1901-0039
A11CR2	1902-0041		DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A11CR3	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A11L1	9100-1649	1	COIL/CHOKE 620 UH 5%	28480	9100-1649
A11Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A11Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A11Q3	1854-0295		TSTR:SI NPN	28480	1854-0295
A11Q4			PART OF A8Q4		
A11Q5			PART OF A8Q4		
A11Q6	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A11Q7	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A11R1	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A11R2	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A11R3	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A11R4	0698-3154		R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A11R5	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A11R6	0757-0288		R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A11R7	0757-0278		R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A11R8	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A11R9	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11R10	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A11R11	0698-3151		R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A11R12	0757-0439		R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A11R13	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A11R14	0757-0817		R:FXD MET FLM 750 OHM 1% 1/2W	28480	0757-0817
A11R15	0698-3404		R:FXD MET FLM 383 OHM 1% 1/2W	28480	0698-3404
A11R16	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A11R17	0757-0817		R:FXD MET FLM 750 OHM 1% 1/2W	28480	0757-0817
A11R18	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A11R19	0757-0422		R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A11R20	0757-0422		R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A11R21	0757-0290		R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A11R22	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A11R23	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A11R24	0757-0463		R:FXD MET FLM 82.5K OHM 1% 1/8W	28480	0757-0463
A11R24			FACTORY SELECTED PART		
A11R25	0757-0462	1	R:FXD MET FLM 75.0K OHM 1% 1/8W	28480	0757-0462
A11R26	0757-0278		R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A11R27	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A11R28	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A11R29	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A11T1	9100-2870		TRANSFORMER	28480	9100-2870
A11T2	9100-2869		TRANSFORMER	28480	9100-2869
A12	08407-60006	1	BANDPASS FILTER ASSY SAME AS A9, USE PREFIX A12	28480	08407-60006
A12	08407-60105		REBUILT 08407-60006, REQUIRES EXCHANGE	28480	08407-60105
A13	08407-60002	1	BOARD ASSY:ALC AMPLIFIER	28480	08407-60002
A13	08407-60102	1	REBUILT 08407-60002,REQUIRES EXCHANGE	28480	08407-60102
A13C1	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C2	0160-2265	2	C:FXD CER 22 PF 5% 500VDCW	72982	301-NPO-22PF
A13C3	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C5	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C6	0160-2199		C:FXD MICA 30 PF 5% 300VDCW	28480	0160-2199
A13C7	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C8	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C9	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C10	0160-2250		C:FXD CER 5.1 PF 500VDCW	72982	301-000-COH0-519E
A13C11	0160-2265		C:FXD CER 22 PF 5% 500VDCW	72982	301-NPO-22PF
A13C12	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C13	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C14	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C15	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C16	0160-0163	1	C:FXD MY 0.033 UF 10% 200VDCW	56289	192P33392-PTS
A13C17	0160-0162	1	C:FXD MY 0.022 UF 10% 200VDCW	56289	192P22392-PTS
A13C18	0160-0166	1	C:FXD MY 0.068 UF 10% 200VDCW	56289	192P68392-PTS
A13C19	0160-0302	1	C:FXD MY 0.018 UF 10% 200VDCW	56289	192P18392-PTS
A13C20	0160-0165	1	C:FXD MY 0.056 UF 10% 200VDCW	56289	192P56392-PTS
A13C21	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C22	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C23	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C24	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C25	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C26	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C27	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C28	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A13C29	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C30	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C31	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C32	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C33	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C34	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C35	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13L1	9100-2255	3	COIL/CHOKE 0.47 UH 10%	28480	9100-2255
A13L2	9100-2250	1	COIL/CHOKE 0.18 UH 10%	28480	9100-2250
A13L3	9100-2254	1	COIL/CHOKE .39 UH 10%	28480	9100-2254
A13L4	9140-0237	1	COIL:FXD 200 UH 5% RECOMMENDED REPLACEMENT	28480	9140-0237
A13L5	9100-1646	1	COIL/CHOKE 430 UH 5% RECOMMENDED REPLACEMENT	82142	19-1331-26J
A13L6	9140-0158	3	COIL:FXD RF 1 UH 10%	99800	1025-20
A13L7	9140-0158		COIL:FXD RF 1 UH 10%	99800	1025-20
A13L8	9140-0158		COIL:FXD RF 1 UH 10%	99800	1025-20
A13Q1	1854-0345		TSTR:SI NPN	80131	2N5179
A13Q2	1854-0345		TSTR:SI NPN	80131	2N5179

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A13Q4	1854-0247	2	TSTR:SI NPN	28480	1854-0247
A13Q5	1854-0280	1	TSTR:SI NPN DUAL	28480	1854-0280
A13Q6	1854-0345		TSTR:SI NPN	80131	2N5179
A13Q7	1854-0247		TSTR:SI NPN	28480	1854-0247
A13Q8	1853-0034		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A13Q9	1854-0471		TSTR:SI NPN	28480	1854-0471
A13R1	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A13R2	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A13R3	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A13R4	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A13R5	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A13R6	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A13R7	0757-0294	1	R:FXD MET FLM 17.8 OHM 1% 1/8W	28480	0757-0294
A13R8	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A13R9	0698-3437	2	R:FXD MET FLM 133 OHM 1% 1/8W	28480	0698-3437
A13R10	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A13R11	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A13R12	0698-3430	3	R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A13R13	0757-0200		R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A13R14	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A13R15	0698-3432	1	R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A13R16	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A13R17	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A13R18	0698-3430		R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A13R19	0698-3430		R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A13R20	0698-3150		R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A13R21	0757-0403		R:FXD MET FLM 121 OHM 1% 1/8W	28480	0757-0403
A13R22	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A13R23	0698-3156	1	R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A13R24	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A13R25	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A13R26	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A13R27	2100-2521	1	R:VAR FLM 2000 OHM 10% LIN 1/2W	28480	2100-2521
A13R28	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W RECOMMENDED REPLACEMENT	28480	0757-0401
A13R29	0698-3154		R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A13R30	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A13R31	0698-3445		R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A13R32	0757-0290		R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A13R33	0757-0290		R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A13R34	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A13R35	0698-3444		R:FXD MET FLM 316 OHM 1% 1/8W	28480	0698-3444
A13R36	0698-3437		R:FXD MET FLM 133 OHM 1% 1/8W	28480	0698-3437
A13R37	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A13R38	0698-3132		R:FXD FLM 261 OHM 1% 1/8W	28480	0698-3132
A13R39	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A13R40	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A13R41	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A13R42	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A13R43	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A13R44	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A13R45	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A13U1			NOT ASSIGNED		
A13U2	1821-0001	1	TRANSISTOR ARRAY:SI NPN	02735	CA3046
A13Z1	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A13Z2	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A13Z3	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A13Z4	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A14	08407-60123	1	BOARD ASSY:PHASE-LOCKED OSCILLATOR RECOMMENDED REPLACEMENT	28480	08407-60123
A14	08407-60107	1	REBUILT 08407-60123,REQUIRES EXCHANGE	28480	08407-60107
A14C1	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C2	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C3	0160-2206	2	C:FXD MICA 160 PF 5%	28480	0160-2206
A14C4	0160-2206		C:FXD MICA 160 PF 5%	28480	0160-2206
A14C5	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C7	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C8	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C9	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14C10	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C11	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C12	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A14C13	0180-0100	3	C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A14C14	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A14C15	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C16	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C17	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C18	0160-3490		C:FXD CER 1.0 UF 20% 50VDCW	72982	8131-050-651-105M
A14C19	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C20	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C21	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C22	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C23	0160-2016	1	C:FXD MICA 62 PF 5% 500VDCW	00853	RDM15E620J5S
A14C24	0150-0050	2	C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C0678102E102ZS26-CDH
A14C25	0160-0386	1	C:FXD CER 3.3 TO 0.25 PF 500VDCW	72982	301-000-S2H0-339C
A14C25			FACTORY SELECTED PART		
A14C26	0160-3535	1	C:FXD MICA 510 PF 5% 100VDCW	72136	RDM15F511J1C
A14C27	0150-0115	1	C:FXD CER 27 PF 10% 500VDCW	72982	301-000-U2J0-270K
A14C28	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A14C29	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C30	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C31	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C0678102E102ZS26-CDH
A14C32	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A14C33	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A14C34	0160-3534	2	C:FXD MICA 510 PF 5% 100VDCW	00853	RDM15F511JIC
A14C35	0160-3534		C:FXD MICA 510 PF 5% 100VDCW	00853	RDM15F511JIC
A14C36	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C37	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C38	0160-2246	1	C:FXD CER 3.6+/-0.25 PF 500VDCW	72982	301-000-C0J0-369C
			FACTORY SELECTED PART		
A14C39	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A14CR1	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A14CR2	1902-0025	1	DIODE,BREAKDOWN:10.0V 5% 400 MW	28480	1902-0025
A14CR3	0122-0263	7	C:VOLTAGE VAR 47 PF 10% 60WV	04713	1N5148
			RECOMMENDED REPLACEMENT		
A14J1	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A14L1	9100-1658	2	COIL/CHOKE 1600 UH 5%	99800	2500-38
A14L2	9100-1658		COIL/CHOKE 1600 UH 5%	99800	2500-38
A14L3	9100-2247	10	COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L4	9100-1643	2	COIL/CHOKE 300 UH 5%	28480	9100-1643
A14L5	9100-1643		COIL/CHOKE 300 UH 5%	28480	9100-1643
A14L6	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L7	08407-80008	1	COIL ASSY:ADJUSTABLE	28480	08407-80008
A14L8	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L9	9100-2248	3	COIL/CHOKE 0.12 UH 10%	82142	09-4416-2K
A14L10	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L11	9140-0137		COIL:FXD RF 1000 UH 5%	28480	9140-0137
A14L12	9100-1639	1	COIL/CHOKE 150 UH 5%	82142	15-1315-16J
A14Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q4	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q5	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q6	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q8	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q9	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q10	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q12	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q13	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q14	1854-0431		TSTR:SI NPN	80131	2N5179
A14Q15	1854-0471		TSTR:SI NPN	28480	1854-0471
A14Q16	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14R1	0698-7255	4	R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R2	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R3	0698-7248	2	R:FXD FLM 3.16K OHM 2% 1/8W	28480	0698-7248
A14R4	0698-7248		R:FXD FLM 3.16K OHM 2% 1/8W	28480	0698-7248
A14R5	0698-7265	2	R:FXD FLM 16.2K OHM 2% 1/8W	28480	0698-7265
A14R6	0698-7265		R:FXD FLM 16.2K OHM 2% 1/8W	28480	0698-7265
A14R7	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R8	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R9	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A14R10	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14R11	0698-7257	4	R:FXD FLM 7.5K OHM 2% 1/8W	28480	0698-7257
A14R12	0698-7237	2	R:FXD FLM 1.1K OHM 2% 1/8W	28480	0698-7237
A14R13	0698-7252	1	R:FXD FLM 4.64K OHM 2% 1/8W	28480	0698-7252
A14R14	0698-7237		R:FXD FLM 1.1K OHM 2% 1/8W	28480	0698-7237
A14R15	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R16	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R17	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A14R18	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A14R19	0698-7269	1	R:FXD FLM 23.7K OHM 2% 1/8W	28480	0698-7269
A14R20	0698-7246	1	R:FXD FLM 2610 OHM 2% 1/8W	28480	0698-7246
A14R21	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R22	0698-7267	5	R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R23	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R24	0698-7244	1	R:FXD FLM 2.15K OHM 2% 1/8W	28480	0698-7244
A14R25	0698-7257		R:FXD FLM 7.5K OHM 2% 1/8W	28480	0698-7257
A14R26	0698-7222	4	R:FXD FLM 261 OHM 2% 1/8W	28480	0698-7222
A14R27	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R28	0698-7222		R:FXD FLM 261 OHM 2% 1/8W	28480	0698-7222
A14R29	0698-7231	2	R:FXD FLM 619 OHM 2% 1/8W	28480	0698-7231
A14R30	0698-7209	1	R:FXD FLM 75 OHM 2% 1/8W	28480	0698-7209
A14R31	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R32	0698-7222		R:FXD FLM 261 OHM 2% 1/8W	28480	0698-7222
A14R33	0698-7231		R:FXD FLM 619 OHM 2% 1/8W	28480	0698-7231
A14R34	0698-7257		R:FXD FLM 7.5K OHM 2% 1/8W	28480	0698-7257
A14R35	0698-7222		R:FXD FLM 261 OHM 2% 1/8W	28480	0698-7222
A14R36	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R37	0698-7253	2	R:FXD MET FLM 5.11K OHM 2% 1/8W	28480	0698-7253
A14R38	0698-7264	1	R:FXD FLM 14.7K OHM 2% 1/8W	28480	0698-7264
A14R39	0698-7257		R:FXD FLM 7.5K OHM 2% 1/8W	28480	0698-7257
A14R40	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R41	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R42	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R42			RECOMMENDED REPLACEMENT W/A14R43		
A14R43	0698-7243	1	R:FXD FLM 1.96K OHM 2% 1/8W	28480	0698-7243
A14R43			RECOMMENDED REPLACEMENT W/ A14R42		
A14R44	0698-7212	1	R:FXD FLM 100 OHM 2% 1/8W	28480	0698-7212
A14R45	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A14R46	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R47	0698-7229	1	R:FXD FLM 511 OHM 2% 1/8W	28480	0698-7229
A14R47			FACTORY SELECTED PART		
A14R48	0698-7223	1	R:FXD FLM 287 OHM 2% 1/8W	28480	0698-7223
A14R49	0757-0159	2	R:FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159
A14R50	0757-0159		R:FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159
A14R51	0698-7205	1	R:FXD FLM 51.1 OHM 2% 1/8W	28480	0698-7205
A14R52	2100-1761	1	R:VAR WW 10K OHM 5% TYPE V 1W	28480	2100-1761
A14R53	0698-7253		R:FXD MET FLM 5.11K OHM 2% 1/8W	28480	0698-7253
A14R54	0698-7258	1	R:FXD FLM 8.25K OHM 2% 1/8W	28480	0698-7258
A14R55	0698-7259	1	R:FXD FLM 9.09K OHM 2% 1/8W	28480	0698-7259
A14R56	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R57	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R58	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R59	0698-7221	1	R:FXD FLM 237 OHM 2% 1/8W	28480	0698-7221
A14R60	0698-7250		R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A14Y1	0410-0195	1	CRYSTAL:QUARTZ	28480	0410-0195
	1200-0770	1	SOCKET:CRYSTAL	91506	8000-AG-26
A14Y2	0410-0194	1	CRYSTAL:QUARTZ	28480	0410-0194
A14Z1	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A15	08407-60012	1	LO MIXER ASSY	28480	08407-60012
A15	08407-60110	1	REBUILT 08407-60012, REQUIRES EXCHANGE	28480	08407-60110
A15C1	0160-2260	4	C:FXD CER 13 PF 5% 500VDCW	72982	301-000-C0G0 130J
A15C2	0160-2260		C:FXD CER 13 PF 5% 500VDCW	72982	301-000-C0G0 130J
A15C3	0160-2260		C:FXD CER 13 PF 5% 500VDCW	72982	301-000-C0G0 130J
A15C4	0160-2260		C:FXD CER 13 PF 5% 500VDCW	72982	301-000-C0G0 130J
A15C5	0160-0179	4	C:FXD MICA 33 PF 5% 300VDCW	00853	DM15E330J 300V
A15C6	0160-0179		C:FXD MICA 33 PF 5% 300VDCW	00853	DM15E330J 300V
A15C7	0160-0179		C:FXD MICA 33 PF 5% 300VDCW	00853	DM15E330J 300V
A15C8	0160-0179		C:FXD MICA 33 PF 5% 300VDCW	00853	DM15E330J 300V
A15C9	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A15CR1	10514-8454	1	DIODE:SILICON MATCHED QUAD	28480	10514-8454
A15CR2	10514-8454		DIODE:SILICON MATCHED QUAD	28480	10514-8454
A15CR3	10514-8454		DIODE:SILICON MATCHED QUAD	28480	10514-8454
A15CR4	10514-8454		DIODE:SILICON MATCHED QUAD	28480	10514-8454
A15J1	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A15J2	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A15J3	1250-1205		CONNECTOR:PC RT ANGLE	28480	1250-1205
A15L1	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A15L2	9100-2249	7	COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A15L3	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A15L4	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A15L5	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A15L6	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A15L7	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A15L8	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A15L9	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A15L10	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A15R1	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A15R2	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A15R3	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A15R4	0698-3435		R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A15R5	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A15R6	0698-3438		R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A15R7	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A15T1	08552-6024	1	TRANSFORMER:RF(CODE=YELLOW)	28480	08552-6024
A15T2	08553-6012	4	TRANSFORMER:RF(CODE=BLUE)	28480	08553-6012
A15T3	08553-6012		TRANSFORMER:RF(CODE=BLUE)	28480	08553-6012
A16	08407-60001	1	VTO AMPLIFIER ASSY	28480	08407-60001
A16	08407-60112	1	REBUILT 08407-60001, REQUIRES EXCHANGE	28480	08407-60112
A16C1	0150-0093	14	C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C2	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C3	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C4	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C5	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C6	0160-2250		C:FXD CER 5.1 PF 500VDCW	72982	301-000-COH0-519E
A16C7	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C8	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C9	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A16C10	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A16C11	0160-2261	2	C:FXD CER 15 PF 5% 500VDCW	72982	301-NPO-15 PF
A16C12	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C13	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C14	0160-2261		C:FXD CER 15 PF 5% 500VDCW	72982	301-NPO-15 PF
A16C15	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A16C16	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C17	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C18	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A16C19	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C20	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C21	0150-0093		C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A16C22	0160-2251	2	C:FXD CER 5.6 PF 500VDCW	72982	301-000-COH0-569G
A16C23	0160-2251		C:FXD CER 5.6 PF 500VDCW	72982	301-000-COH0-569G
A16C24	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A16C25	0150-0059	2	C:FXD CER 3.3-0.25 PF 500VDCW	72982	301-000-COJ0-339C
A16C26	0160-2263	2	C:FXD CER 18 PF 5% 500VDCW	72982	301-000-COG0-180J
A16C27	0160-2243	1	C:FXD CER 2.7+/-0.25 PF 500VDCW	72982	301-000-COJ0-279C
A16C28	0160-2263		C:FXD CER 18 PF 5% 500VDCW	72982	301-000-COG0-180J
A16C29	0150-0059		C:FXD CER 3.3-0.25 PF 500VDCW	72982	301-000-COJ0-339C
A16L1	9100-0346	3	COIL:FXD 0.05 UH 20%	36196	H-10886
A16L2	9100-0346		COIL:FXD 0.05 UH 20%	36196	H-10886
A16L3	9100-2255		COIL/CHOKE 0.47 UH 10%	28480	9100-2255
A16L4	9100-0346		COIL:FXD 0.05 UH 20%	36196	H-10886
A15L5	9100-2255		COIL/CHOKE 0.47 UH 10%	28480	9100-2255
A16L6	9100-2248		COIL/CHOKE 0.12 UH 10%	82142	09-4416-2K
A15L7	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A16L8	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A15L9	9100-2248		COIL/CHOKE 0.12 UH 10%	82142	09-4416-2K
A15L10	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A15Q1	1854-0345		TSTR:SI NPN	80131	2N5179
A15Q2	1854-0345		TSTR:SI NPN	80131	2N5179
A16Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A15Q4	1854-0332	2	TSTR:SI NPN	02735	38868
A16Q5	1854-0332		TSTR:SI NPN	02735	38868
A16Q6	1854-0345		TSTR:SI NPN	80131	2N5179
A16Q7	1854-0345		TSTR:SI NPN	80131	2N5179
A16R1	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A15R2	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R3	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R4	0683-1225	2	R:FXD COMP 1200 OHM 5% 1/4W	01121	CB 1225
A15R5	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A15R6	0757-0316		R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

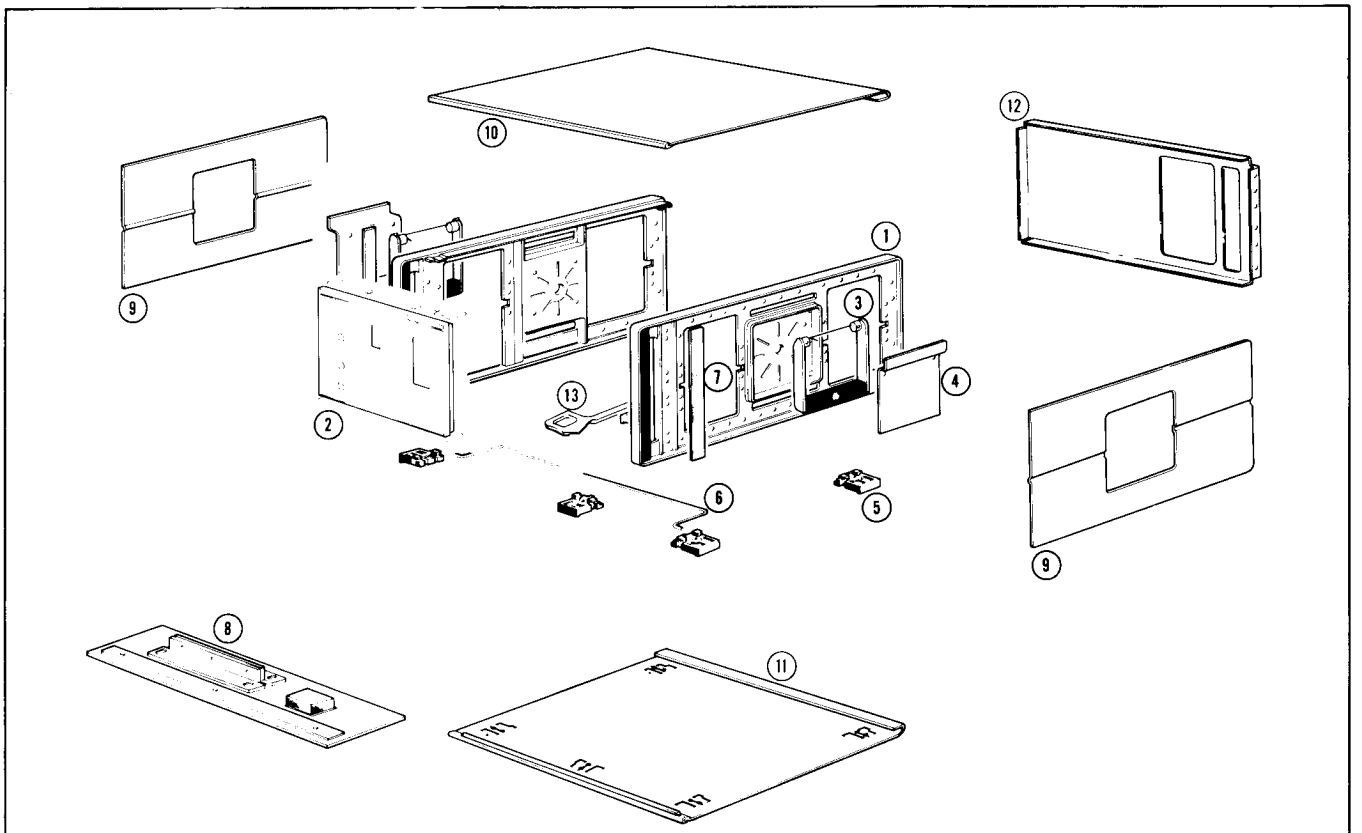
Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A16R7	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R8	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R9	0683-1225		R:FXD COMP 1200 OHM 5% 1/4W	01121	CB 1225
A16R10	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R11	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R12	0683-2005	2	R:FXD COMP 20 OHM 5% 1/4W	01121	CB 2005
A16R13	0683-9115	1	R:FXD COMP 910 OHM 5% 1/4W	01121	CB 9115
A16R14	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R15	0683-1325	1	R:FXD COMP 1300 OHM 5% 1/4W	01121	CB 1325
A16R16	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R17	0757-0815	2	R:FXD MET FLM 562 OHM 1% 1/2W	28480	0757-0815
A16R18	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R19	0757-0818	2	R:FXD MET FLM 825 OHM 1% 1/2W	28480	0757-0818
A16R20	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A16R21	0683-2005		R:FXD COMP 20 OHM 5% 1/4W	01121	CB 2005
A16R22	0757-0815		R:FXD MET FLM 562 OHM 1% 1/2W	28480	0757-0815
A16R23	0757-0818		R:FXD MET FLM 825 OHM 1% 1/2W	28480	0757-0818
A16R24	0757-0158	1	R:FXD MET FLM 619 OHM 1% 1/2W	28480	0757-0158
A16R25	0683-2025	2	R:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A16R26	0683-2025		R:FXD COMP 2000 OHM 5% 1/4W	01121	CB 2025
A16T1	08552-6018	1	TRANSFORMER:RF(CODE=RED)	28480	08552-6018
A16T2	08553-6012		TRANSFORMER:RF(CODE=BLUE)	28480	08553-6012
A16T3	08553-6012		TRANSFORMER:RF(CODE=BLUE)	28480	08553-6012
A16Z1	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A16Z2	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A16Z3	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A16Z4	9170-0847		BEAD:SHIELDING, RECOMMENDED REPLACEMENT	02114	56-590-65-3B
A17	08407-60013	1	BOARD ASSY:POWER SUPPLY	28480	08407-60013
A17	08407-60113	1	REBUILT 08407-60013, REQUIRES EXCHANGE	28480	08407-60113
A17C1	0160-2211	2	C:FXD MICA 510 PF 5% 300VDCW	28480	0160-2211
A17C2	0160-2211		C:FXD MICA 510 PF 5% 300VDCW	28480	0160-2211
A17C3	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A17C4	0180-0100		C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A17C5	0170-0040		C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A17C6	0170-0040		C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A17CR1	1902-3245	2	DIODE BREAKDOWN:SILICON 21.5V 5%	28480	1902-3245
A17CR2	1901-0158	4	DIODE:SILICON 0.75A 200 PIV	28480	1901-0158
A17CR3	1901-0158		DIODE:SILICON 0.75A 200 PIV	28480	1901-0158
A17CR4	1884-0012	2	RECTIFIER:SILICON CONTROLLED 2N3528 RECOMMENDED REPLACEMENT	02735	2N3528
A17CR5	1902-3245		DIODE BREAKDOWN:SILICON 21.5V 5%	28480	1902-3245
A17CR6	1901-0158		DIODE:SILICON 0.75A 200 PIV	28480	1901-0158
A17CR7	1901-0158		DIODE:SILICON 0.75A 200 PIV	28480	1901-0158
A17CR8	1884-0012		RECTIFIER:SILICON CONTROLLED 2N3528 RECOMMENDED REPLACEMENT	02735	2N3528
A17Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A17Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A17Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A17Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A17Q5	1854-0039	2	TSTR:SI NPN	80131	2N3053
A17Q6	1854-0039		TSTR:SI NPN	80131	2N3053
A17R1	0812-0020	2	R:FXD WW 0.39 OHM 5% 3W	28480	0812-0020
A17R2	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A17R3	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A17R4	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A17R5	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A17R6	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A17R7	2100-1758	2	R:VAR WW 1K OHM 5% TYPE V 1W	28480	2100-1758
A17R8	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A17R9	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A17R10	0812-0020		R:FXD WW 0.39 OHM 5% 3W	28480	0812-0020
A17R11	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A17R12	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A17R13	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A17R14	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A17R15	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A17R16	2100-1758		R:VAR WW 1K OHM 5% TYPE V 1W	28480	2100-1758
A17R17	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A17R18	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A17R19	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A17R20	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A17R21	0757-0440		R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A17R22	0757-0440		R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A17U1	1820-0196	2	IC:LINEAR VOLTAGE REGULATOR(INPUT)	28480	1820-0196
	1200-0196	1	SOCKET:INTEGRATED CIRCUIT 10 PIN	91506	8058-1G31
A17U2	1820-0196		IC:LINEAR VOLTAGE REGULATOR(INPUT)	28480	1820-0196
			CHASSIS PARTS		
B1	3160-0209	1	FAN:AXIAL 115V 50/60HZ	28480	3160-0209
C1	0180-2274	2	C:FXD ELECT 4600 UF +75-10% 50VDCW	56289	36D462G050AD2A-DQB
C2	0180-2274		C:FXD ELECT 4600 UF +75-10% 50VDCW	56289	36D462G050AD2A-DQB
C3	0160-0168		C:FXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
CR1	1902-1226	1	DIODE BREAKDOWN:5.1V 5%	04713	1N3996A
	1200-0080	2	INSULATOR:TRANSISTOR MTG.	71785	294834
CR2	1902-1234	1	DIODE BREAKDOWN:7.5V 5%	04713	1N4000A
	1200-0080		INSULATOR:TRANSISTOR MTG.	71785	294834
DS1	2140-0244	1	LAMP:GLOW MINIATURE 95V	87034	A1H
DS2	2140-0092	1	LAMP:INCANDESCENT 5.0V 0.060A	71744	CM 685
	1450-0153	1	LAMPHOLDER:FOR T-1 SERIES	08717	102SR
	1450-0371	1	LENS:LAMPHOLDER, AMBER	08717	102-A(LENS)
			RECOMMENDED REPLACEMENT		
F1	2110-0001	1	FUSE:1 AMP 250V	75915	312001.
			(230V OPERATION)RECOMMENDED REPLACEMENT		
F1	2110-0002	1	FUSE:CARTRIDGE 2 AMP 3 AG	75915	312.002
			(115V OPERATION)RECOMMENDED REPLACEMENT		
	1400-0084	1	FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014
FL1	9100-2877	1	FILTER:LINE	05245	F1262
J1	1250-0102	4	CONNECTOR:BNC	28480	1250-0102
J2	5060-0467	2	CONNECTOR:MALE PROBE	28480	5060-0467
J3	1250-0102		CONNECTOR:BNC	28480	1250-0102
J4	1250-0102		CONNECTOR:BNC	28480	1250-0102
J5	5060-0467		CONNECTOR:MALE PROBE	28480	5060-0467
J6	1250-0102		CONNECTOR:BNC	28480	1250-0102
J7	1250-0870	3	BODY:RF CONNECTOR REAR MTG	27251	28JS112-1
J8	1250-0870		BODY:RF CONNECTOR REAR MTG	27251	28JS112-1
J9	1250-0870		BODY:RF CONNECTOR REAR MTG	27251	28JS112-1
J10			PART OF FL1		
J11	08410-2029	1	CONNECTOR:FEMALE MOD	28480	08410-2029
M1	1120-1525	1	METER	28480	1120-1525
Q1	1854-0439	2	TSTR:SI NPN	04713	2N3055
Q2	1854-0439		TSTR:SI NPN	04713	2N3055
R1	2100-2728	1	R:VAR CERMET 1K OHM 20% LIN 2W	28480	2100-2728
R2	2100-2727	1	R:VAR CERMET 500 OHM 20% LIN 2W	28480	2100-2727
R3	0698-7276	1	R:FXD FLM 46.4K OHM 2% 1/8W	28480	0698-7276
S1	3101-1244	1	SWITCH:PUSHBUTTON SPDT-DB	87034	53-55480-120/A1H
S2	3101-1234	1	SWITCH:SLIDE DPDT	82389	11A-1242
T1	9100-2871	1	TRANSFORMER:POWER	28480	9100-2871
W1	08407-60046	1	CABLE ASSY:FLEX	28480	08407-60046
W2	08407-60121	1	CABLE ASSY:POWER,	28480	08407-60121
			INCLUDES DS1, R3, S1.		
W3	08407-60064	1	CABLE ASSY:REF CHAN DIRECT RF INPT	28480	08407-60064
W4	08407-60065	1	CABLE ASSY:REF CHAN ATTEN RF INPT	28480	08407-60065
W5	08407-60066	1	CABLE ASSY:TEST CHAN DIRECT RF INPUT	28480	08407-60066
W6	08407-60067	1	CABLE ASSY:TEST CHAN ATTEN RF INPUT	28480	08407-60067
W7	08407-60076	1	CABLE ASSY:PHASE VERNIER POT TO A2A1	28480	08407-60076
W8	08407-60077	1	CABLE ASSY:AMPL VERNIER POT TO A2A2	28480	08407-60077
W9	08407-60039	1	CABLE ASSY:PHASE-LOCKED OSC OUTPT TO LO	28480	08407-60039
W10	08407-60040	1	CABLE ASSY:LOCAL OSC TO TEST CHAN CONV	28480	08407-60040
W11	08407-60078	1	CABLE ASSY:REF CHAN FROM BPF TO PLUG-IN	28480	08407-60078
W12	08407-60079	1	CABLE ASSY:TEST CHAN AMPL FROM BPF TO	28480	08407-60079
W13	08407-60080	1	CABLE ASSY:TEST CHAN PHASE FROM BPF	28480	08407-60080
W14	08407-60042	1	CABLE ASSY:REF CHAN BPF TO REAR PANEL	28480	08407-60042
W15	08407-60043	1	CABLE ASSY:TEST CHAN BPF TO REAR PANEL	28480	08407-60043
W16	08407-60044	1	CABLE ASSY:REAR PANEL VTO INPT TO VTO	28480	08407-60044
W17	8120-1348	1	CABLE ASSY:POWER, DETACHABLE	70903	KHS-7041
W18	08407-60041	1	CABLE ASSY:VTO AMP OUT TO LO MIXER	28480	08407-60041
W19	08407-60045	1	CABLE ASSY:LOCAL OSC OUT TO AUTO LEVEL	28480	08407-60045
W20	08407-60062	1	CABLE ASSY:LOCAL OSC TO REF CHAN CONV	28480	08407-60062
W21	08407-60068	1	CABLE ASSY:TEST AGC AMP TO IF ATTEN	28480	08407-60068
W22	08407-60070	1	CABLE ASSY:TEST IF ATTEN TO AMPL VER	28480	08407-60070
W23	08407-60071	1	CABLE ASSY:TEST CHAN CONV TO AGC AMPL	28480	08407-60071
W24	08407-60072	1	CABLE ASSY:AMPL VER TO TEST CHAN(BPF)	28480	08407-60072
W25	08407-60073	1	CABLE ASSY:REF CHAN CONV TO REF AGC AMP	28480	08407-60073
W26	08407-60074	1	CABLE ASSY:REF AGC AMPL TO PHASE VER	28480	08407-60074
W27	08407-60075	1	CABLE ASSY:PHASE VER TO REF CHAN(BPF)	28480	08407-60075
XA1			NOT ASSIGNED		
XA5			NOT ASSIGNED		

See introduction to this section for ordering information

Table 6-2. Replaceable Parts



Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CABINET PARTS		
			NOTE THE GENERAL COLOR SCHEMES ARE AS FOLLOWS: 8407A(STD) - INDICATES COLOR SCHEME WHICH INCLUDE MINT GRAY FRONT PANEL AND OLIVE GRAY CABINET. 8407A(OPT A85)-INDICATES LITE GRAY PANEL 8407A(OPT X95)-INDICATES COMPLETE COLOR SCHEME OF LITE GRAY PANEL & BLUE GRAY CABINET.		
1	5060-0232	1	FRAME ASSY:MODIFIED	28480	5060-0232
2	08407-60146	1	PANEL ASSY:FRONT(STANDARD)	28480	08407-60146
2	08407-60055	1	PANEL ASSY:FRONT(OPTIONS)	28480	08407-60055
3	5060-0222	1	HANDLE ASSY:5H SIDE	28480	5060-0222
4	5060-8735	1	RETAINER HANDLE ASSY,OLIVE GRAY(STANDARD)	28480	5060-8735
4	5060-0765	1	RETAINER-HANDLE ASSY.(OPTIONS)	28480	5060-0765
5	5060-0767	1	FOOT ASSY:FM	28480	5060-0767
6	1490-0030	1	STAND:TILT	28480	1490-0030
7	5000-0052	1	PLATE:FLUTED ALUMINUM	28480	5000-0052
8	5060-8741	1	KIT:RACK MOUNT,GRAY(STANDARD)	28480	5060-8741
8	5060-0776	1	KIT:RACK MOUNT,LIGHT GRAY(OPTIONS)	28480	5060-0776
9	5000-8719	1	COVER:SIDE 7 X 16,OLIVE GRAY(STANDARD)	28480	5000-8719
9	5000-0743	1	COVER:SIDE,BLUE GRAY(OPTION X95)	28480	5000-0743
10	5060-0267	1	COVER ASSY:TOP,OLIVE GRAY(STANDARD)	28480	5060-0267
10	5060-0227	1	COVER ASSY:TOP,BLUE GRAY(OPTION X95)	28480	5060-0227
11	5060-0268	1	COVER ASSY:BOTTOM,OLIVE GRAY(STANDARD)	28480	5060-0268
11	5060-0228	1	COVER ASSY:BOTTOM,BLUE GRAY(OPTION X95)	28480	5060-0228
12	08407-00057	1	PANEL:REAR	28480	08407-00057
12	08407-60122	1	PANEL ASSY:REAR	28480	08407-60122
13	5040-0361	1	LOCK:EXTRACTOR(STANDARD)	28480	5040-0361
13	5040-0272	1	LOCK:EXTRACTOR,LIGHT GRAY(OPTIONS)	28480	5040-0272

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
XA6	1251-2338	1	CONNECTOR:PC (2 X 15) 30 CONTACT	03877	614-093-15
			MISCELLANEOUS		
	0370-0103	1	KNOB:BLK W/ARROW 5/8" OD 1/4" SHAFT	28480	0370-0103
	0380-0173	1	STANDOFF:6-32 INTERNAL THREAD	00000	OBD
	0380-0175	1	STANDOFF:6-32 INTERNAL THREAD	00000	OBD
	08407-00052	1	PLATE:SPRING	28480	08407-00052
	08407-00053	1	DIVIDER READOUT	28480	08407-00053
	08407-20044	1	WINDOW	28480	08407-20044
	08407-20046	1	SPACER READOUT	28480	08407-20046
	08407-20048	1	STANDOFF:FRONT PANEL BOARD	28480	08407-20048
	08407-20049	1	SPACER:DIODE	28480	08407-20049
	08407-20055	1	STANDOFF:SWITCH BOARD	28480	08407-20055
	08407-60094	1	READOUT ASSY	28480	08407-60094
	5060-0050	1	BOARD EXTENDER:6 PIN	28480	5060-0050
	03950-4001	1	EXTRACTOR:TOOL	28480	03950-4001
	08407-00021	1	DIVIDER BOARD	28480	08407-00021
	11593A	1	TERMINATION:50 OHM	28480	11593A
	08410-60067	1	CABLE ASSY:SERVICE	28480	08410-60067
	10503A	1	CABLE ASSY:BNC SHIELDED (3 EA)	28480	10503A
	5020-7977	1	TRIM:UPPER FRAME(MINT GRAY)	28480	5020-7977
	5020-3275	1	TRIM:UPPER FRAME(LIGHT GRAY)	28480	5020-3275
	5020-7978	1	TRIM:LOWER FRAME(MINT GRAY)	28480	5020-7978
	5020-3276	1	TRIM:LOWER FRAME(LIGHT GRAY)	28480	5020-3276
	08407-00063	1	DECK:SLIDE(STANDARD)	28480	08407-00063
	08407-00011	1	DECK:SLIDE(OPT X95)	28480	08407-00011
	08407-20126	1	FRAME:UPPER(STANDARD)	28480	08407-20126
	08407-20041	1	FRAME:UPPER(OPTIONS)	28480	08407-20041
	08407-40005	1	DIVIDER:CENTER(STANDARD)	28480	08407-40005
	08407-40001	1	DIVIDER:CENTER(OPTIONS)	28480	08407-40001
	08410-20053	1	FRAME:LOWER(STANDARD)	28480	08410-20053
	08410-2015	1	FRAME:LOWER(LIGHT GRAY)	28480	08410-2015

Table 6-3. Code List of Manufacturers

MFR. NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
00853	SANGAMO ELECTRIC CO.PICKENS DIV.	PICKENS, S.C.	29671
01121	ALLEN BRADLEY CO.	MILWAUKEE, WIS.	53204
01295	TEXAS INSTRUMENTS INC. SEMICONDUCTOR COMPONENTS DIV.	DALLAS, TEX.	75231
02114	FERROXCUBE CORP.	SAUGERTIES, N.Y.	12477
02660	AMPHENOL CORP.	BROADVIEW, ILL.	60153
02735	RCA SOLID STATE & RECEIVING TUBE DIV.	SOMERVILLE, N.J.	08876
03877	TRANSITRON ELECTRONIC CORP.	WAKEFIELD, MASS.	01880
04713	MOTOROLA SEMICONDUCTOR PROD.INC.	PHOENIX, ARIZ.	85008
05245	COMPONENTS CORP.	CHICAGO, ILL.	60657
07263	FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94040
08717	SLOAN CO. THE	SUN VALLEY, CALIF.	91352
13103	THERMALLOY CO.	DALLAS, TEX.	75247
14655	CORNELL DUBLIER ELECT. DIV.FEDERAL PACIFIC ELECT. CO.	NEWARK, N.J.	07105
27251	SPECIALITIES MFG. CO. INC.	BRIDGEPORT, CONN.	06601
28480	HEWLETT-PACKARD COMPANY	PALO ALTO, CALIF.	94304
36196	STANWYCK COIL PROD. LTD.	HAWKSBURY ONTARIO, CANADA	
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	01247
70903	BELDEN CORP.	CHICAGO, ILL.	60644
71590	GLOBE UNION INC. CENTRALAB DIV.	MILWAUKEE, WISC.	53201
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
80131	ELECTRONIC INDUSTRIES ASSOCIATION	WASHINGTON D.C.	20006
82142	AIRCO SPEER ELECT. COMP.	DU BOIS, PA.	15801
82389	SWITCHCRAFT INC.	CHICAGO, ILL.	60630
87034	MARCOAK INDUSTRIES	ANAHEIM, CALIF.	92803
91418	RADIO MATERIALS CO.	CHICAGO, ILL.	60646
91506	AUGAT INC.	ATTLEBORO, MASS.	02703
93332	SYLVANIA ELECTRIC PROD. INC. SEMICONDUCTOR DIV.	WOBURN, MASS.	01801
95354	METHODE MFG. CO.	ROLLING MEADOWS, ILL.	60008
98291	SEALECTRO CORP.	MAMARONECK, N.Y.	10544
99800	DELEVAN ELECTRONICS CORP.	E. AURORA, N.Y.	14052

See introduction to this section for ordering information

SECTION VII
SERVICE

7-1. INTRODUCTION

7-3. The schematic diagrams in this section represent the circuits electrically. They are not wiring diagrams, though wire colors are given where practical.

7-3. The large numbers in the lower right corners of the schematics are the schematic numbers. These numbers are used to cross reference connections between schematics. Smaller numbers preceded by A, located below the schematic number, list the assemblies included in the schematic.

7-4. Some of the general information obtainable from the schematic diagrams is shown in Figure 7-1. Notes and explanations of symbols pertaining to all the diagrams are contained in Figure 7-2. Figure 7-2 also contains the test setup and measurement conditions required to obtain the normal test point waveforms and voltages noted on the schematic diagrams. Notes about specific components, circuits, or conditions are given on the diagram to which they apply.

7-5. As an aid to finding components and assemblies in the set of diagrams, each diagram has a box labelled Reference Designations that contains all the reference designations appearing on the diagram.

7-6. An asterisk indicates a factory selected part. The component value shown is the typical or most commonly selected value.

7-7. Component procurement information and specific component descriptions are included in Section VI. Refer to page 6-1 for information on how to order parts.

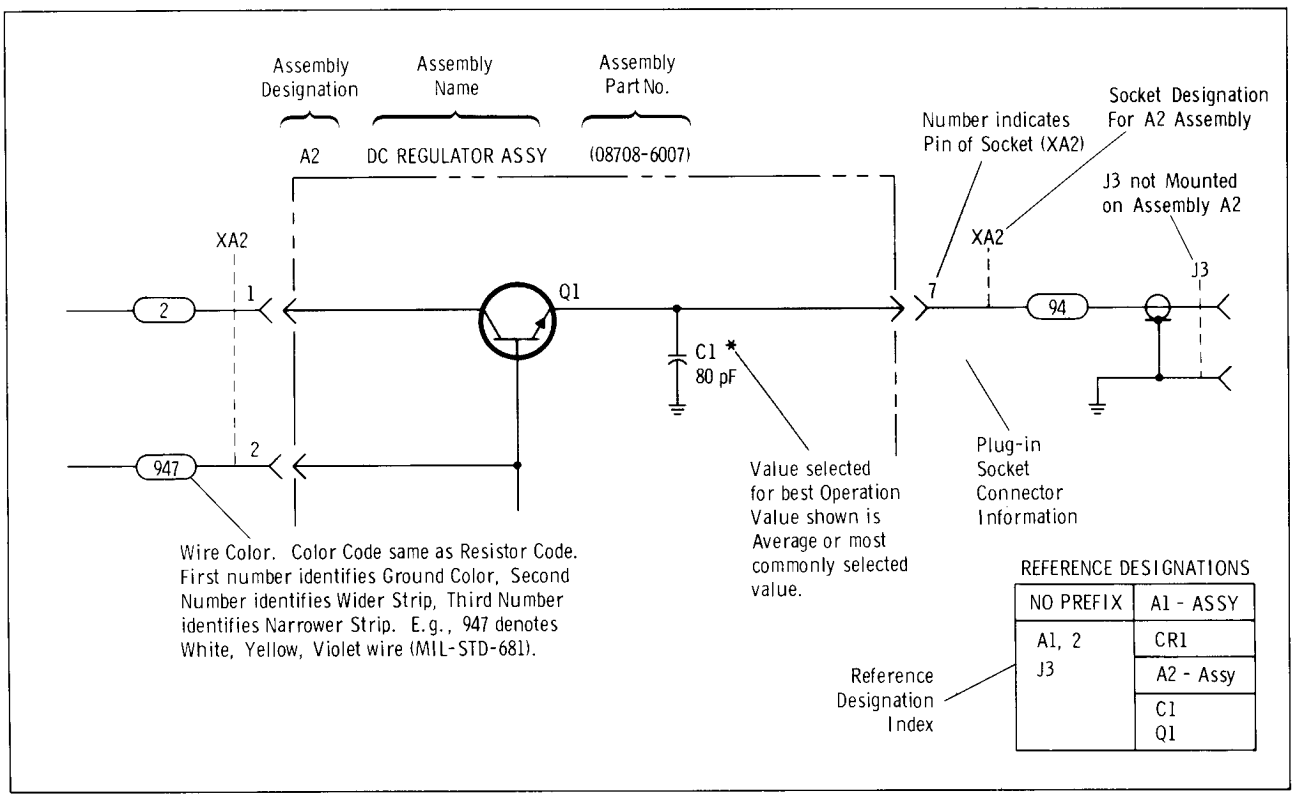


Figure 7-1. General Information on Schematic Diagrams

SCHEMATIC DIAGRAM NOTES

Refer to MIL Std 15B for Symbols Not Shown

Resistance is in ohms and capacitance is in microfarads unless otherwise noted.

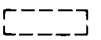
P/O = part of.

*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.

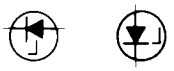
Heavy line with arrows indicates path and direction of main signal.

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 circles 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.



Voltage regulator (breakdown diode).

Denotes Field Effect transistor (FET) with N-type base.

Denotes FET with P-type base.

Denotes Capacitive diode (Varicap, varactor).

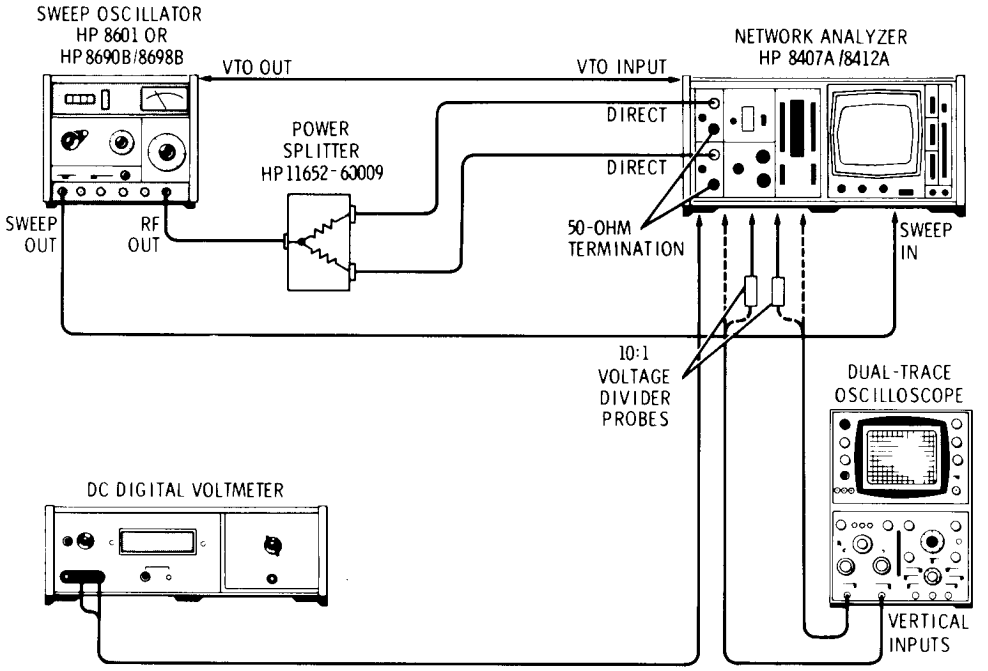
Denotes Silicon Controlled Rectifier.

P-Type Metal Oxide Substrate FET (MOSFET)

N-Type Metal Oxide Substrate FET (MOSFET)

Figure 7-2. Schematic Diagram Notes (1 of 2)

SCHEMATIC DIAGRAM NOTES (cont'd)



CONDITIONS FOR WAVEFORMS AND DC VOLTAGES ON SCHEMATICS.

a. Connect equipment as shown in test setup.

b. Set 8407A controls as follows:

DISPLAY REFERENCE CAL — Zero dB at top switch positions.
DISPLAY REFERENCE — 10 dB/step switch and 1 dB/step switch at top position (0 dB).
REF CHANNEL LEVEL ADJ — Middle position.
AMPL VERNIER — Midrange.
PHASE VERNIER — Midrange.

c. Set sweep oscillator controls for single-frequency (CW) operation at 1 MHz.

d. Adjust sweep oscillator RF for 20 mV P-P at REF CHANNEL DIRECT input tee as read on oscilloscope.

e. On Model 8412A Plug-in, set controls as follows:

MODE to DUAL
AMPL DB/DIV to 10
PHASE DEG/DIV to 90
PHASE OFFSET polarity to +
DEGREES to zero
INTENSITY for moderate trace intensity

Figure 7-2. Schematic Diagram Notes (2 of 2)

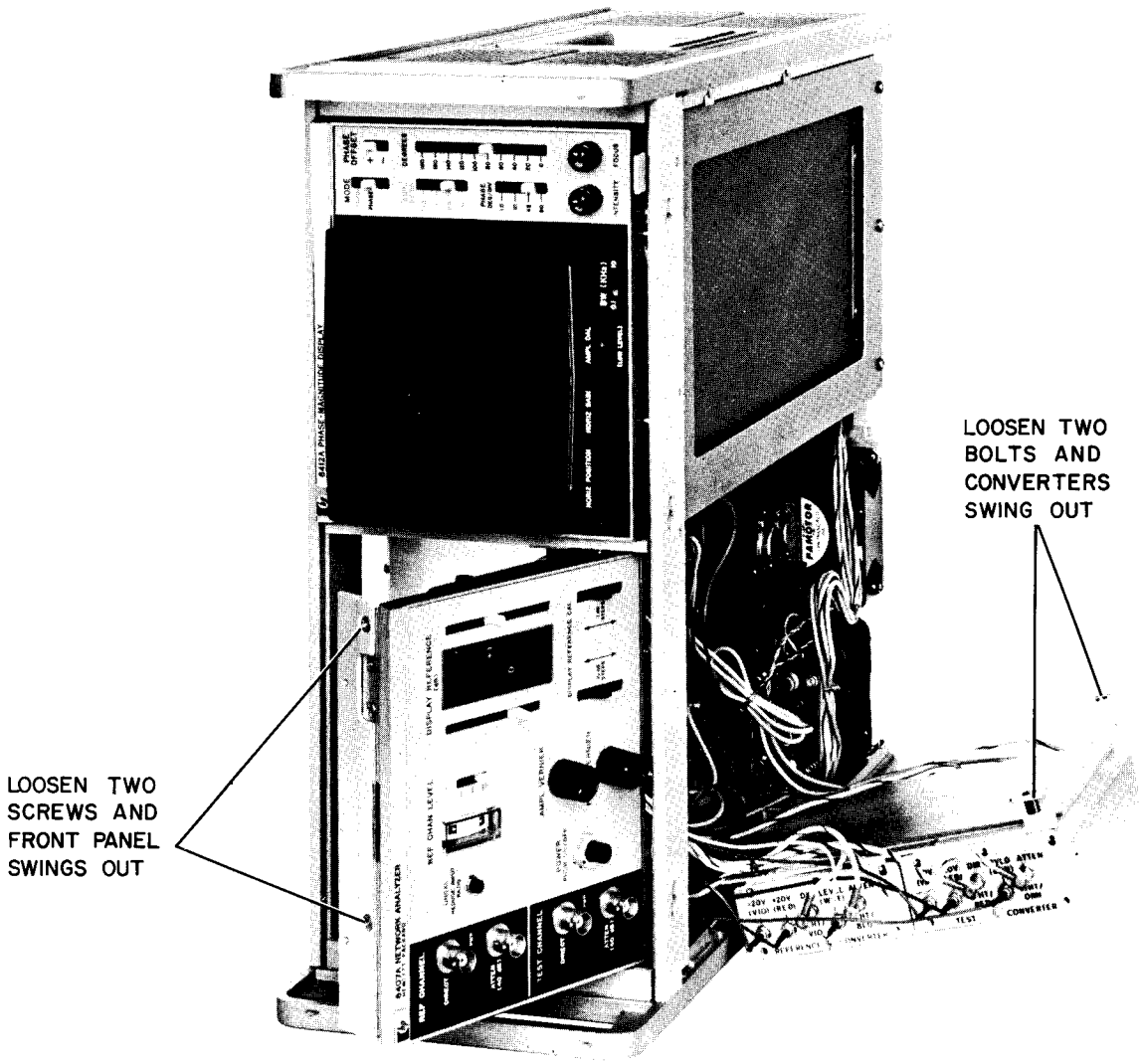


Figure 7-3. Cabinet Dissassembly for Maintenance

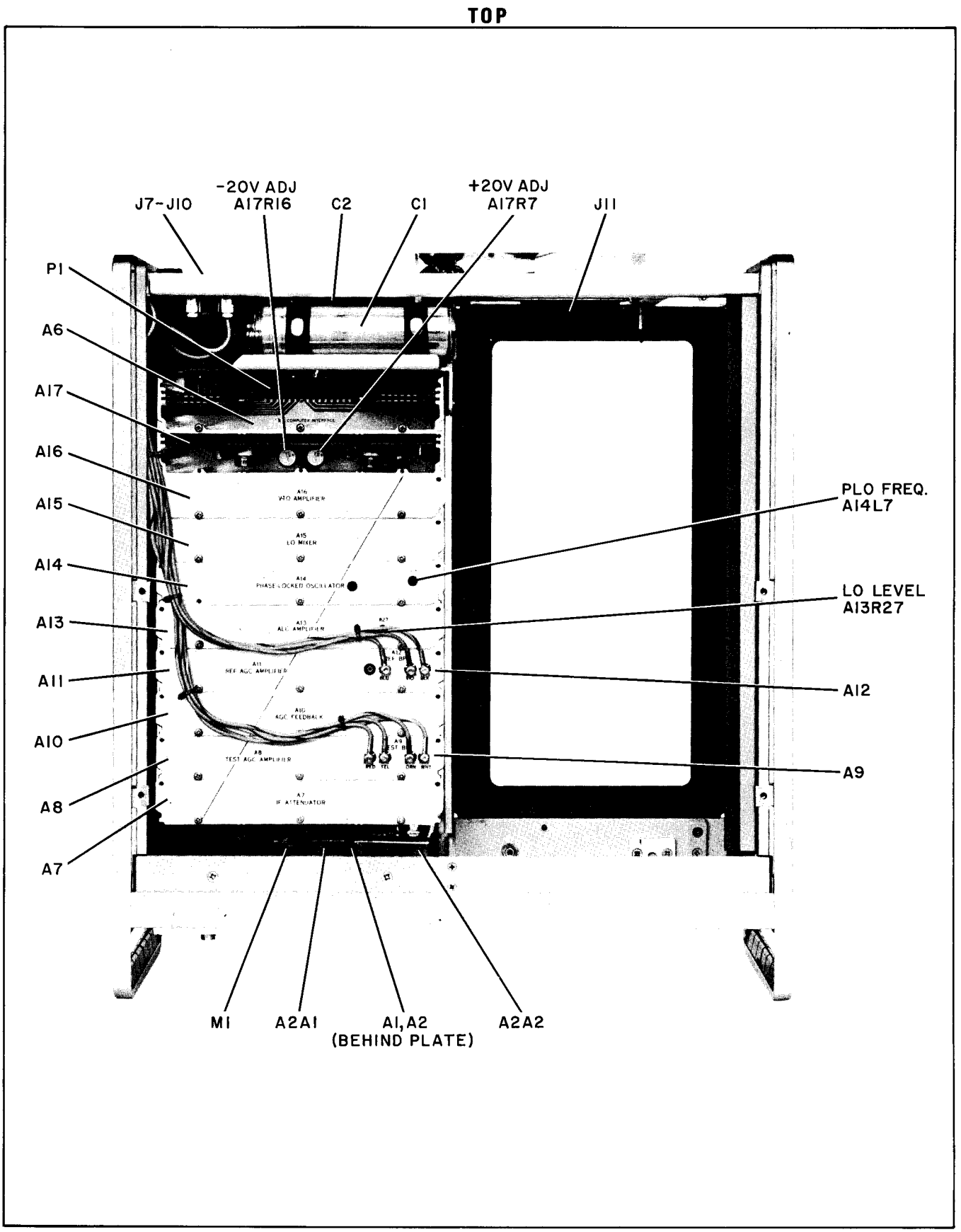


Figure 7-4. Location of Major Assemblies and Adjustment Points (1 of 2)

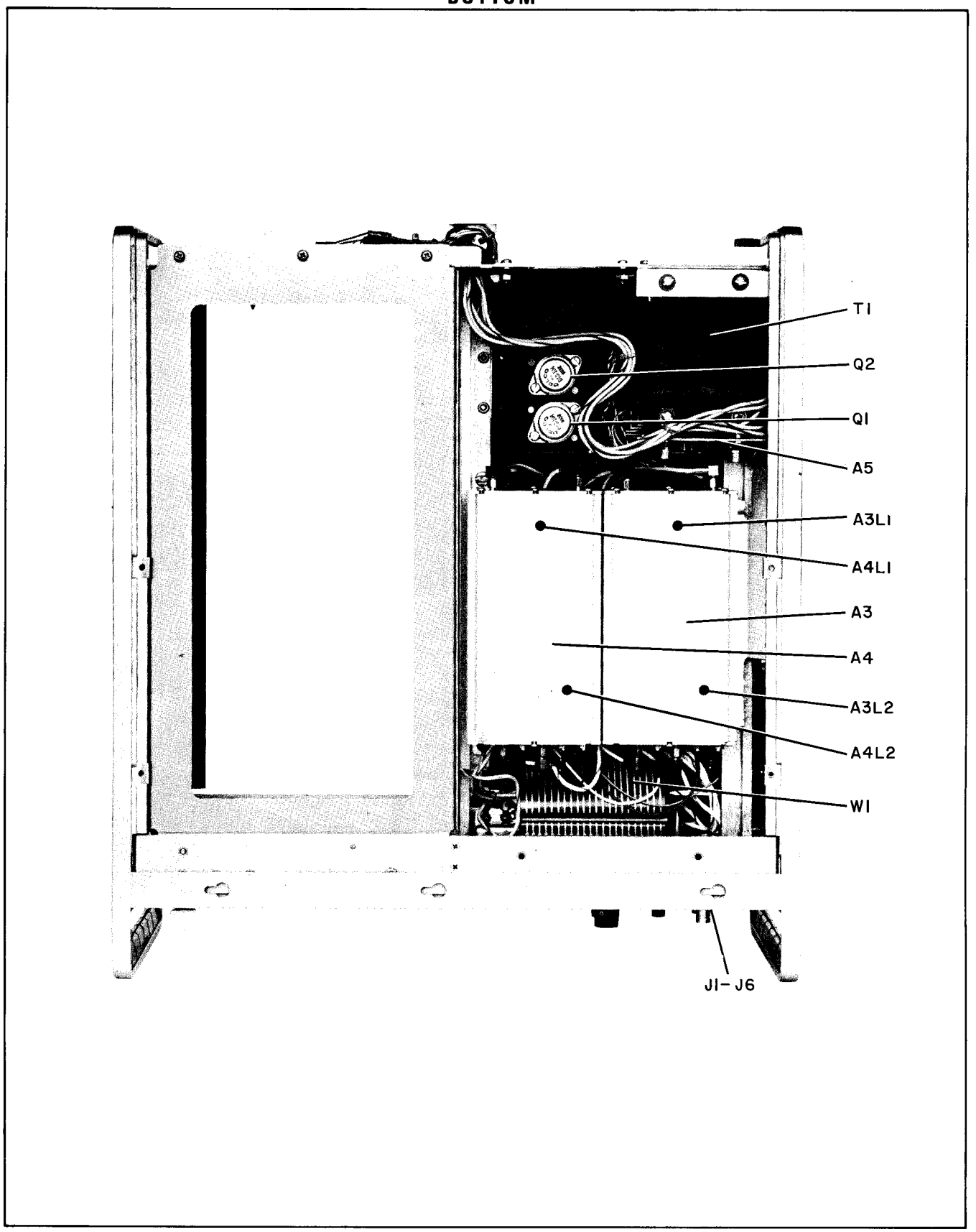


Figure 7-4. Location of Major Assemblies and Adjustment Points (2 of 2)

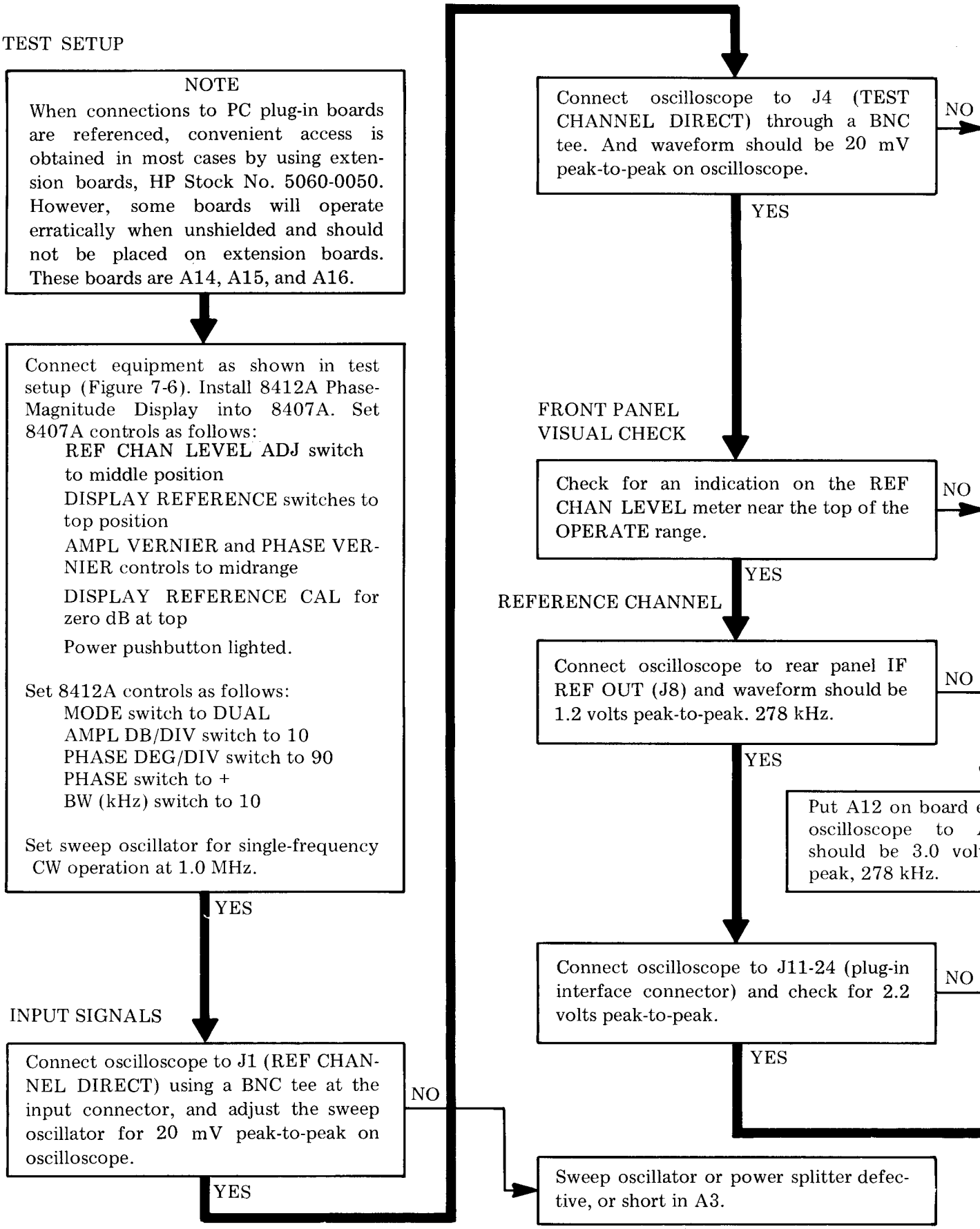
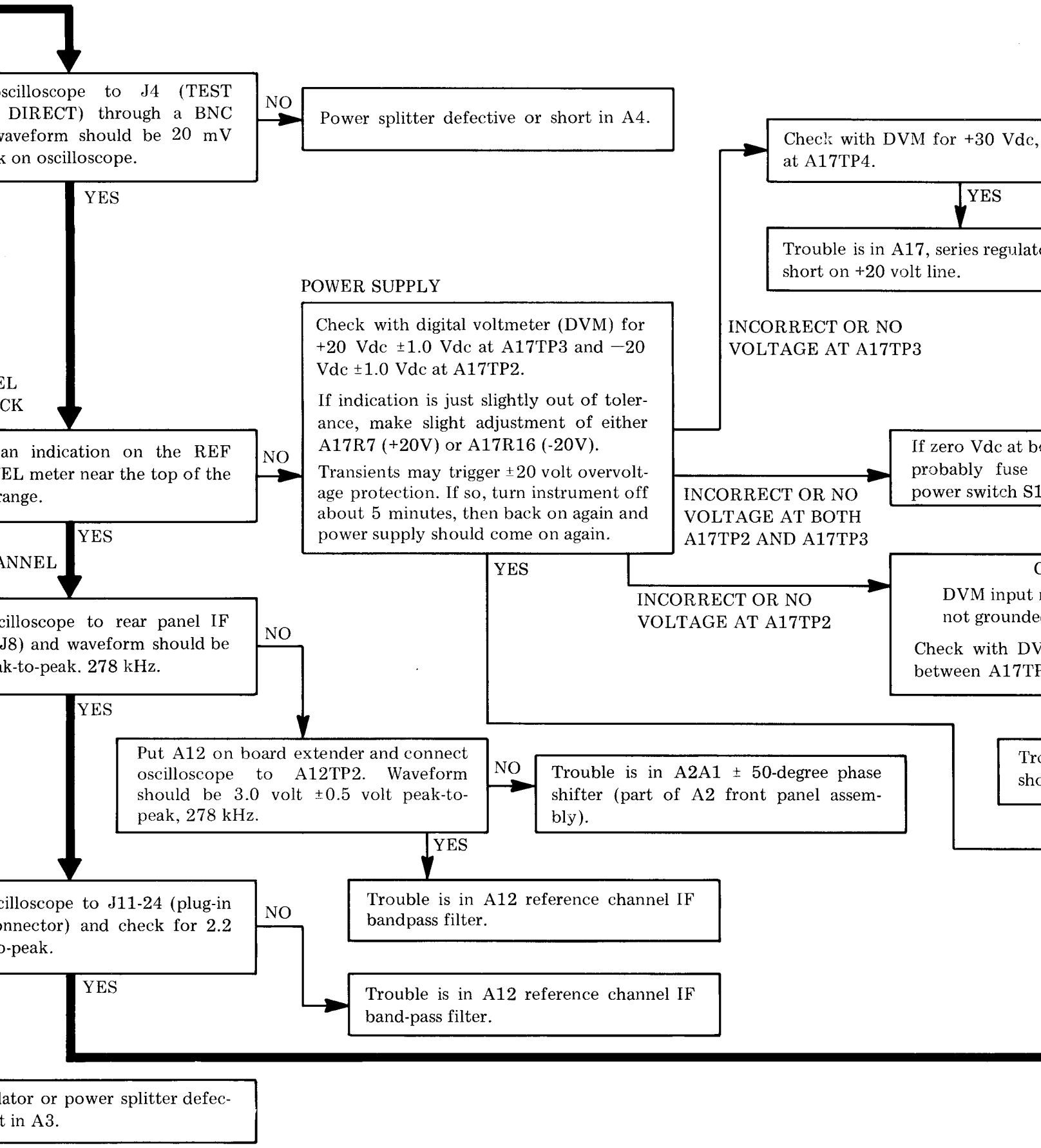
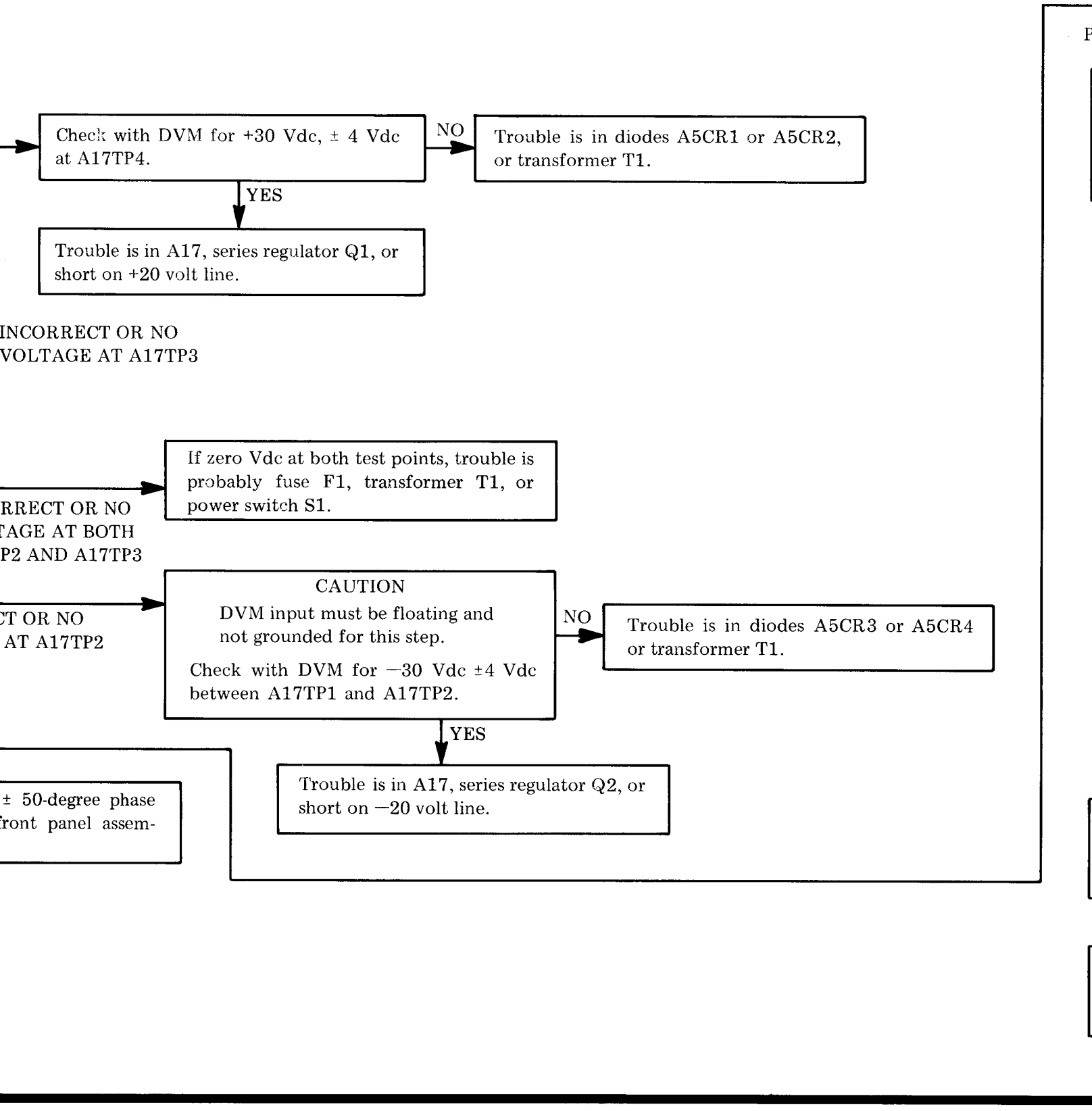
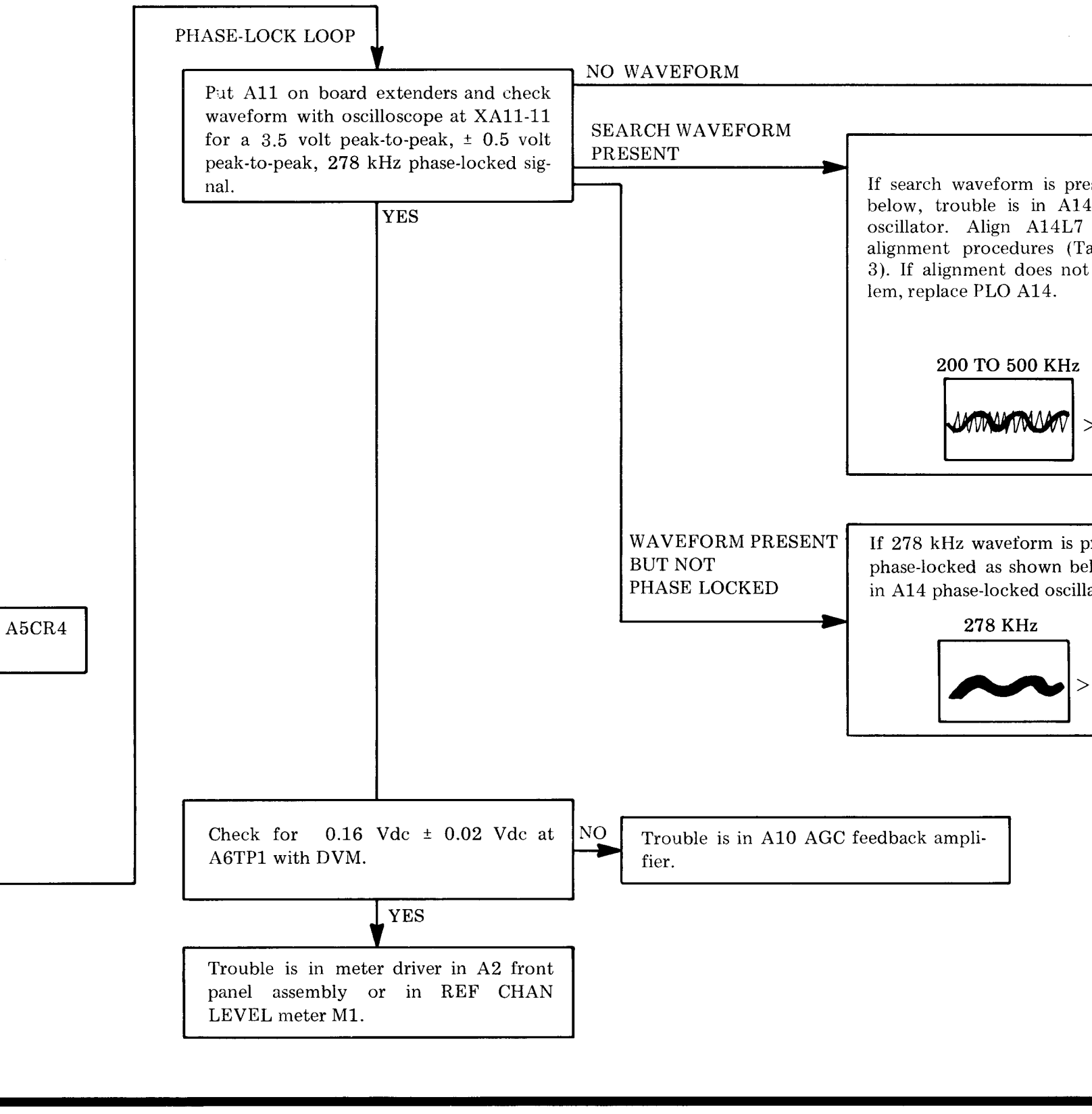


Figure 7-5. Troubleshooting Tree (1 of 3)


scilloscope to J4 (TEST DIRECT) through a BNC waveform should be 20 mV k on oscilloscope.
NO
Power splitter defective or short in A4.
YES
EL CK
an indication on the REF EL meter near the top of the range.
NO
YES
ANNEL
cilloscope to rear panel IF J8) and waveform should be k-to-peak. 278 kHz.
NO
YES
Put A12 on board extender and connect oscilloscope to A12TP2. Waveform should be 3.0 volt ±0.5 volt peak-to-peak, 278 kHz.
NO
Trouble is in A2A1 ± 50-degree phase shifter (part of A2 front panel assembly).
YES
Trouble is in A12 reference channel IF bandpass filter.
cilloscope to J11-24 (plug-in onnector) and check for 2.2 o-peak.
NO
YES
Trouble is in A12 reference channel IF band-pass filter.
lator or power splitter defect in A3.
POWER SUPPLY
Check with digital voltmeter (DVM) for +20 Vdc ±1.0 Vdc at A17TP3 and −20 Vdc ±1.0 Vdc at A17TP2.
If indication is just slightly out of tolerance, make slight adjustment of either A17R7 (+20V) or A17R16 (-20V).
Transients may trigger ±20 volt overvoltage protection. If so, turn instrument off about 5 minutes, then back on again and power supply should come on again.
INCORRECT OR NO VOLTAGE AT A17TP3
Check with DVM for +30 Vdc, at A17TP4.
YES
Trouble is in A17, series regulat short on +20 volt line.
INCORRECT OR NO VOLTAGE AT BOTH A17TP2 AND A17TP3
If zero Vdc at b probably fuse power switch S1
YES
INCORRECT OR NO VOLTAGE AT A17TP2
DVM input not ground
Check with DV between A17TP
Tr sh


Check with DVM for +30 Vdc, ± 4 Vdc at A17TP4.
NO
Trouble is in diodes A5CR1 or A5CR2, or transformer T1.
YES
Trouble is in A17, series regulator Q1, or short on +20 volt line.
INCORRECT OR NO
VOLTAGE AT A17TP3
If zero Vdc at both test points, trouble is probably fuse F1, transformer T1, or power switch S1.
RRECT OR NO
TAGE AT BOTH
P2 AND A17TP3
CAUTION
DVM input must be floating and not grounded for this step.
Check with DVM for −30 Vdc ±4 Vdc between A17TP1 and A17TP2.
NO
Trouble is in diodes A5CR3 or A5CR4 or transformer T1.
CT OR NO
AT A17TP2
YES
Trouble is in A17, series regulator Q2, or short on −20 volt line.
± 50-degree phase
front panel assem-


PHASE-LOCK LOOP
Put A11 on board extenders and check waveform with oscilloscope at XA11-11 for a 3.5 volt peak-to-peak, ± 0.5 volt peak-to-peak, 278 kHz phase-locked signal.
NO WAVEFORM
SEARCH WAVEFORM PRESENT
If search waveform is pre
below, trouble is in A14
oscillator. Align A14L7
alignment procedures (Ta
3). If alignment does not
lem, replace PLO A14.
200 TO 500 KHz
YES
WAVEFORM PRESENT BUT NOT PHASE LOCKED
If 278 kHz waveform is p
phase-locked as shown bel
in A14 phase-locked oscilla
278 KHz
A5CR4
Check for 0.16 Vdc ± 0.02 Vdc at A6TP1 with DVM.
NO
Trouble is in A10 AGC feedback amplifier.
YES
Trouble is in meter driver in A2 front panel assembly or in REF CHAN LEVEL meter M1.

TO SHEET 2

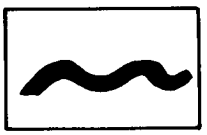
If search waveform is present as shown below, trouble is in A14 phase-locked oscillator. Align A14L7 according to alignment procedures (Table 5-6, Test 3). If alignment does not correct problem, replace PLO A14.

200 TO 500 KHz

>2V p-p

If 278 kHz waveform is present but not phase-locked as shown below, trouble is in A14 phase-locked oscillator.

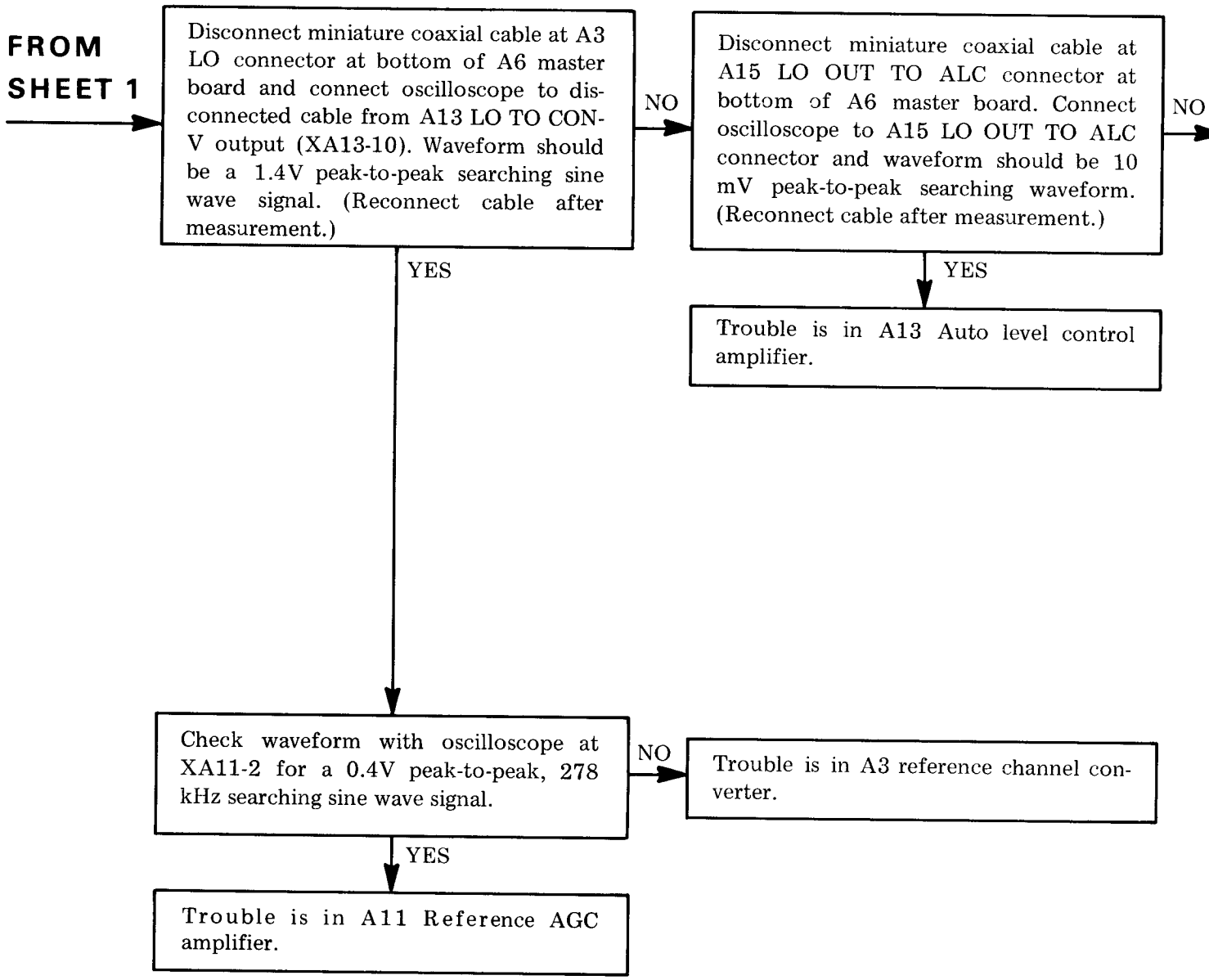
278 KHz



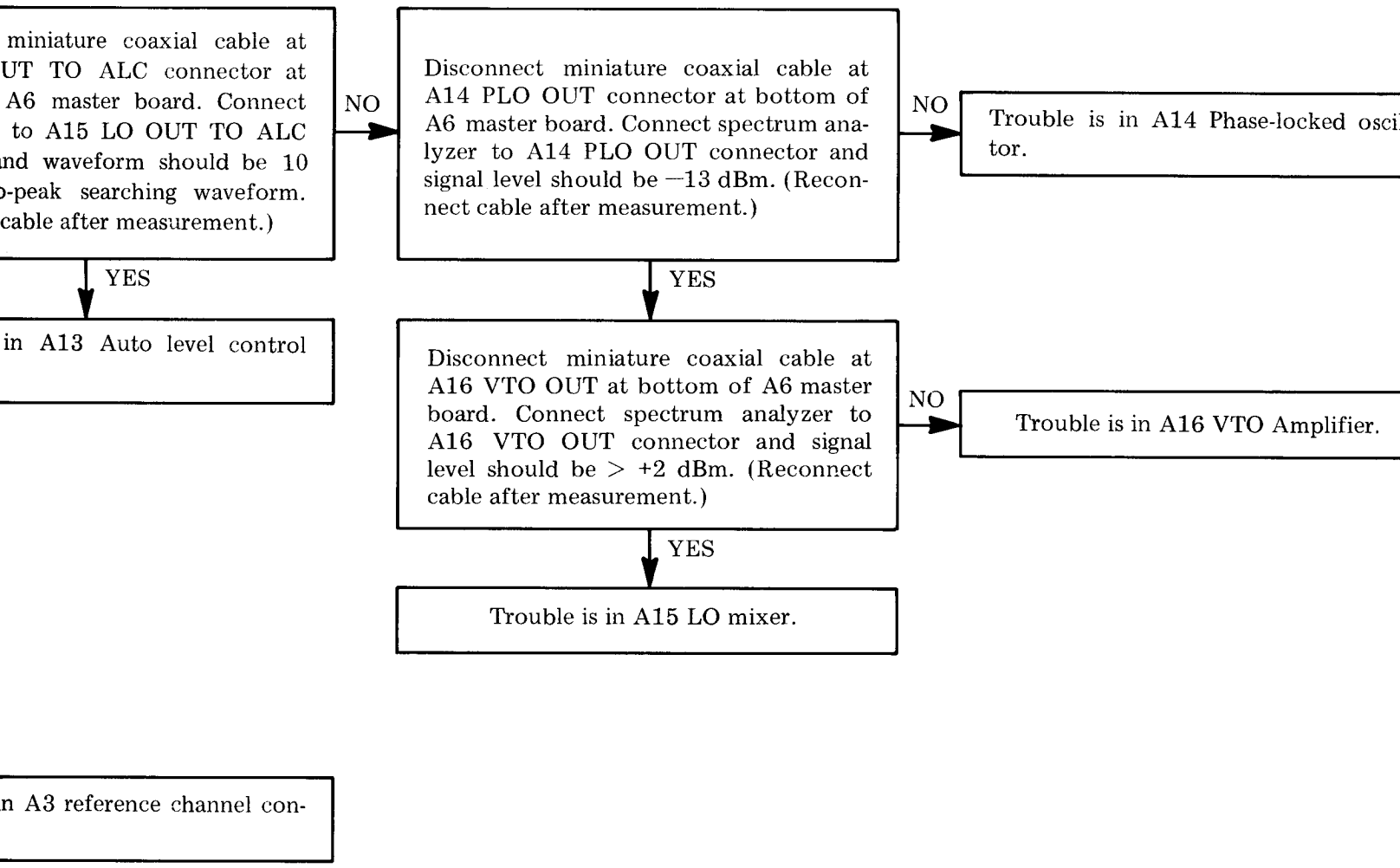
>2V p-p

C feedback ampli-

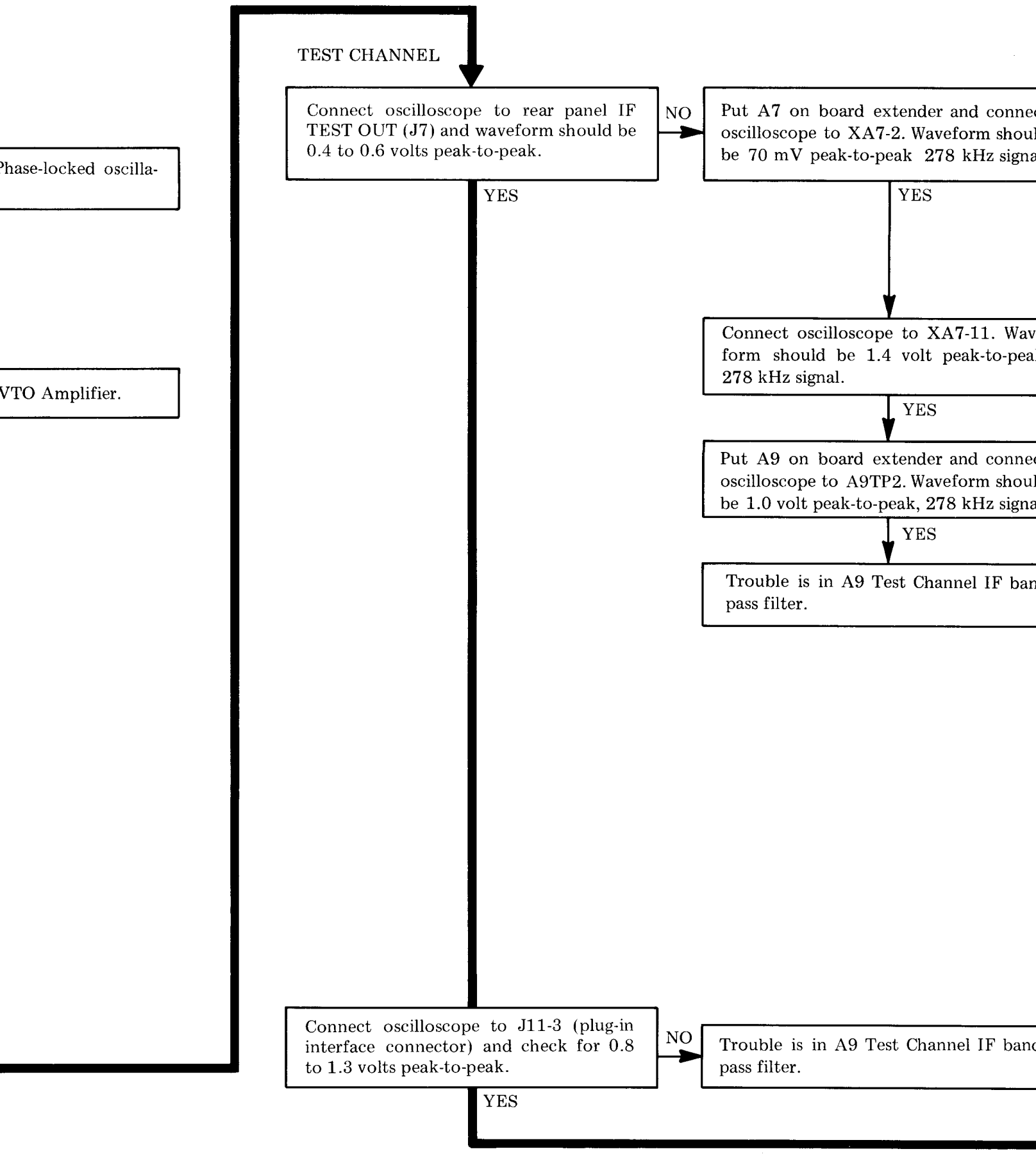
TO SHEET 2


FROM SHEET 1
Disconnect miniature coaxial cable at A3 LO connector at bottom of A6 master board and connect oscilloscope to disconnected cable from A13 LO TO CON-V output (XA13-10). Waveform should be a 1.4V peak-to-peak searching sine wave signal. (Reconnect cable after measurement.)
NO
Disconnect miniature coaxial cable at A15 LO OUT TO ALC connector at bottom of A6 master board. Connect oscilloscope to A15 LO OUT TO ALC connector and waveform should be 10 mV peak-to-peak searching waveform. (Reconnect cable after measurement.)
NO
YES
Trouble is in A13 Auto level control amplifier.
YES
Check waveform with oscilloscope at XA11-2 for a 0.4V peak-to-peak, 278 kHz searching sine wave signal.
NO
Trouble is in A3 reference channel converter.
YES
Trouble is in A11 Reference AGC amplifier.

FROM SHEET 1


miniature coaxial cable at
UT TO ALC connector at
A6 master board. Connect
to A15 LO OUT TO ALC
nd waveform should be 10
-peak searching waveform.
cable after measurement.)
NO
Disconnect miniature coaxial cable at A14 PLO OUT connector at bottom of A6 master board. Connect spectrum analyzer to A14 PLO OUT connector and signal level should be −13 dBm. (Reconnect cable after measurement.)
NO
Trouble is in A14 Phase-locked osci
tor.
YES
in A13 Auto level control
YES
Disconnect miniature coaxial cable at A16 VTO OUT at bottom of A6 master board. Connect spectrum analyzer to A16 VTO OUT connector and signal level should be > +2 dBm. (Reconnect cable after measurement.)
NO
Trouble is in A16 VTO Amplifier.
YES
Trouble is in A15 LO mixer.
n A3 reference channel con-

SHEET 2


TEST CHANNEL
Connect oscilloscope to rear panel IF TEST OUT (J7) and waveform should be 0.4 to 0.6 volts peak-to-peak.
NO
Put A7 on board extender and connec
oscilloscope to XA7-2. Waveform shoul
be 70 mV peak-to-peak 278 kHz signa
YES
YES
Connect oscilloscope to XA7-11. Wav
form should be 1.4 volt peak-to-pea
278 kHz signal.
YES
Put A9 on board extender and connec
oscilloscope to A9TP2. Waveform shoul
be 1.0 volt peak-to-peak, 278 kHz signa
YES
Trouble is in A9 Test Channel IF ban
pass filter.
Phase-locked oscilla-
VTO Amplifier.
Connect oscilloscope to J11-3 (plug-in interface connector) and check for 0.8 to 1.3 volts peak-to-peak.
NO
Trouble is in A9 Test Channel IF banc
pass filter.
YES

NO

Put A7 on board extender and connect oscilloscope to XA7-2. Waveform should be 70 mV peak-to-peak 278 kHz signal.

NO

Put A8 on board extender and connect oscilloscope to XA8-2. Waveform should be 0.25 volt peak-to-peak, 278 kHz signal.

NO

Disconnect cab
tor. Connect
nected cable. W
volt peak-to-pea

YES

YES

Trouble is in A8 Test AGC amplifier.

Trouble is in A

Connect oscilloscope to XA7-11. Waveform should be 1.4 volt peak-to-peak, 278 kHz signal.

NO

Trouble is in A7 IF attenuator.

YES

Put A9 on board extender and connect oscilloscope to A9TP2. Waveform should be 1.0 volt peak-to-peak, 278 kHz signal.

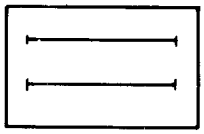
NO

Trouble is in A2A2 units attenuator, part of A2 front panel assembly.

YES

Trouble is in A9 Test Channel IF band-pass filter.

Set sweep oscillator for swept mode over 10 kHz or narrower band. Check 8412A display for proper amplitude and phase trace as shown below. Both amplitude and phase traces should be straight and relatively smooth. (Noise should be less than 1 small division peak-to-peak.)



NO

If eithe
not a sr
trace, t
lock. I
describe

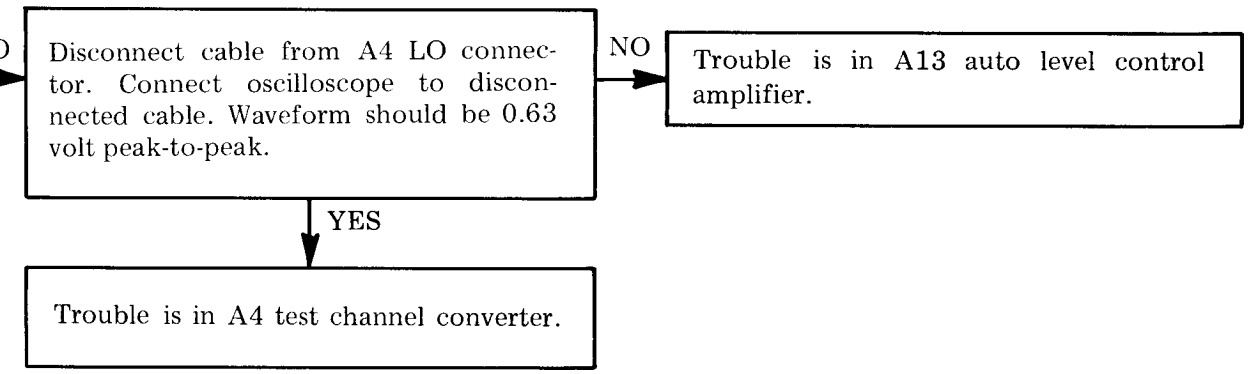
If no tr
for 480
and J1
present,
T1.

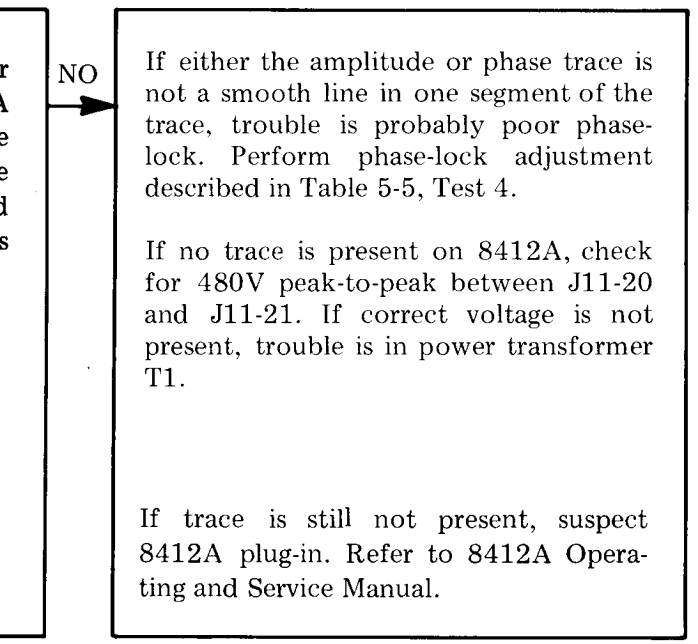
If trace
8412A
ting and

NO

Trouble is in A9 Test Channel IF band-pass filter.

YES





TO SHEET 3

Figure 7-5. Troubleshooting Tree (2 of 3)

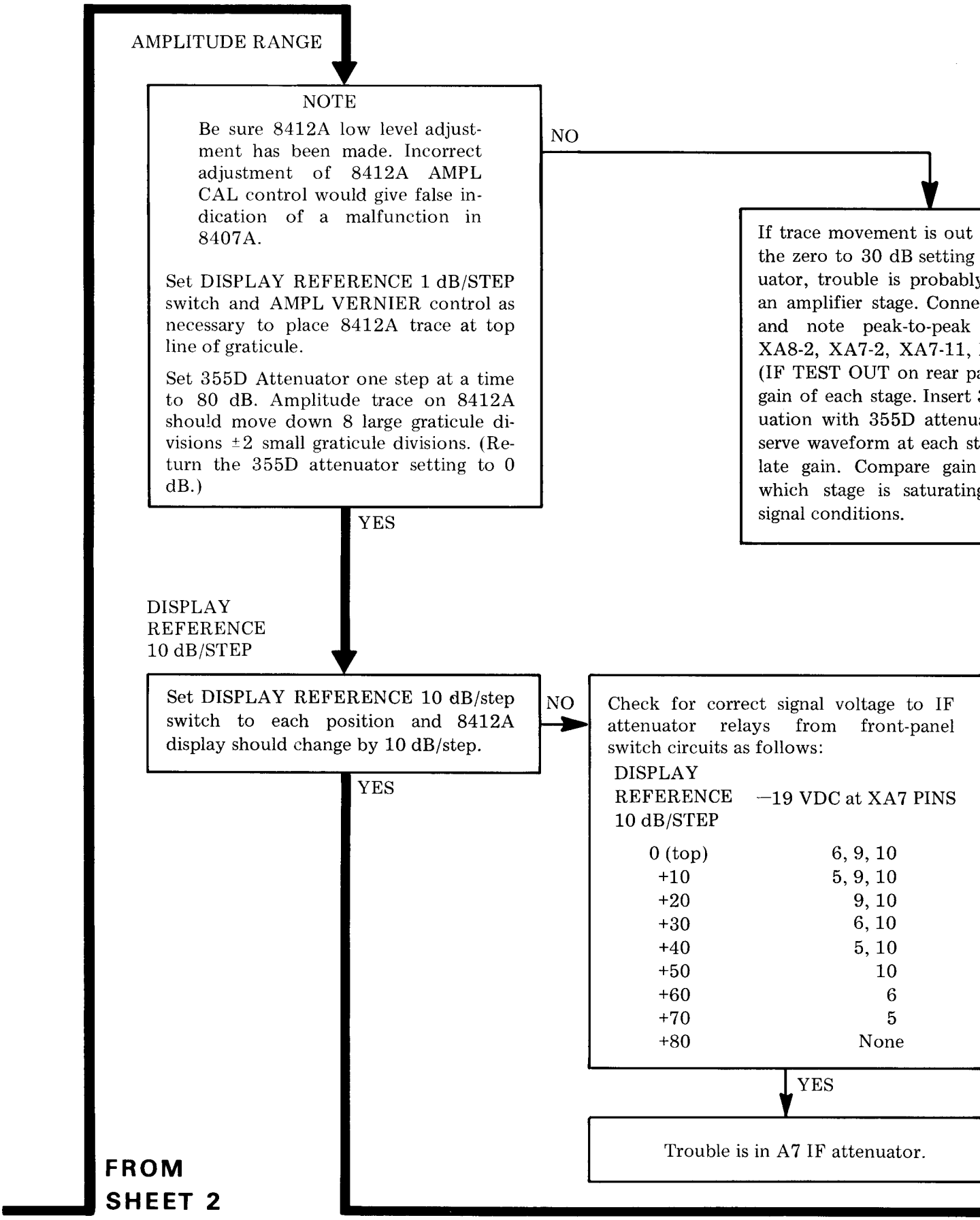


Figure 7-5. Troubleshooting Tree (3 of 3)

Set DISPLAY
switch to each
play should cha

If trace movement is out of tolerance in the zero to 30 dB setting of 355D attenuator, trouble is probably saturation in an amplifier stage. Connect oscilloscope and note peak-to-peak waveform at XA8-2, XA7-2, XA7-11, XA9-1, and J7 (IF TEST OUT on rear panel); calculate gain of each stage. Insert 30 dB of attenuation with 355D attenuator, again observe waveform at each stage, and calculate gain. Compare gain to determine which stage is saturating under large-signal conditions.

Check for correct signal voltage to IF attenuator relays from front-panel switch circuits as follows:

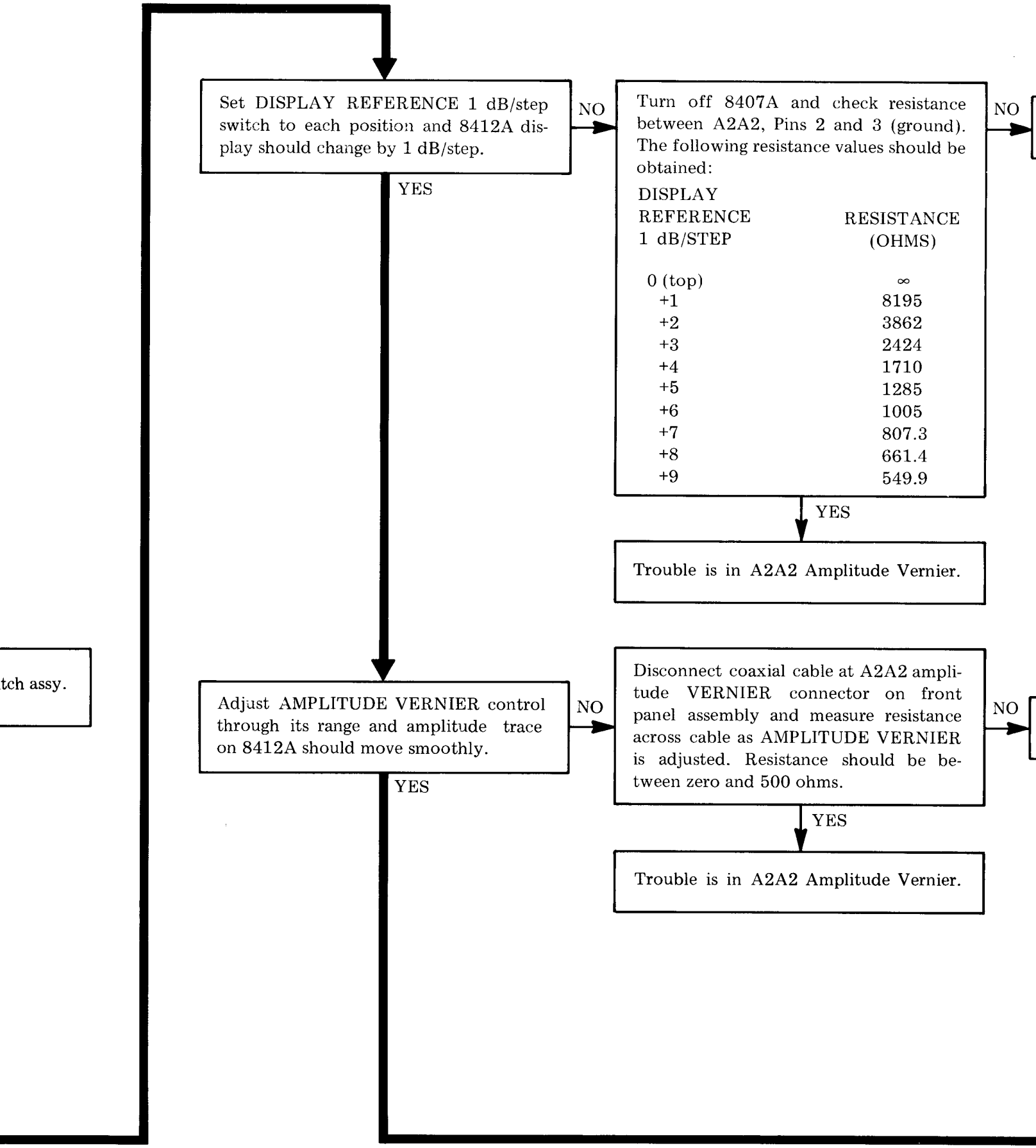
DISPLAY REFERENCE 10 dB/STEP	—19 VDC at XA7 PINS
0 (top)	6, 9, 10
+10	5, 9, 10
+20	9, 10
+30	6, 10
+40	5, 10
+50	10
+60	6
+70	5
+80	None

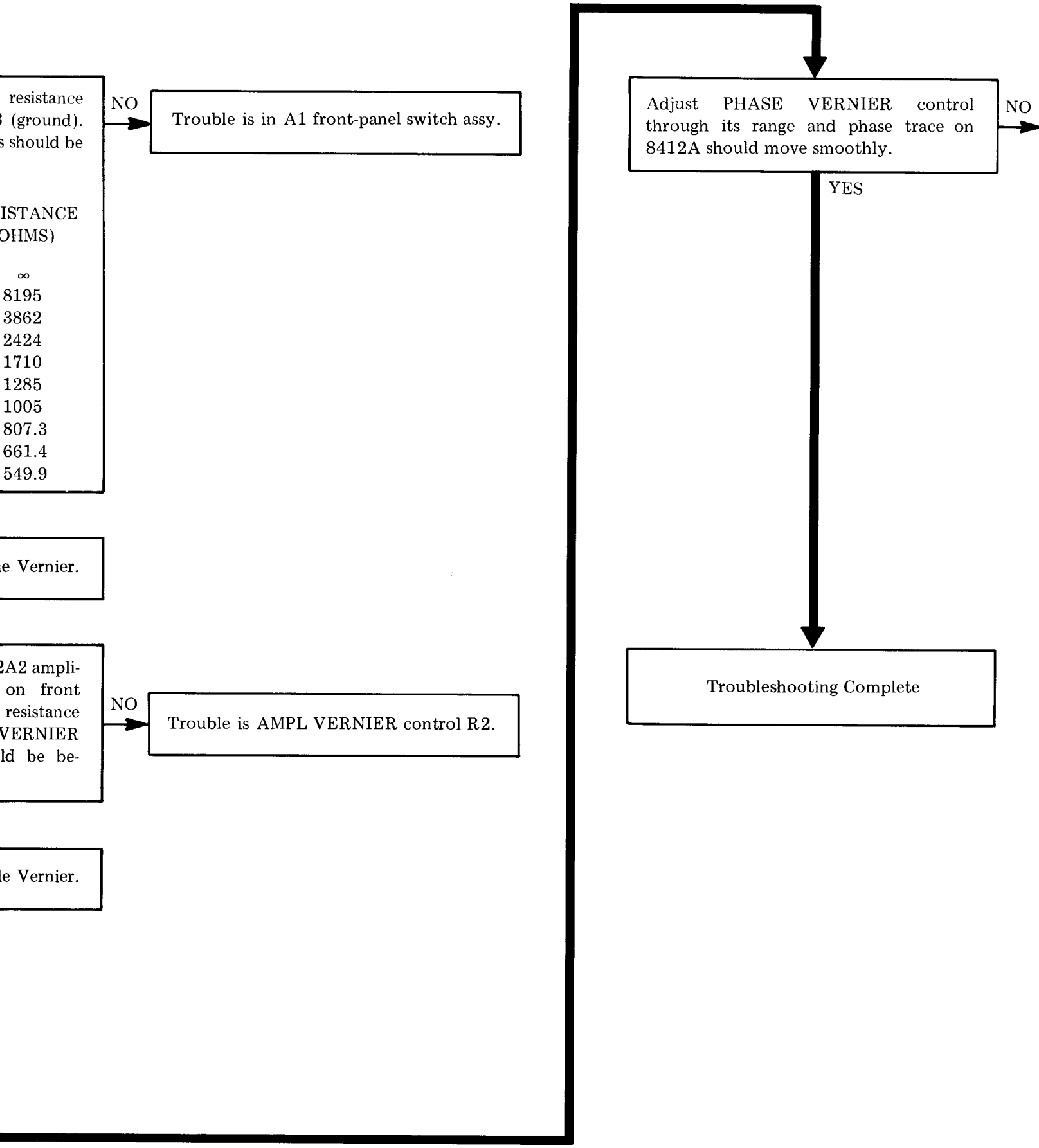
NO → Trouble is in A1 front-panel switch assy.

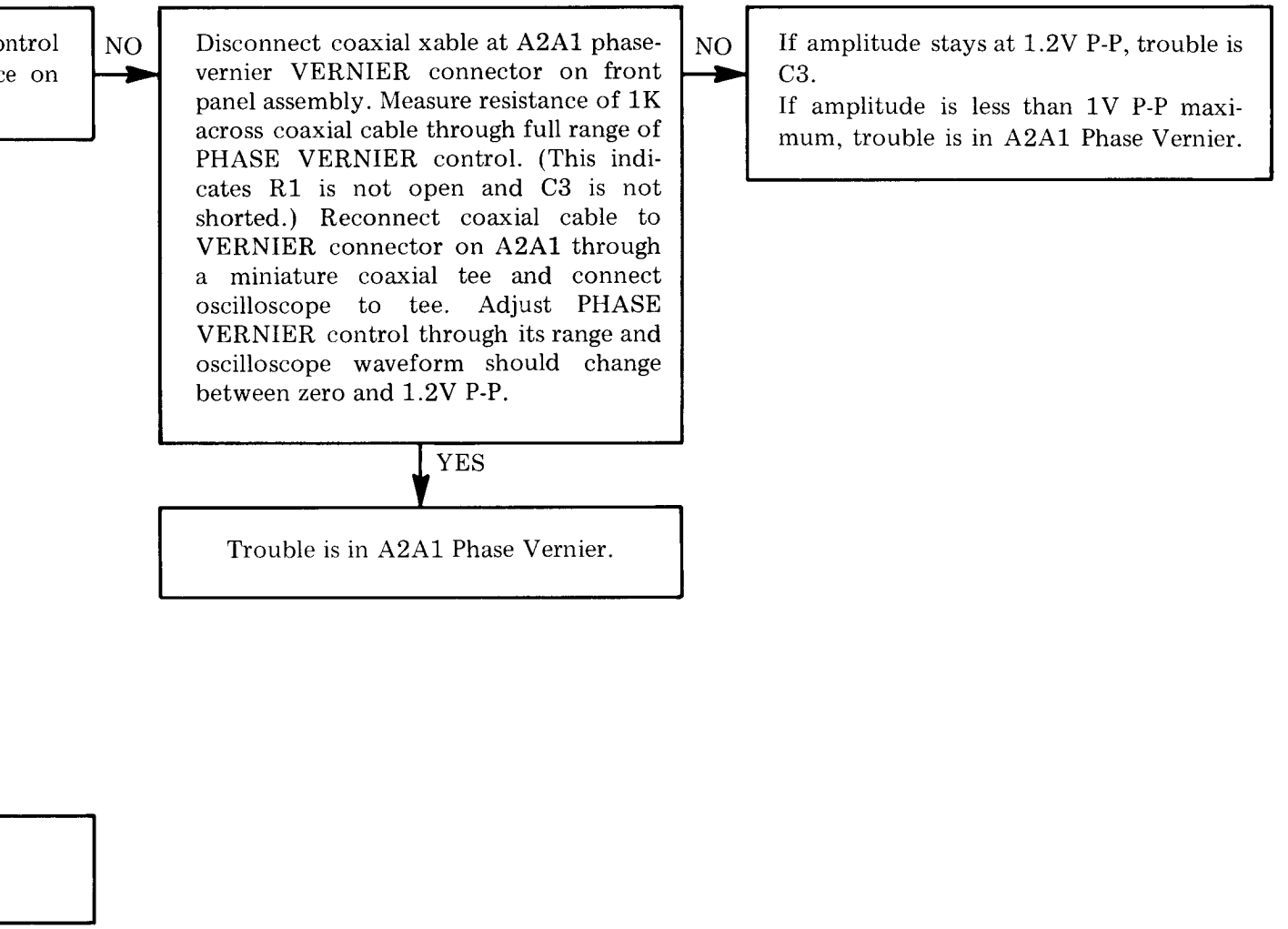
YES

Trouble is in A7 IF attenuator.

Adjust AMPLI
through its ra
on 8412A shou


Set DISPLAY REFERENCE 1 dB/step switch to each position and 8412A display should change by 1 dB/step.
NO
Turn off 8407A and check resistance between A2A2, Pins 2 and 3 (ground). The following resistance values should be obtained:
DISPLAY REFERENCE 1 dB/STEP
RESISTANCE (OHMS)
0 (top) ∞
+1 8195
+2 3862
+3 2424
+4 1710
+5 1285
+6 1005
+7 807.3
+8 661.4
+9 549.9
NO
YES
Trouble is in A2A2 Amplitude Vernier.
YES
Adjust AMPLITUDE VERNIER control through its range and amplitude trace on 8412A should move smoothly.
NO
Disconnect coaxial cable at A2A2 amplitude VERNIER connector on front panel assembly and measure resistance across cable as AMPLITUDE VERNIER is adjusted. Resistance should be between zero and 500 ohms.
NO
YES
Trouble is in A2A2 Amplitude Vernier.
YES
tch assy.


resistance
(ground).
should be
ISTANCE
OHMS)
∞
8195
3862
2424
1710
1285
1005
807.3
661.4
549.9
NO
Trouble is in A1 front-panel switch assy.
e Vernier.
2A2 ampli-
on front
resistance
VERNIER
ld be be-
NO
Trouble is AMPL VERNIER control R2.
le Vernier.
Adjust PHASE VERNIER control through its range and phase trace on 8412A should move smoothly.
NO
YES
Troubleshooting Complete


ntrol
e on
NO
Disconnect coaxial xable at A2A1 phase-vernier VERNIER connector on front panel assembly. Measure resistance of 1K across coaxial cable through full range of PHASE VERNIER control. (This indicates R1 is not open and C3 is not shorted.) Reconnect coaxial cable to VERNIER connector on A2A1 through a miniature coaxial tee and connect oscilloscope to tee. Adjust PHASE VERNIER control through its range and oscilloscope waveform should change between zero and 1.2V P-P.
NO
If amplitude stays at 1.2V P-P, trouble is C3.
If amplitude is less than 1V P-P maximum, trouble is in A2A1 Phase Vernier.
YES
Trouble is in A2A1 Phase Vernier.

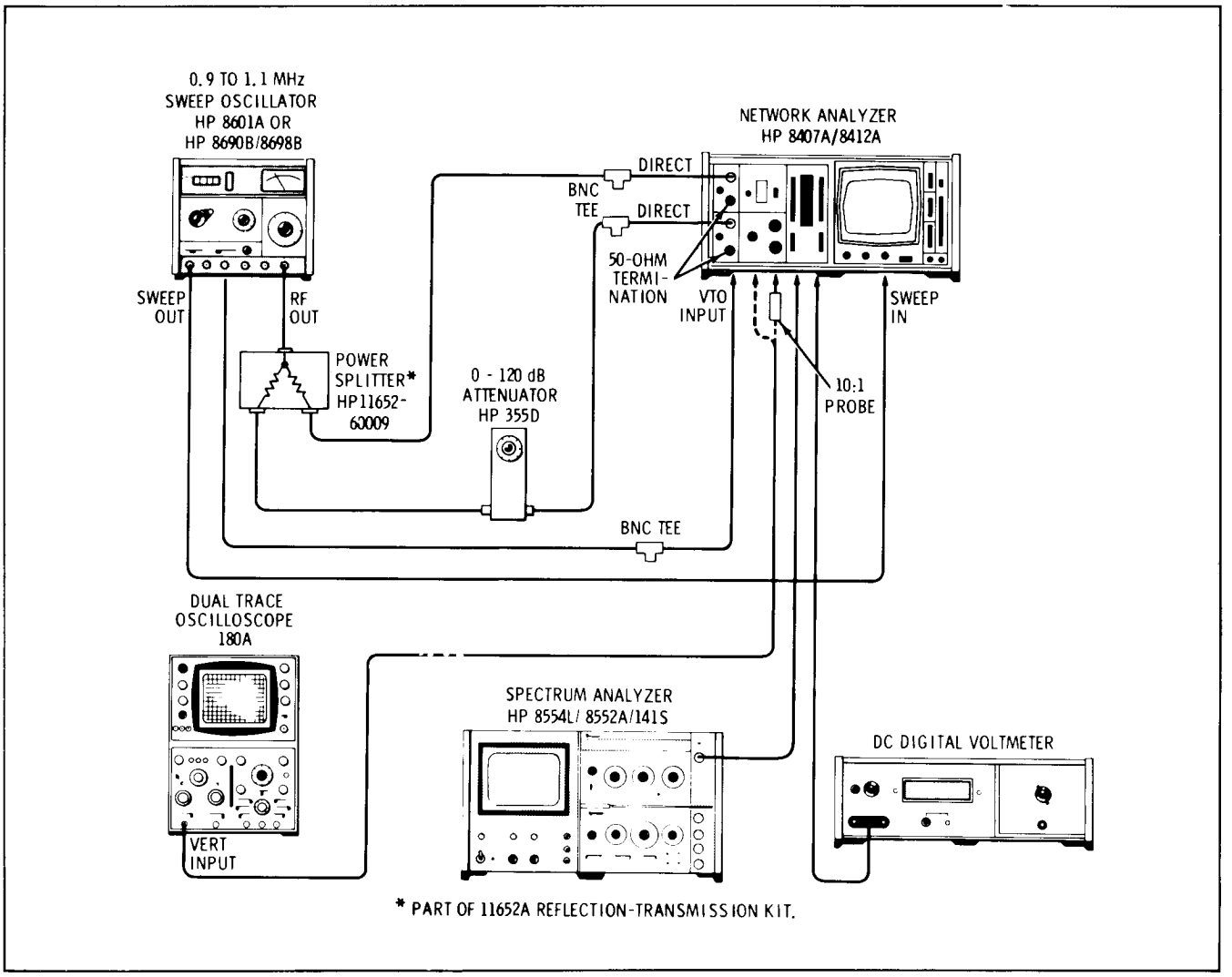
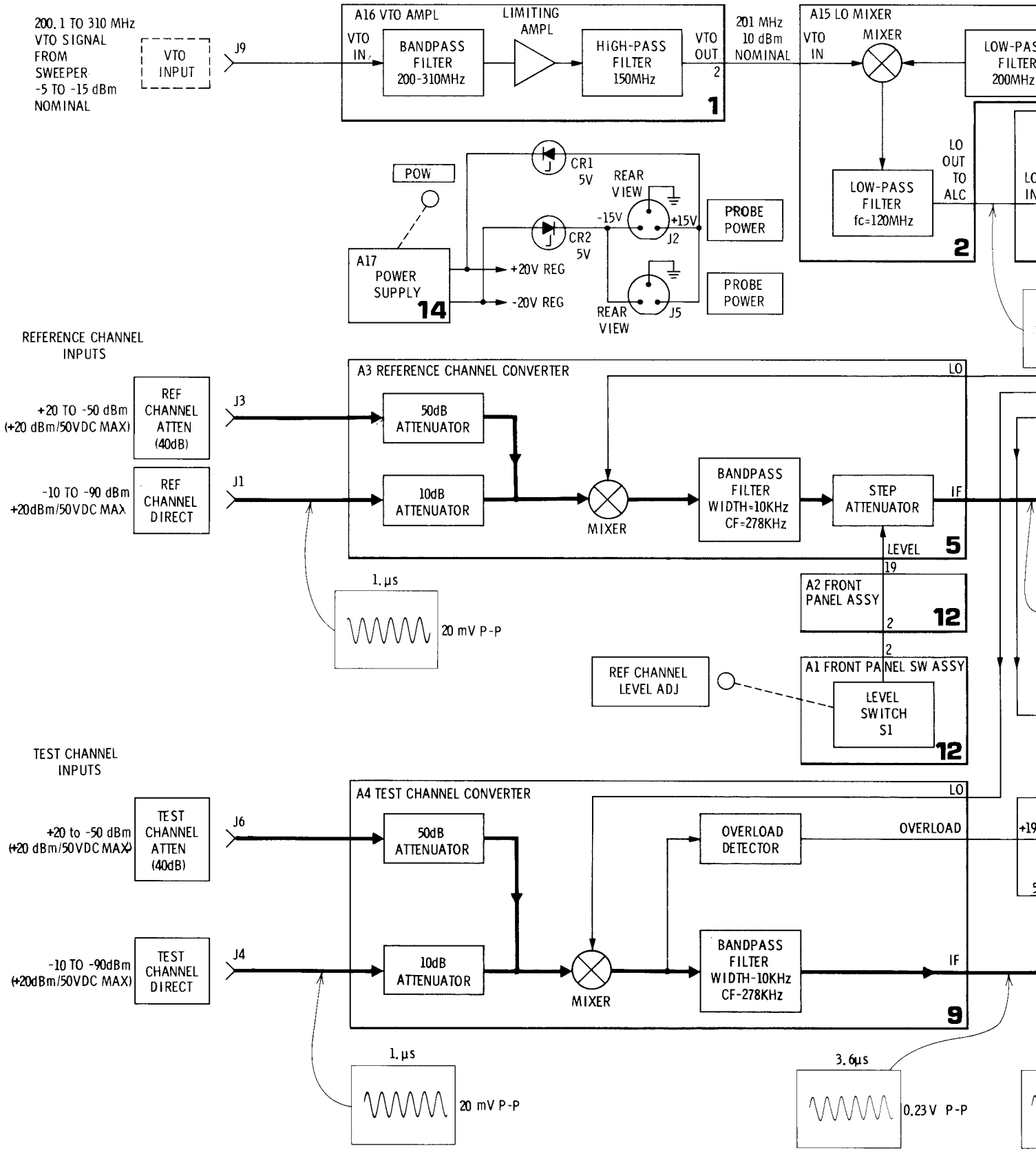
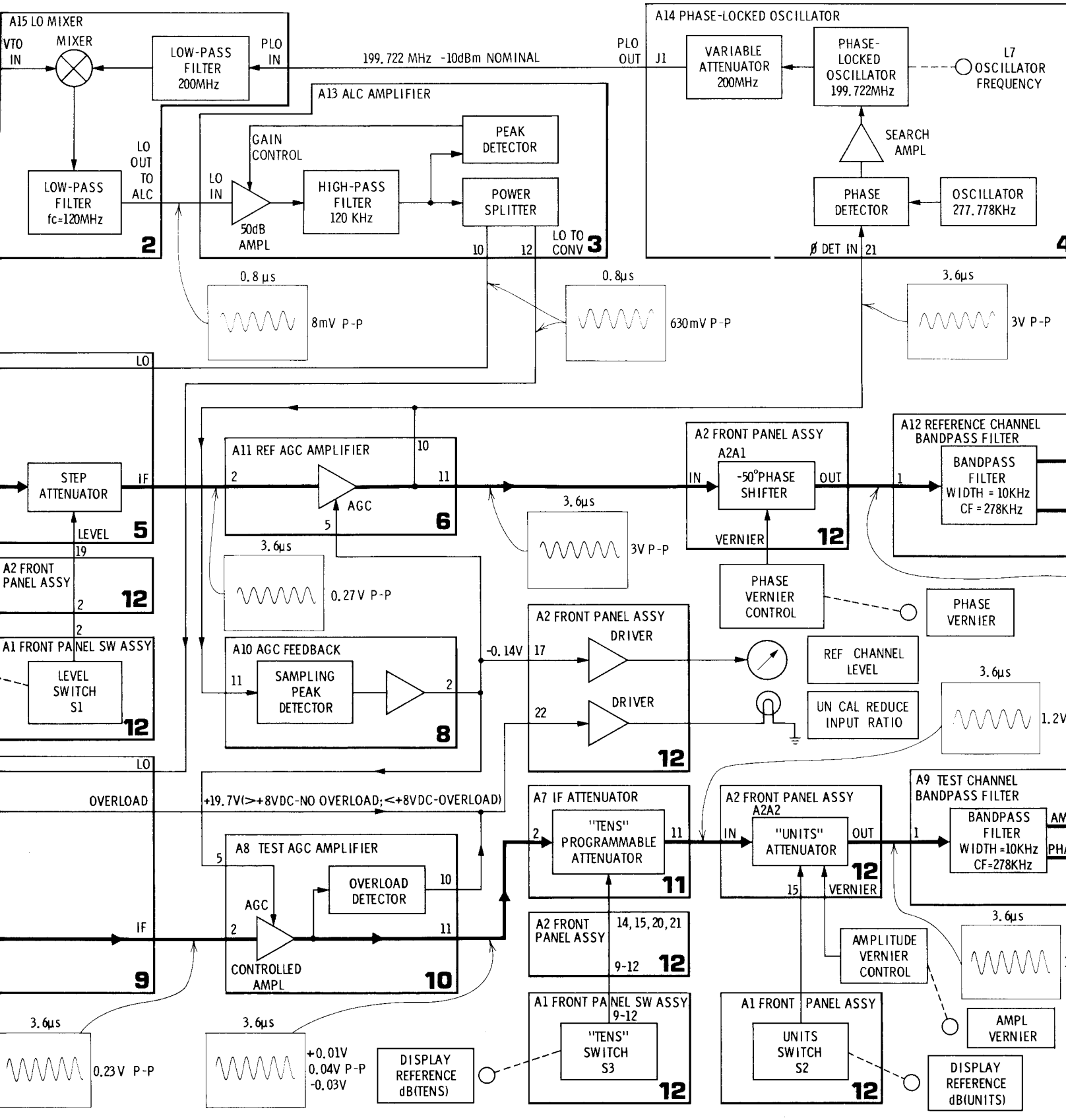


Figure 7-6. Test Setup for Troubleshooting Tree and Block Diagram


200.1 TO 310 MHz
VTO SIGNAL
FROM
SWEEPER
-5 TO -15 dBm
NOMINAL
VTO
INPUT
J9
A16 VTO AMPL
VTO
IN
BANDPASS
FILTER
200-310MHz
LIMITING
AMPL
HIGH-PASS
FILTER
150MHz
VTO
OUT
2
1
201 MHz
10 dBm
NOMINAL
A15 LO MIXER
VTO
IN
MIXER
LOW-PAS
FILTER
200MHz
LO
OUT
TO
ALC
LOW-PASS
FILTER
fc=120MHz
2
POW
A17
POWER
SUPPLY
14
+20V REG
-20V REG
CR1
5V
CR2
5V
REAR
VIEW
-15V
+15V
J2
J5
PROBE
POWER
PROBE
POWER
REFERENCE CHANNEL
INPUTS
+20 TO -50 dBm
(+20 dBm/50VDC MAX)
REF
CHANNEL
ATTEN
(40dB)
J3
-10 TO -90 dBm
+20dBm/50VDC MAX
REF
CHANNEL
DIRECT
J1
A3 REFERENCE CHANNEL CONVERTER
LO
50dB
ATTENUATOR
10dB
ATTENUATOR
MIXER
BANDPASS
FILTER
WIDTH=10KHz
CF=278KHz
STEP
ATTENUATOR
IF
LEVEL
5
19
A2 FRONT
PANEL ASSY
2
12
1.µs
20 mV P-P
REF CHANNEL
LEVEL ADJ
A1 FRONT PANEL SW ASSY
LEVEL
SWITCH
S1
12
TEST CHANNEL
INPUTS
+20 to -50 dBm
(+20 dBm/50VDC MAX)
TEST
CHANNEL
ATTEN
(40dB)
J6
-10 TO -90dBm
(+20dBm/50VDC MAX)
TEST
CHANNEL
DIRECT
J4
A4 TEST CHANNEL CONVERTER
LO
50dB
ATTENUATOR
10dB
ATTENUATOR
MIXER
OVERLOAD
DETECTOR
OVERLOAD
BANDPASS
FILTER
WIDTH-10KHz
CF-278KHz
IF
9
1.µs
20 mV P-P
3.6µs
0.23V P-P


A15 LO MIXER
VTO IN
MIXER
LOW-PASS FILTER 200MHz
PLO IN
199.722 MHz -10dBm NOMINAL
PLO OUT
A14 PHASE-LOCKED OSCILLATOR
J1
VARIABLE ATTENUATOR 200MHz
PHASE-LOCKED OSCILLATOR 199.722MHz
L7 OSCILLATOR FREQUENCY
SEARCH AMPL
PHASE DETECTOR
OSCILLATOR 277.778KHz
Ø DET IN 21
A13 ALC AMPLIFIER
GAIN CONTROL
PEAK DETECTOR
POWER SPLITTER
LO OUT TO ALC
LO IN
50dB AMPL
HIGH-PASS FILTER 120 KHz
LOW-PASS FILTER fc=120MHz
LO TO CONV
10
12
2
3
4
0.8 µs
8mV P-P
0.8µs
630mV P-P
3.6µs
3V P-P
LO
STEP ATTENUATOR
IF
LEVEL
5
A11 REF AGC AMPLIFIER
AGC
6
A2 FRONT PANEL ASSY
A2A1
-50°PHASE SHIFTER
IN
OUT
VERNIER
12
A12 REFERENCE CHANNEL BANDPASS FILTER
BANDPASS FILTER WIDTH = 10KHz CF = 278KHz
3.6µs
3V P-P
3.6µs
0.27V P-P
A2 FRONT PANEL ASSY
19
2
12
PHASE VERNIER CONTROL
PHASE VERNIER
A1 FRONT PANEL SW ASSY
LEVEL SWITCH S1
12
A10 AGC FEEDBACK
SAMPLING PEAK DETECTOR
8
-0.14V
A2 FRONT PANEL ASSY
DRIVER
17
22
12
REF CHANNEL LEVEL
UN CAL REDUCE INPUT RATIO
3.6µs
1.2V
LO
OVERLOAD
+19.7V(>+8VDC-NO OVERLOAD;<+8VDC-OVERLOAD)
A7 IF ATTENUATOR
"TENS" PROGRAMMABLE ATTENUATOR
11
A2 FRONT PANEL ASSY
A2A2
"UNITS" ATTENUATOR
12
15
VERNIER
A9 TEST CHANNEL BANDPASS FILTER
BANDPASS FILTER WIDTH =10KHz CF=278KHz
A8 TEST AGC AMPLIFIER
OVERLOAD DETECTOR
AGC
IF
CONTROLLED AMPL
9
10
A2 FRONT PANEL ASSY
14, 15, 20, 21
9-12
12
3.6µs
AMPLITUDE VERNIER CONTROL
AMPL VERNIER
3.6µs
0.23V P-P
3.6µs
+0.01V
0.04V P-P
-0.03V
DISPLAY REFERENCE dB(TENS)
A1 FRONT PANEL SW ASSY
9-12
"TENS" SWITCH S3
12
A1 FRONT PANEL ASSY
UNITS SWITCH S2
12
DISPLAY REFERENCE dB(UNITS)

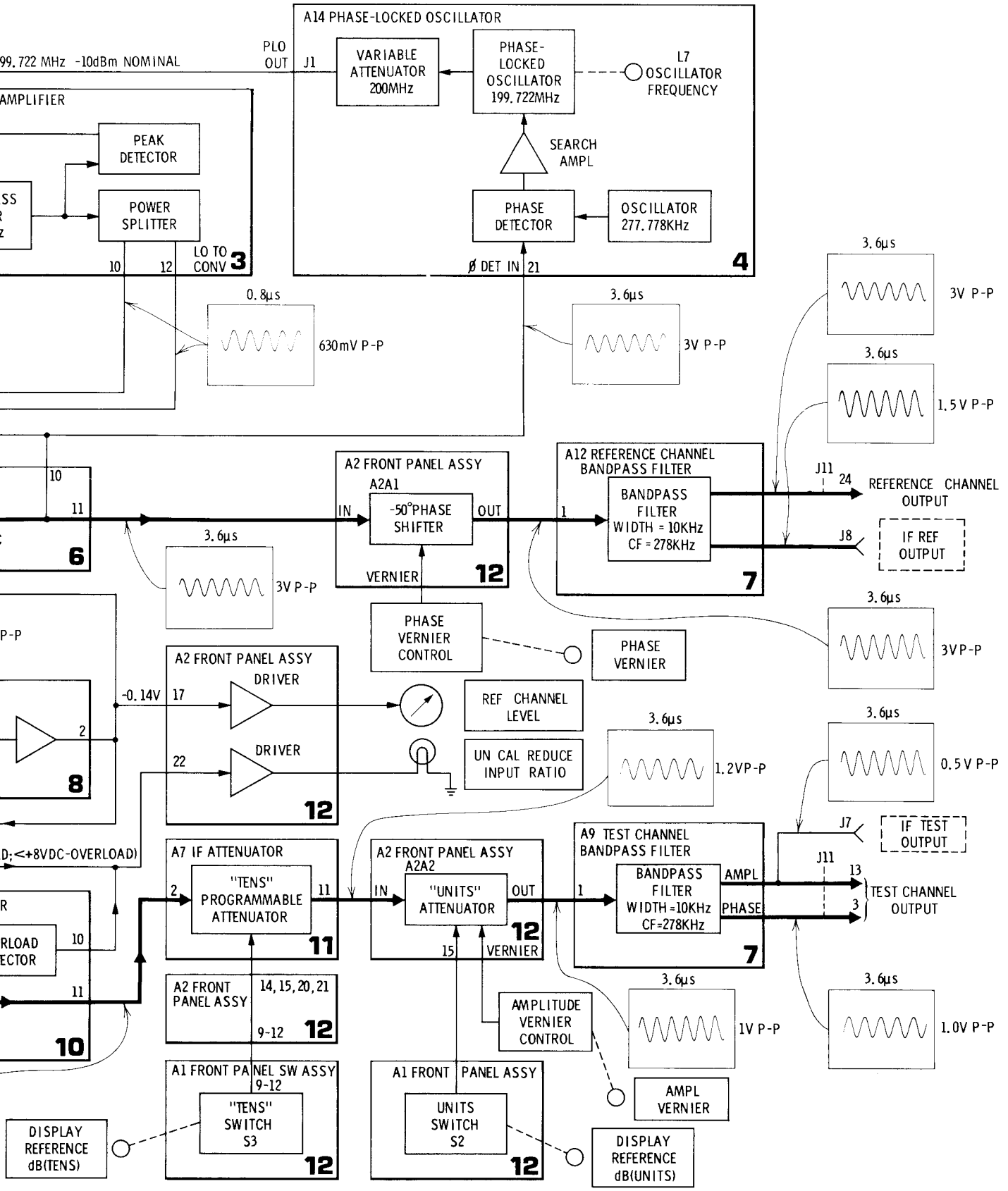


Figure 7-7. Detailed Block Diagram

SERVICE SHEET 1

A16 VTO Amplifier

BUFFER AMPLIFIER

Q1 forms a grounded base RF amplifier. Z1 suppresses spurious oscillations. Transformer T1 forms the output load for Q1, coupling the 200 to 310 MHz RF signal to the bandpass filter.

BANDPASS FILTER

A multisection bandpass filter is formed by a group of parallel-resonate and series-resonate circuits. The passband is from 200 to 310 MHz.

LIMITING AMPLIFIER

Q2 forms a grounded-base RF amplifier followed by three grounded-emitter stages, Q3, Q4, and Q5. Transformer T2 changes from single-ended to push-pull drive for push-pull amplifiers Q6 and Q7. Transformer T3 is a conventional push-pull output transformer with a low-impedance output winding.

150 MHz HIGH-PASS FILTER

Capacitors C22 and C23 and inductors L6 and L7 form a high-pass filter. This filters any harmonics or mixing products below 150 MHz.

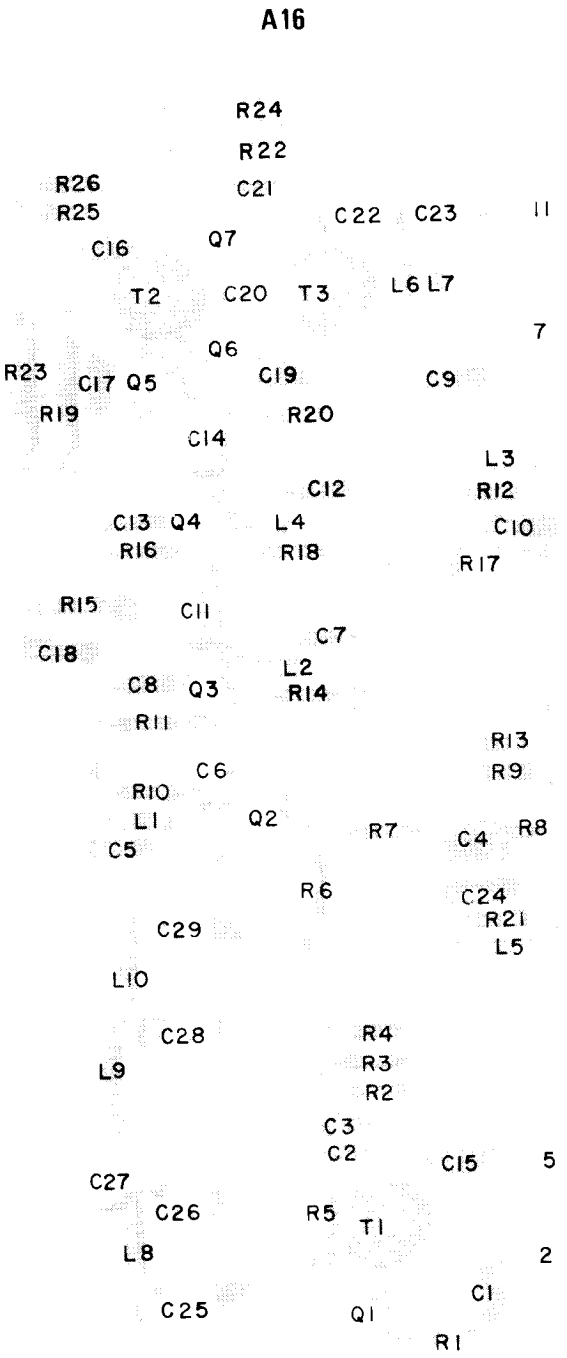
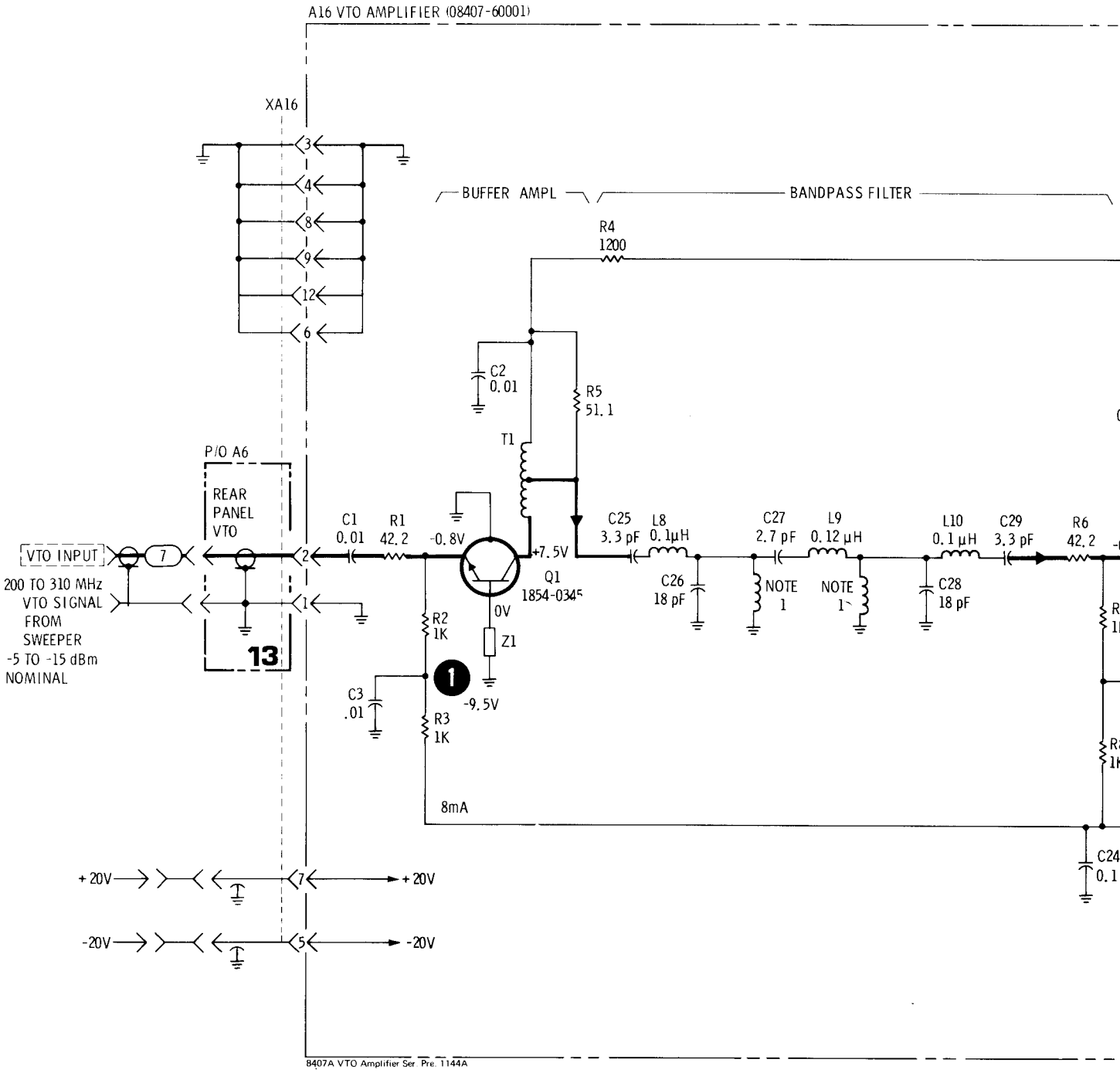
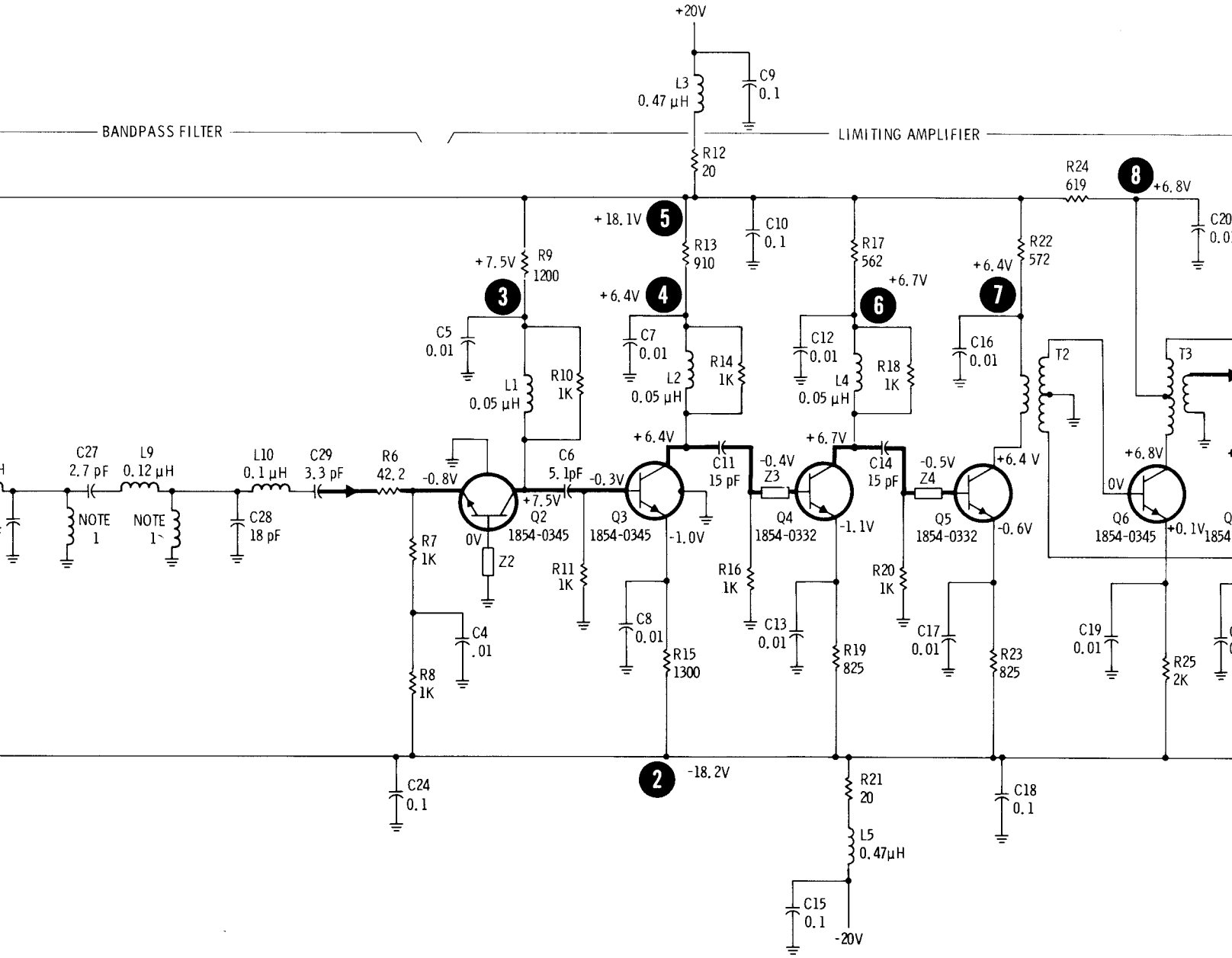


Figure 7-8. Parts Location for VTO Amplifier A16



NOTE: 1. TWO INDUCTORS IN BANDPASS FILTER 08407-60050 ARE PRINTED CIRCUIT SPIRALS.

2. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.



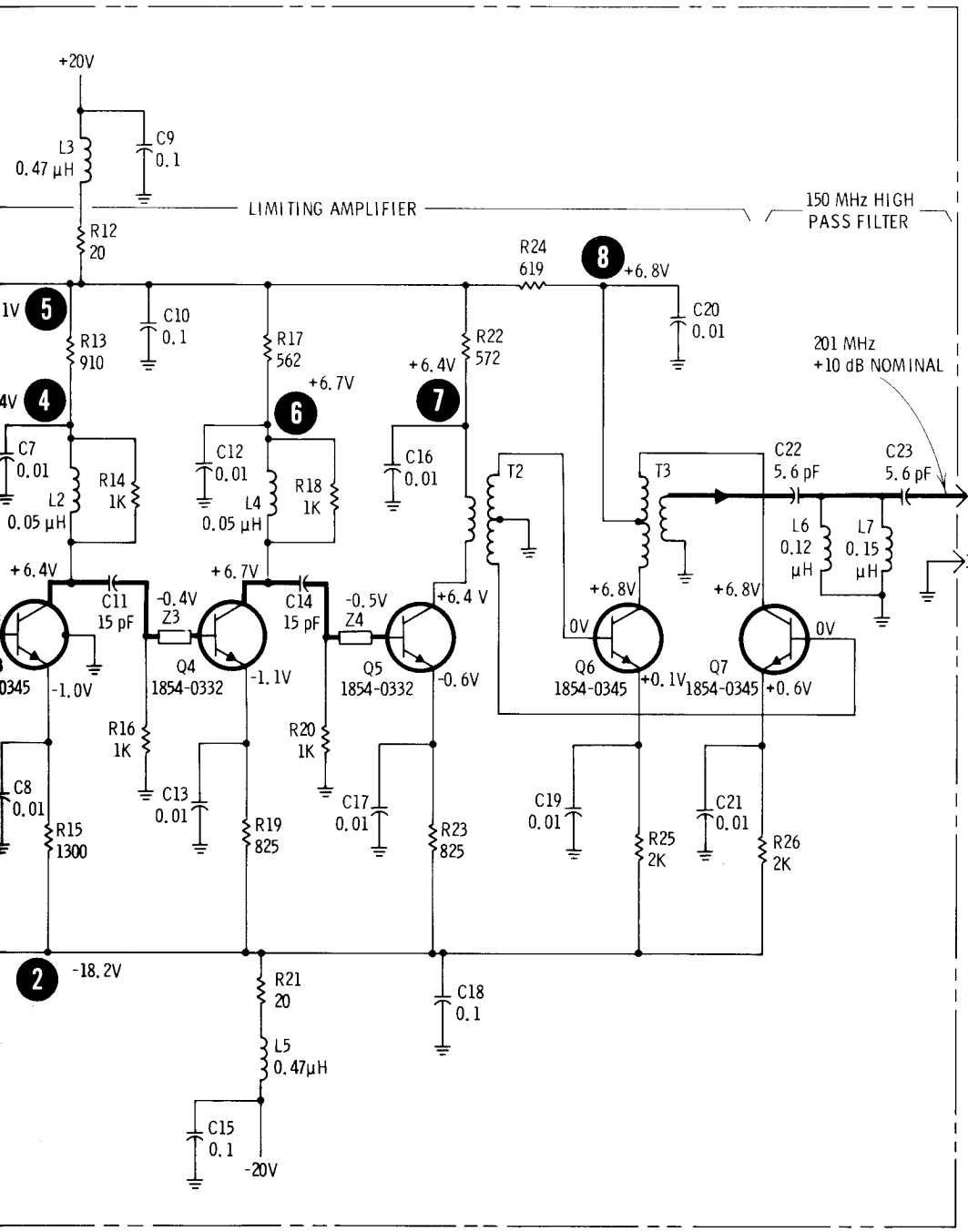
R 08407-60050

ONDITIONS
RMS AND

REFERENCE DESIGNATIONS

A16 ASSY	A16A1 ASSY
C1-24 L1-7 Q1-7 R1-R26 T1-3 Z1-4	C1-5 L1-3

REFERENCE DESIGNATIO
ASSEMBLIES ARE ABBRI
CLUDES ASSEMBLY NU
IS A1R1. DESIGNATIO
COMPLETE AS SHOWN.



REFERENCE DESIGNATIONS

A16 ASSY	A16A1 ASSY
C1-24 L1-7 Q1-7 R1-R26 T1-3 Z1-4	C1-5 L1-3

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.

1
A16

Figure 7-9. VTO Amplifier A16, Schematic Diagram

SERVICE SHEET 2

A15 LO Mixer

200 MHz LOW-PASS FILTER

A low-pass filter prevents harmonics of the phase-locked oscillator from reaching the mixer. This keeps the mixing products to a minimum and produces a clean local oscillator signal.

MIXER

The 200 to 310 MHz VTO signal and the 199.722 MHz PLO signal are transformer-coupled into a balanced diode bridge. The output at the centertap of T3 is the local oscillator signal.

110 MHz LOW-PASS FILTER

The low-pass filter cuts off signals above 110.278 MHz. The signals of concern are the 199.722 MHz phase-locked oscillator and the 200 to 310 MHz VTO signals which were used in the mixer to produce a difference frequency called the local oscillator signal.

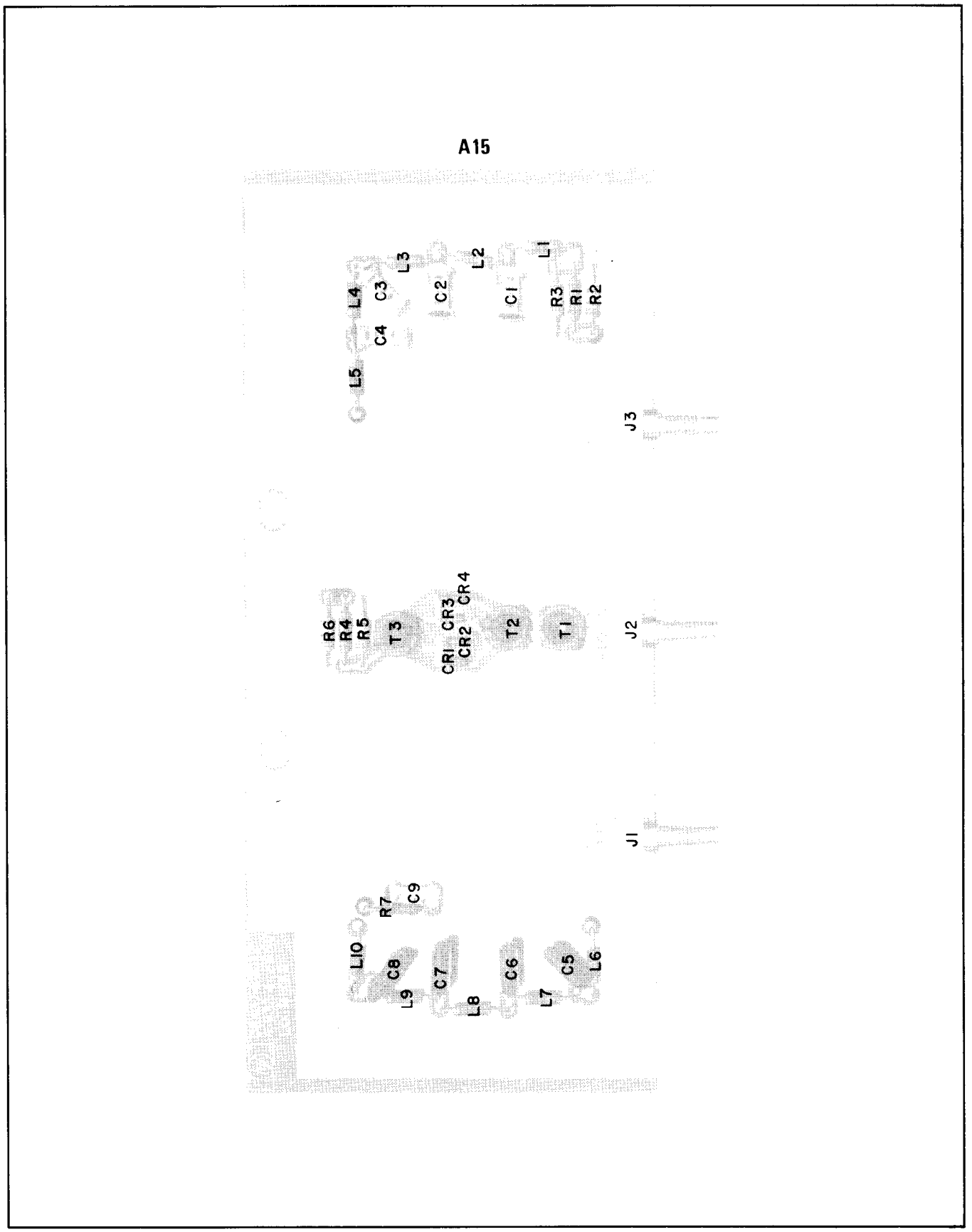
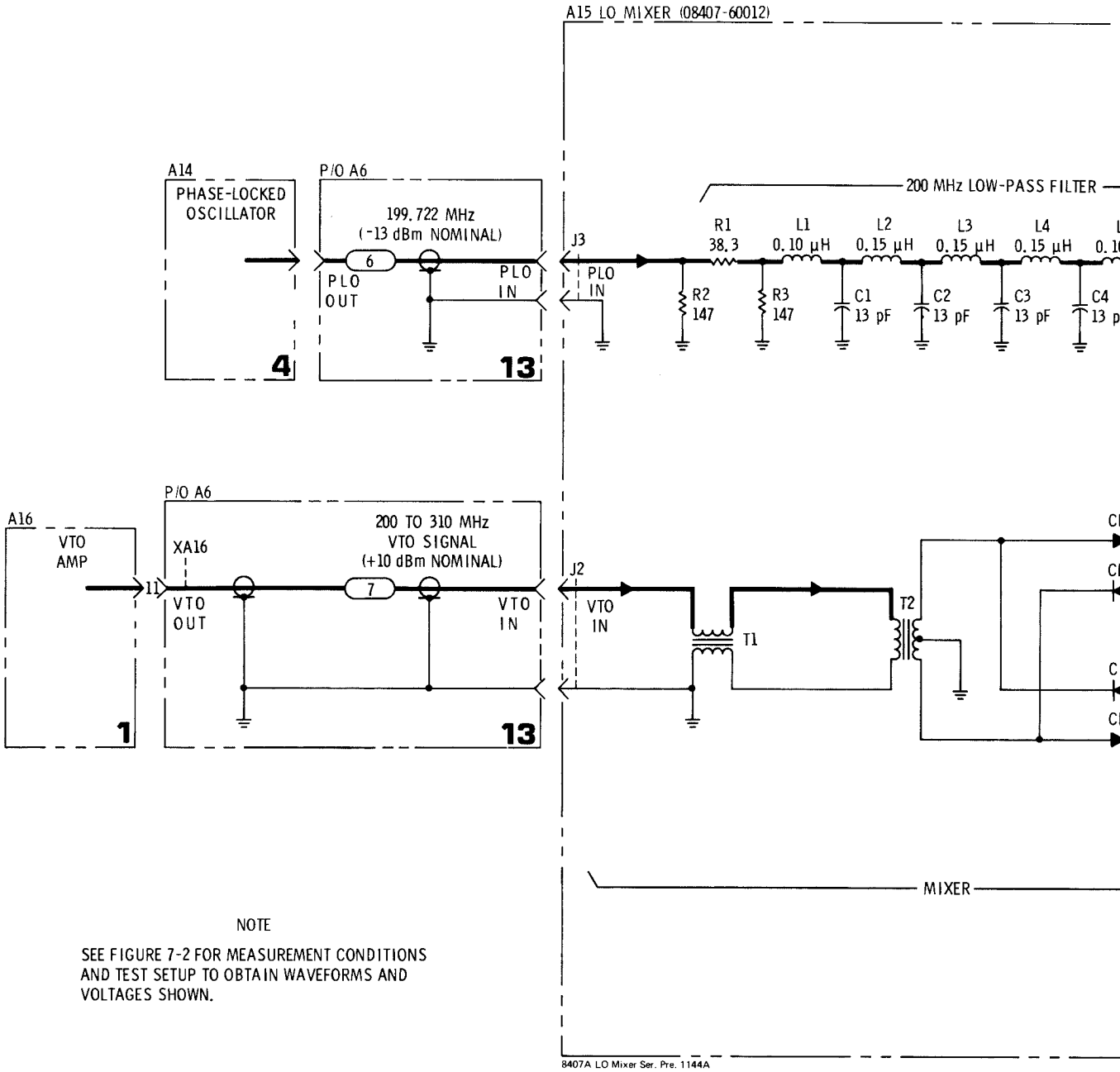
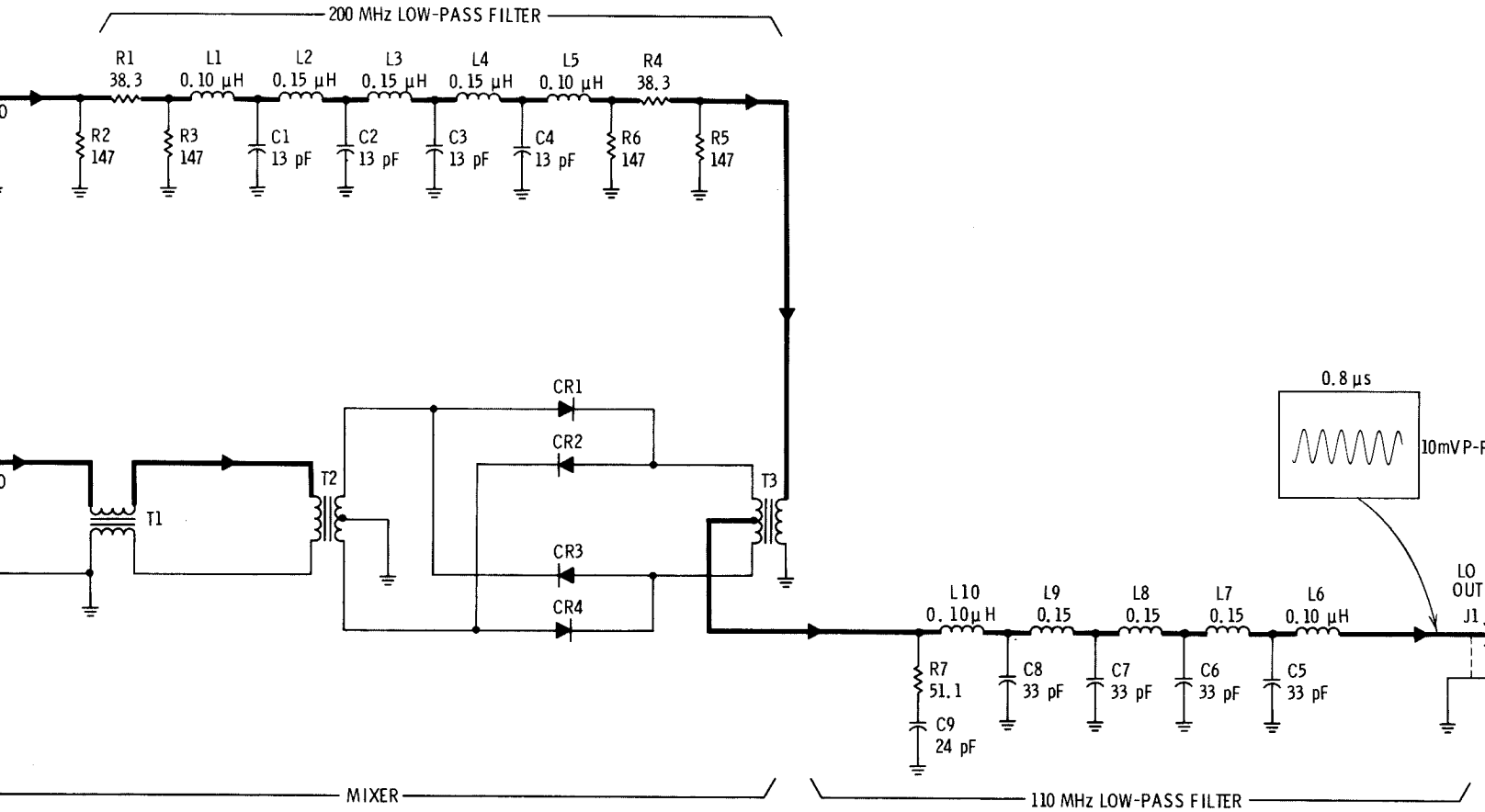


Figure 7-10. Parts Location for Local Oscillator Mixer A15



NOTE

SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES 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.

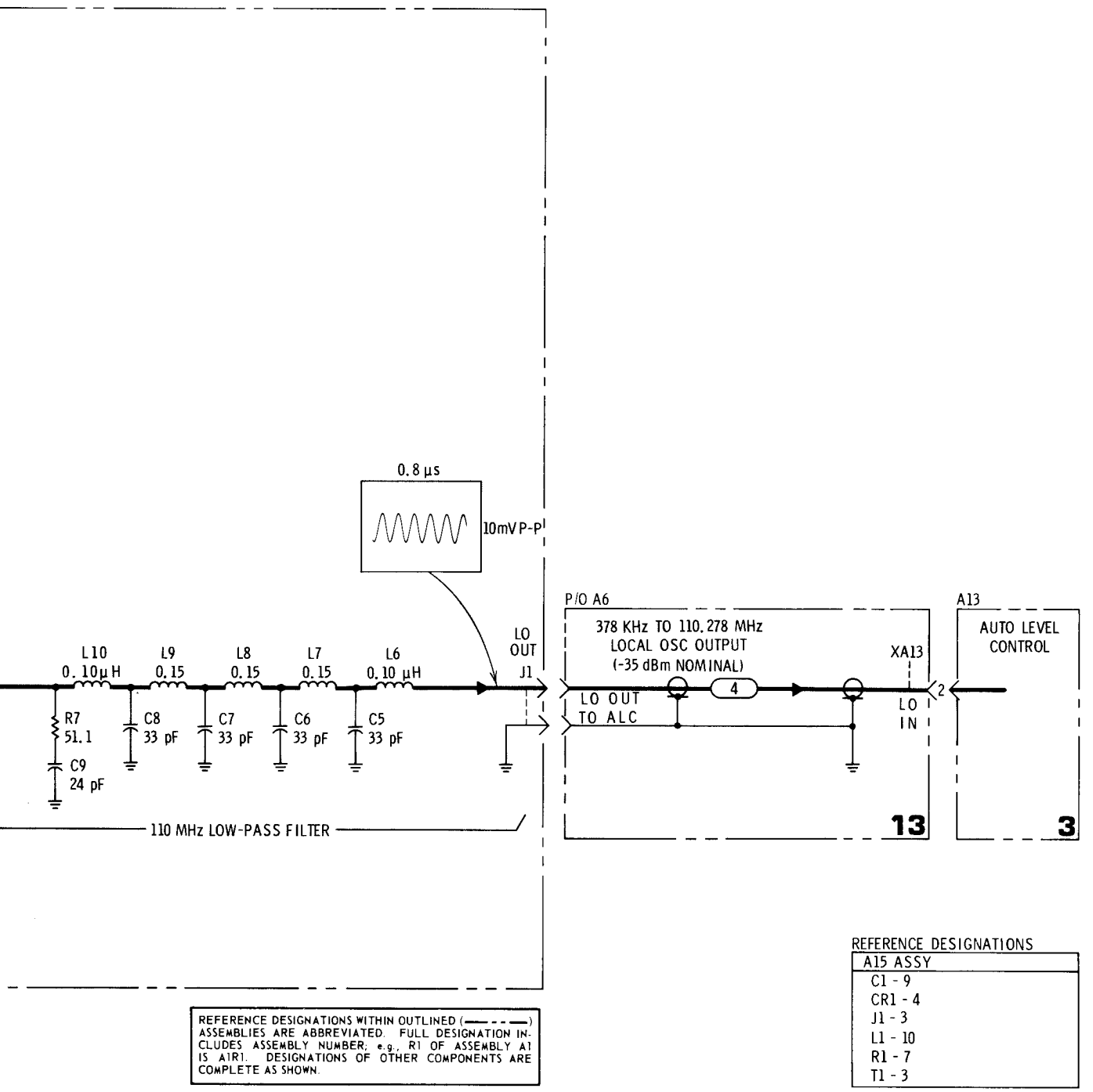


Figure 7-11. Local Oscillator Mixer A15, Schematic Diagram

SERVICE SHEET 3

A13 Automatic Level Control

X10 AMPLIFIER

The local oscillator signal passes through an X10 amplifier composed of Q1 and Q2. Q1 is a grounded base amplifier driving emitter follower Q2. Q2 drives amplifier Q3. The gain of Q3 changes with frequency because of bypass capacitors C5 and C6 and inductor L2.

FREQUENCY-DEPENDENT-GAIN AMPLIFIER

The gain of amplifiers Q3 and Q4 is dependent on frequency. It provides higher gain at the higher frequencies. This is obtained by the time constant of C6-R12 and C11-R18 which bypass the emitters at the higher frequencies.

DIFFERENTIAL AMPLIFIER

A differential amplifier is formed by the two sections of Q5. The stage is driven through the emitter by Q4. One base circuit sets the local oscillator level (LO LEVEL) and the other base circuit receives the feedback signal for leveling. The bias on the bases of Q5 changes the effective collector load impedance of Q4 thus changing the gain of Q4.

100 kHz HIGH-PASS FILTER

A high-pass filter is formed by C16-C20 and L4 and L5. This filters out any mixing products below 100 kHz, providing a clean local-oscillator signal.

X1 AMPLIFIER (Q8 & Q9)

Q8 and Q9 form a complementary emitter follower with a gain of one. The local oscillator (LO) signal at the output of Q8,Q9 is a leveled signal of fairly constant amplitude through the LO signal range.

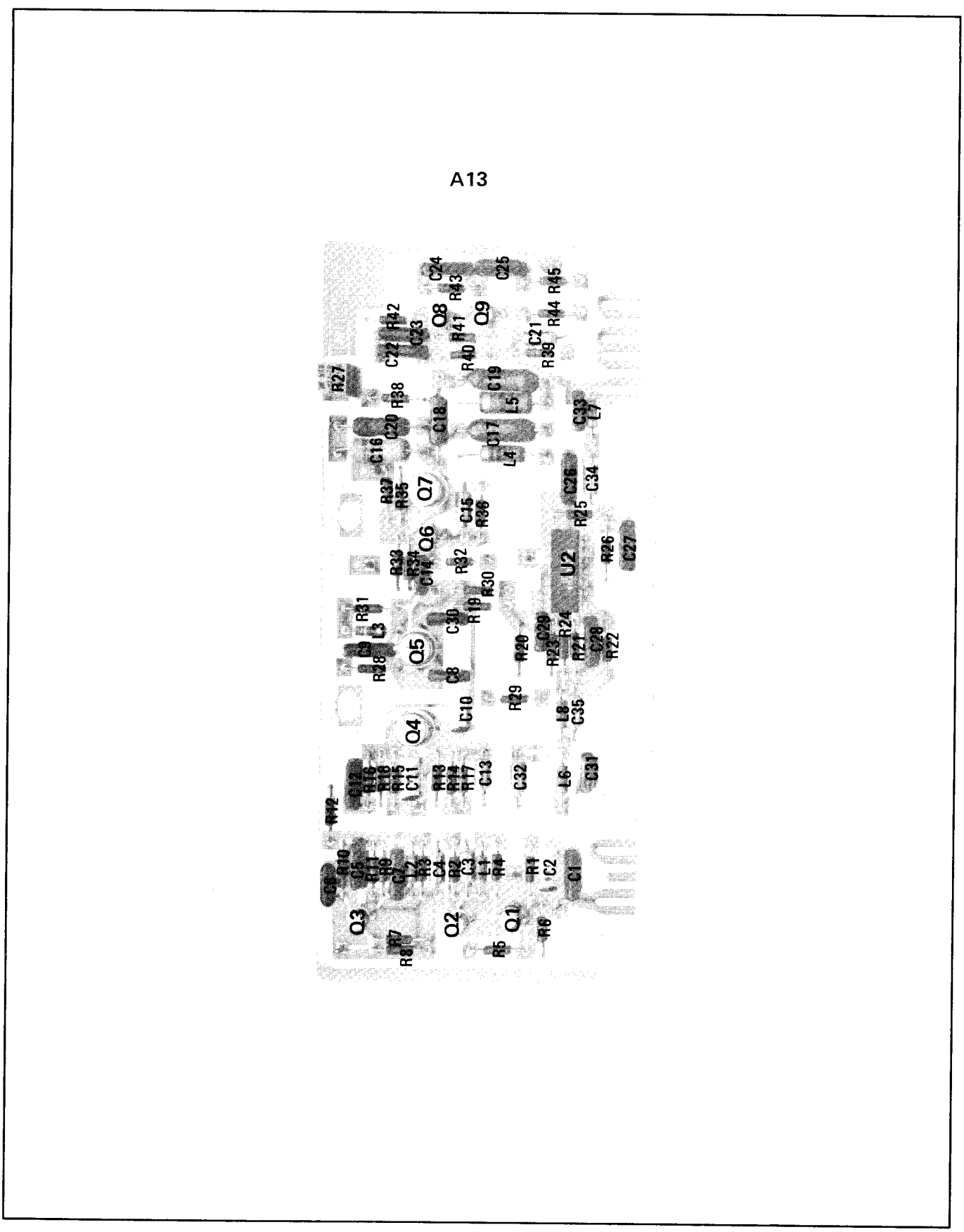
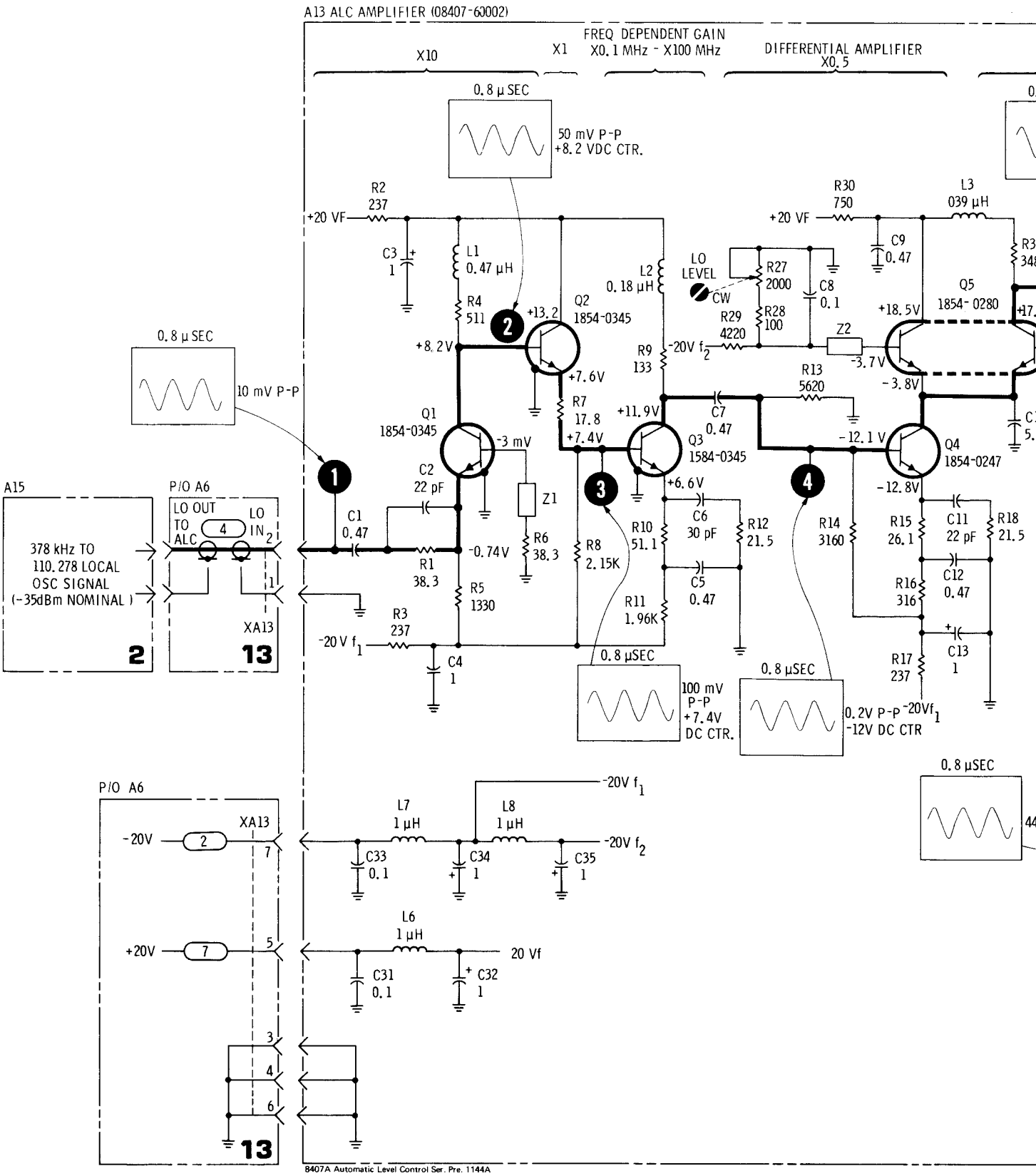
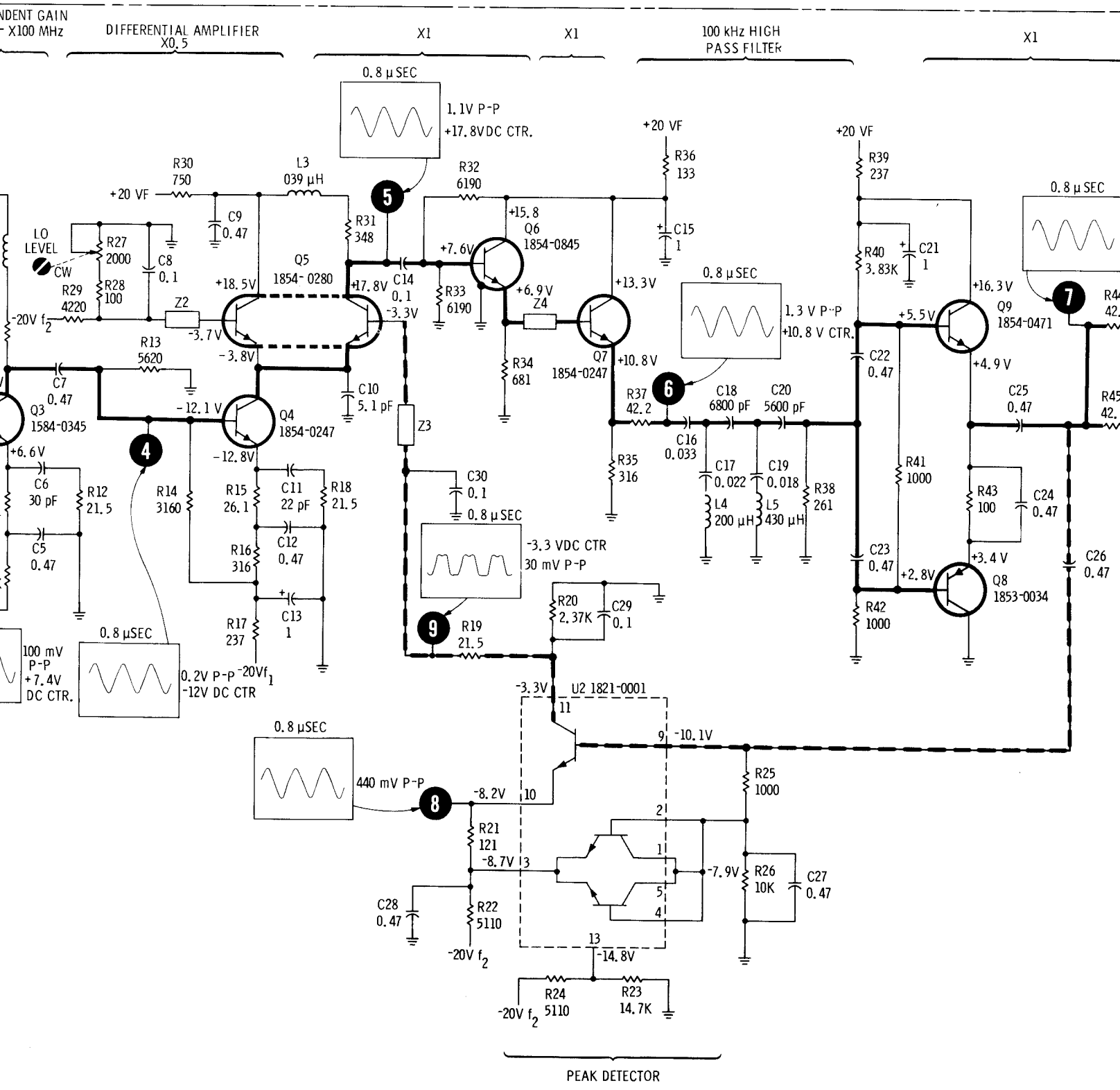


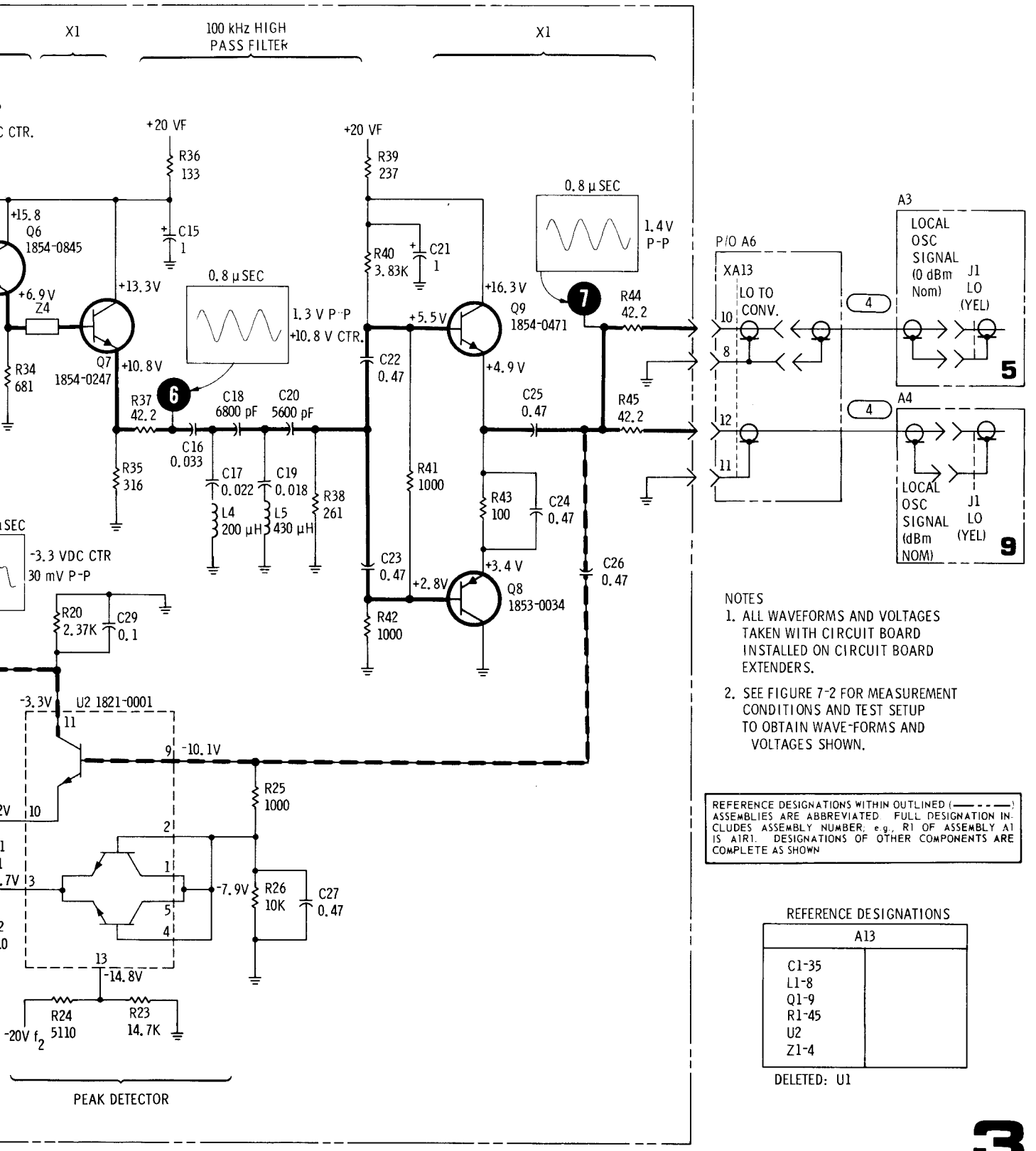
Figure 7-12. Parts Location for Automatic Level Control Amplifier A13



8407A Automatic Level Control Ser. Pre. 1144A


NDENT GAIN
- X100 MHz
DIFFERENTIAL AMPLIFIER
X0.5
X1
X1
100 kHz HIGH
PASS FILTER
X1
PEAK DETECTOR
0.8 µ SEC
1.1V P-P
+17.8VDC CTR.
+20 VF
R30
750
L3
039 µH
R32
6190
R36
133
R39
237
LO
LEVEL
CW
R27
2000
R28
100
R29
4220
C8
0.1
C9
0.47
R31
348
Q5
1854-0280
+18.5V
+17.8V
C14
0.1
-3.3V
-3.7V
-3.8V
Z2
-20V f2
R13
5620
C7
0.47
Q3
1584-0345
-12.1V
Q4
1854-0247
C10
5.1 pF
Z3
+15.8
Q6
1854-0845
+7.6V
R33
6190
+6.9V
Z4
R34
681
Q7
1854-0247
+13.3V
+10.8V
C15
1
0.8 µ SEC
1.3 V P-P
+10.8 V CTR.
R37
42.2
C16
0.033
C18
6800 pF
C20
5600 pF
C17
0.022
L4
200 µH
C19
0.018
L5
430 µH
R38
261
R35
316
R40
3.83K
C21
1
+16.3 V
Q9
1854-0471
+5.5V
+4.9 V
C22
0.47
C25
0.47
R41
1000
R43
100
C24
0.47
C23
0.47
+3.4 V
+2.8V
Q8
1853-0034
R42
1000
C26
0.47
+6.6V
C6
30 pF
R12
21.5
C5
0.47
R14
3160
R15
26.1
C11
22 pF
R18
21.5
R16
316
C12
0.47
R17
237
C13
1
C30
0.1
0.8 µ SEC
-3.3 VDC CTR
30 mV P-P
R20
2.37K
C29
0.1
R19
21.5
100 mV
P-P
+7.4V
DC CTR.
0.8 µSEC
0.2V P-P -20Vf1
-12V DC CTR
-3.3V
U2 1821-0001
11
9
-10.1V
0.8 µSEC
440 mV P-P
-8.2V
10
R25
1000
2
1
3
-8.7V
-7.9V
R26
10K
C27
0.47
5
4
R21
121
C28
0.47
R22
5110
-20V f2
13
-14.8V
R24
5110
-20V f2
R23
14.7K
4
5
6
7
8
9

Figure



NOTES

1. ALL WAVEFORMS AND VOLTAGES TAKEN WITH CIRCUIT BOARD INSTALLED ON CIRCUIT BOARD EXTENDERS.
2. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVE-FORMS AND VOLTAGES 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

A13	
C1-35 L1-8 Q1-9 R1-45 U2 Z1-4	

DELETED: U1

3
A13

Figure 7-13. Automatic Level Control Amplifier A13, Schematic Diagram

SERVICE SHEET 4

A14 Phase-Locked Oscillator

PHASE DETECTOR

The 278 kHz reference oscillator signal at the bases of Q9 and Q11 acts as the gating signal for the detector circuit. Detection occurs in the two differential amplifier circuits formed by Q7, Q8, Q10 and Q12. Q13 forms a constant current supply for the phase detector.

SEARCH AMPLIFIER

The search amplifier is formed by constant current source Q5 and differential amplifier Q3 and Q4. The dc voltage from the search amplifier passes through emitter-follower Q6. This dc voltage is applied to the phase-locked oscillator, producing a correction in phase or frequency necessary to maintain a 278 kHz reference channel IF signal. When loss of phase lock occurs, the search amplifier produces a sawtooth signal that causes the 199.850 MHz oscillator to sweep above and below the crystal frequency. When the sweep produces a momentary reference channel IF signal of 278 kHz, the signal produces a dc output from the phase detector which stops the search, and locks the phase-lock oscillator.

278 kHz REFERENCE OSCILLATOR

Q1 and Q2 form a crystal oscillator at 277.778 kHz. The output is used to compare with the reference channel IF signal.

PHASE-LOCK OSCILLATOR

Oscillator Q15 produces a 199.722 MHz phase-locked oscillator (PLO) signal. The frequency may be changed by the adjustment of inductor L7 to center the capture range. The frequency of the oscillator is controlled through the capture range by a dc signal from the phase detector. This dc signal is applied to CR3 and changes the effective capacity presented to the circuit by CR3. This, in turn, changes the oscillator frequency and causes phase tracking between the oscillator and the RF input signal.

BUFFER

Buffer amplifier Q14 is a grounded-base configuration. It provides isolation between the PLO and the variable attenuator circuit. Isolation is necessary to prevent changes in the attenuator from reflecting into the PLO and pulling it out of phase lock.

LOW-PASS FILTER 250 MHz

A low-pass filter is formed by C32, C33, and L8-L10. This removes mixing products and harmonics above the PLO frequency range.

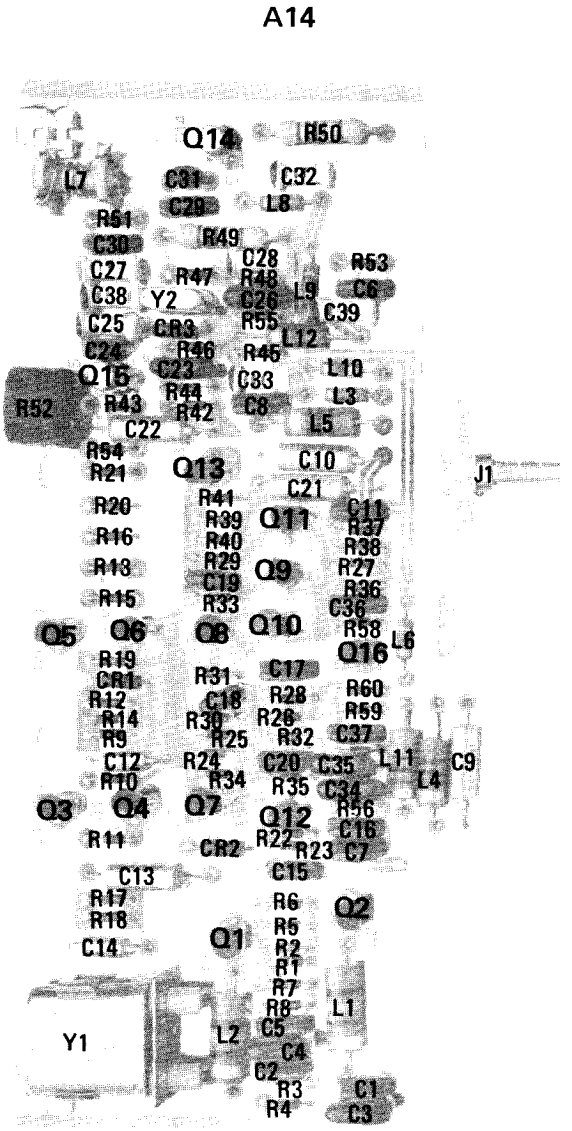
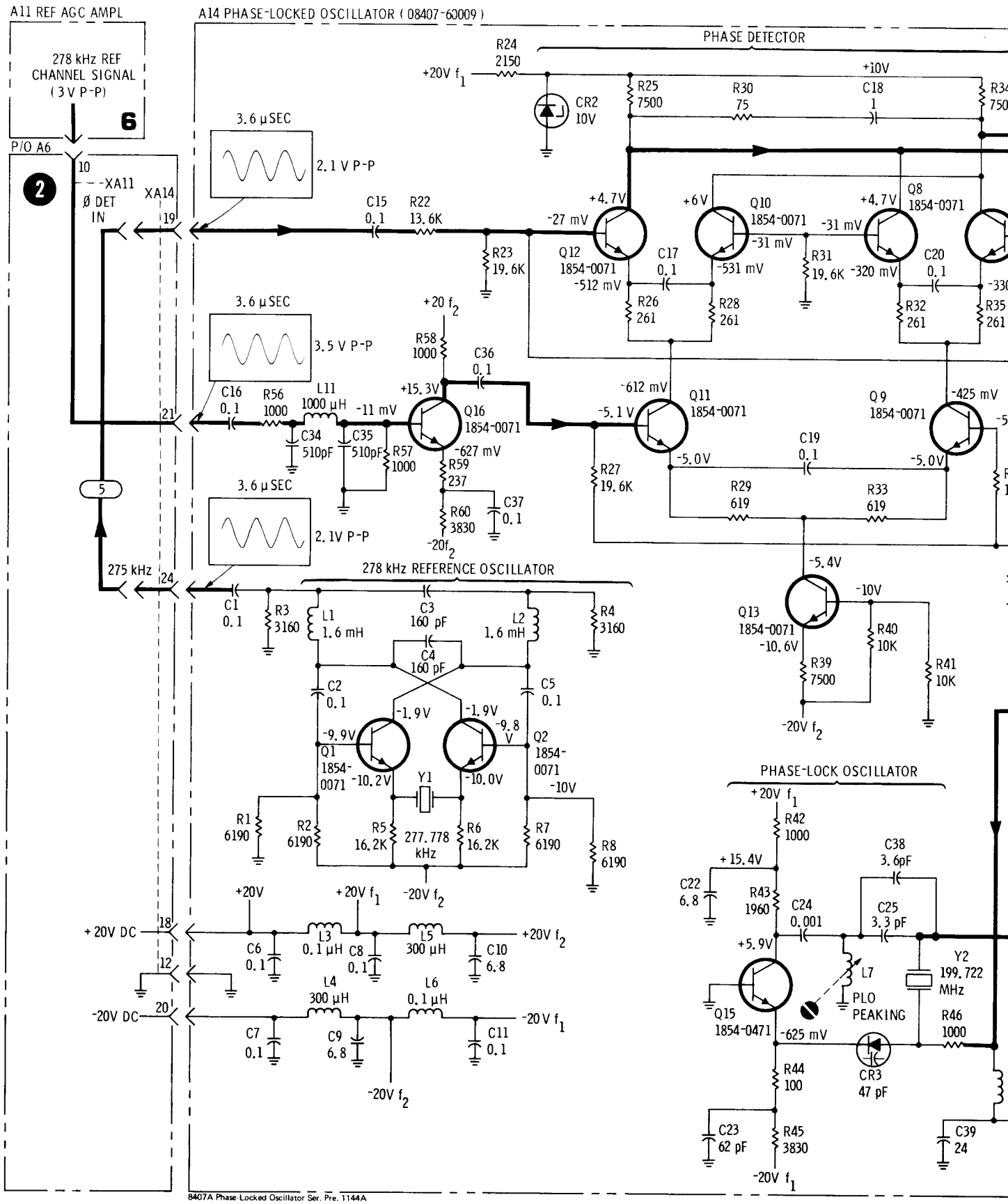
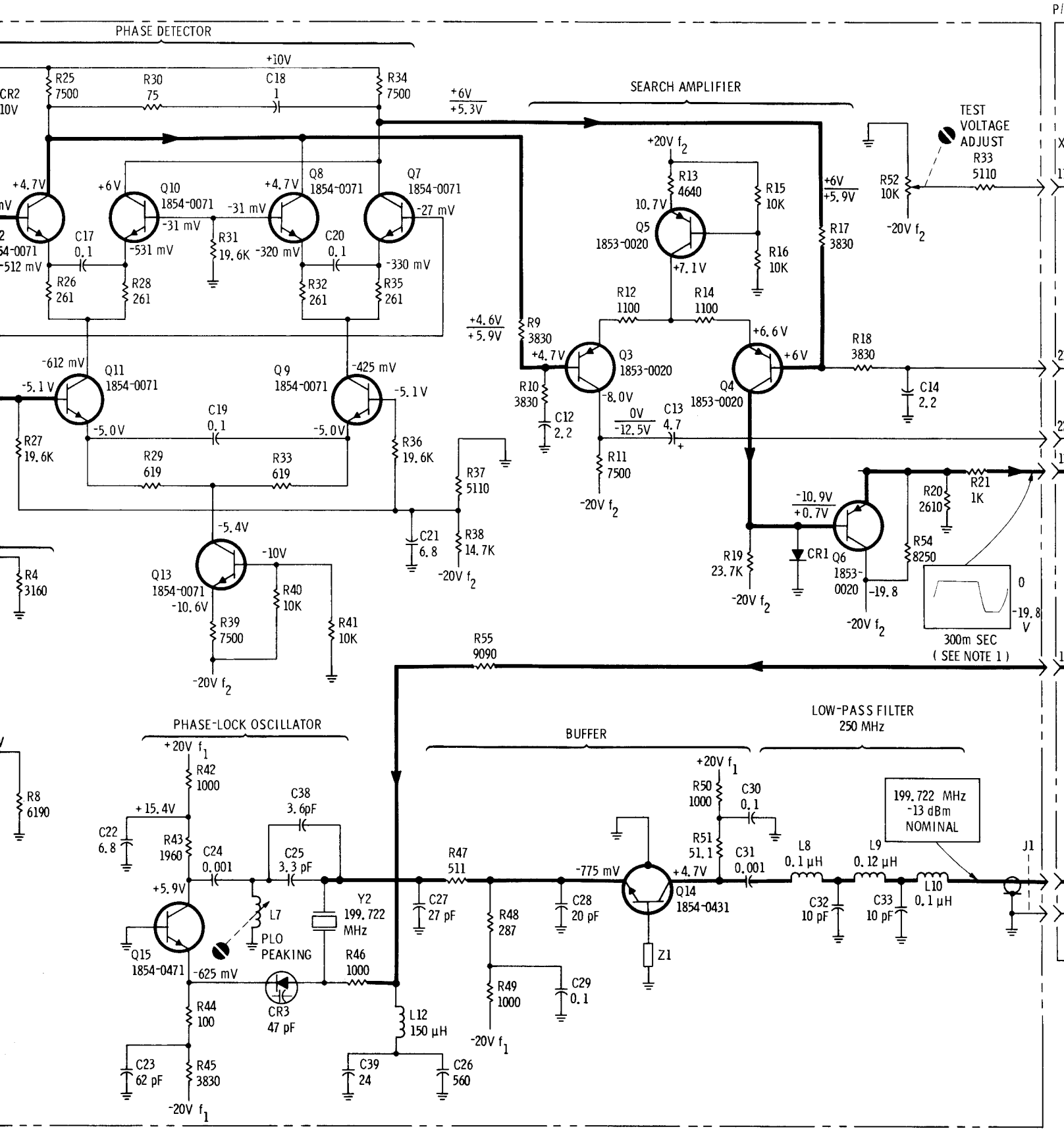
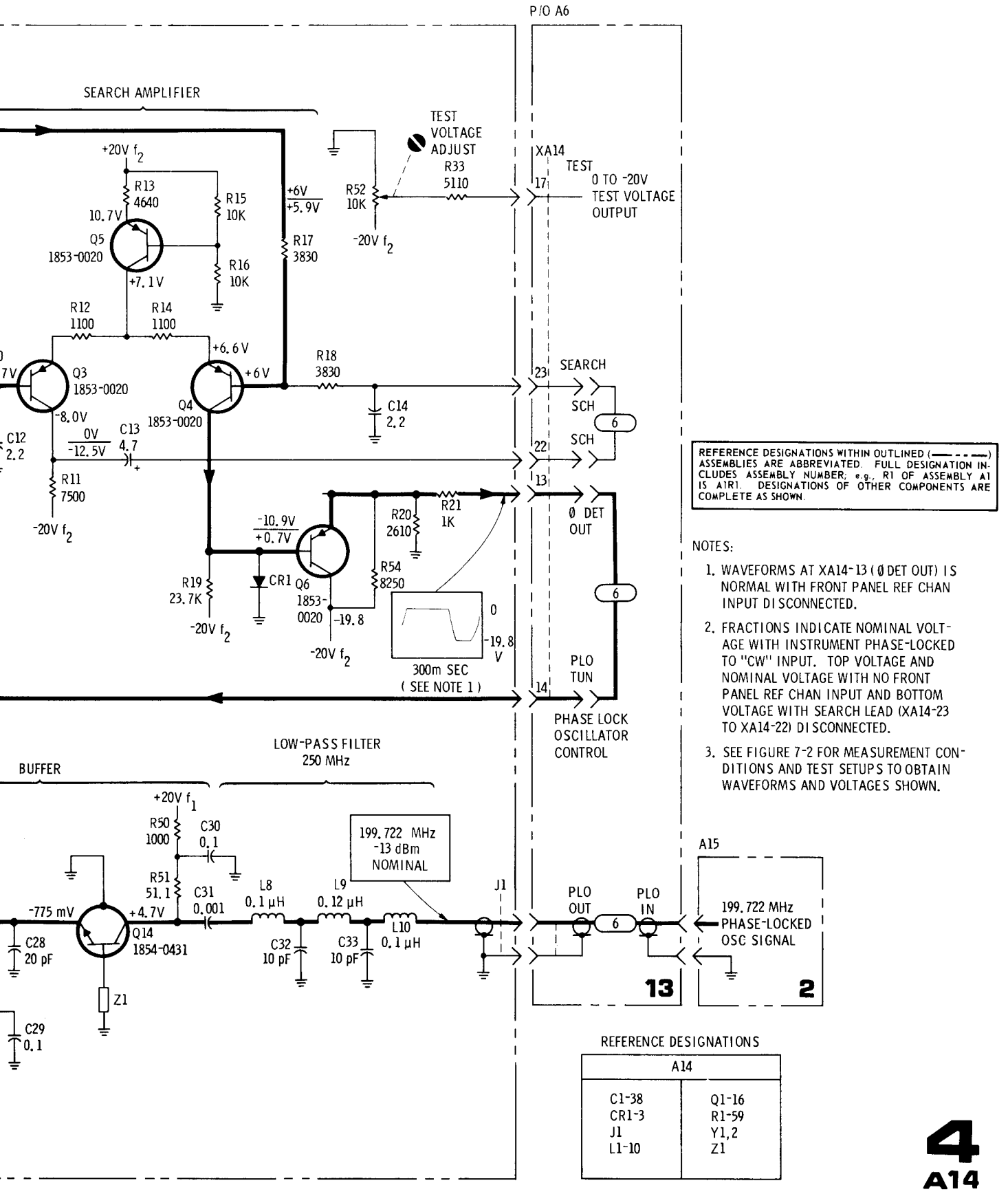


Figure 7-14. Parts Location for Phase-Locked Oscillator A14



8407A Phase-Locked Oscillator Ser. Pre. 1144A


PHASE DETECTOR
SEARCH AMPLIFIER
TEST VOLTAGE ADJUST R33 5110
PHASE-LOCK OSCILLATOR
BUFFER
LOW-PASS FILTER 250 MHz
199.722 MHz -13 dBm NOMINAL
300m SEC (SEE NOTE 1)
+10V
R25 7500
R30 75
C18 1
R34 7500
+6V +5.3V
+20V f2
R13 4640
R15 10K
10.7V
Q5 1853-0020
+7.1V
R16 10K
R17 3830
+6V +5.9V
R52 10K
-20V f2
+4.7V
+6V
Q10 1854-0071
-31 mV
Q8 1854-0071
Q7 1854-0071
-27 mV
C17 0.1
-531 mV
R31 19.6K
-320 mV
C20 0.1
-330 mV
R26 261
R28 261
R32 261
R35 261
+4.6V +5.9V
R9 3830
+4.7V
Q3 1853-0020
R12 1100
R14 1100
+6.6 V
Q4 1853-0020
+6V
R18 3830
C14 2.2
R10 3830
C12 2.2
-8.0V
0V
-12.5V
C13 4.7
R11 7500
-20V f2
-612 mV
Q11 1854-0071
-5.1 V
Q9 1854-0071
-425 mV
-5.1 V
C19 0.1
-5.0V
-5.0V
R27 19.6K
R29 619
R33 619
R36 19.6K
R37 5110
C21 6.8
R38 14.7K
-20V f2
-10.9V
+0.7V
R20 2610
R21 1K
R19 23.7K
CR1
Q6 1853-0020
R54 8250
-19.8
-20V f2
0
-19.8 V
-5.4V
-10V
Q13 1854-0071
-10.6V
R40 10K
R39 7500
R41 10K
-20V f2
R4 3160
R55 9090
R8 6190
+20V f1
R42 1000
+15.4V
C38 3.6pF
C22 6.8
R43 1960
C24 0.001
C25 3.3 pF
+5.9V
Q15 1854-0471
L7
PLO PEAKING
Y2 199.722 MHz
-625 mV
CR3 47 pF
R46 1000
R44 100
C23 62 pF
R45 3830
-20V f1
R47 511
C27 27 pF
R48 287
C28 20 pF
R49 1000
C29 0.1
L12 150 µH
C39 24
C26 560
-20V f1
-775 mV
+4.7V
Q14 1854-0431
Z1
+20V f1
R50 1000
C30 0.1
R51 51.1
C31 0.001
L8 0.1 µH
L9 0.12 µH
L10 0.1 µH
C32 10 pF
C33 10 pF
J1



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.

NOTES:

1. WAVEFORMS AT XA14-13 (Ø DET OUT) IS NORMAL WITH FRONT PANEL REF CHAN INPUT DISCONNECTED.
2. FRACTIONS INDICATE NOMINAL VOLTAGE WITH INSTRUMENT PHASE-LOCKED TO "CW" INPUT. TOP VOLTAGE AND NOMINAL VOLTAGE WITH NO FRONT PANEL REF CHAN INPUT AND BOTTOM VOLTAGE WITH SEARCH LEAD (XA14-23 TO XA14-22) DISCONNECTED.
3. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUPS TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.

Figure 7-15. Phase-Locked Oscillator A14, Schematic Diagram

SERVICE SHEET 5

A3 Reference Channel Converter

LOCAL OSCILLATOR AMPLIFIER

Q11 is a grounded base configuration RF amplifier followed by emitter-follower Q10. L1 adjusts swept-frequency phase tracking between the test and reference channel converters. The output of Q10 is amplified by complementary amplifiers Q8 and Q9.

RF AMPLIFIER

Q1 forms a grounded base amplifier. L2 adjusts the swept frequency amplitude tracking between converters A3 and A4. The RF input to Q1 comes either through a 10 dB attenuator from the DIRECT input or through a 50 dB attenuator from the ATTEN input. Q2 and Q3 are direct-coupled emitter followers to isolate the RF amplifier circuit from balanced mixer A3A1.

MIXER

Balanced mixer A3A1 mixes the local oscillator signal with the RF input signal to produce a 278 kHz difference signal.

26 dB AMPLIFIER

Q4, Q5, and Q12 form an IF amplifier. The overall gain of this amplifier is controlled by Q6 and Q7. Control input to Q6 and Q7 is furnished by the front-panel REF CHAN LEVEL ADJ switch. Each change in switch position produces a 20 dB nominal change in the test channel output due to the AGC amplifier action.

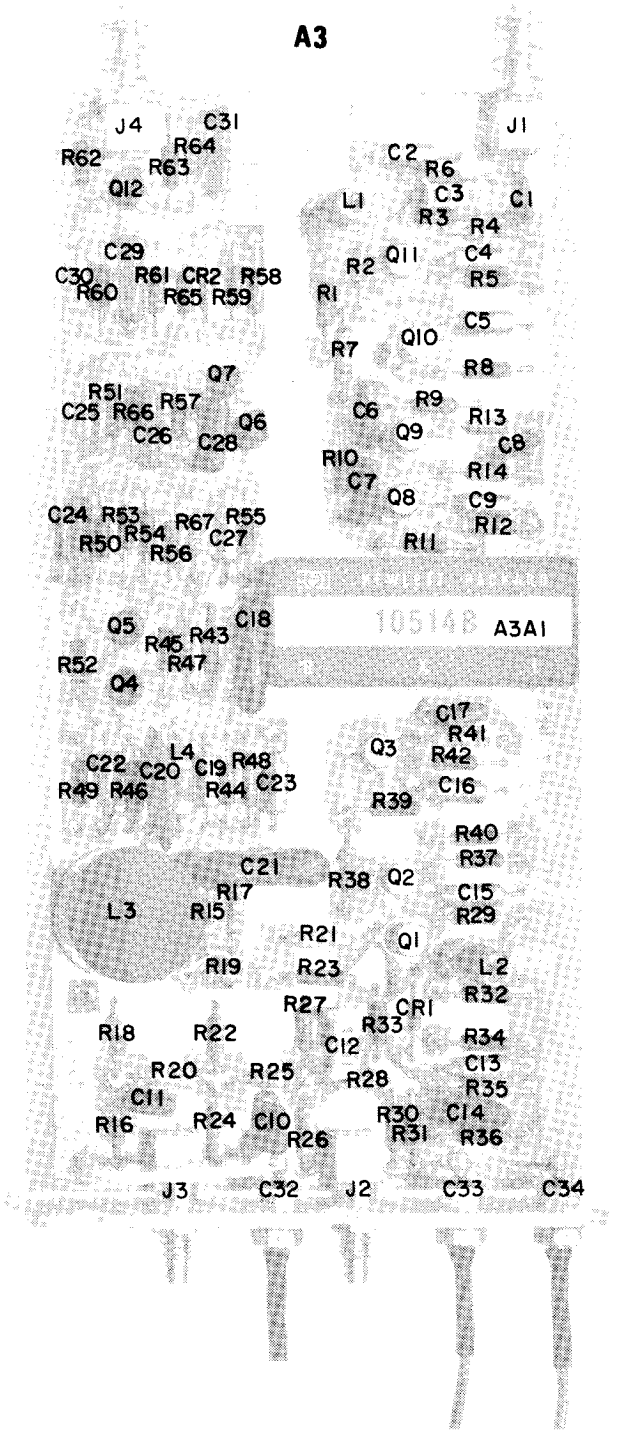
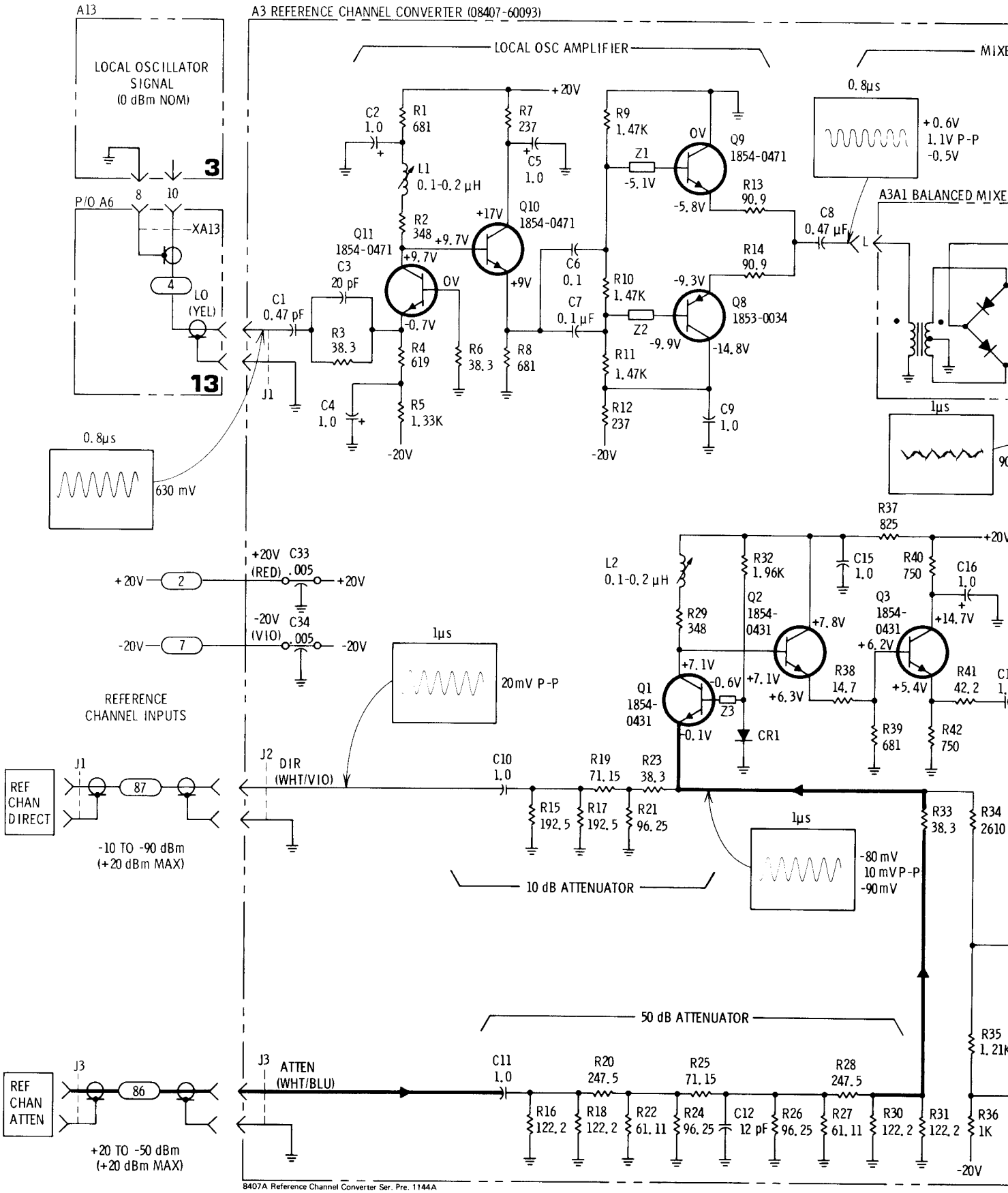
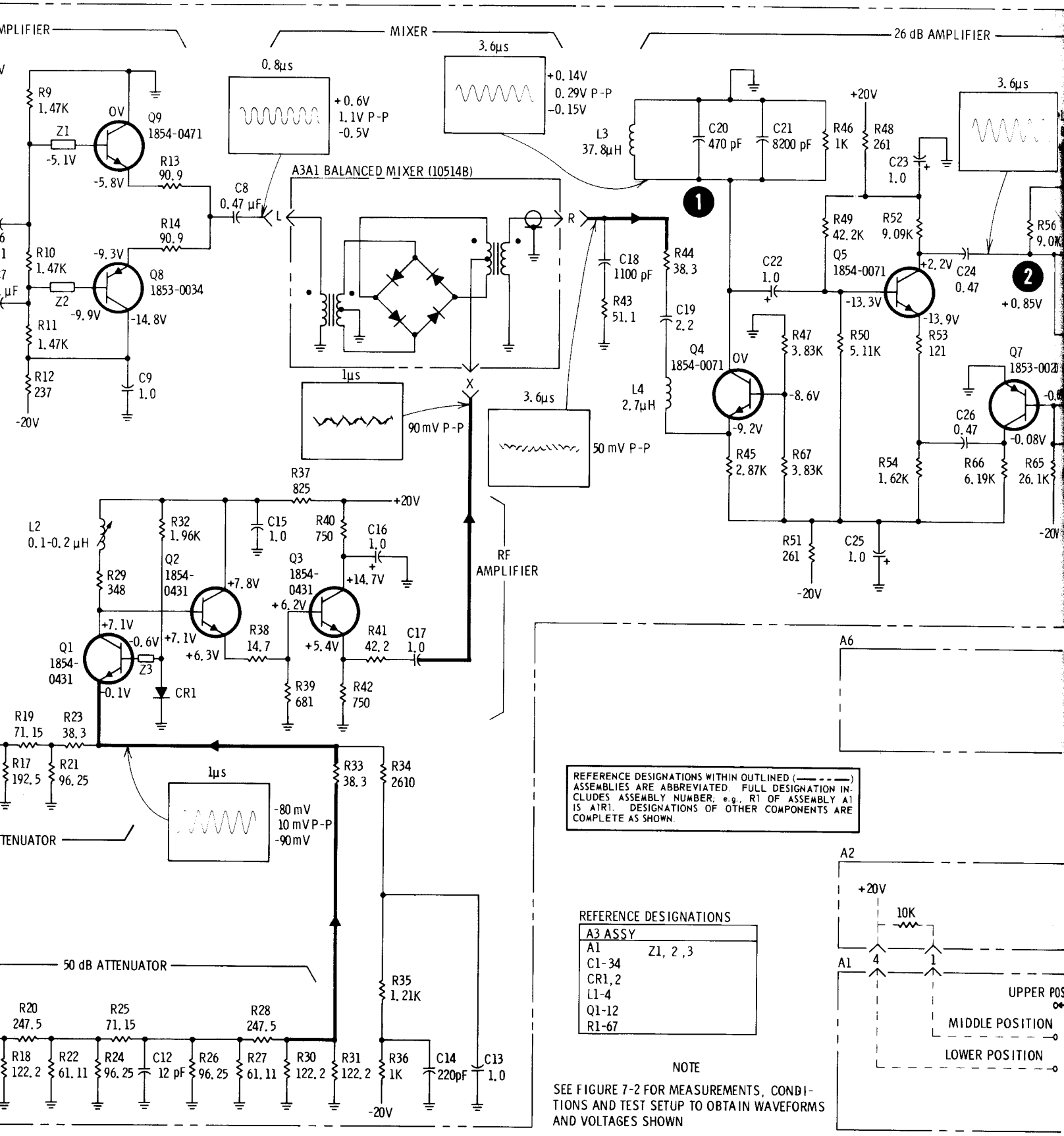


Figure 7-16. Parts Location for Reference Channel Converter A3


A13
LOCAL OSCILLATOR SIGNAL (0 dBm NOM)
3
P/O A6
8
10
XA13
4
LO (YEL)
13
A3 REFERENCE CHANNEL CONVERTER (08407-60093)
LOCAL OSC AMPLIFIER
MIXE
A3A1 BALANCED MIXE
+20V
C2 1.0
R1 681
L1 0.1-0.2 µH
R2 348
C3 20 pF
C1 0.47 pF
R3 38.3
R4 619
R5 1.33K
-20V
C4 1.0
J1
R6 38.3
R7 237
C5 1.0
R8 681
+17V
Q10 1854-0471
+9V
Q11 1854-0471
+9.7V
-0.7V
OV
C6 0.1
C7 0.1 µF
R9 1.47K
Z1
-5.1V
OV
Q9 1854-0471
-5.8V
R13 90.9
R10 1.47K
Z2
-9.9V
-9.3V
Q8 1853-0034
-14.8V
R14 90.9
R11 1.47K
R12 237
-20V
C9 1.0
C8 0.47 µF
0.8µs
+0.6V
1.1V P-P
-0.5V
1µs
0.8µs
630 mV
+20V C33 (RED) .005 +20V
-20V C34 (VIO) .005 -20V
+20V 2
-20V 7
REFERENCE CHANNEL INPUTS
1µs
20mV P-P
L2 0.1-0.2 µH
R29 348
R32 1.96K
C15 1.0
R37 825
R40 750
C16 1.0
Q2 1854-0431
+7.8V
Q3 1854-0431
+14.7V
+6.2V
Q1 1854-0431
+7.1V
-0.6V
+7.1V
Z3
+6.3V
R38 14.7
+5.4V
R41 42.2
-0.1V
CR1
R39 681
R42 750
J1
REF CHAN DIRECT
87
-10 TO -90 dBm
(+20 dBm MAX)
J2
DIR (WHT/VIO)
C10 1.0
R19 71.15
R23 38.3
R15 192.5
R17 192.5
R21 96.25
1µs
-80 mV
10 mV P-P
-90 mV
R33 38.3
R34 2610
10 dB ATTENUATOR
50 dB ATTENUATOR
J3
REF CHAN ATTEN
86
+20 TO -50 dBm
(+20 dBm MAX)
J3
ATTEN (WHT/BLU)
C11 1.0
R20 247.5
R25 71.15
R28 247.5
R16 122.2
R18 122.2
R22 61.11
R24 96.25
C12 12 pF
R26 96.25
R27 61.11
R30 122.2
R31 122.2
R35 1.21K
R36 1K
-20V
8407A Reference Channel Converter Ser. Pre. 1144A


MPLIFIER
MIXER
26 dB AMPLIFIER
0.8µs
+0.6V
1.1V P-P
-0.5V
3.6µs
+0.14V
0.29V P-P
-0.15V
A3A1 BALANCED MIXER (10514B)
C8
0.47 µF
L
R
X
R9
1.47K
OV
Q9
1854-0471
Z1
-5.1V
-5.8V
R13
90.9
R14
90.9
R10
1.47K
-9.3V
Q8
1853-0034
Z2
-9.9V
-14.8V
R11
1.47K
R12
237
-20V
C9
1.0
1µs
90mV P-P
3.6µs
50 mV P-P
L3
37.8µH
C20
470 pF
C21
8200 pF
R46
1K
+20V
R48
261
C23
1.0
R49
42.2K
R52
9.09K
Q5
1854-0071
+2.2V
C24
0.47
-13.3V
-13.9V
R50
5.11K
R53
121
R56
9.0K
+0.85V
C18
1100 pF
R44
38.3
R43
51.1
C19
2.2
C22
1.0
Q4
1854-0071
OV
-9.2V
-8.6V
L4
2.7µH
R47
3.83K
R45
2.87K
R67
3.83K
Q7
1853-0021
C26
0.47
-0.08V
R54
1.62K
R66
6.19K
R65
26.1K
-20V
R51
261
C25
1.0
-20V
R37
825
+20V
L2
0.1-0.2 µH
R32
1.96K
C15
1.0
R40
750
C16
1.0
R29
348
Q2
1854-
0431
+7.8V
Q3
1854-
0431
+14.7V
+6.2V
+7.1V
-0.6V
+7.1V
+6.3V
R38
14.7
+5.4V
R41
42.2
C17
1.0
Q1
1854-
0431
Z3
-0.1V
CR1
R39
681
R42
750
RF
AMPLIFIER
R19
71.15
R23
38.3
R17
192.5
R21
96.25
1µs
-80 mV
10 mV P-P
-90mV
R33
38.3
R34
2610
TENUATOR
50 dB ATTENUATOR
R35
1.21K
R20
247.5
R25
71.15
R28
247.5
R18
122.2
R22
61.11
R24
96.25
C12
12 pF
R26
96.25
R27
61.11
R30
122.2
R31
122.2
R36
1K
C14
220pF
C13
1.0
-20V
A6
A2
+20V
10K
A1
4
1
UPPER POS
MIDDLE POSITION
LOWER POSITION
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
A3 ASSY
A1 Z1, 2, 3
C1-34
CR1, 2
L1-4
Q1-12
R1-67
NOTE
SEE FIGURE 7-2 FOR MEASUREMENTS, CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN

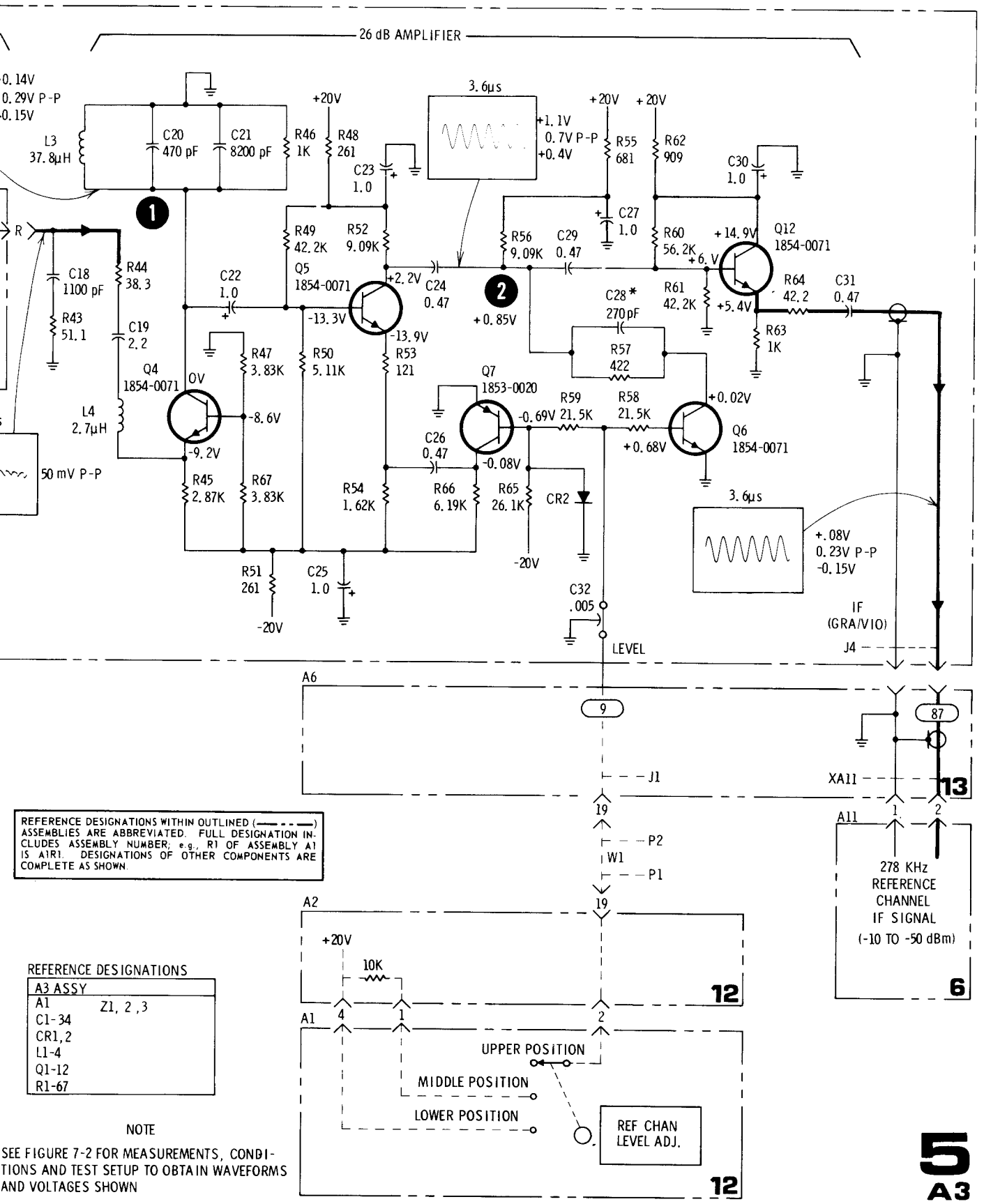


Figure 7-17. Reference Channel Converter A3, Schematic Diagram

SERVICE SHEET 6

A11 Reference Channel AGC Amplifier

20 dB AMPLIFIER

Q1 and Q2 form a high-gain IF amplifier. T1 changes the output from single-ended to push-pull output.

PUSH-PULL AMPLIFIER

Q3 forms a push-pull amplifier which drives T2 through amplifier gain control Q4 and Q5.

AMPLIFIER GAIN CONTROL

Signal flow between Q3A—Q3B and transformer T2 is controlled at Q4 and Q5 by the AGC control signal from A10. As the AGC control signal goes in the positive direction, Q5A and Q5B turn on and Q4A and Q4B turn off. This gives maximum IF signal to transformer T2. Conversely, when the AGC control signal goes in the negative direction, Q5A and Q5B turn off and Q4A and Q4B turn on. This gives the minimum IF signal to transformer T2. Instead of the signal flowing through Q5A and Q5B to transformer T2, the IF signal flows through Q4A and Q4B to ground.

IF AMPLIFIER

Q6A and Q6B form a differential amplifier followed by amplifier Q7. A feedback loop is formed between the output of Q7 and the input of Q6A by resistors R24 and R25, and capacitor C11.

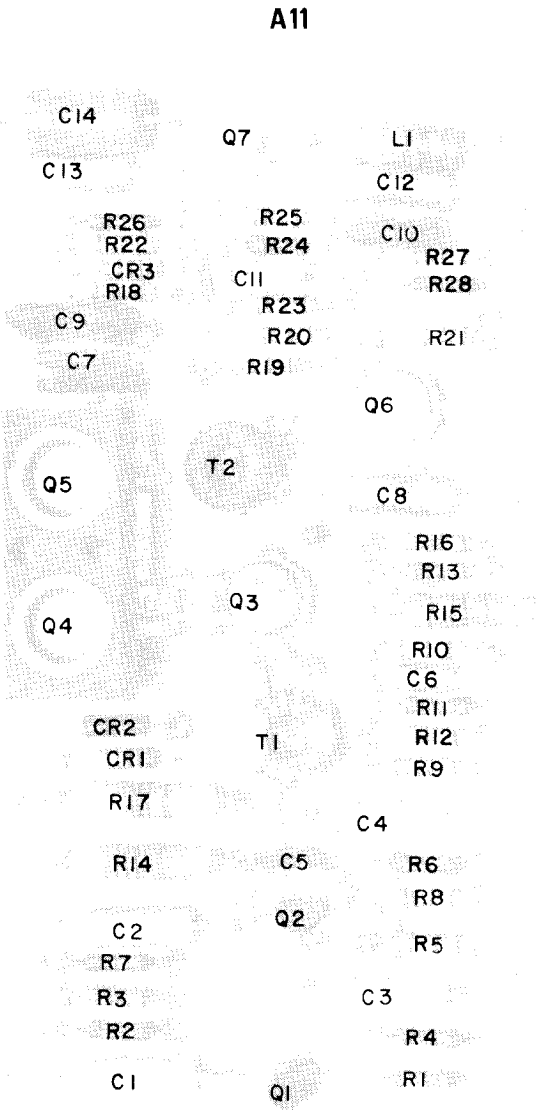
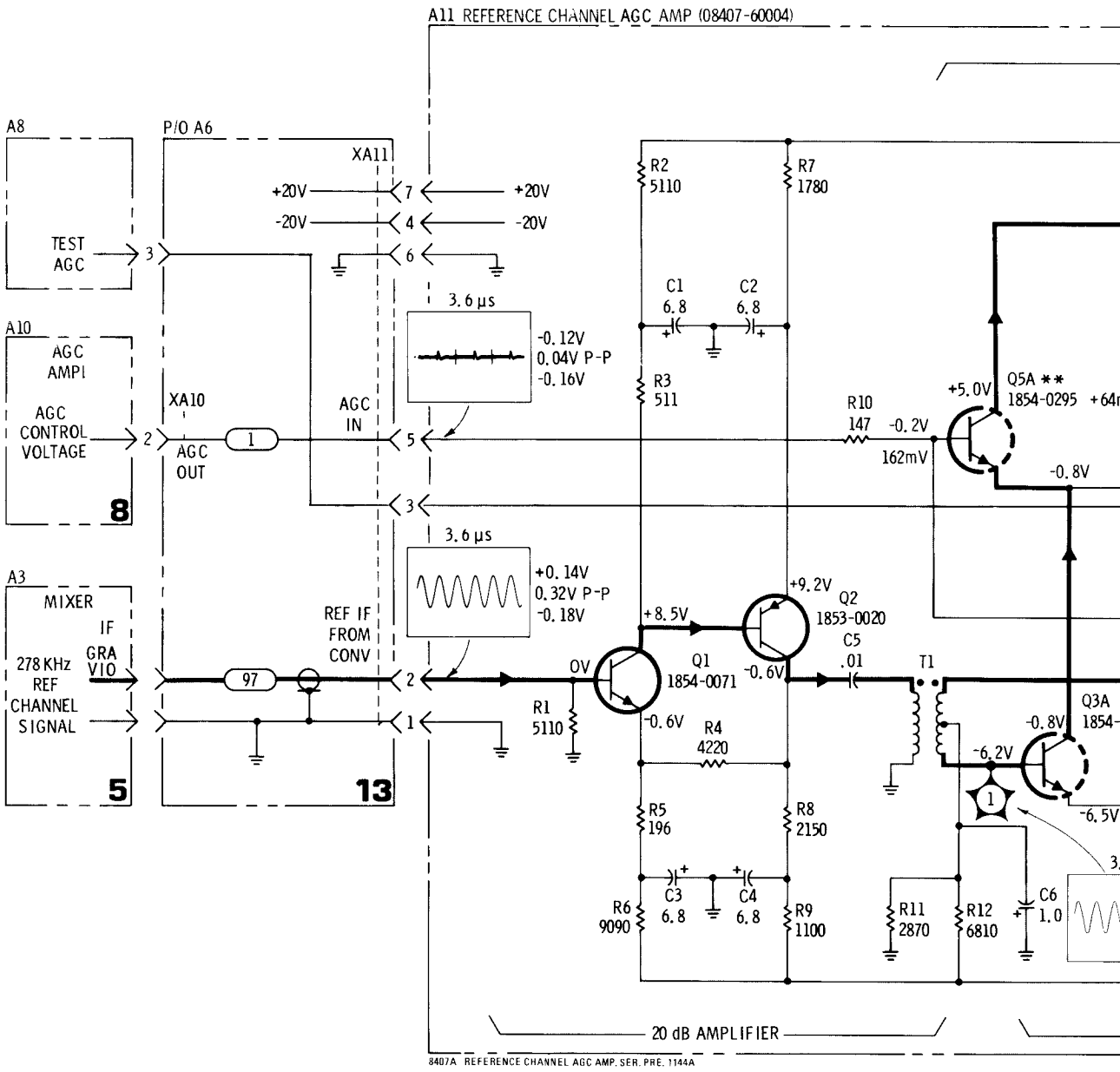


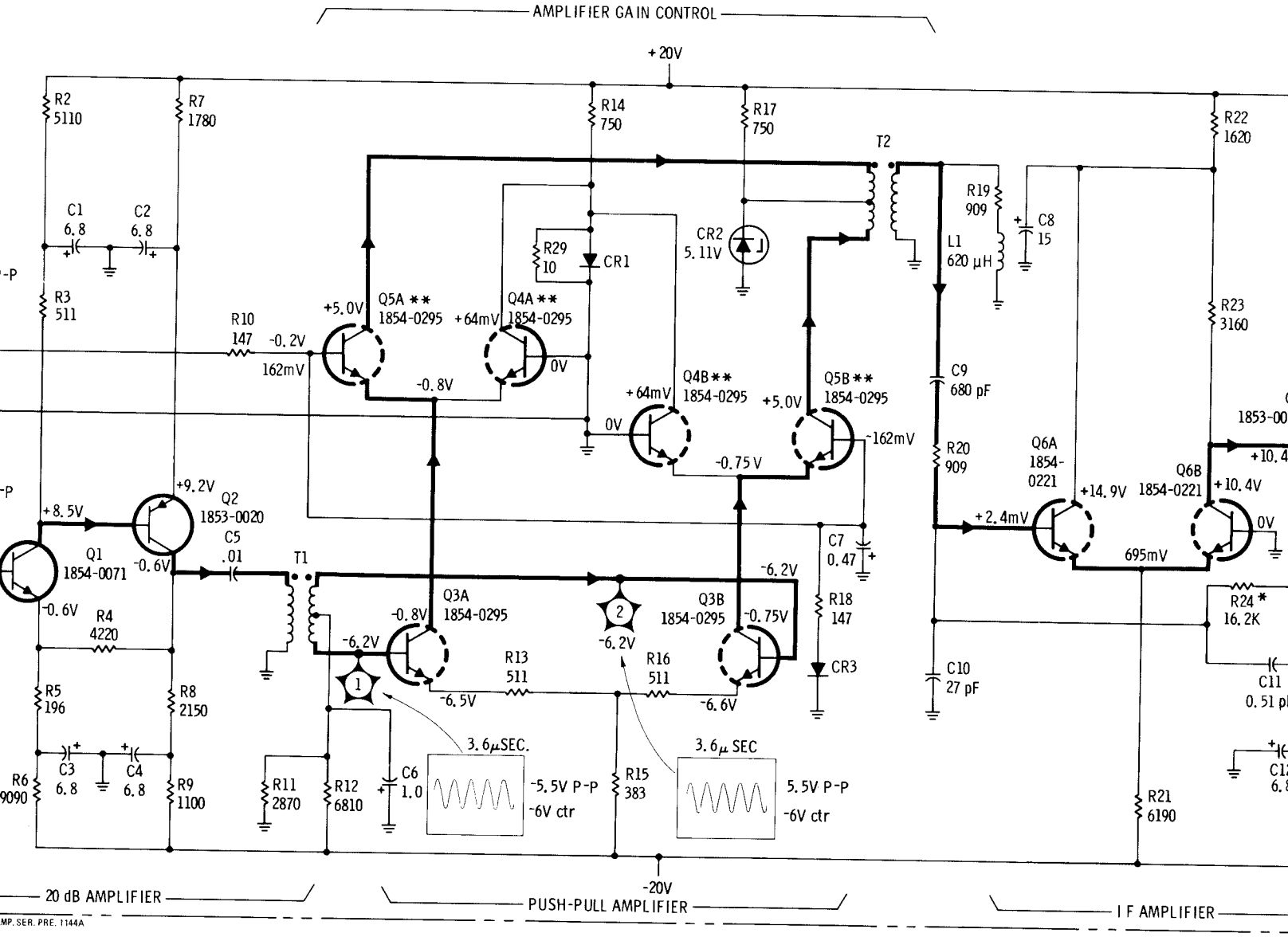
Figure 7-18. Parts Location for Reference Channel AGC Amplifier A11



NOTES:

1. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.

**DUAL TRANSISTORS A8Q4, A8Q5, A11Q4 AND A11Q5 ARE A MATCHED SET OF FOUR. IF ANY ONE OF THE TRANSISTORS NEEDS TO BE REPLACED, ALL FOUR SHOULD BE REPLACED BY A FACTORY-SELECTED MATCHED SET.



MP. SER. PRE. 1144A

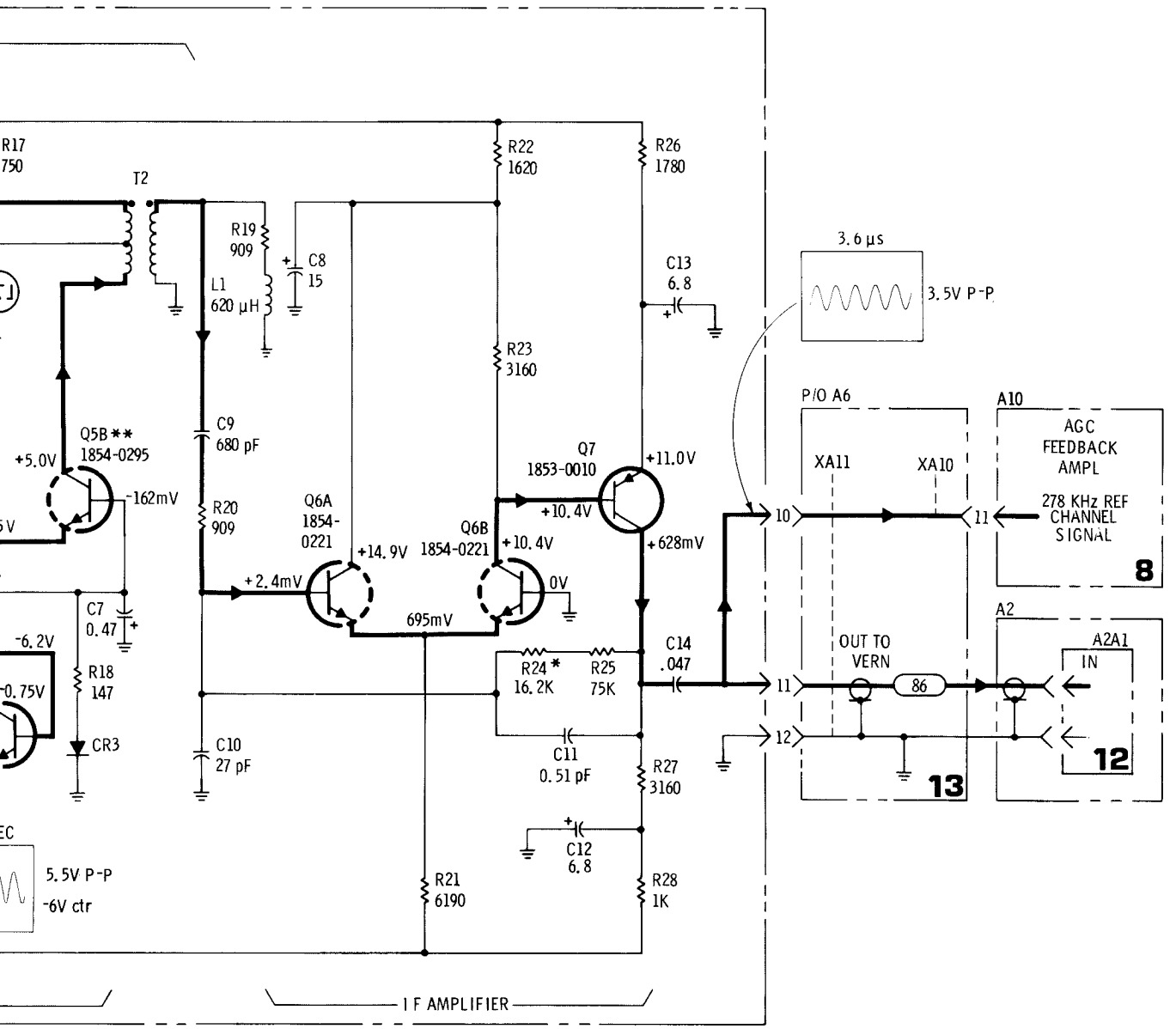
ASUREMENT CONDITIONS AND
WAVEFORMS AND VOLTAGES

Q4, A8Q5, A11Q4 AND A11Q5
FOUR. IF ANY ONE OF THE
BE REPLACED, ALL FOUR
Y A FACTORY-SELECTED

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.

REFER

A11 ASS
C1-14
CR1-R3
Q1-8
R1-26



REFERENCE DESIGNATIONS

A11 ASSY	
C1-14	T1, 2
CR1-R3	
Q1-8	
R1-26	

OUTLINED (— - - —)
FULL DESIGNATION IN-
, R1 OF ASSEMBLY A1
THER COMPONENTS ARE

6
A11

Figure 7-19. Reference Channel AGC Amplifier A11, Schematic Diagram

SERVICE SHEET 7

A9 Test IF Bandpass Filter & A12 Reference IF Bandpass Filter

PASSBAND FILTER

A9 and A12 are identical circuit boards. L1, C2, and C3 form a parallel-resonate circuit at 278 kHz, allowing only the IF signal to be passed by the circuit.

OUTPUT EMITTER FOLLOWERS

Q1 and Q2 are conventional emitter followers. The output of Q2 is 6-dB lower than Q1 because of the voltage divider, R2 and R3, at the input.

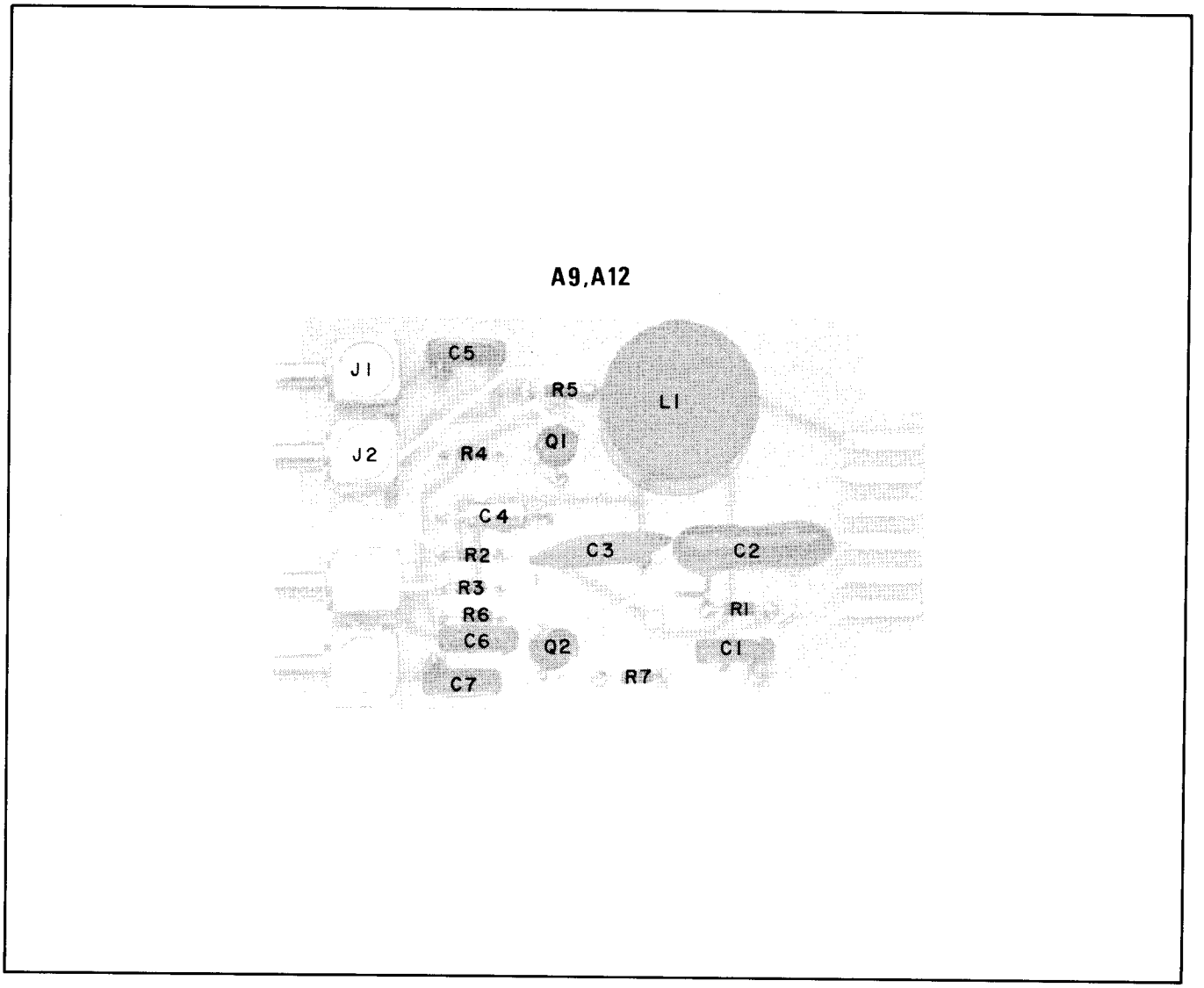
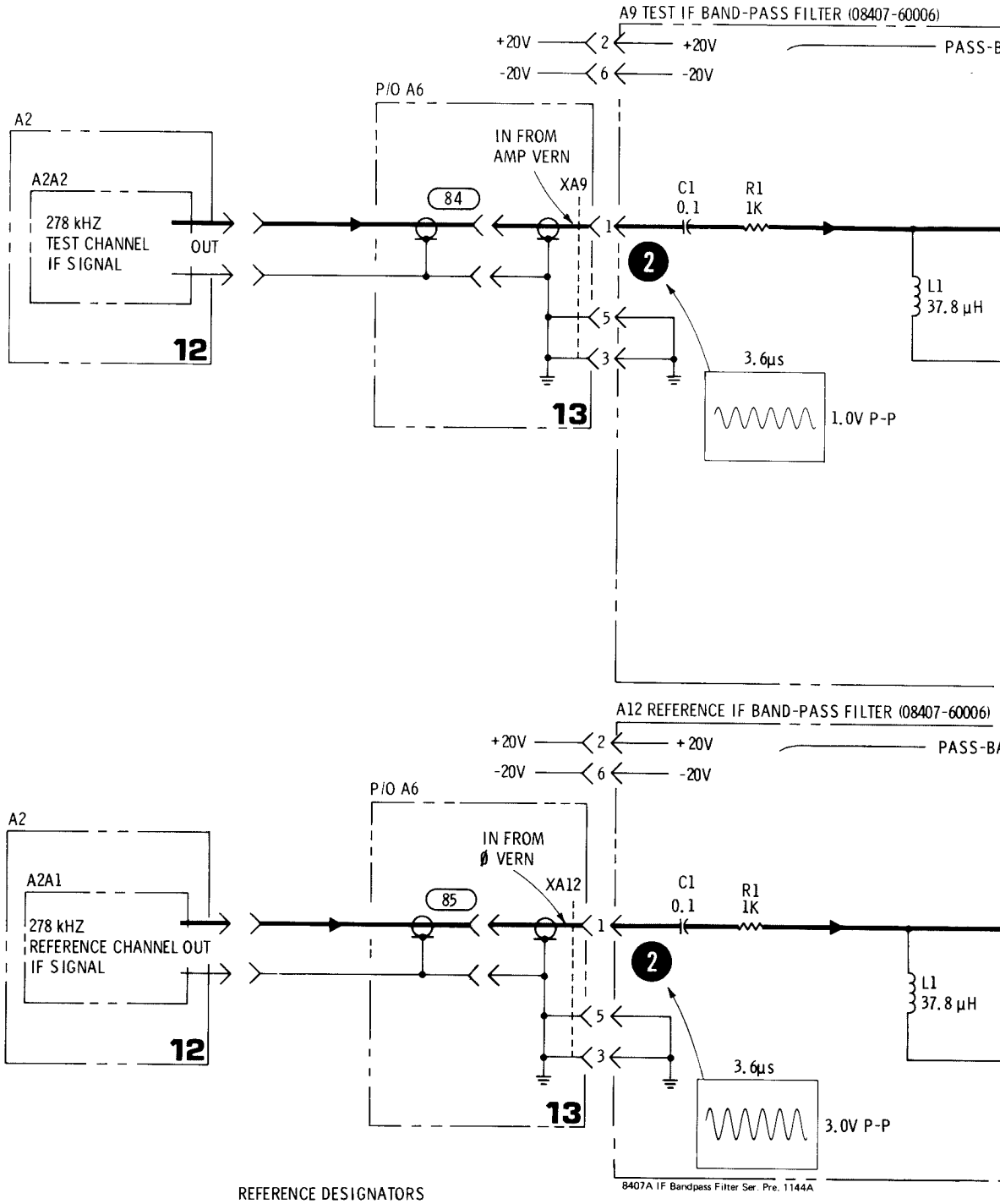


Figure 7-20. Parts Location for IF Bandpass Filters A9 and A12

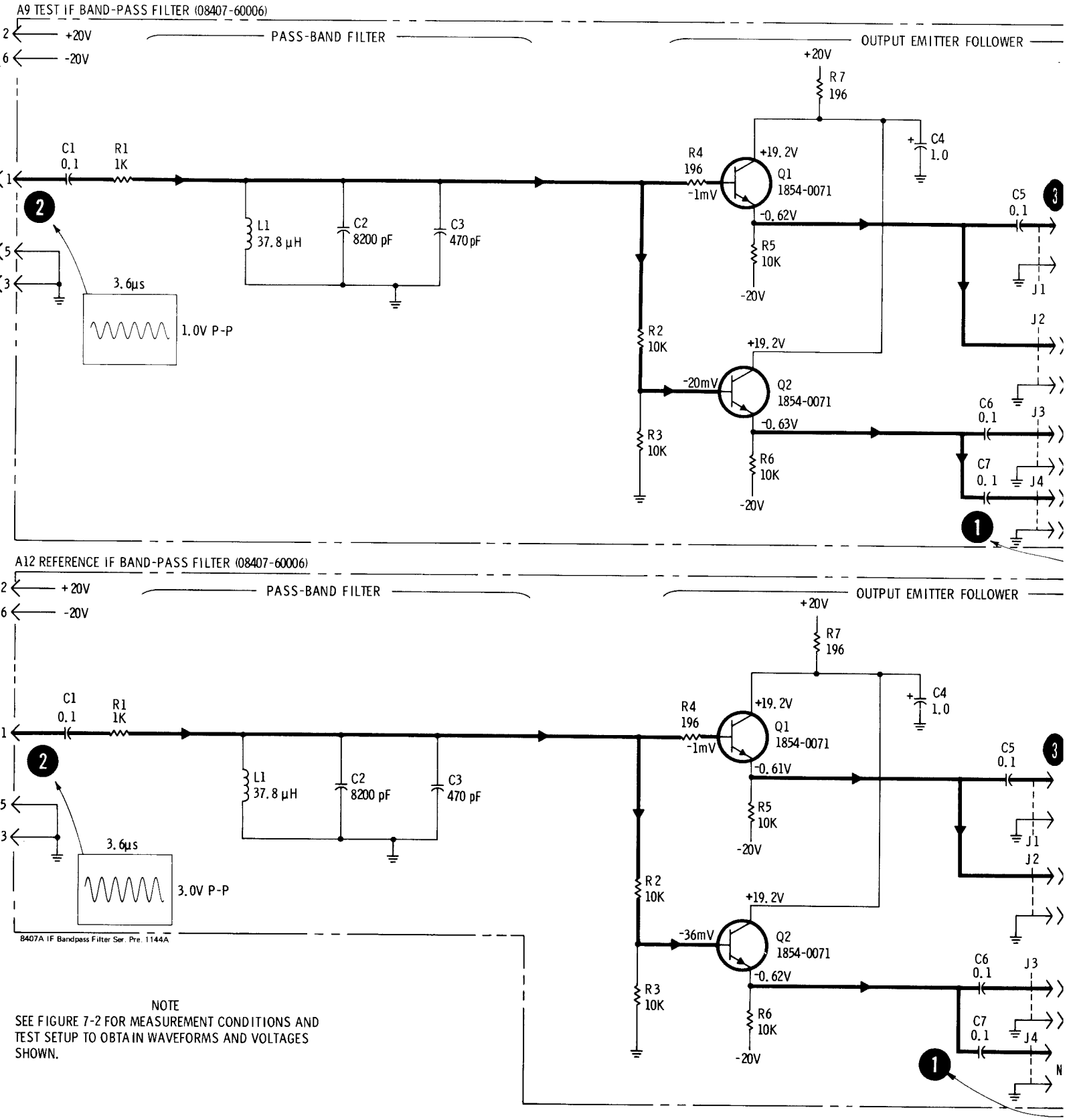


REFERENCE DESIGNATORS

A9 ASSY	A12 ASSY
C1-7	C1-7
J1-4	J1-4
L1	L1
Q1,2	Q1,2
R1-7	R1-9

NOTE

SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.



NOTE

SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.

REFERENCE DESIGNATIONS WITHIN OUTLINED (——·—·—) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION CLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY IS A1R1. DESIGNATIONS OF OTHER COMPONENTS COMPLETE AS SHOWN.

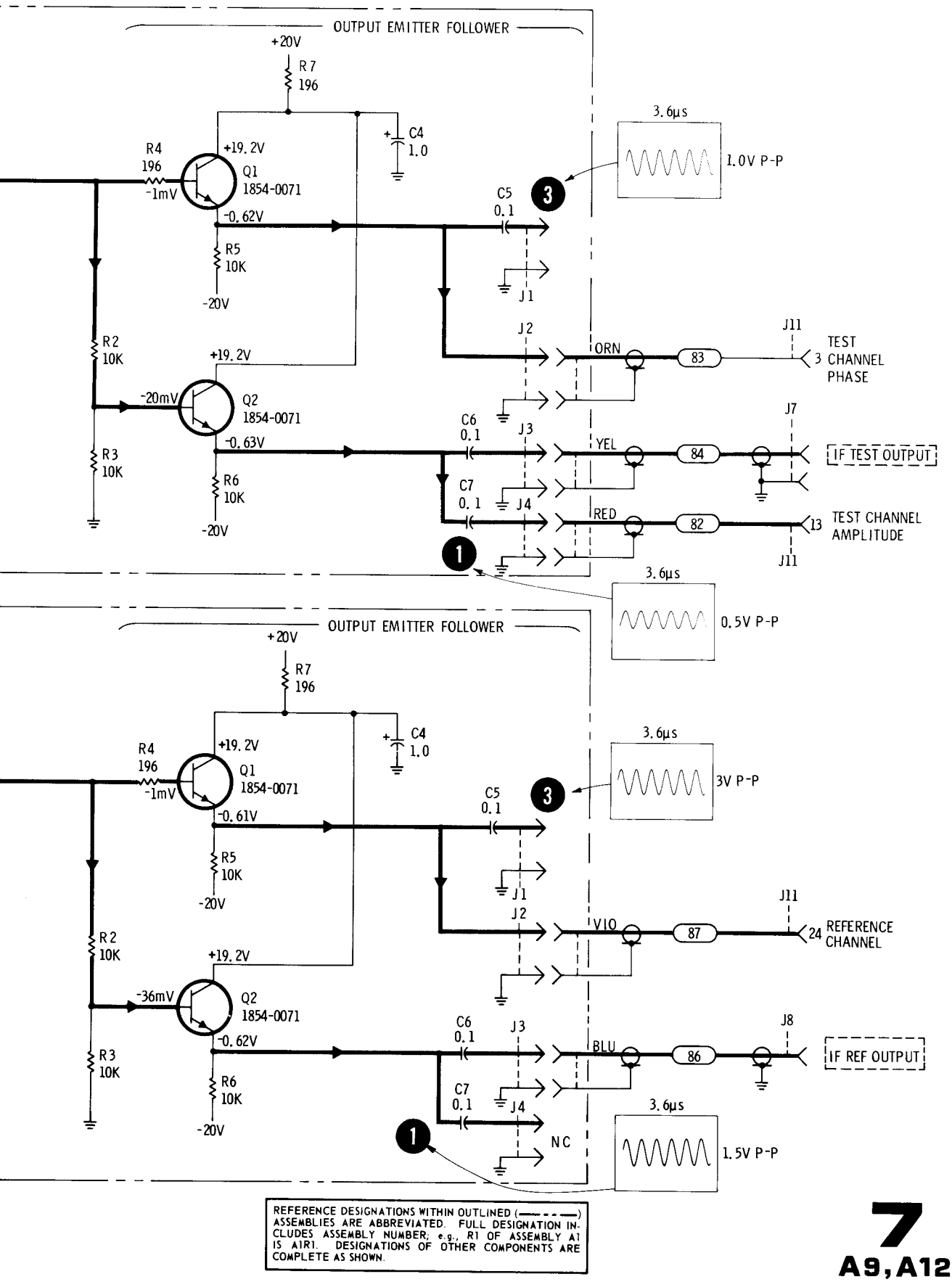


Figure 7-21. IF Bandpass Filter A9 and A12, Schematic Diagram

SERVICE SHEET 8

A10 AGC Feedback Amplifier

90-DEGREE PHASE SHIFTER

The reference channel IF signal passes through Q12 to the input of Q11. The IF signal is shifted by 90 degrees through Q11 primarily due to capacitor C9 between base and collector. Amplifier U1 squares the 278 kHz signal.

FREQUENCY DOUBLER

The frequency doubler consists of diode bridge CR9-CR12 and differential amplifier Q7 and Q8. The square-wave pulse at A10TP4 is rectified by the diode bridge. A negative pulse is coupled through C17 to the base of Q7. This pulse passes through Q7 and Q8 and is applied to Q6 as a positive-going gate pulse. This pulse coincides with a negative peak from the full-wave rectifier. Also, a negative pulse from the diode bridge passes through C18 and is applied to Q8 base. This pulse is inverted through Q8, forming a positive pulse to Q6 gate. This gives a positive-going pulse train at the gate of Q6 which corresponds in timing with the peaks of the pulse train from the full-wave rectifier.

FULL-WAVE RECTIFIER

The 278 kHz reference-channel signal at test point 7 is effectively full-wave rectified through Q10 and the associated diodes. The negative-going portion of the sine wave is rectified by CR2. The positive-going portion of the sine wave is inverted through Q10, making it negative going. This negative-going signal is detected by CR3. The resultant waveform at test point 6 is a series of negative peaks with a repetition rate twice the frequency of the original 278 kHz sine wave. CR5 and CR6 provide temperature compensation.

SAMPLE AND HOLD

Q6 samples the peak amplitude of the signal at the source and produces a dc output at A10TP1. Each gate pulse (A10TP3) occurs coincident with a negative peak at A10TP6. The peak amplitude at A10TP6 varies with varying signal levels at the reference channel input.

DC AMPLIFIER

The dc voltage level at A10TP1 is amplified by a differential amplifier, Q4A and Q4B, driven by two FET's, Q5A and Q5B. Another differential amplifier, Q2 and Q3, drives emitter-follower Q1. The dc output from Q1 emitter is the automatic gain control voltage used to level both test and reference channels, as well as drive the REF-CHANNEL-LEVEL meter driver circuit.

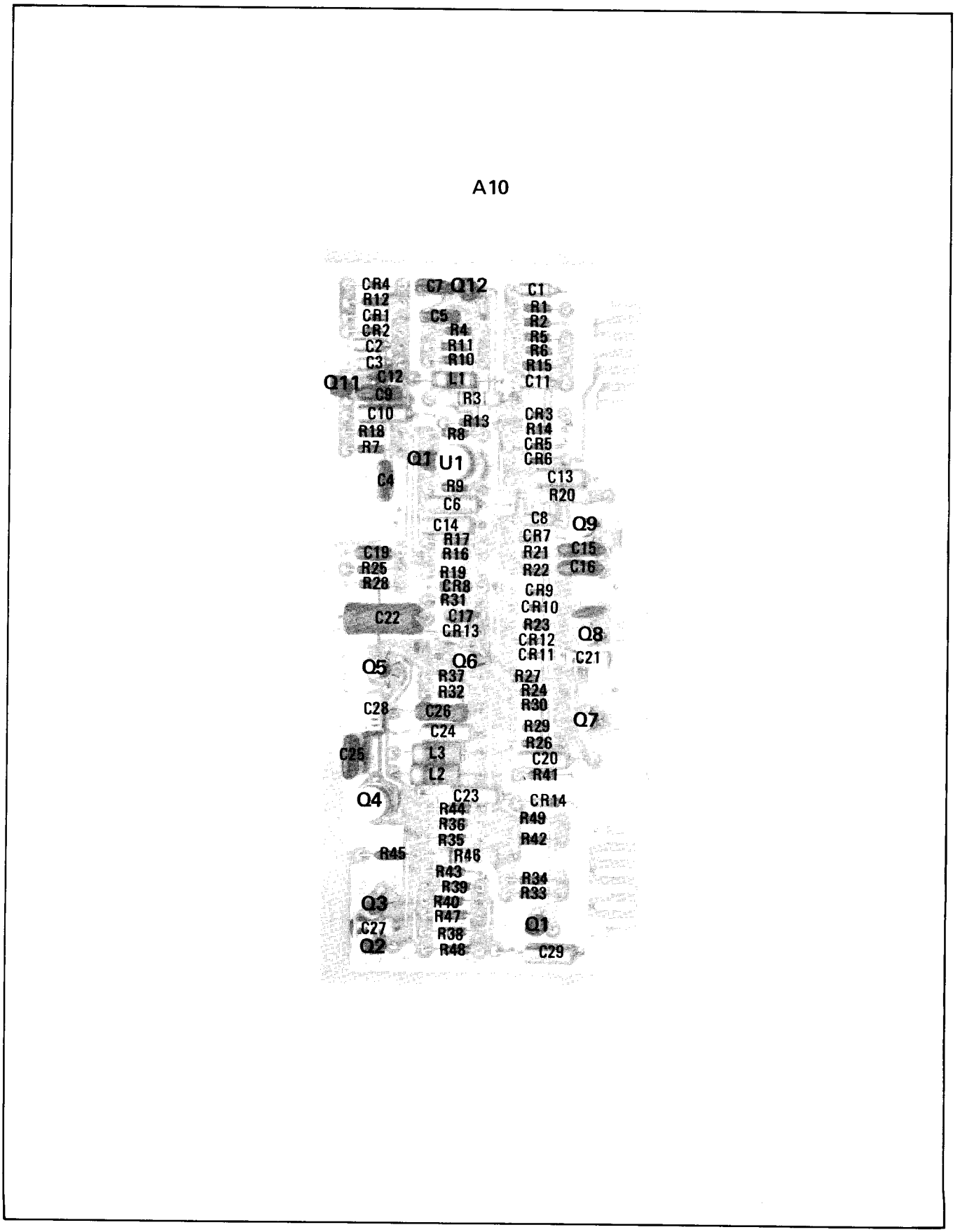
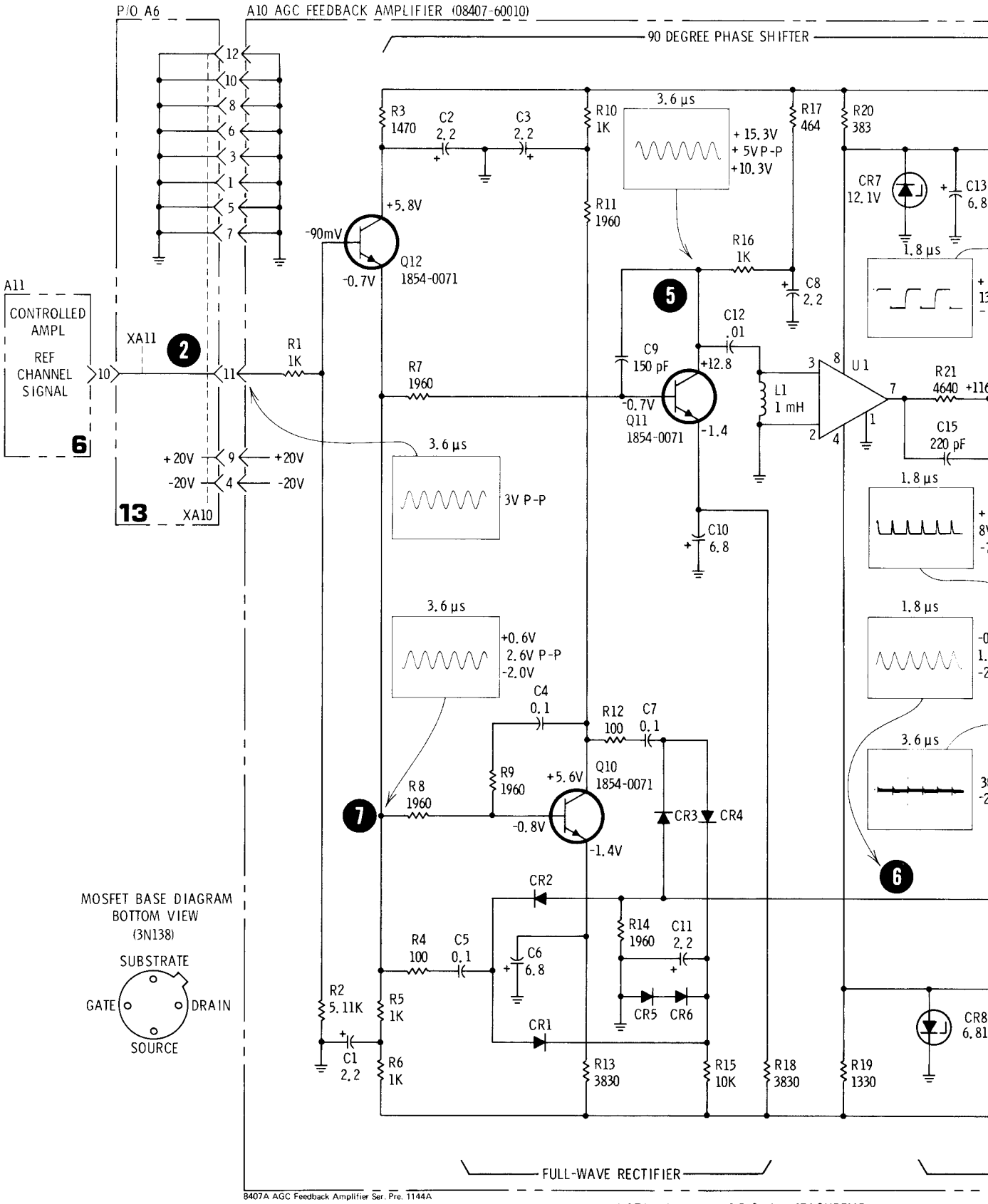
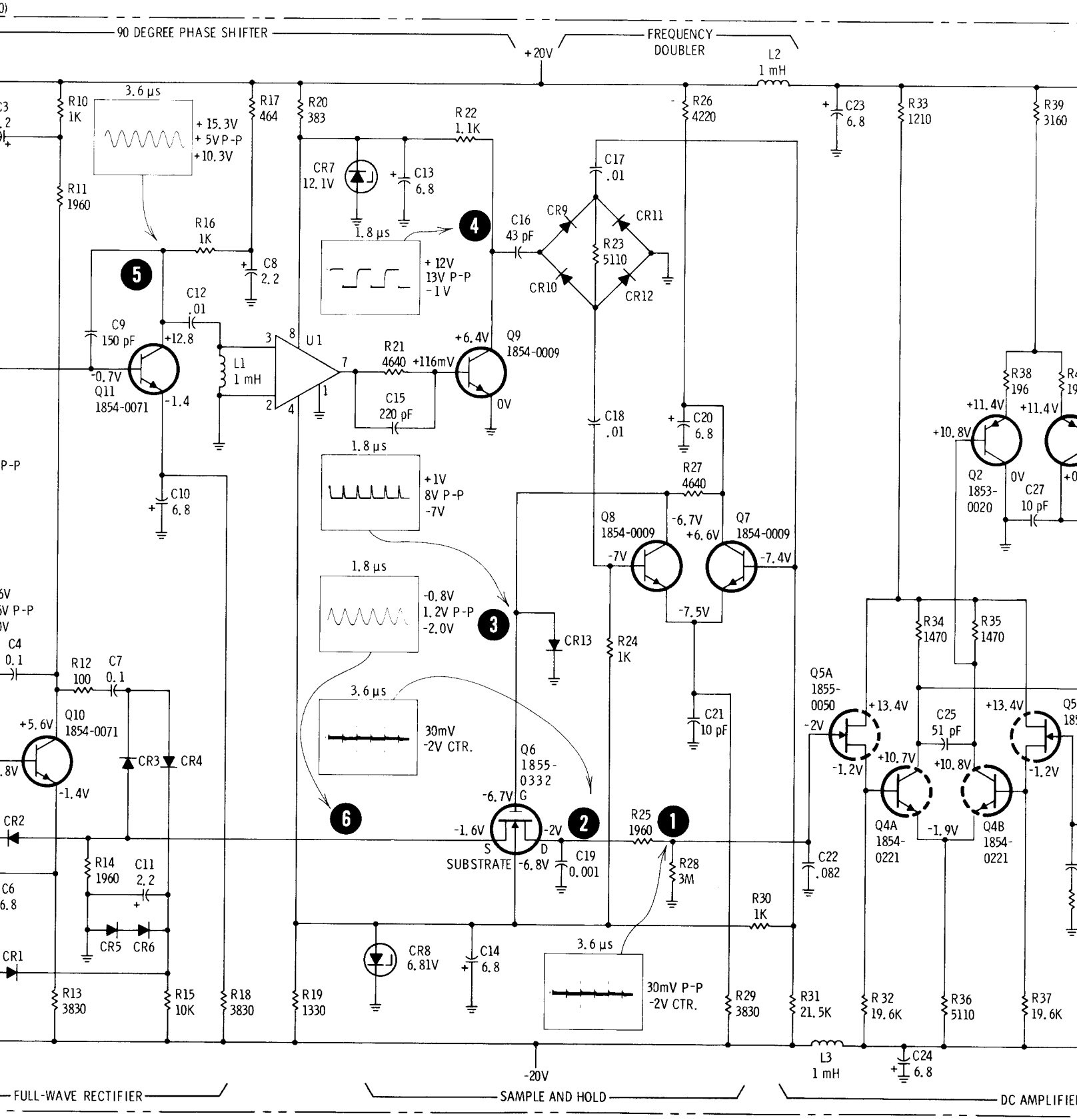


Figure 7-22. Parts Location for AGC Feedback Amplifier A10



NOTE SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AN
SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOW



NOTE SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.

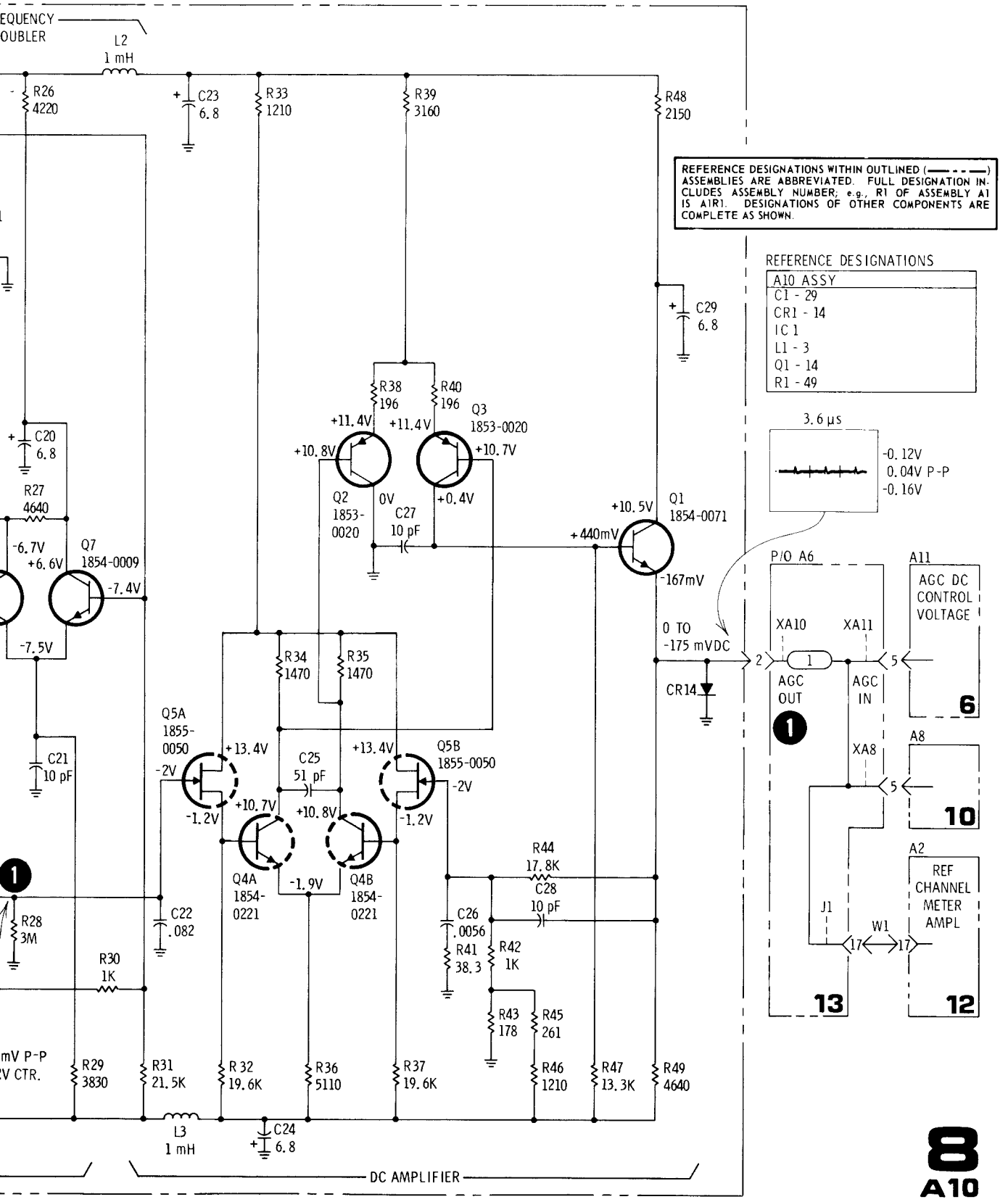


Figure 7-23. AGC Feedback Amplifier A10, Schematic Diagram

SERVICE SHEET 9

A4 Test Channel Converter

LOCAL OSCILLATOR AMPLIFIER

Q11 is a grounded base configuration RF amplifier, followed by emitter-follower Q10. L1 adjusts swept-frequency phase tracking between the test and reference channel converters. The output of Q10 is amplified by complementary amplifiers Q8 and Q9.

RF AMPLIFIER

Q1 forms a grounded base amplifier. L2 adjusts the swept frequency amplitude tracking between converters A3 and A4. The RF input to Q1 comes either through a 10 dB attenuator from the DIRECT input or through a 50-dB attenuator from the ATTEN input. Q2 and Q3 are direct-coupled emitter followers to isolate the RF amplifier circuit from balanced mixer A4A1.

MIXER

Balanced mixer A4A1 mixes the local oscillator signal with the RF input signal to produce a 278 kHz difference signal.

26 dB IF AMPLIFIER

Q4, Q5, and Q7 form an IF amplifier. Q7 provides isolation for the amplifier stages and provides a low-impedance output. L3, C22, C23, and R46 form a low-Q parallel-resonate circuit at 278 kHz and effectively provides a bandpass filter for the 278 kHz IF signal.

OVERLOAD AMPLIFIER

Q6 senses the amplitude of the IF signal and turns on when a preselected limit is reached. The value of resistor R58 is selected for the correct turn-on level. The overload amplifier makes a closure to ground when turned on that switches the overload light driver and turns on the UNCAL REDUCE INPUT RATIO light.

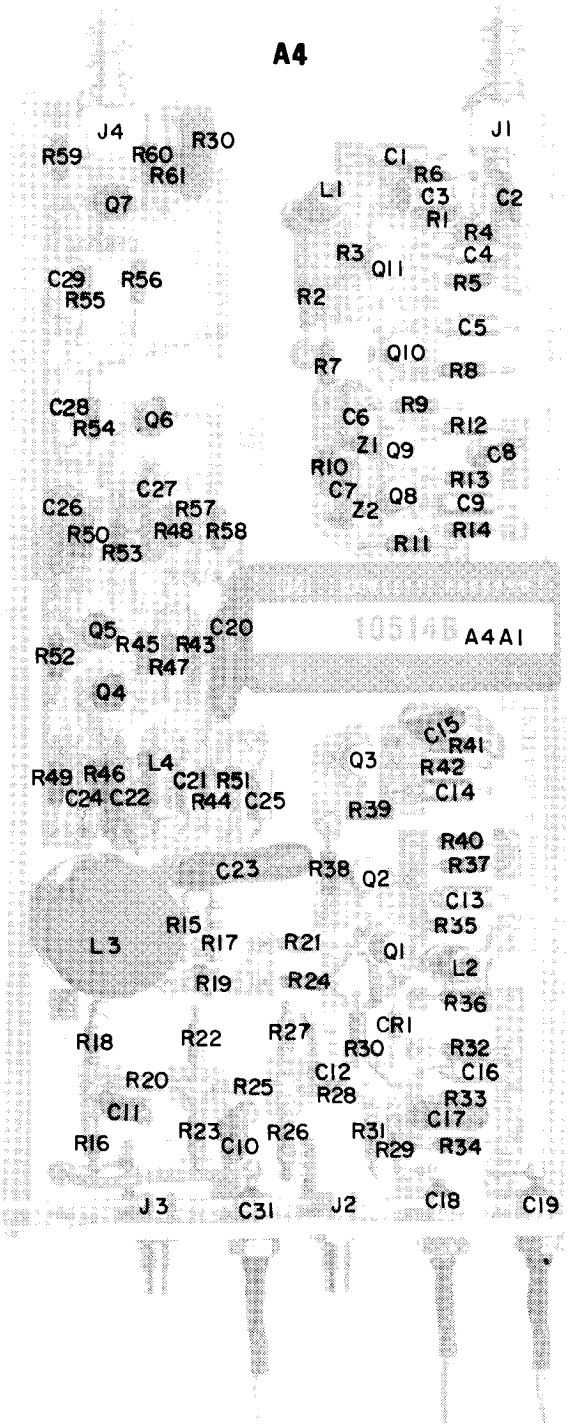
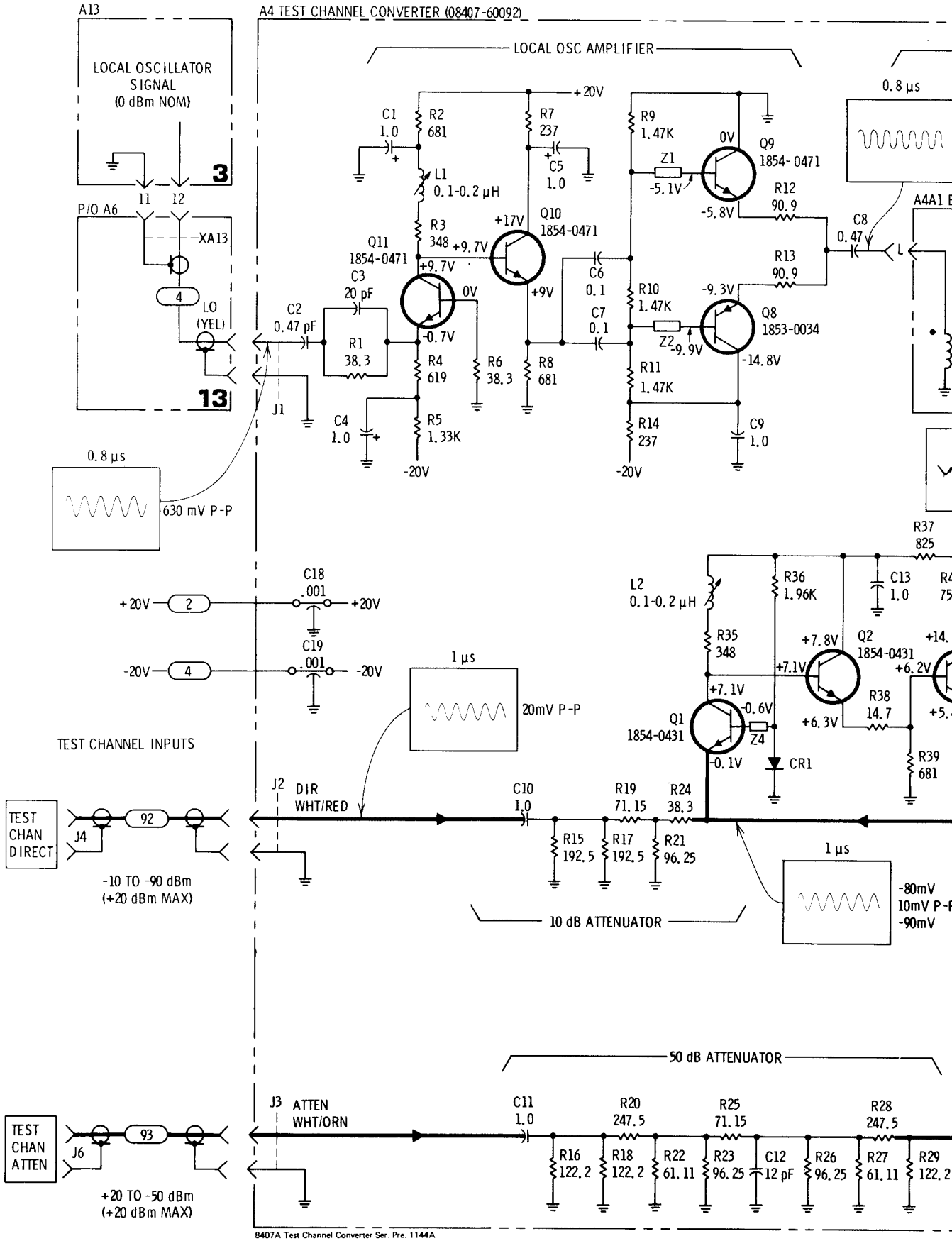
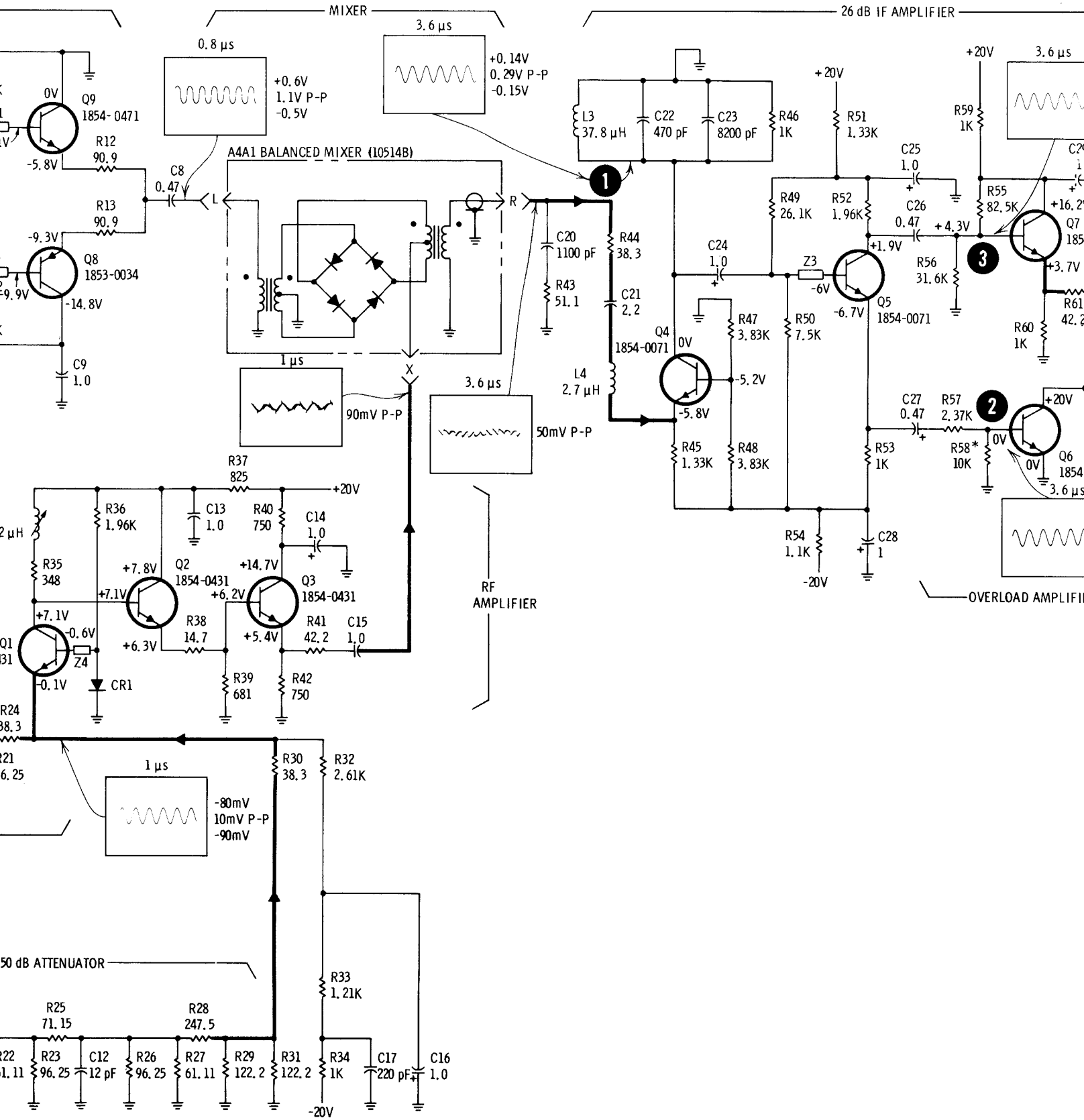


Figure 7-24. Parts Location for Test Channel Converter A4


A13
LOCAL OSCILLATOR SIGNAL (0 dBm NOM)
3
11
12
P/O A6
XA13
4
LO (YEL)
13
A4 TEST CHANNEL CONVERTER (08407-60092)
LOCAL OSC AMPLIFIER
+20V
C1 1.0
R2 681
L1 0.1-0.2 µH
R7 237
C5 1.0
R3 348
Q11 1854-0471
+9.7V
C3 20 pF
C2 0.47 pF
R1 38.3
J1
0.8 µs
630 mV P-P
R4 619
R5 1.33K
-20V
C4 1.0
R6 38.3
R8 681
+17V
Q10 1854-0471
+9V
0V
-0.7V
C6 0.1
C7 0.1
R9 1.47K
Z1
-5.1V
Q9 1854-0471
0V
-5.8V
R12 90.9
R13 90.9
R10 1.47K
Z2
-9.9V
-9.3V
Q8 1853-0034
-14.8V
R11 1.47K
R14 237
C9 1.0
C8 0.47
0.8 µs
A4A1 E
R37 825
C18 .001
+20V
2
+20V
C19 .001
-20V
4
-20V
1 µs
20mV P-P
TEST CHANNEL INPUTS
L2 0.1-0.2 µH
R36 1.96K
C13 1.0
R35 348
Q1 1854-0431
+7.1V
-0.1V
Z4
-0.6V
+7.8V
Q2 1854-0431
+7.1V
+6.3V
+6.2V
R38 14.7
CR1
R39 681
J2
DIR WHT/RED
C10 1.0
R19 71.15
R24 38.3
R15 192.5
R17 192.5
R21 96.25
1 µs
-80mV
10mV P-P
-90mV
10 dB ATTENUATOR
TEST CHAN DIRECT
J4
92
-10 TO -90 dBm
(+20 dBm MAX)
50 dB ATTENUATOR
J3
ATTEN WHT/ORN
C11 1.0
R20 247.5
R25 71.15
R28 247.5
R16 122.2
R18 122.2
R22 61.11
R23 96.25
C12 12 pF
R26 96.25
R27 61.11
R29 122.2
TEST CHAN ATTEN
J6
93
+20 TO -50 dBm
(+20 dBm MAX)
8407A Test Channel Converter Ser. Pre. 1144A


MIXER
26 dB IF AMPLIFIER
A4A1 BALANCED MIXER (10514B)
0.8 µs
+0.6V
1.1V P-P
-0.5V
3.6 µs
+0.14V
0.29V P-P
-0.15V
Q9
1854-0471
0V
-5.8V
R12
90.9
R13
90.9
-9.3V
Q8
1853-0034
-14.8V
C8
0.47
C9
1.0
L3
37.8 µH
C22
470 pF
C23
8200 pF
R46
1K
+20V
R51
1.33K
R49
26.1K
R52
1.96K
C25
1.0
C26
0.47
+4.3V
+1.9V
R55
82.5K
R56
31.6K
Z3
-6V
Q5
1854-0071
-6.7V
R59
1K
R60
1K
C20
1100 pF
R43
51.1
R44
38.3
C21
2.2
C24
1.0
L4
2.7 µH
Q4
1854-0071
0V
-5.8V
-5.2V
R47
3.83K
R50
7.5K
R45
1.33K
R48
3.83K
1 µs
90mV P-P
3.6 µs
50mV P-P
RF
AMPLIFIER
R37
825
+20V
R36
1.96K
C13
1.0
R40
750
C14
1.0
R35
348
+7.8V
Q2
1854-0431
+7.1V
+14.7V
Q3
1854-0431
+6.2V
+7.1V
-0.6V
Z4
-0.1V
CR1
R38
14.7
+6.3V
R41
42.2
+5.4V
C15
1.0
R39
681
R42
750
R53
1K
R54
1.1K
C28
1
-20V
C27
0.47
R57
2.37K
R58*
10K
0V
Q6
1854
3.6 µs
OVERLOAD AMPLIFI
R24
38.3
R21
6.25
1 µs
-80mV
10mV P-P
-90mV
R30
38.3
R32
2.61K
50 dB ATTENUATOR
R33
1.21K
R25
71.15
R28
247.5
R22
1.11
R23
96.25
C12
12 pF
R26
96.25
R27
61.11
R29
122.2
R31
122.2
R34
1K
C17
220 pF
C16
1.0
-20V

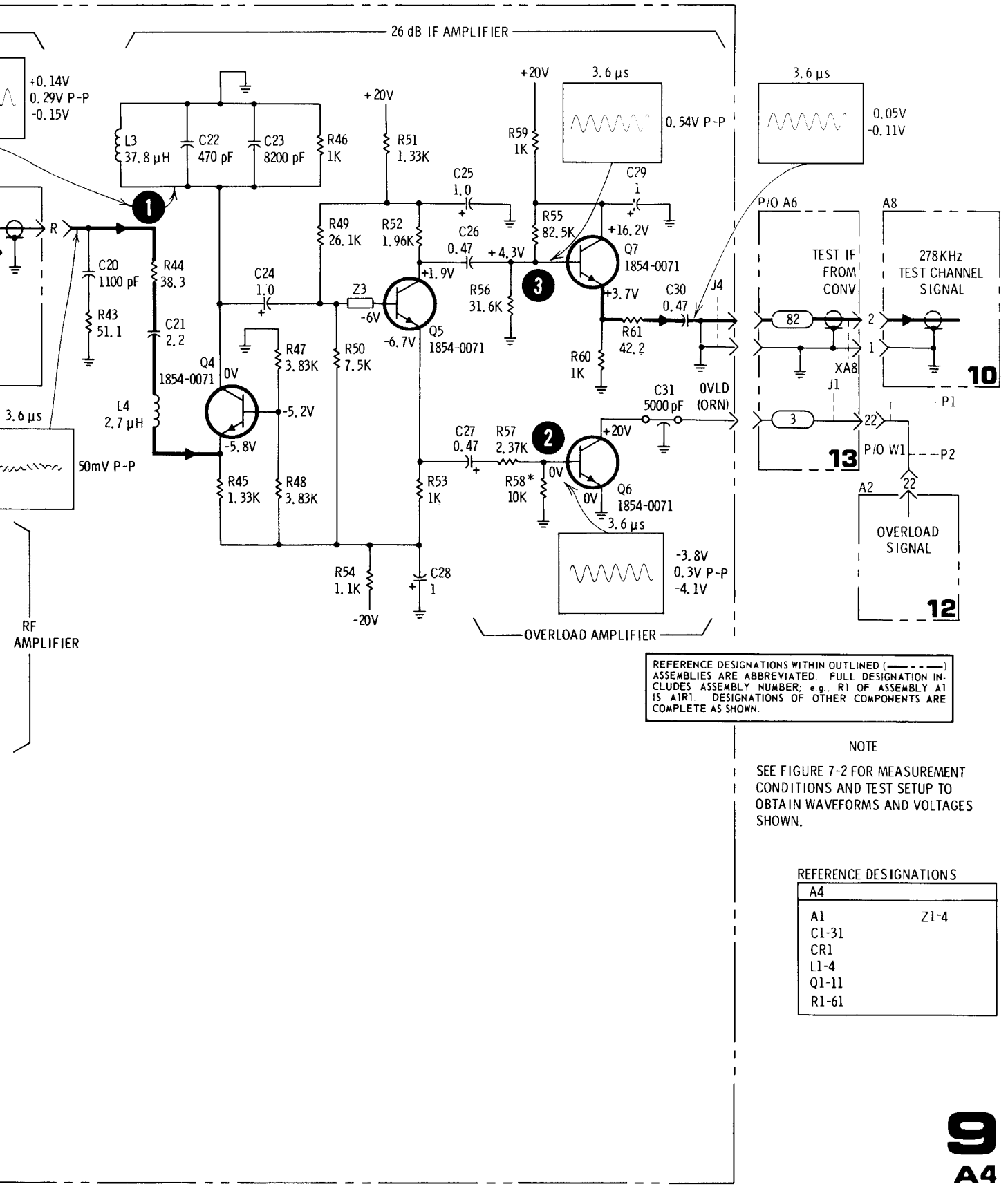


Figure 7-25. Test Channel Converter A4, Schematic Diagram

SERVICE SHEET 10

A8 Test Channel AGC Amplifier

7-dB AMPLIFIER

Q1 and Q2 form an input IF amplifier. T1 changes the output from single-ended to push-pull output.

PUSH-PULL AMPLIFIER

Q3 forms a push-pull amplifier which drives T2 through amplifier gain control Q4 and Q5.

AMPLIFIER GAIN CONTROL

Signal flow between Q3A—Q3B and transformer T2 is controlled at Q4 and Q5 by the AGC control signal from A10. As the AGC control signal goes in the positive direction, Q5A and Q5B turn on and Q4A and Q4B turn off. This gives maximum IF signal to transformer T2. Conversely, when the AGC control signal goes in the negative direction, Q5A and Q5B turn off and Q4A and Q4B turn on. This gives the minimum IF signal to transformer T2. Instead of the signal flowing through Q5A and Q5B to transformer T2,the IF signal flows through Q4A and Q4B to ground.

IF AMPLIFIER

Q6A and Q6B form a differential amplifier followed by amplifier Q7. A feedback loop is formed between the output of Q7 and the input of Q6A by resistor R20 and capacitor C11.

OVERLOAD

Q8 is the overload detector. When the IF signal amplitude exceeds a pre-selected limit Q8 conducts, causing the UNCAL REDUCE INPUT RATIO light to come on.

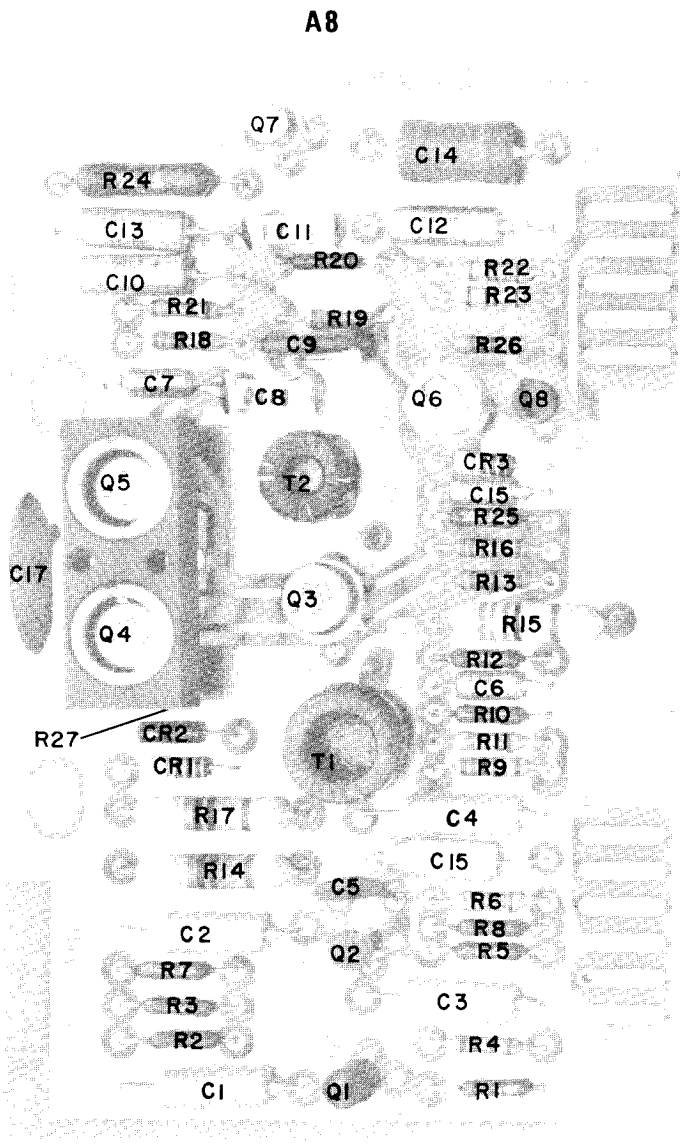
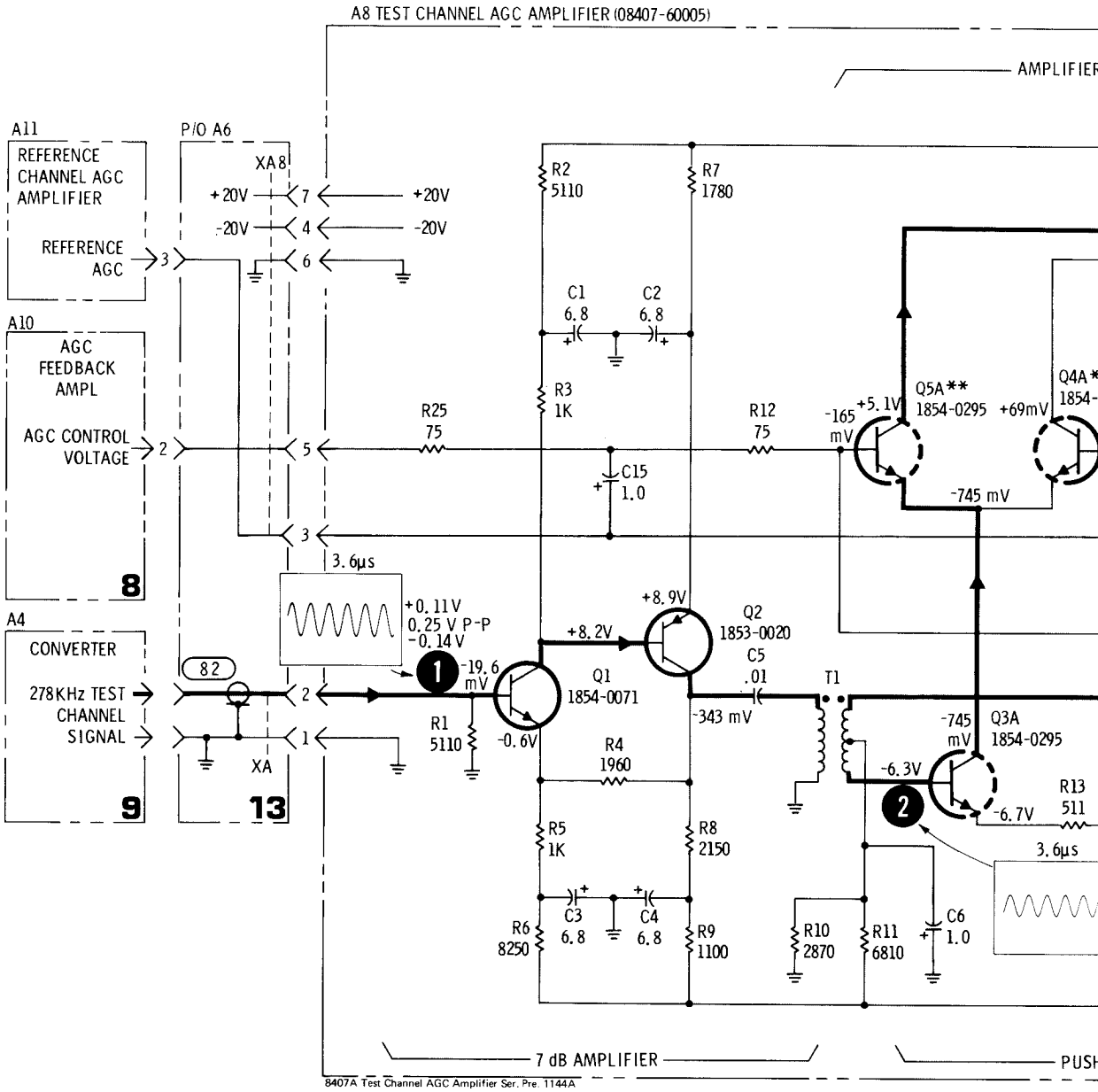


Figure 7-26. Parts Location for Test Channel AGC Amplifier A8

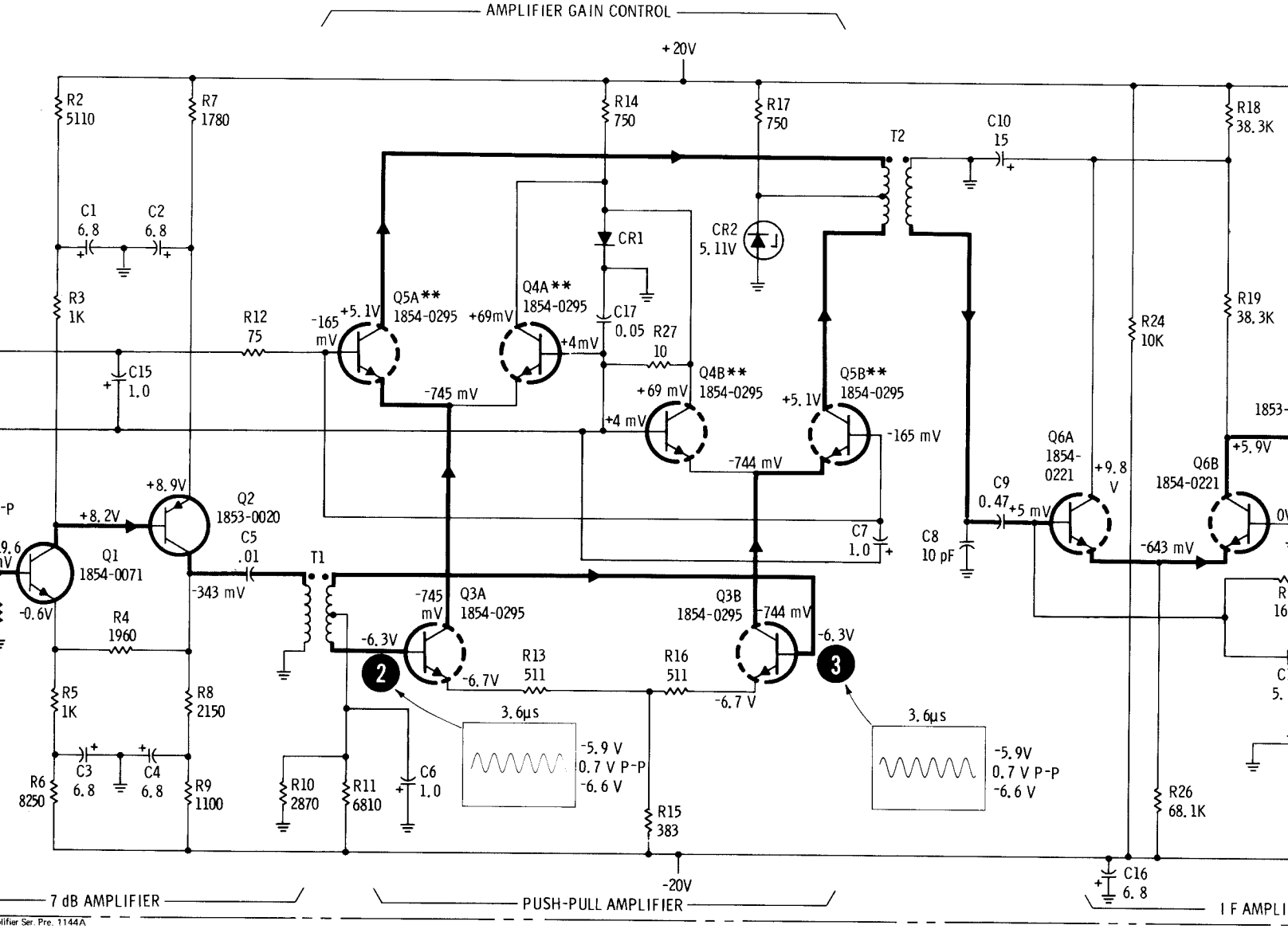


8407A Test Channel AGC Amplifier Ser. Pre. 1144A

NOTES:

1. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.
2. SELECTED AT FACTORY
   DUAL TRANSISTORS A8Q4, A8Q5, A11Q4, & A11Q5 ARE A MATCHED SET OF FOUR. IF ANY ONE OF THE TRANSISTORS NEEDS TO BE REPLACED, ALL FOUR SHOULD BE REPLACED BY A FACTORY-SELECTED MATCHED SET.

EL AGC AMPLIFIER (08407-60005)



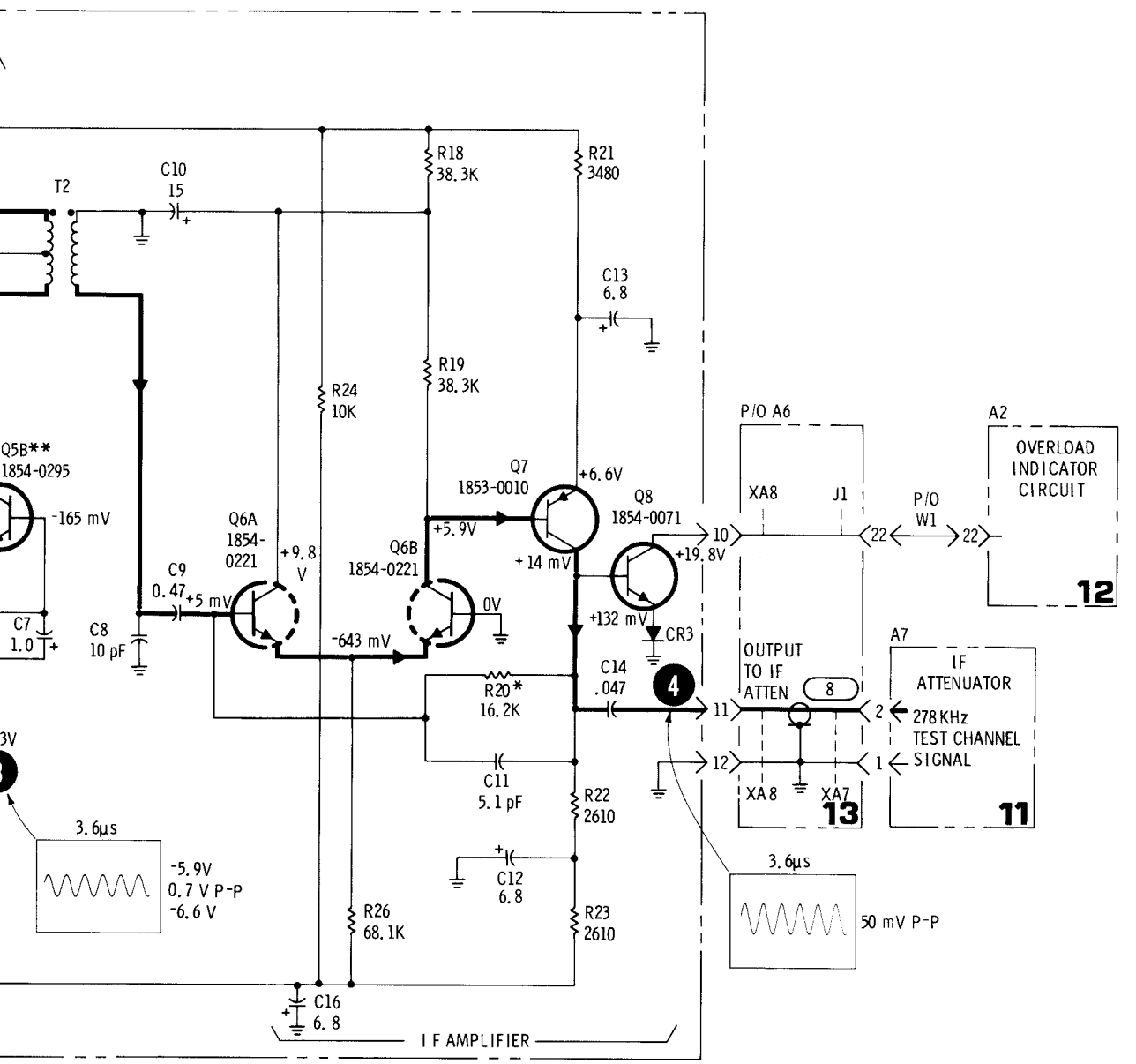
lifier Ser. Pre. 1144A

FOR MEASUREMENT CONDITIONS
P TO OBTAIN WAVEFORMS AND
WN.

ACTORY
TORS A8Q4, A8Q5, A11Q4, & A11Q5
O SET OF FOUR. IF ANY ONE OF
RS NEEDS TO BE REPLACED, ALL
BE REPLACED BY A FACTORY-
CHED SET.

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.

REF
C1-
CR1
Q1-
R1-



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

A8 ASSY	
C1-18	T1,2
CR1-3	
Q1-8	
R1-26	

10
A8

Figure 7-27. Test Channel AGC Amplifier A8, Schematic Diagram

SERVICE SHEET 11

A7 Programmable IF Attenuator

BUFFER

The two-or-three stage buffers are used to provide isolation between attenuator sections. This prevents interaction between adjacent sections.

10- OR 20-DB ATTENUATOR

Relay K1 connects R9 in parallel with R8 and decreases IF attenuation by 10 dB. Relay K2 connects R10 to ground and decreases IF attenuation by 20 dB. K1 and K2 should be operated individually for proper circuit function. The front-panel switch actuates K1 or K2 one at a time.

30 DB ATTENUATOR

Relays K3 and K4 are 30 dB attenuator stages. Relay K3 shorts across R25 and K4 across R39 which decreases the attenuation of the IF signal by 30 dB for each relay.

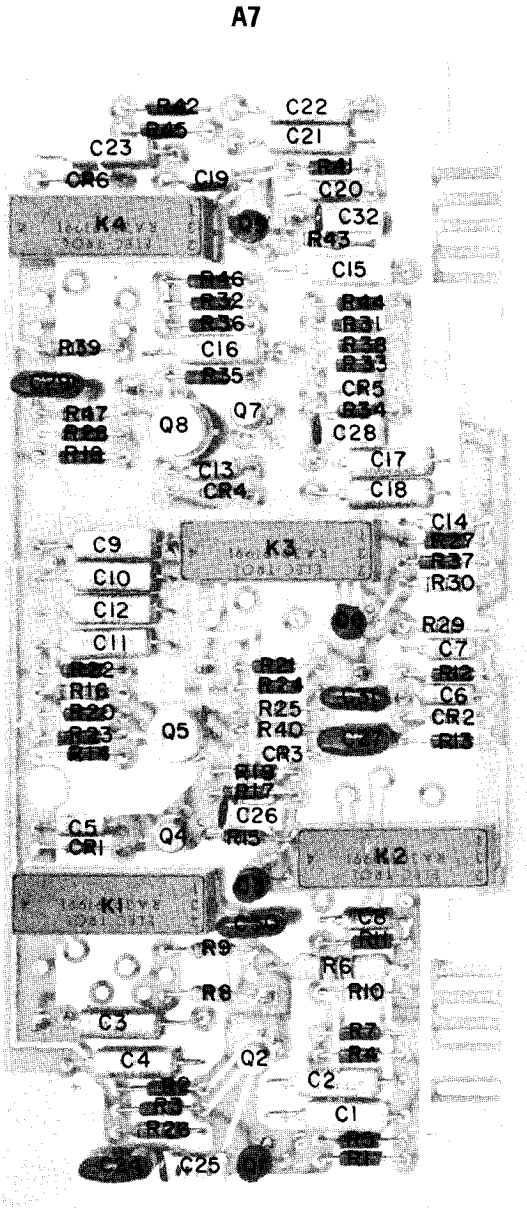
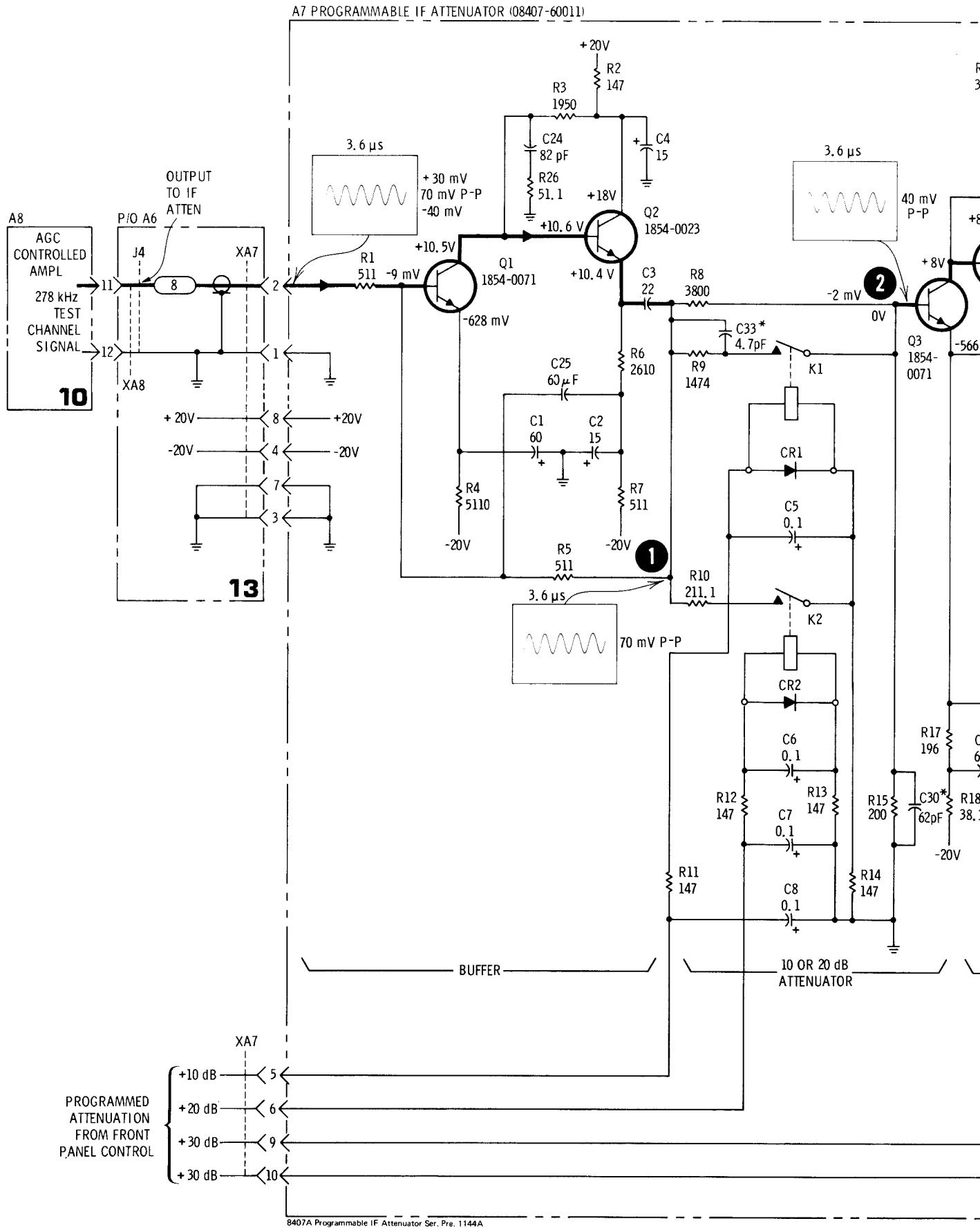
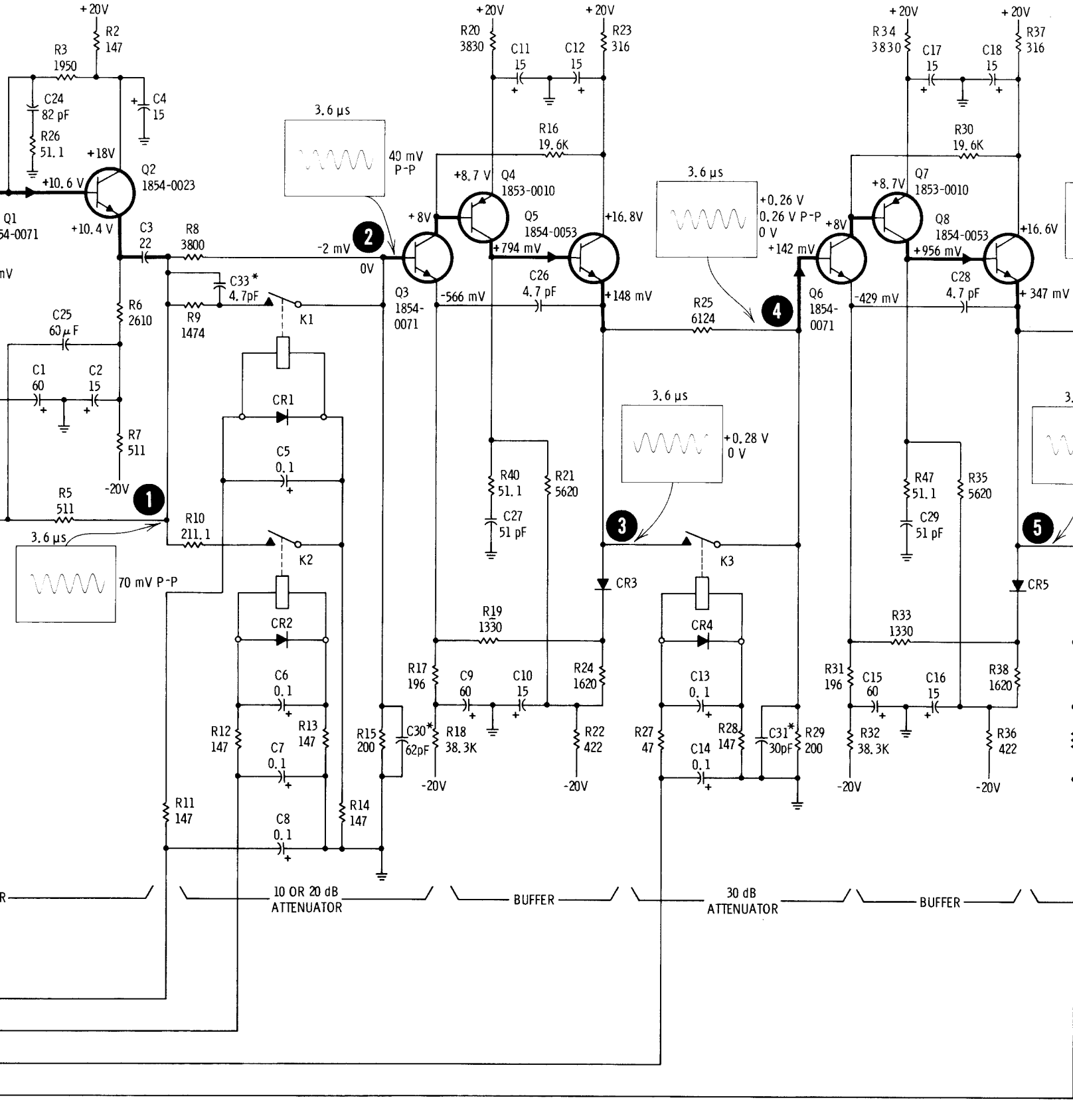


Figure 7-28. Parts Location for Programmable IF Attenuator A7


A7 PROGRAMMABLE IF ATTENUATOR (08407-60011)
A8
AGC CONTROLLED AMPL
278 kHz TEST CHANNEL SIGNAL
10
P/O A6
J4
XA7
XA8
OUTPUT TO IF ATTEN
13
+20V
R2 147
R3 1950
C24 82 pF
C4 15
R26 51.1
3.6 µs
+30 mV 70 mV P-P -40 mV
+18V
Q2 1854-0023
+10.6 V
+10.5V
Q1 1854-0071
+10.4 V
-9 mV
-628 mV
R1 511
C3 22
R8 3800
3.6 µs
40 mV P-P
-2 mV
0V
+8V
Q3 1854-0071
-566
C33* 4.7pF
R9 1474
K1
R6 2610
C25 60 µF
C1 60
C2 15
R4 5110
R7 511
CR1
C5 0.1
R5 511
R10 211.1
3.6 µs
70 mV P-P
K2
CR2
C6 0.1
R12 147
R13 147
C7 0.1
R11 147
R14 147
C8 0.1
R17 196
R15 200
C30* 62pF
R18 38.1
-20V
BUFFER
10 OR 20 dB ATTENUATOR
PROGRAMMED ATTENUATION FROM FRONT PANEL CONTROL
+10 dB
+20 dB
+30 dB
+30 dB
8407A Programmable IF Attenuator Ser. Pre. 1144A


+20V
R2 147
R3 1950
C24 82 pF
R26 51.1
C4 15
+18V
+10.6 V
Q2 1854-0023
Q1 54-0071
+10.4 V
C3 22
R8 3800
C33* 4.7pF
K1
R6 2610
R9 1474
C25 60 µF
C1 60
C2 15
R7 511
-20V
R5 511
CR1
C5 0.1
3.6 µs
70 mV P-P
R10 211.1
K2
CR2
C6 0.1
R12 147
R13 147
C7 0.1
R11 147
R14 147
C8 0.1
3.6 µs
40 mV P-P
-2 mV
0V
2
+20V
R20 3830
C11 15
C12 15
R23 316
R16 19.6K
+8.7 V
Q4 1853-0010
+8V
Q5 1854-0053
+16.8V
+794 mV
Q3 1854-0071
-566 mV
C26 4.7 pF
+148 mV
R40 51.1
R21 5620
C27 51 pF
3
CR3
R19 1330
R17 196
C9 60
C10 15
R24 1620
R15 200
C30* 62pF
R18 38.3K
R22 422
-20V
-20V
3.6 µs
+0.26 V
0.26 V P-P
0 V
+142 mV
R25 6124
4
3.6 µs
+0.28 V
0 V
K3
CR4
C13 0.1
R27 47
R28 147
C14 0.1
C31* 30pF
R29 200
+20V
R34 3830
C17 15
C18 15
R37 316
R30 19.6K
+8.7V
Q7 1853-0010
+8V
Q8 1854-0053
+16.6V
+956 mV
Q6 1854-0071
-429 mV
C28 4.7 pF
+347 mV
R47 51.1
R35 5620
C29 51 pF
5
CR5
R33 1330
R31 196
C15 60
C16 15
R38 1620
R32 38.3K
R36 422
-20V
-20V
10 OR 20 dB ATTENUATOR
BUFFER
30 dB ATTENUATOR
BUFFER

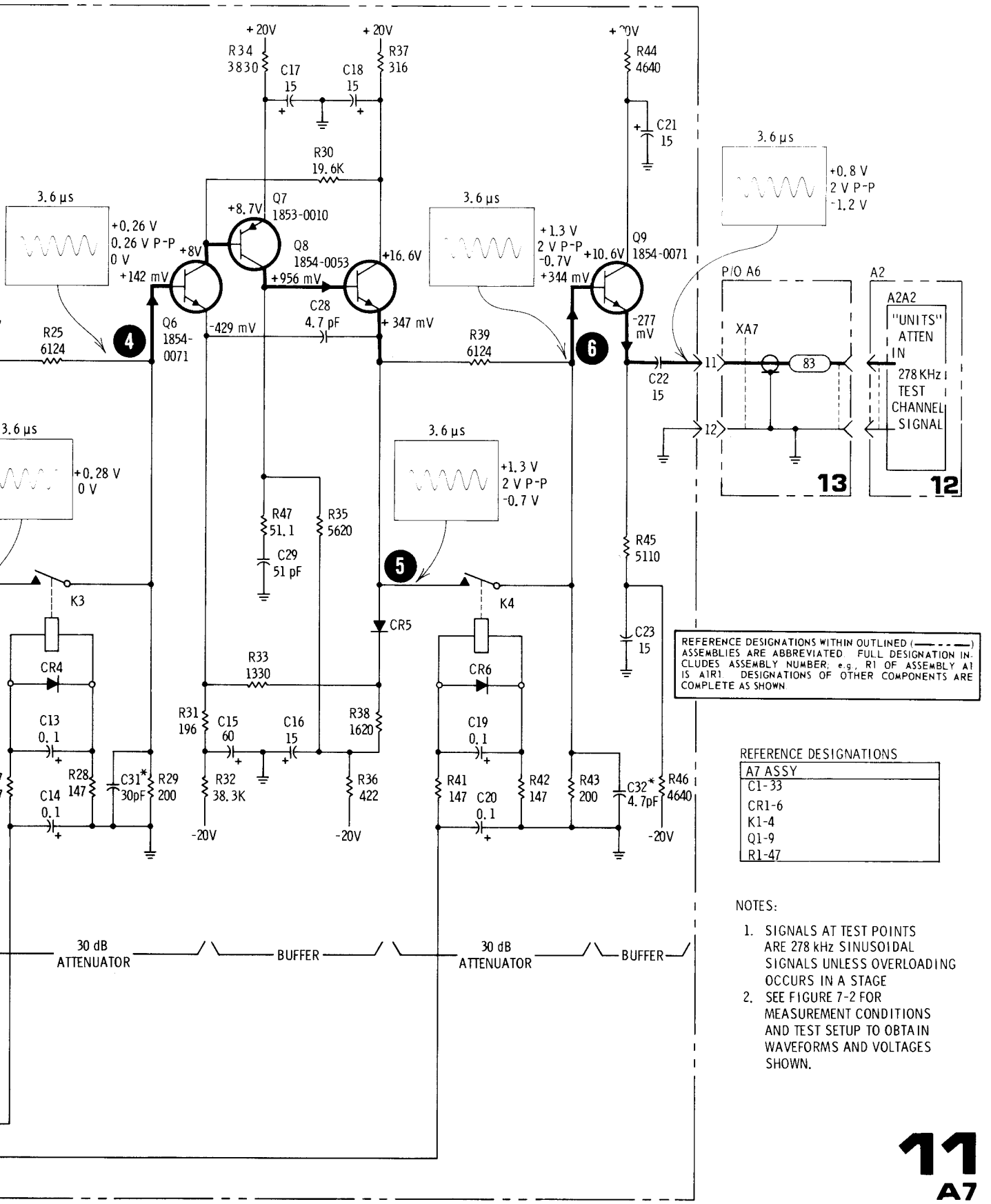


Figure 7-29. Programmable IF Attenuator A7, Schematic Diagram

SERVICE SHEET 12

A1 Front Panel Switch Assembly & A2 Front Panel Assembly

A2 COMPONENTS

A2Q3 is an auto/manual switch. This is used for computer remote control to disable the manual DISPLAY REFERENCE 10 dB/step switch. In manual mode, Q3 conducts, applying −20 Vdc to the wiper side of the DISPLAY REFERENCE 10-dB/step switches.

Integrated circuit U1 amplifies the AGC signal, driving the REF CHAN LEVEL meter. Diodes CR1 and CR2 prevent any overvoltage from damaging the meter.

Transistors Q1 and Q2 amplify the overload signal from the test channel converter and test channel AGC amplifier, driving the UNCAL REDUCE INPUT RATIO light.

A2A1 PHASE VERNIER

The 278 kHz reference channel IF signal passes through A2A1Q1 — A2A1Q3 with no amplification. The prime purpose of the circuit is to shift phase with the PHASE VERNIER control, R1.

A2A2 AMPLITUDE VERNIER

The 278 kHz test channel IF channel is attenuated with the AMPL VERNIER control R2 by changing the effective by-pass to ground of A2A2C4.

The amount of by-pass to ground exhibited by A2A2C1 is controlled by the DISPLAY REFERENCE 1-dB/step switch which changes the resistance between by-pass capacitor C1 and ground.

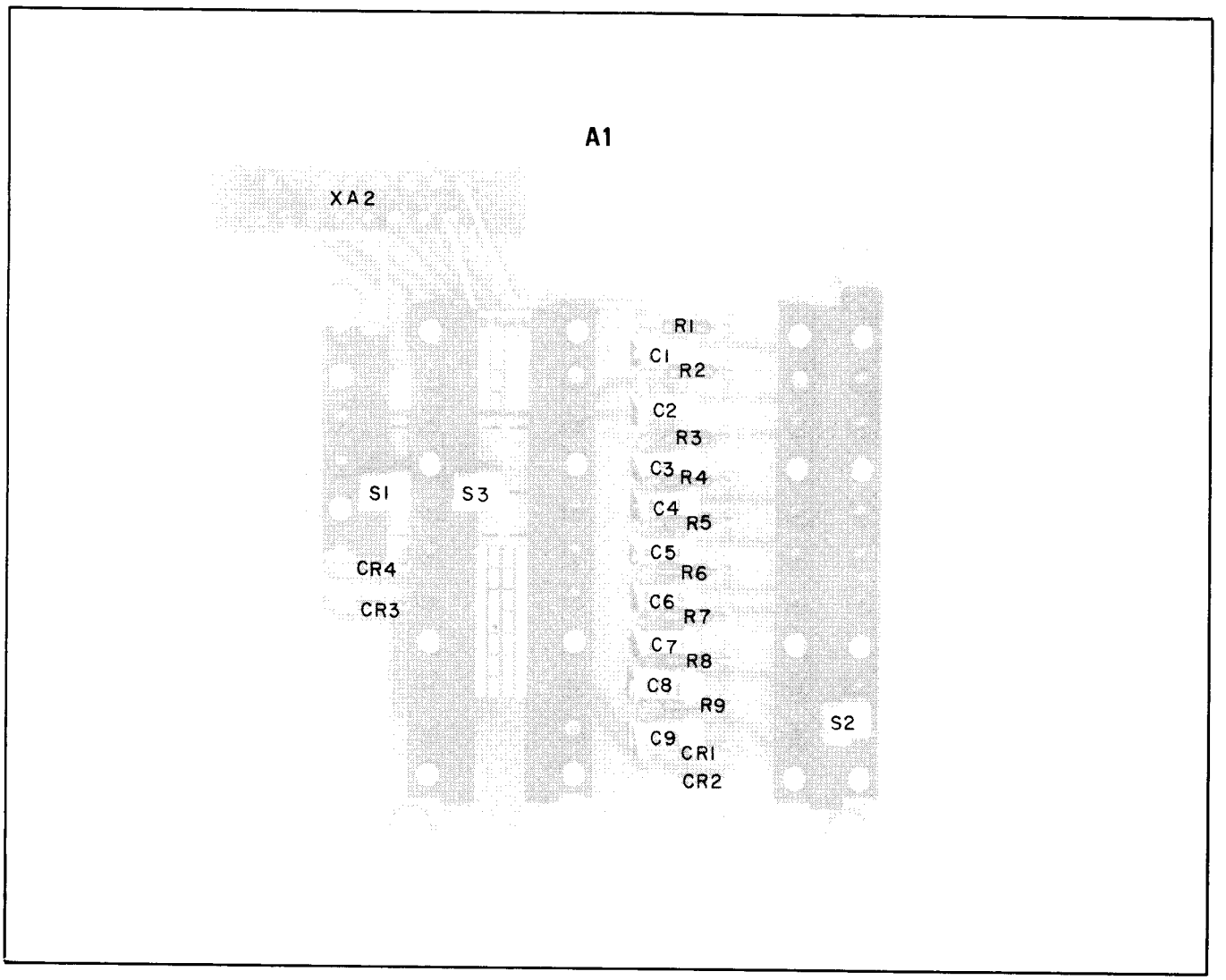


Figure 7-30. Parts Location for Front Panel Assembly A1 and A2 (1 of 2)

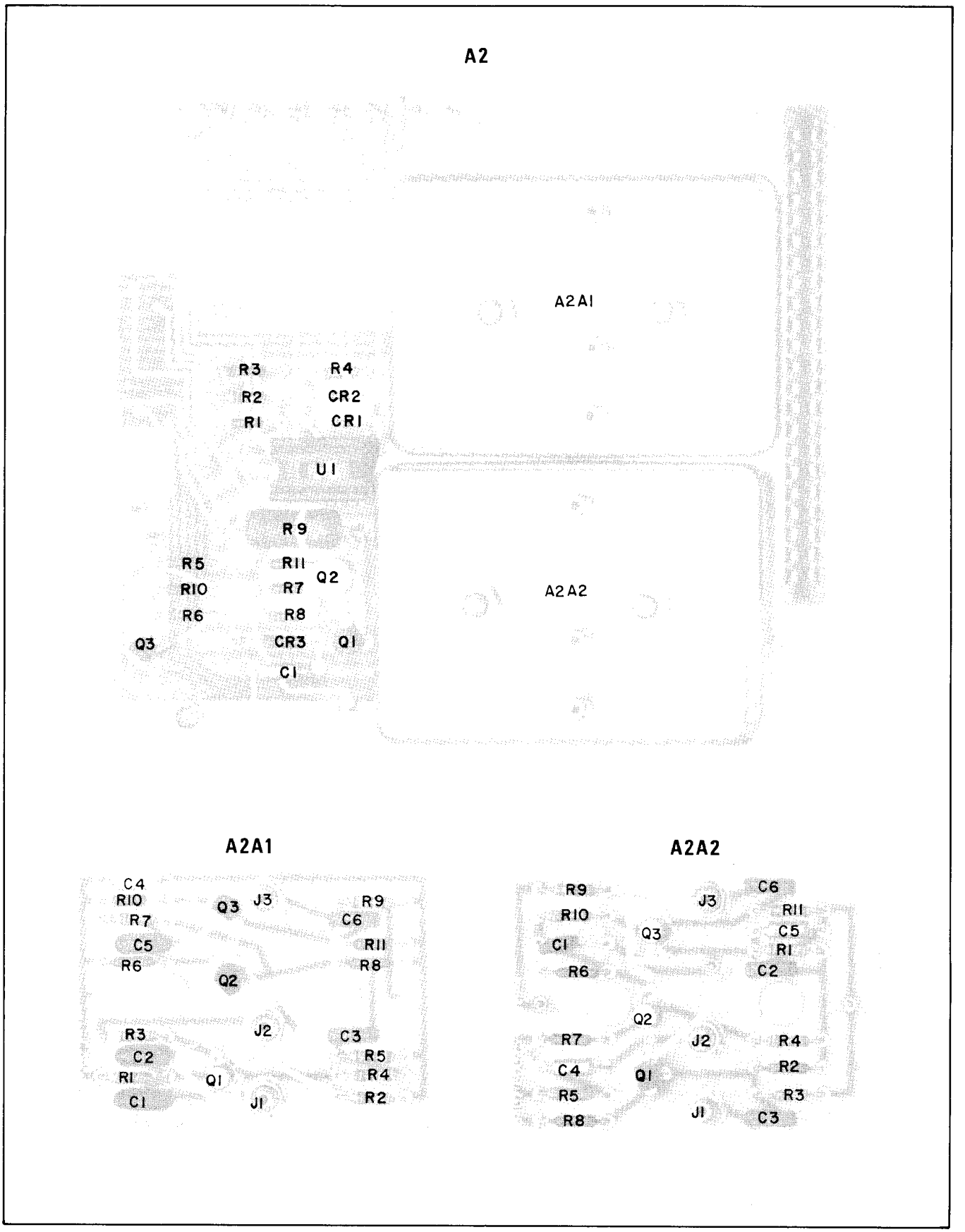
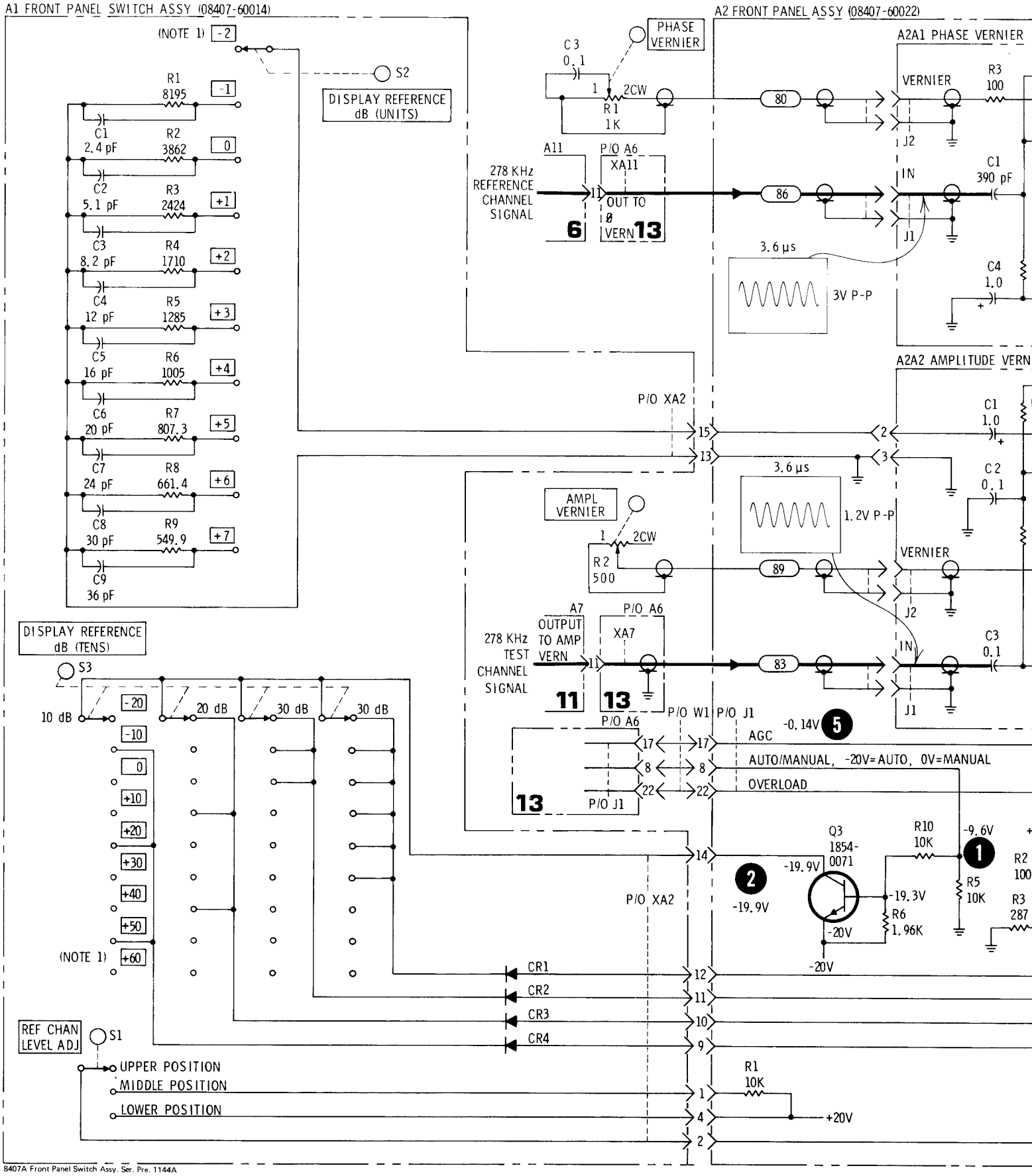
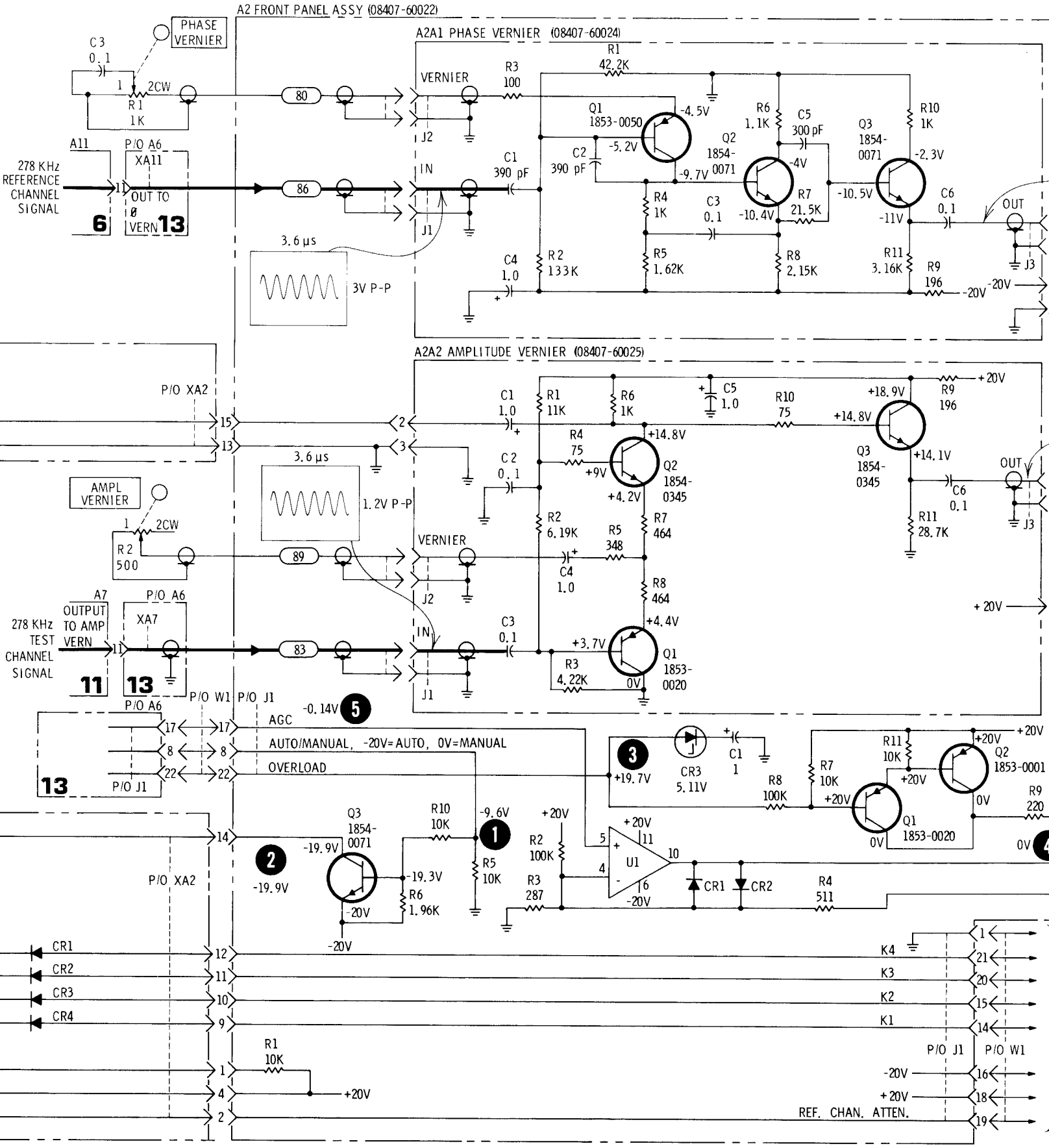


Figure 7-30. Parts Location for Front Panel Assembly A1 and A2 (2 of 2)



8407A Front Panel Switch Assy. Ser. Pre. 1144A


A2 FRONT PANEL ASSY (08407-60022)
A2A1 PHASE VERNIER (08407-60024)
A2A2 AMPLITUDE VERNIER (08407-60025)
PHASE VERNIER
C3 0.1
R1 1K
2CW
278 KHz REFERENCE CHANNEL SIGNAL
A11
P/O A6 XA11
OUT TO ø VERN
VERNIER
IN
R3 100
C1 390 pF
C2 390 pF
R1 42.2K
Q1 1853-0050
Q2 1854-0071
Q3 1854-0071
R4 1K
R5 1.62K
R2 133K
C4 1.0
C3 0.1
R6 1.1K
C5 300 pF
R7 21.5K
R8 2.15K
R10 1K
R11 3.16K
R9 196
C6 0.1
OUT
3.6 µs
3V P-P
P/O XA2
AMPL VERNIER
R2 500
1.2V P-P
A7 OUTPUT TO AMP VERN
P/O A6 XA7
278 KHz TEST CHANNEL SIGNAL
C1 1.0
R1 11K
R6 1K
C5 1.0
R10 75
R9 196
R4 75
C2 0.1
R2 6.19K
R5 348
R7 464
R8 464
C4 1.0
C3 0.1
R3 4.22K
Q1 1853-0020
Q2 1854-0345
Q3 1854-0345
R11 28.7K
C6 0.1
P/O W1
P/O J1
AGC
AUTO/MANUAL, -20V=AUTO, 0V=MANUAL
OVERLOAD
CR3 5.11V
C1 1
R8 100K
R7 10K
R11 10K
Q2 1853-0001
R9 220
Q1 1853-0020
R10 10K
R5 10K
R6 1.96K
R2 100K
R3 287
U1
R4 511
CR1
CR2
CR3
CR4
R1 10K
K4
K3
K2
K1
REF. CHAN. ATTEN.

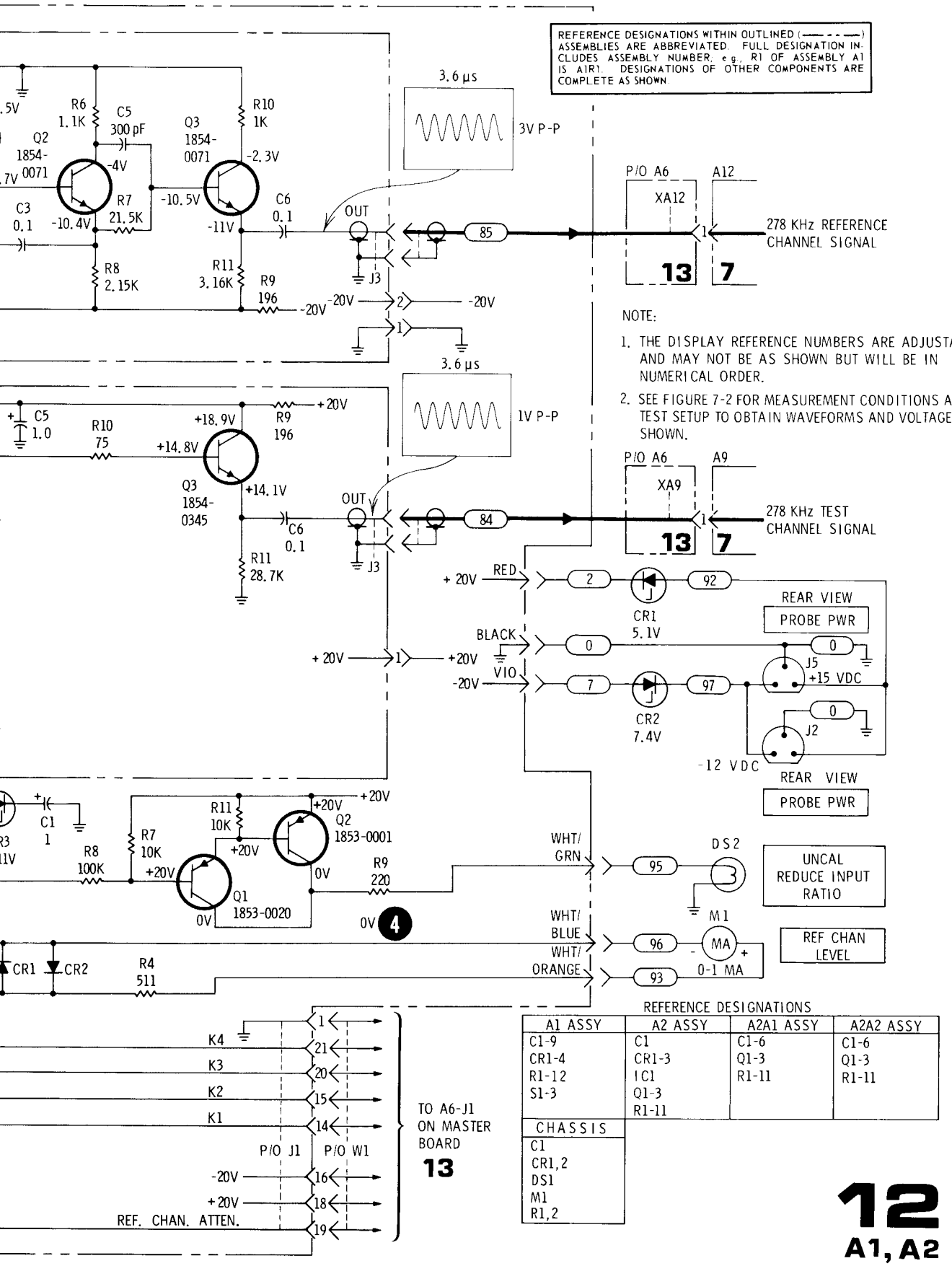


Figure 7-31. Front Panel Assembly A1 and A2, Schematic Diagram

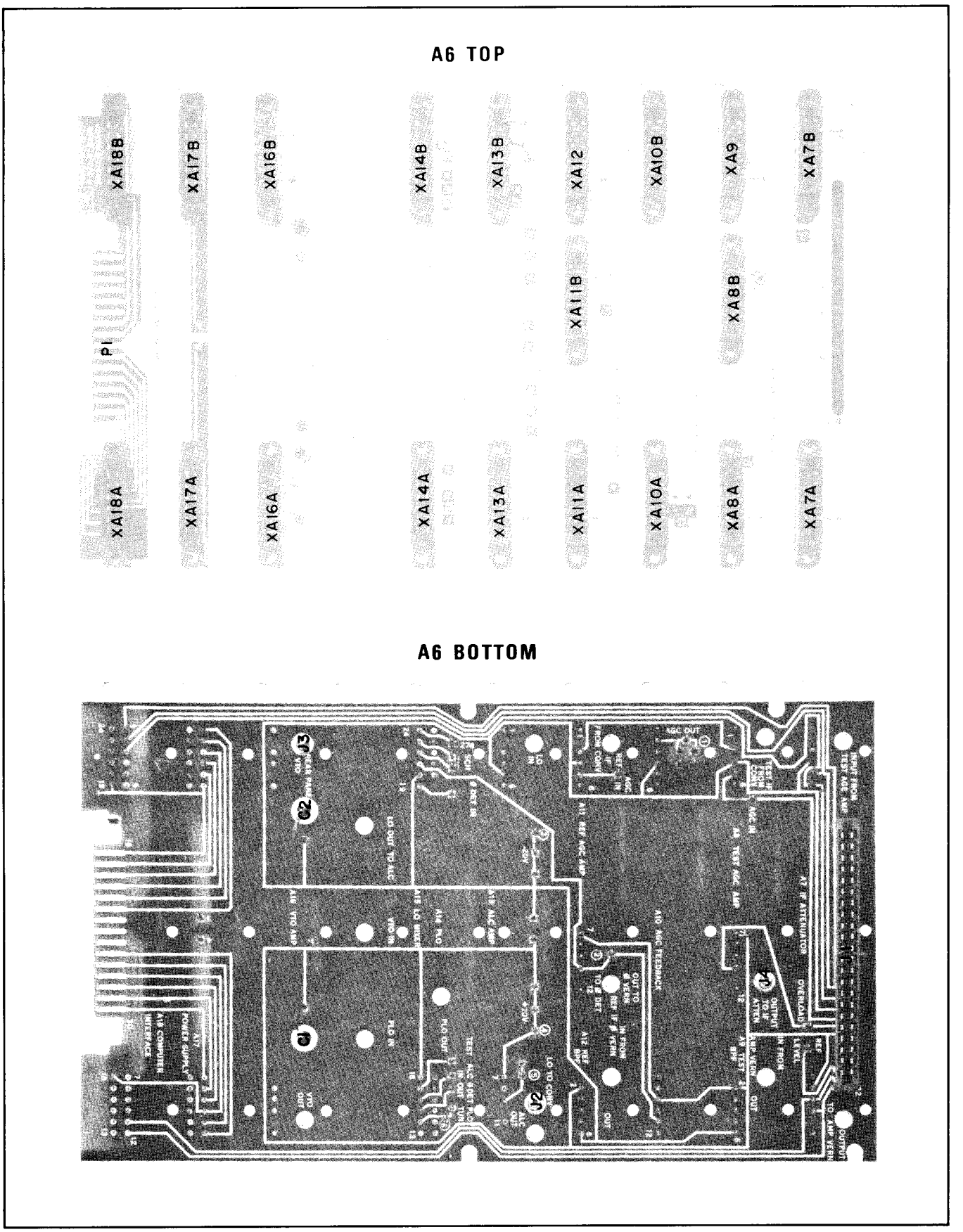
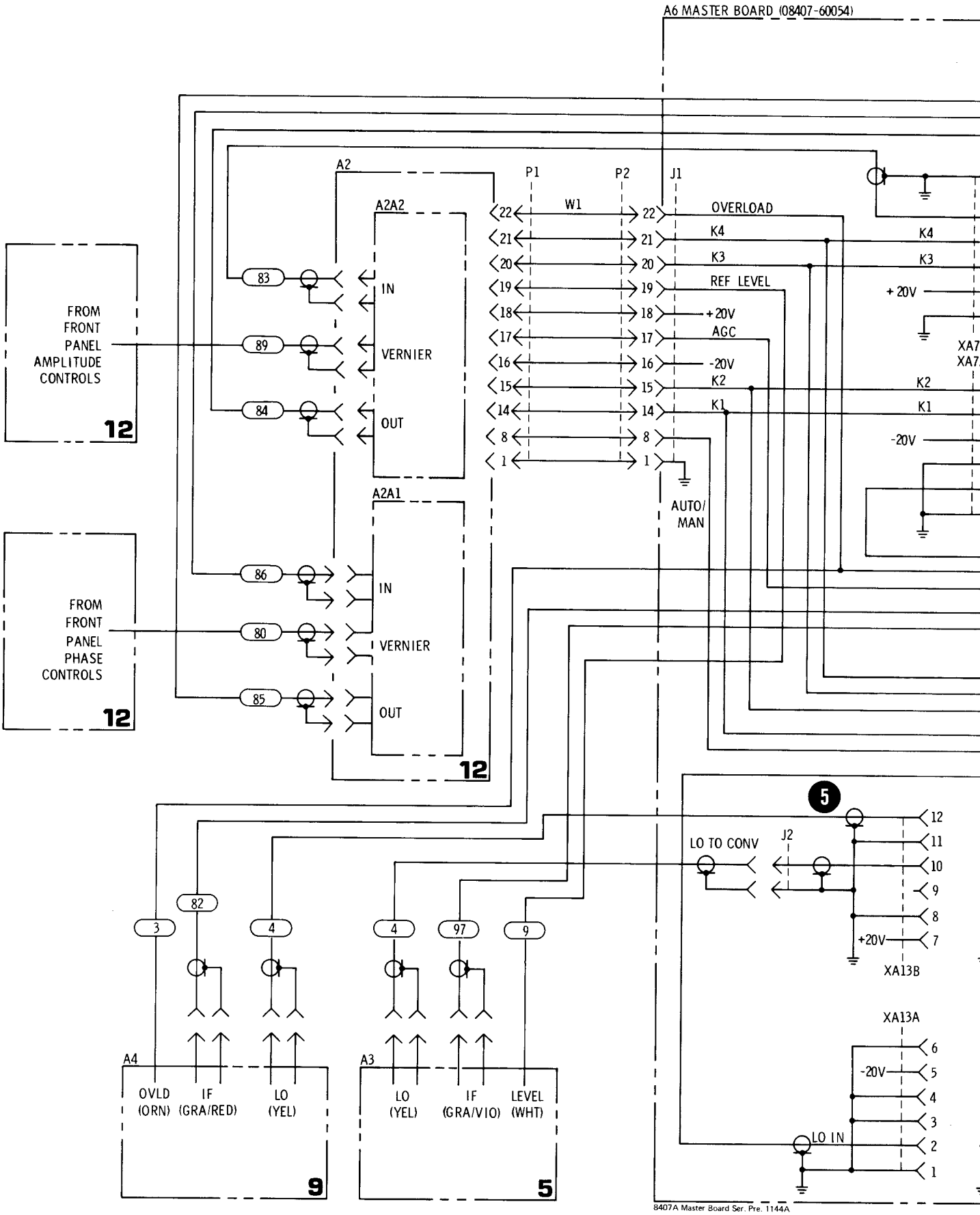
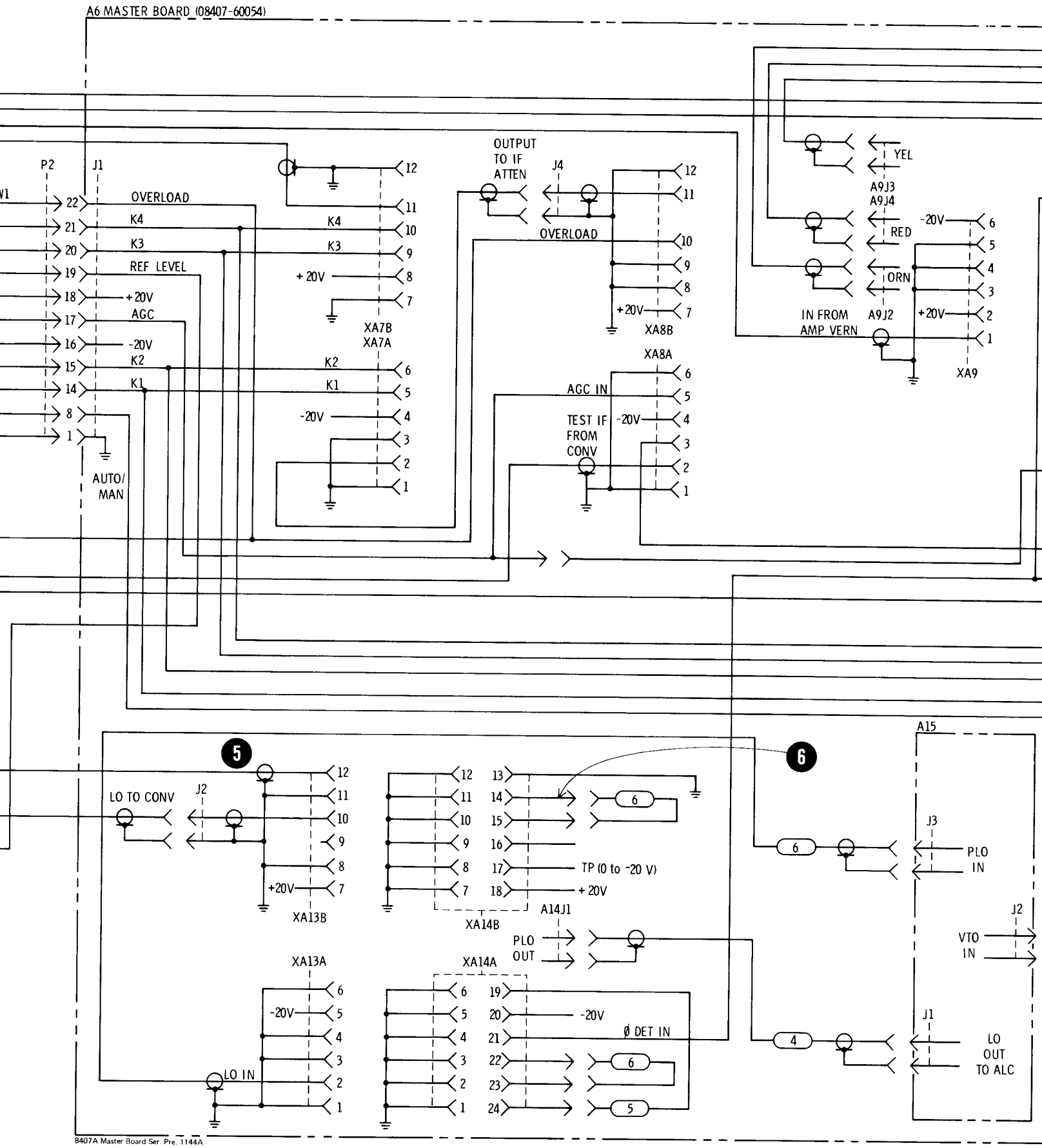
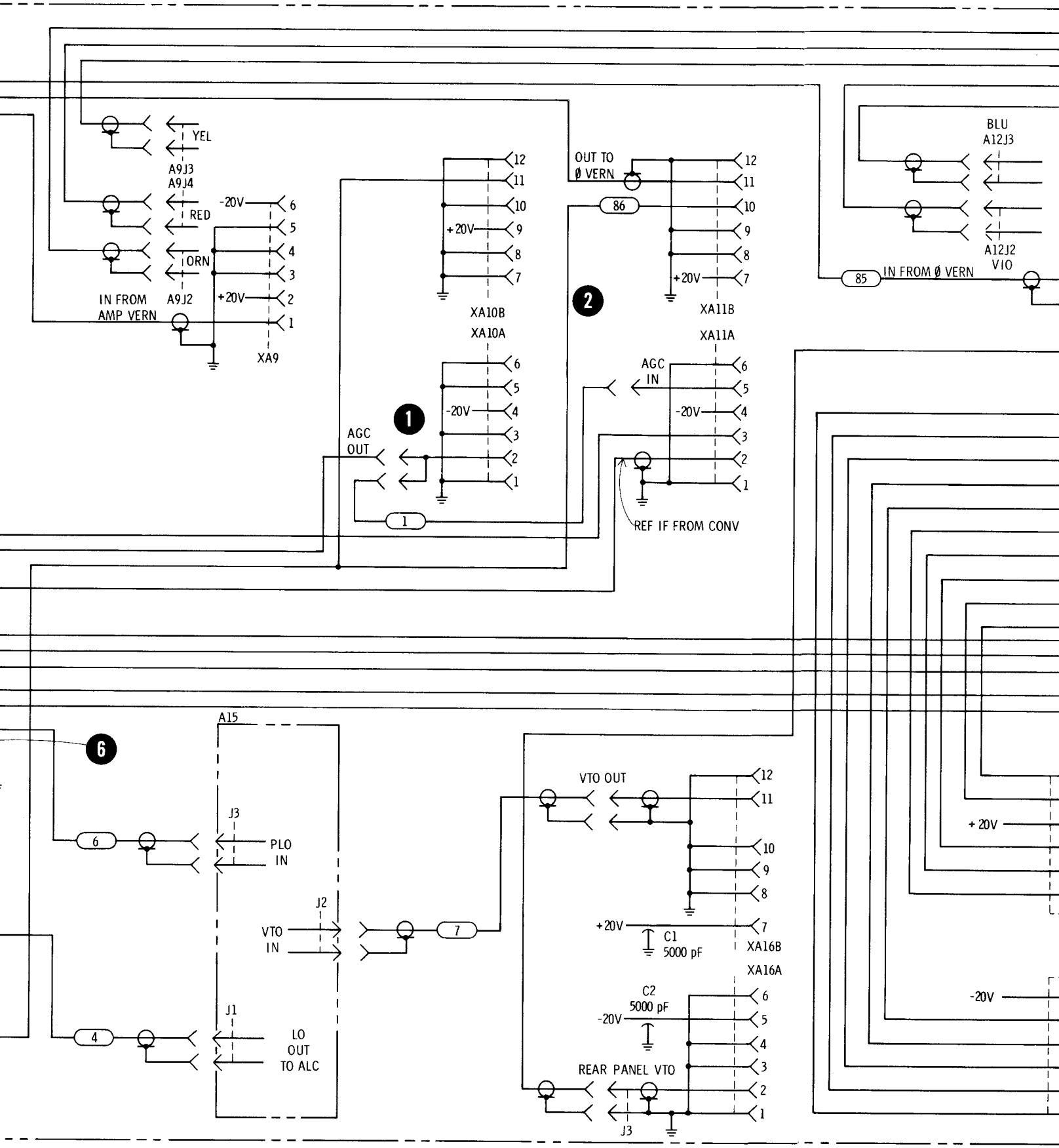
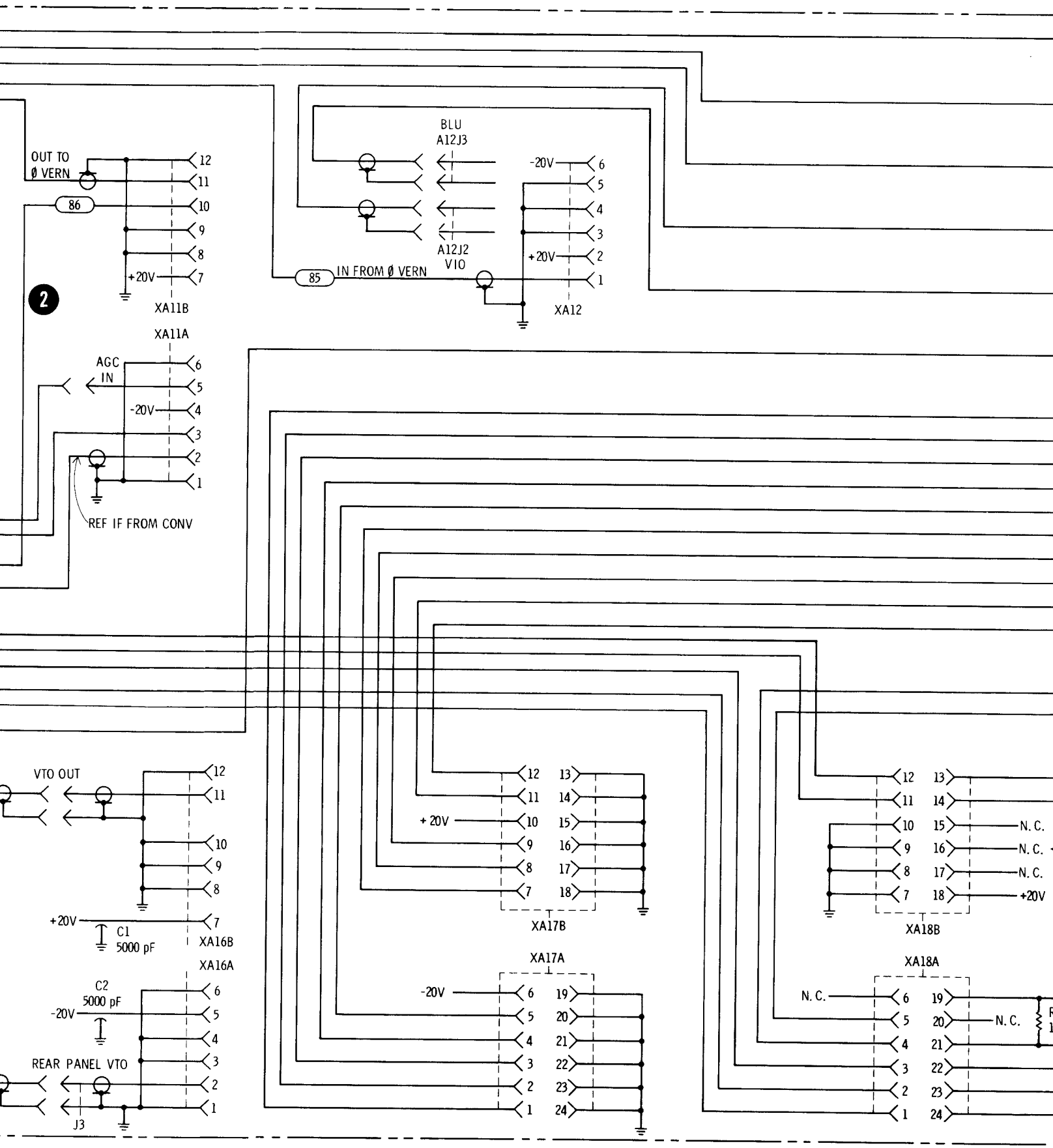


Figure 7-32. Parts Location for Master Board A6


A6 MASTER BOARD (08407-60054)
A2
A2A2
A2A1
P1
P2
J1
W1
FROM FRONT PANEL AMPLITUDE CONTROLS
12
FROM FRONT PANEL PHASE CONTROLS
12
IN
VERNIER
OUT
83
89
84
86
80
85
22
21
20
19
18
17
16
15
14
8
1
OVERLOAD
K4
K3
REF LEVEL
+20V
AGC
-20V
K2
K1
AUTO/ MAN
+20V
-20V
K4
K3
K2
K1
XA7
XA7
5
LO TO CONV
J2
12
11
10
9
8
+20V
7
XA13B
XA13A
6
-20V
5
4
3
LO IN
2
1
82
3
4
4
97
9
A4
OVLD (ORN)
IF (GRA/RED)
LO (YEL)
9
A3
LO (YEL)
IF (GRA/VIO)
LEVEL (WHT)
5
8407A Master Board Ser. Pre. 1144A


A6 MASTER BOARD (08407-60054)
P2
J1
OVERLOAD
K4
K3
REF LEVEL
+20V
AGC
-20V
K2
K1
AUTO/
MAN
XA7B
XA7A
OUTPUT
TO IF
ATTEN
J4
OVERLOAD
XA8B
XA8A
AGC IN
TEST IF
FROM
CONV
YEL
A9J3
A9J4
RED
ORN
A9J2
IN FROM
AMP VERN
XA9
5
6
LO TO CONV
J2
XA13B
XA14B
TP (0 to -20 V)
A14J1
PLO
OUT
XA13A
XA14A
LO IN
Ø DET IN
A15
J3
PLO
IN
J2
VTO
IN
J1
LO
OUT
TO ALC
8407A Master Board Ser. Pre. 1144A


YEL
A9J3
A9J4
RED
ORN
-20V
+20V
IN FROM AMP VERN
A9J2
XA9
XA10B
XA10A
AGC OUT
OUT TO Ø VERN
86
XA11B
XA11A
AGC IN
REF IF FROM CONV
BLU
A12J3
A12J2
VIO
85
IN FROM Ø VERN
A15
J3
PLO IN
J2
VTO IN
J1
LO OUT TO ALC
VTO OUT
C1
5000 pF
XA16B
XA16A
C2
5000 pF
REAR PANEL VTO
J3


OUT TO
Ø VERN
86
12
11
10
9
8
+20V
7
XA11B
2
XA11A
AGC
IN
6
5
-20V
4
3
2
1
REF IF FROM CONV
BLU
A12J3
A12J2
VIO
-20V
6
5
4
3
+20V
2
85
IN FROM Ø VERN
1
XA12
VTO OUT
12
11
10
9
8
+20V
7
C1
5000 pF
XA16B
XA16A
C2
5000 pF
-20V
6
5
4
3
2
1
REAR PANEL VTO
J3
12
11
+20V
10
9
8
7
13
14
15
16
17
18
XA17B
XA17A
-20V
6
5
4
3
2
1
19
20
21
22
23
24
12
11
10
9
8
7
13
14
15
16
17
18
N.C.
N.C.
N.C.
+20V
XA18B
XA18A
N.C.
6
5
4
3
2
1
19
20
21
22
23
24
N.C.

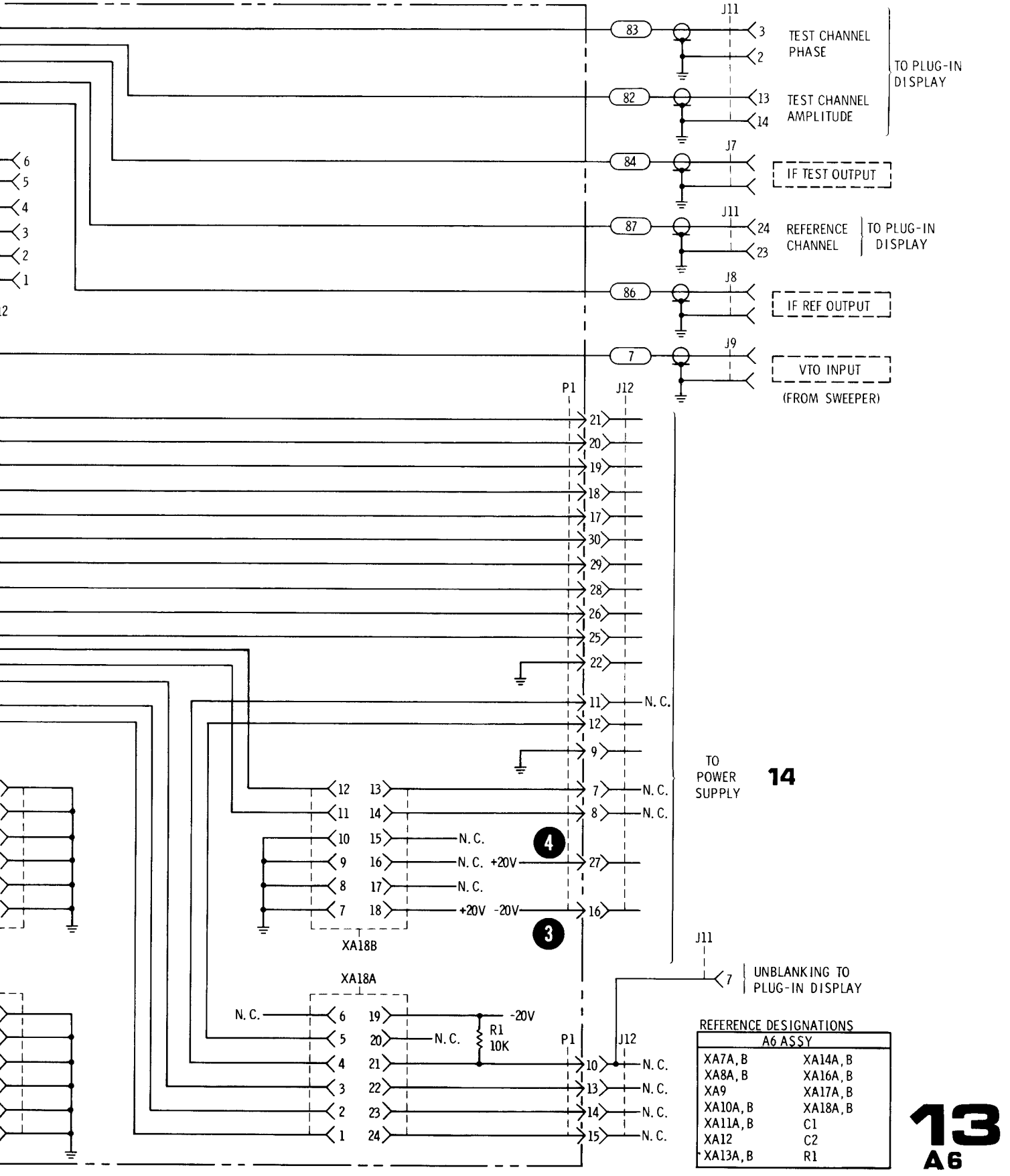


Figure 7-33. Master Board A6, Schematic Diagram

SERVICE SHEET 14

A5 Rectifier Assembly and A17 Power Supply

+20V POWER SUPPLY

An overload limiter senses current through R1. When an overload occurs, Q3 and Q4 turn on, causing Q5 and series regulator Q1 to turn off.

The regulator feedback loop starting at A17TP3 is through R6, R7, U2, and Q5 to the base of Q1. A change in the +20V output, due to a change in load, produces a change through the regulator loop which changes the effective resistance of series regulator Q1 and brings the output voltage back to +20 Vdc.

Overvoltage protection is provided by A17CR4. If the output voltage rises to above 21.5 Vdc, CR4 conducts and causes the overload limiter Q3 to actuate. Overvoltage may inadvertently occur during adjustment of R7 and the supply will go to near-zero volt output. To clear overload, set R7 to mid-position, turn main power off, then on again. This should clear trouble and allow R7 to be adjusted for +20 Vdc output.

−20V POWER SUPPLY

The −20V supply functions identically to the +20V supply, except that the −20 Vdc output is taken from the point on the circuit corresponding the ground point on the +20V supply and the −20V dc ground return is connected to a point that corresponds to the +20V output on the +20V supply.

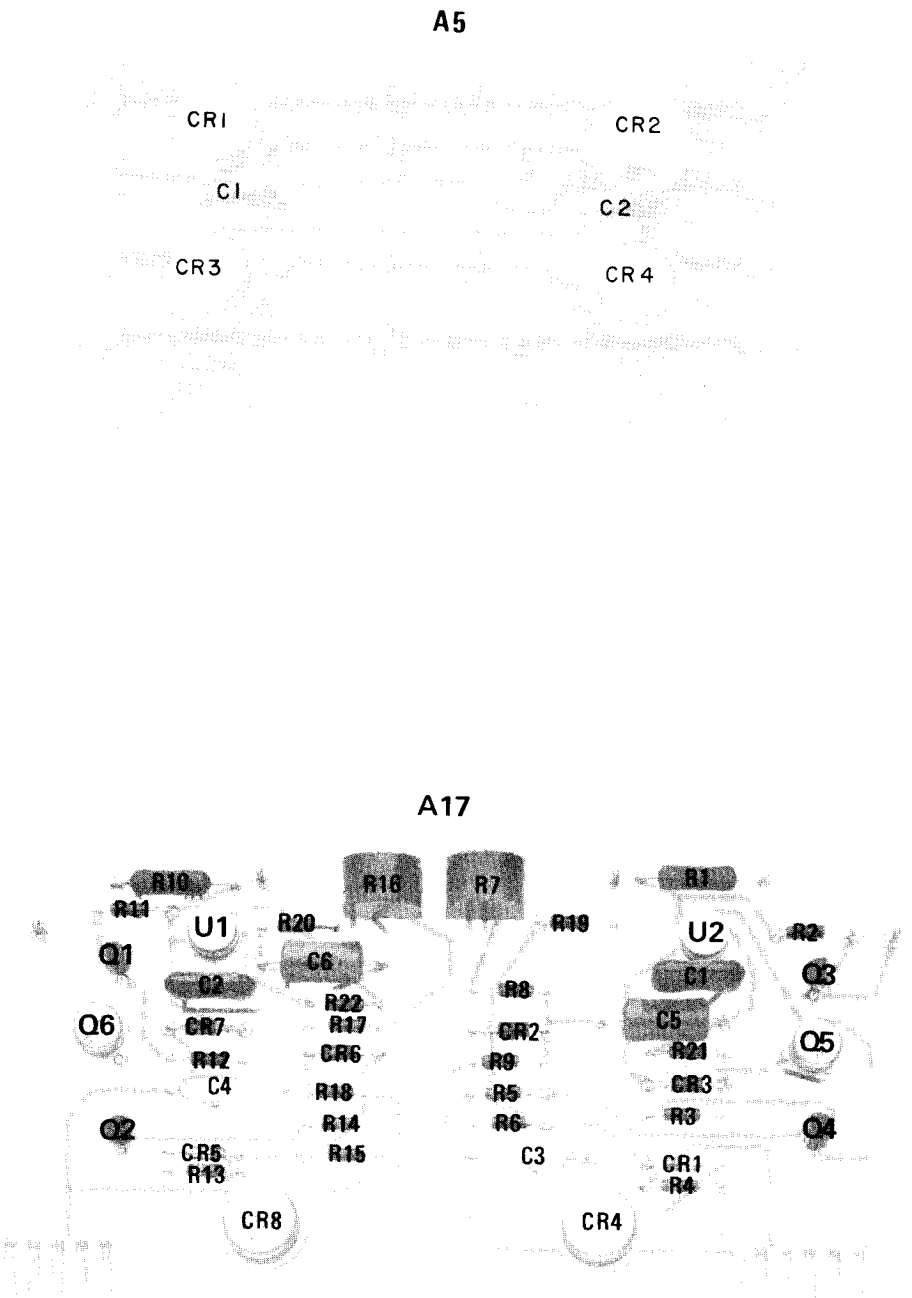
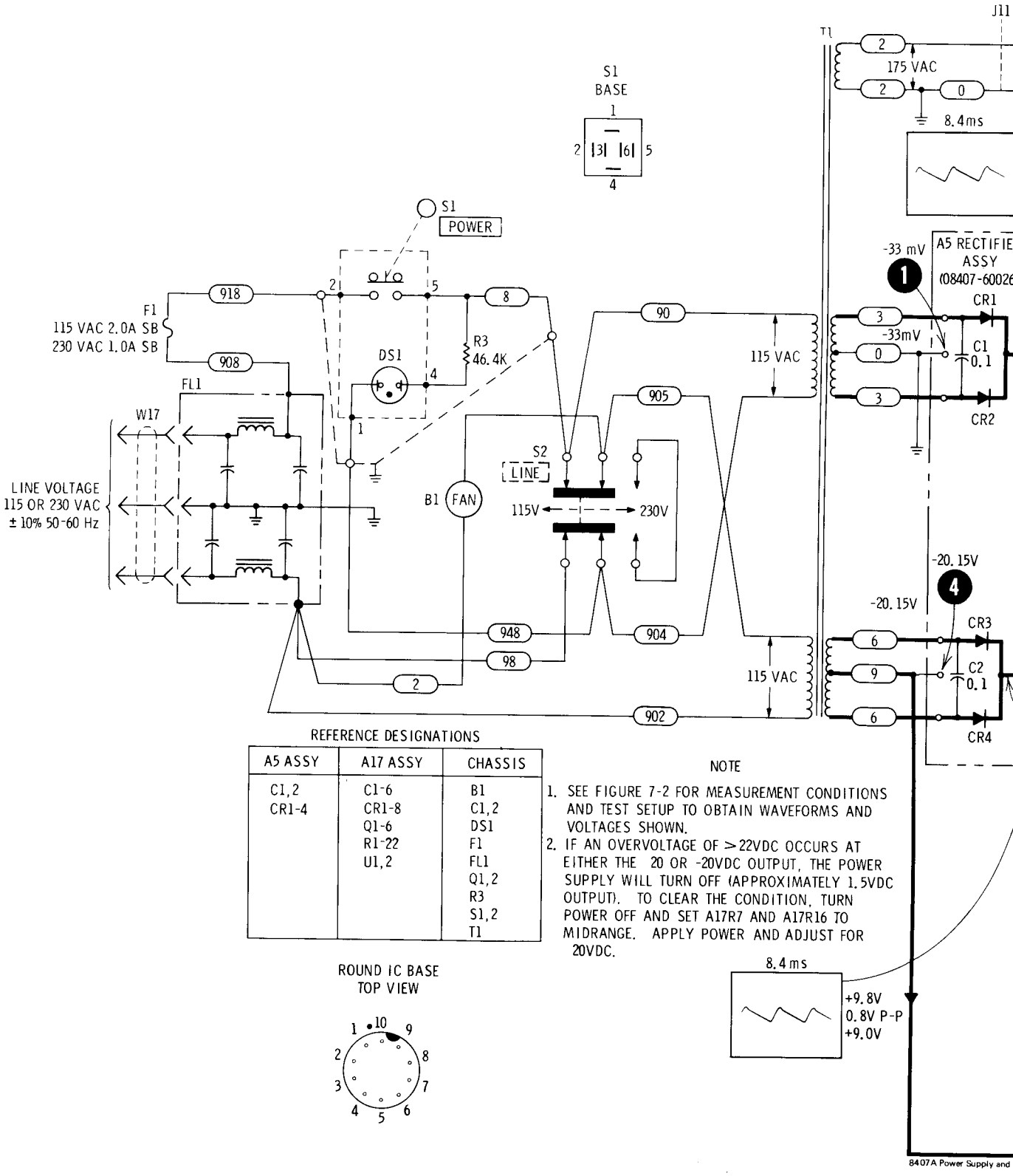


Figure 7-34. Parts Location for Diode Board A5 and Power Supply A17



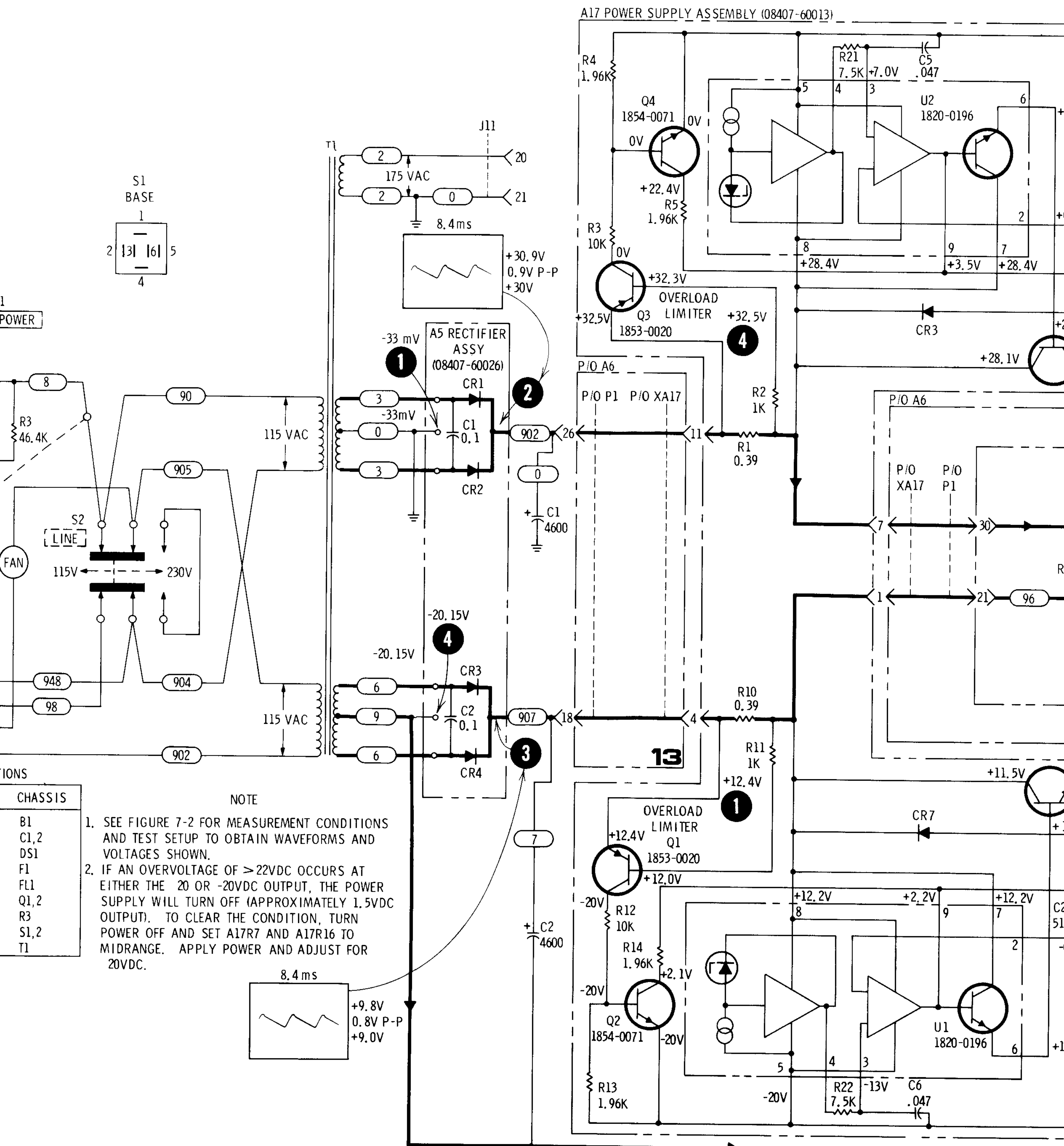
REFERENCE DESIGNATIONS

A5 ASSY	A17 ASSY	CHASSIS
C1,2	C1-6	B1
CR1-4	CR1-8	C1,2
	Q1-6	DS1
	R1-22	F1
	U1,2	FL1
		Q1,2
		R3
		S1,2
		T1

NOTE

1. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.
2. IF AN OVERVOLTAGE OF >22VDC OCCURS AT EITHER THE 20 OR -20VDC OUTPUT, THE POWER SUPPLY WILL TURN OFF (APPROXIMATELY 1.5VDC OUTPUT). TO CLEAR THE CONDITION, TURN POWER OFF AND SET A17R7 AND A17R16 TO MIDRANGE. APPLY POWER AND ADJUST FOR 20VDC.

ROUND IC BASE
TOP VIEW



NOTE

1. SEE FIGURE 7-2 FOR MEASUREMENT CONDITIONS AND TEST SETUP TO OBTAIN WAVEFORMS AND VOLTAGES SHOWN.
2. IF AN OVERVOLTAGE OF >22VDC OCCURS AT EITHER THE 20 OR -20VDC OUTPUT, THE POWER SUPPLY WILL TURN OFF (APPROXIMATELY 1.5VDC OUTPUT). TO CLEAR THE CONDITION, TURN POWER OFF AND SET A17R7 AND A17R16 TO MIDRANGE. APPLY POWER AND ADJUST FOR 20VDC.

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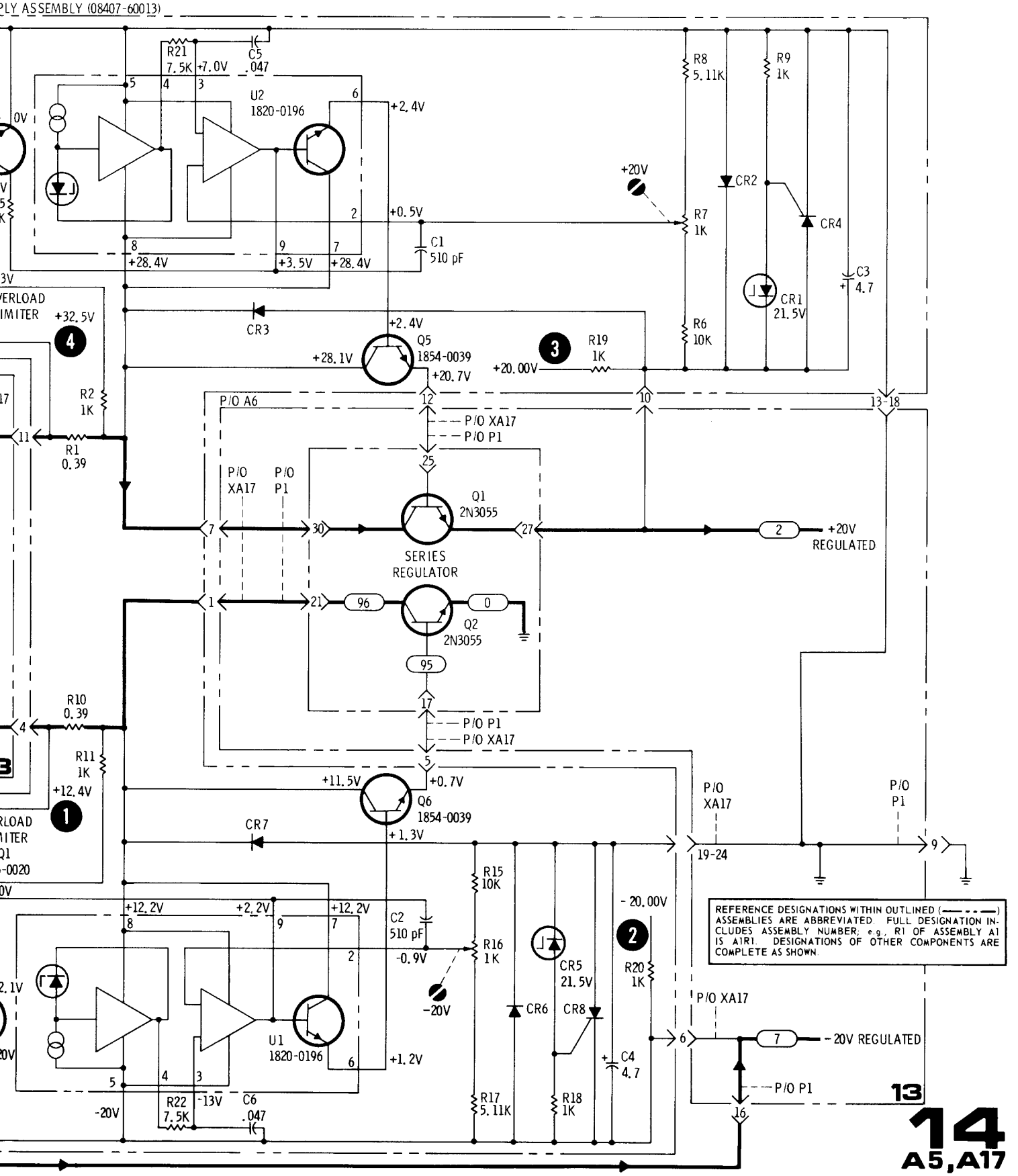


Figure 7-35. Power Supply A17 and Diode Board A5, Schematic Diagram

APPENDIX I

MANUAL CHANGES

I-1. INTRODUCTION

I-2. To adapt this manual to instruments with serial numbers listed in the table below, make the indicated manual changes.

I-3. Information for adapting this manual to instruments with serial numbers not listed in the table below may be included in a yellow MANUAL CHANGES insert supplied with this manual. Information about serial numbers not covered in any of these ways can be obtained from the nearest Hewlett-Packard office.

Serial Prefix or Number	Make Manual Changes
924-00101 thru 924-00110	A thru M
924-00111 thru 924-00130	A thru L
944-00131 thru 944-00150	A thru K
948-00151 thru 948-00165	A thru J
948-00166 thru 948-00175	A thru I
959-00176 thru 959-00245	A thru H
965-00246 thru 965-00315	A thru G

Serial Prefix or Number	Make Manual Changes
972-00316 thru 972-00385	A thru F
983-00386 thru 938-00445	A thru E
1103A00446 thru 1103A00505	A thru D
1103A00506 thru 1103A00555	A, B, C
1103A00556 thru 1103A00580	A, B
1103A00581 thru 1103A00605	A
1141A	No change

CHANGE A:

Page 6-14, Table 6-1:
Change A14C26 to HP Part No. 0140-0197, C: FXD, 180 pF 300 VDCW
Delete A14C39
Delete A14L12
Change A14R21 to HP Part No. 0698-7260, R: FXD, 10K OHM 2%
Delete A14R55

CHANGE A (cont'd)

Page 7-15, Figure 7-15:

Change A14C26 to 180 pF
Delete A14C39
Delete A14L12 and jumper across connections
Change A14R21 to 10K ohm
Delete A14R55 and jumper across connections.

Page 7-15, Figure 7-14:

Replace Figure 7-14 in Section VII of Manual with Figure 7-14 (Change A) in this Appendix.

CHANGE B

Page 6-2, Table 6-1:
Change A2R3 to HP Part No. 0698-3132, R: FXD 261 OHM 1% 1/8W. Recommended replacement is 0698-3443, 287 OHM.

Page 6-3. Table 6-1:
Change A3C28 to HP Part No. 0160-2208, C: FXD, 330 PF 300V. Recommended replacement is 0140-0210, 270 PF.

Page 7-17, Figure 7-17:
Change A3C28 to 330 pF.

Page 7-31, Figure 7-31:
Change A2R3 to 261 OHMS.

CHANGE C

Page 6-8, Table 6-1:
Change A5C1 and A5C2 to HP Part No. 0160-2930, C: FXD CER 0.01 UF +80 −20% 100 VDCW. Recommended replacement is 0160-0168, 0.1 UF.

Page 6-11, Table 6-1
Add under A10U1 Part No. 1200-0195, SOCKET: INTEGRATED CIRCUIT. It is recommended that this socket be removed for better reliability.

Page 7-35, Figure 7-35:
Change A5C1 and C2 to 0.01 UF.

CHANGE D

Page 6-5, Table 6-1:
Change A3Z1, Z2 and Z3 to HP Part No. 9170-0016. Recommended replacement is 9170-0847.

Page 6-6, Table 6-1:
Change A4Z1, Z2, Z3 and Z4 to HP Part No. 9170-0016. Recommended replacement is 9170-0847.

Page 6-13, Table 6-1:
Change A13Z1, Z2, Z3 and Z4 to HP Part No. 9170-0016. Recommended replacement is 9170-0847.

Page 6-15, Table 6-1:
Change A14Z1 to HP Part No. 9170-0016. Recommended replacement is 9170-0847.

Page 6-17, Table 6-1:
Change A16Z1, Z2, Z3 and Z4 to HP Part No. 9170-0016. Recommended replacement is 9170-0847.

CHANGE E

Page 6-9, Table 6-1:
Change A8C12 and A8C13 to HP Part No. 0180-1746, C: FXD ELECT 15 UF 10%, 20 VDCW.
Add A8C18, HP Part No. 0160-2667, C: FXD 36 PF 500 VDCW.
Change A8R4 to HP Part No. 0698-3150 R: FXD MET FLM 2.37K OHM 1% 1/8W.

Change A8R20 to HP Part No. 0757-0290 R: FXD MET FLM 6.19K OHM 1% 1/8W, FACTORY SELECTED.

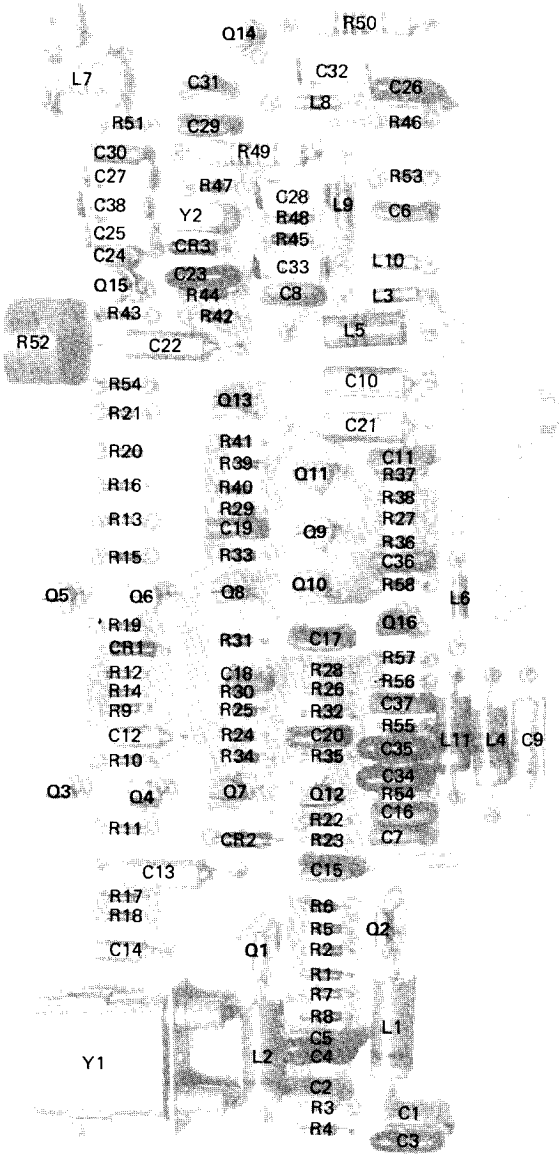


Figure 7-14. Parts Location for Phase-Locked Oscillator A14 (Change A, Serial No. 983-00446 thru 1103A00605)

CHANGE E (cont'd)

Page 6-9, Table 6-1 (cont'd):
Delete A8R27.

Page 6-11, Table 6-1:
Change A11C12 and A11C13 to HP Part No. 0180-1746, C: FXD ELECT 15 UF 10% 20 VDCW.

Page 6-12, Table 6-1:
Delete A11R29.
Change A11T1 to HP Part No. 9100-2854.

Page 6-13, Table 6-1:
Change A13R28 to HP Part No. 0757-0416, R: FXD MET FLM 511 OHM 1% 1/8W. Recommended replacement is 0757-0401, 100 OHMS.

Page 6-14, Table 6-1:
Change A14C25 to HP Part No. 0160-2255, C: FXD CER 8.2 ±0.25 PF 500 VDCW.
Delete A14C34-A14C38.
Delete A14L11.
Delete A14Q16.

Page 6-15, Table 6-1:
Delete A14R56 – A14R60.

Page 6-17, Table 6-1:
Change A17CR4 and CR8 to HP Part No. 1884-0073. Recommended replacement is 1884-0012.
Change A17R1 and R10 to HP Part No. 0812-0017, R: FXD WW 0.25 OHMS 5%, 3W.

Page 7-13, Figure 7-13:
Change A13R28 to 511 OHMS.

Page 7-15, Figures 7-14 and 7-15:
Replace Figure 7-14 and Figure 7-15 in Section VII of Manual with Figures 7-14 and 7-15 (Change E) in this Appendix.

Page 7-19, Figure 7-19:
Change A11C12 and A11C13 to 15 UF.
Delete A11R29.

Page 7-27, Figure 7-27:
Change A8C12 and A8C13 to 15 UF;
Change A8R4 to 2370 OHM.
Change A8R20 to 6190 OHMS, FACTORY SELECTED.
Delete A8C18 and connect A8R27, a 10 ohm resistor, in its place.

Page 7-35, Figure 7-35:
Change A17R1 and A17R10 to 0.25 OHMS.

CHANGE F

Page 6-7, Table 6-1:
Change A7C25 to HP Part No. 0160-2250, C: FXD CER 5.1—0.25 PF 500 VDCW.
Delete A7C30—A7C33.
Change A7K1—A7K4 to HP Part No. 0490-0760, RELAY: REED 0.1 AMP MAX. 250V MIN. Recommended replacement is 0490-0884.

Page 7-29, Figures 7-28 and 7-29:
Replace Figure 7-28 and Figure 7-29 in Section VII of Manual with Figures 7-28 and 7-29 (Change F) in this Appendix.

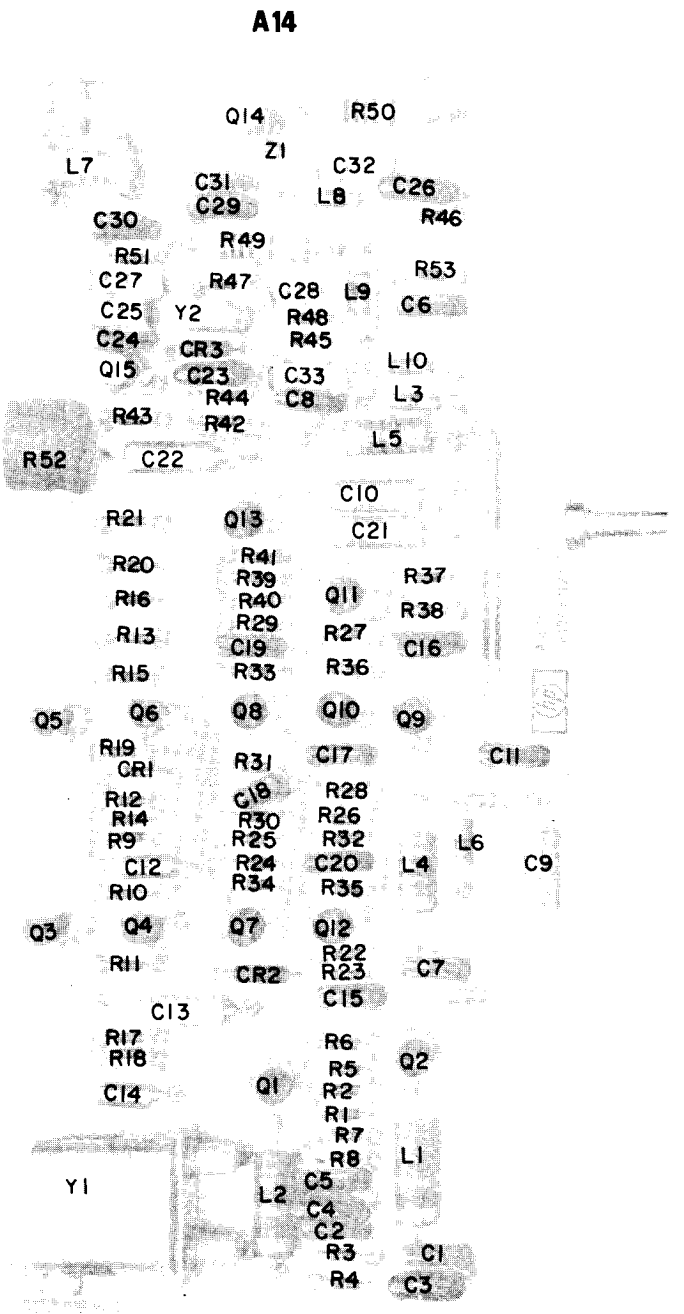


Figure 7-14. Parts Location for Phase-Locked Oscillator A14 (Change E, Serial No. 948-00176 thru 983-00445)

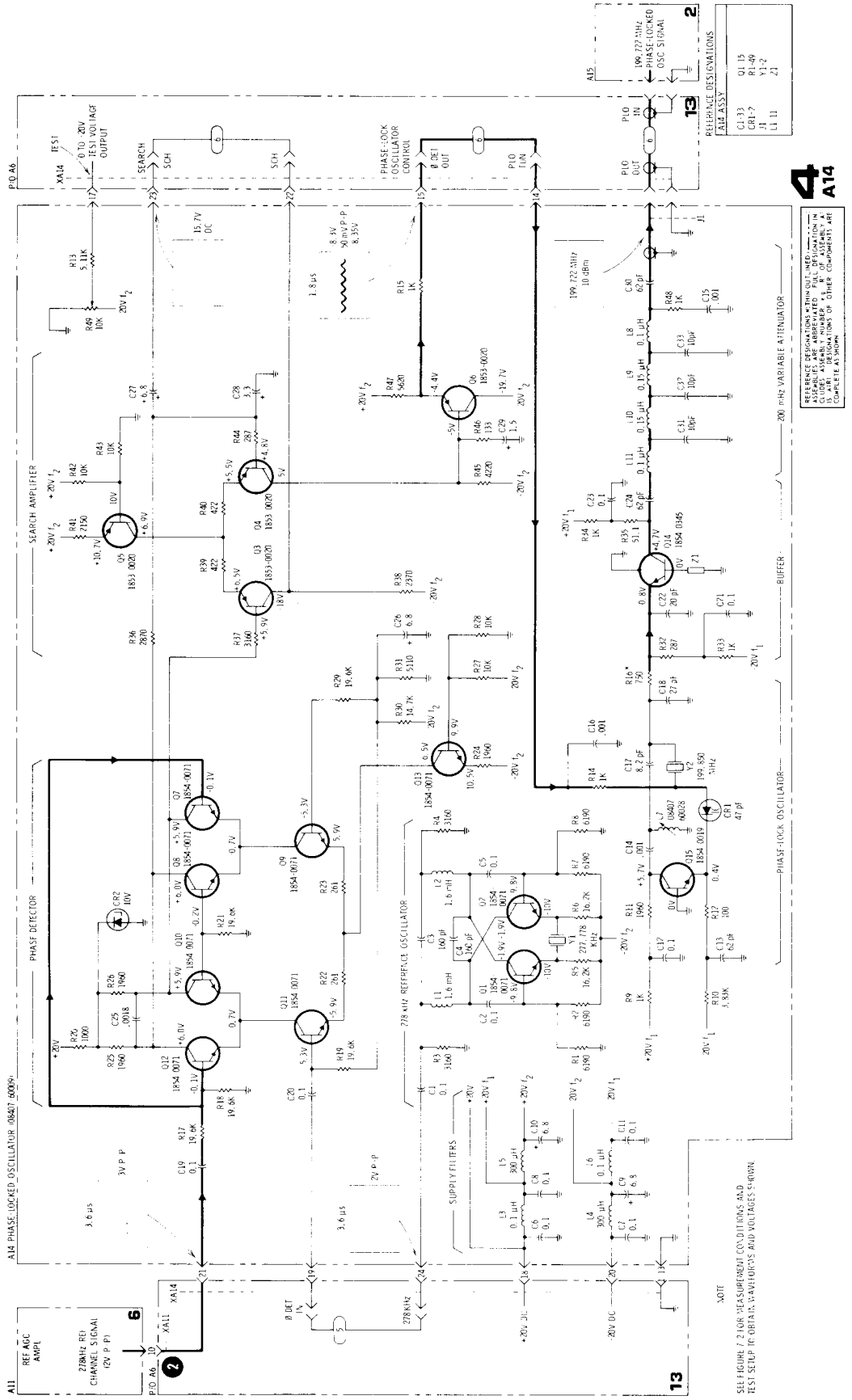


Figure 7-15. Phase-Locked Oscillator A14, Schematic (Change E, Serial No. 948-00176 thru 983-00445)

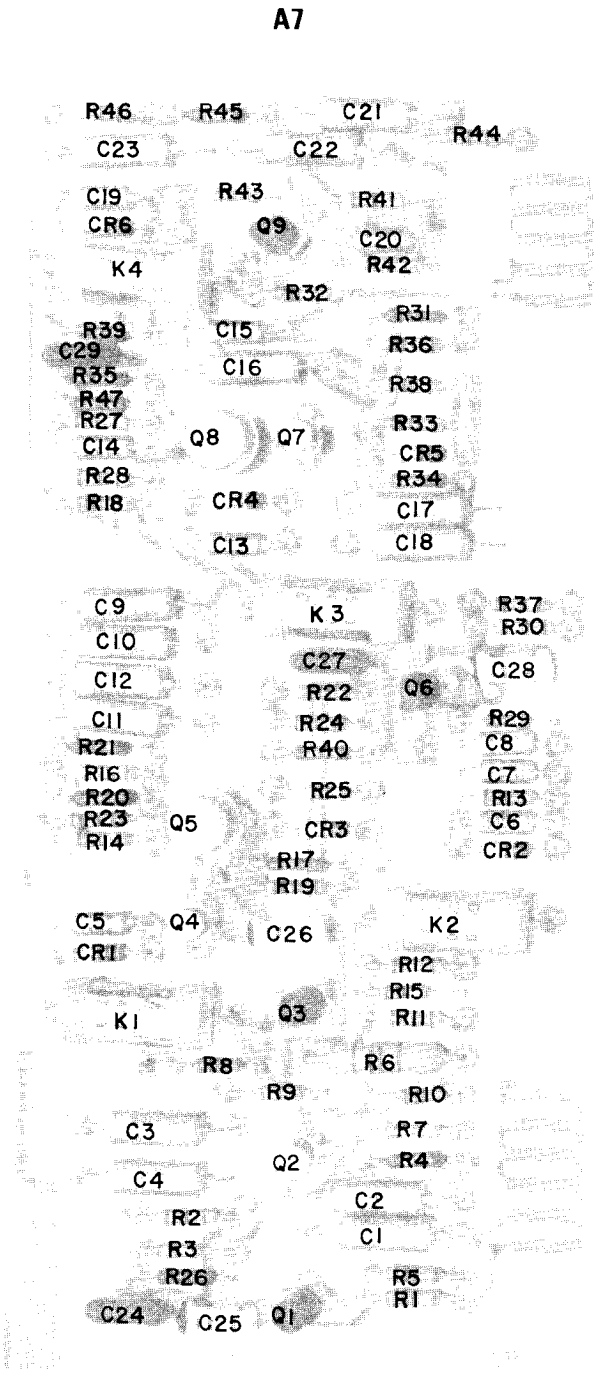


Figure 7-28. Parts Location for Programmable IF Attenuator A7 (Change F, Serial No. 972-00385 and Below)

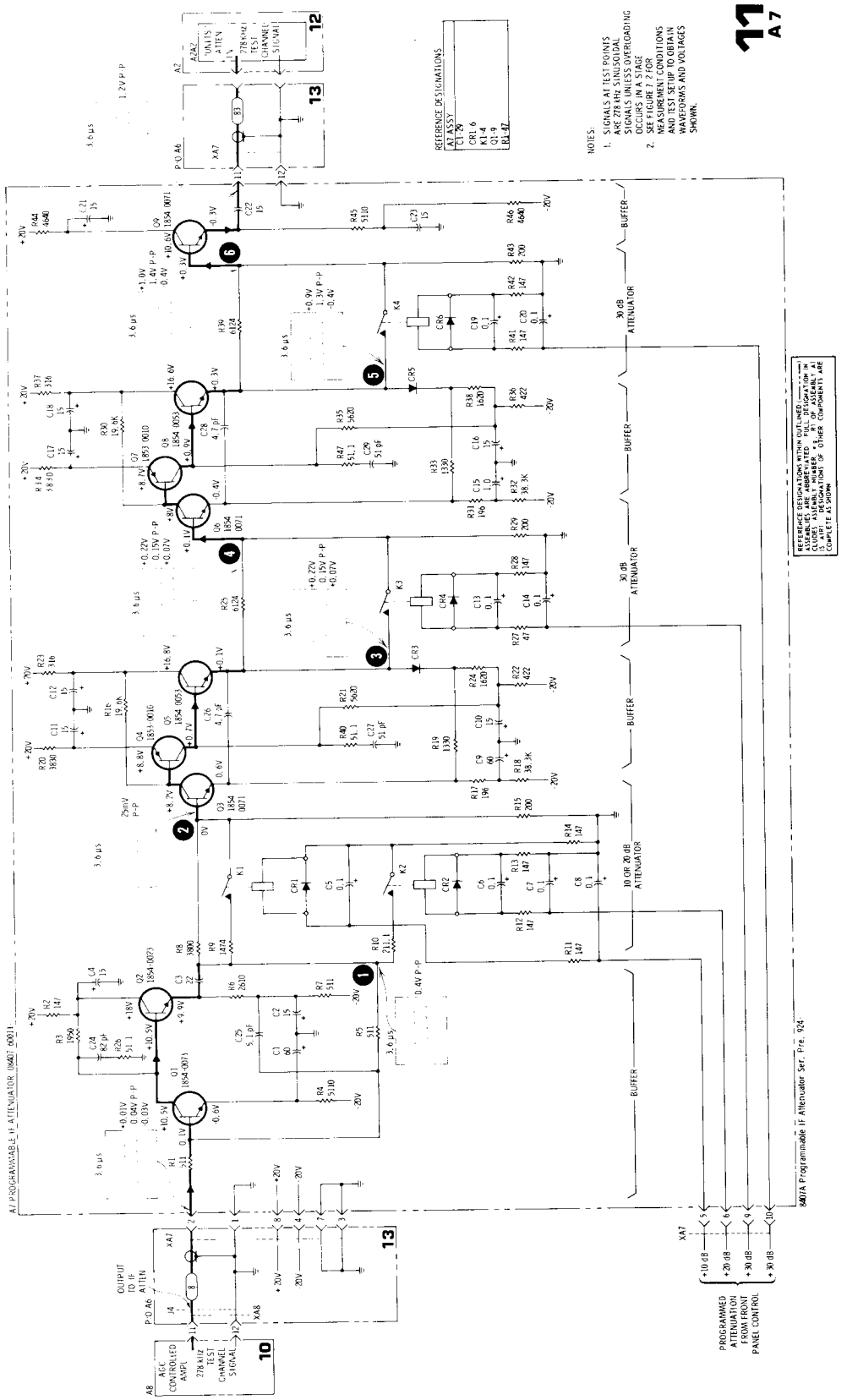


Figure 7-29. Programmable IF Attenuator A7, Schematic (Change F, Serial No. 972-00385 and Below)

CHANGE G

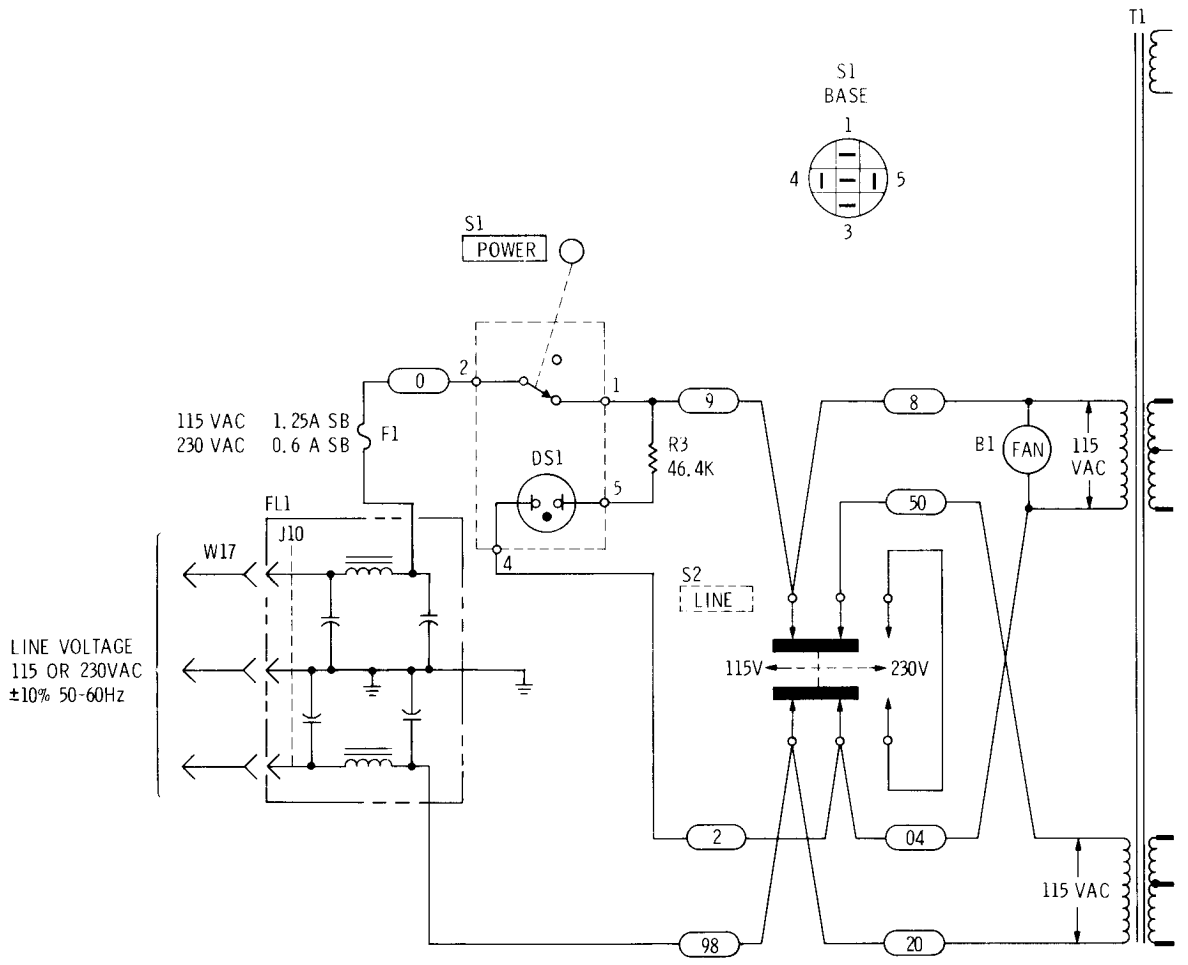
Page 6-18, Table 6-1:
Change FL1 to HP Part No. 9100-2586.
Change W2 to HP Part No. 08407-60059.
Change W17 to HP Part No. 08407-60059.
Change S1 to HP Part No. 3101-0100.

Page 6-19, Table 6-1:

Change CABINET PART, Item 12 to:

12 08407-00002 PANEL: REAR
12 08407-60056 PANEL ASSY: REAR

Page 7-35, Figure 7-35:
Change power supply schematic in manual, Section VII, per the attached partial schematic.



Part of Figure 7-35. Power Supply A17 and Diode Board A5, Schematic (Change G, Serial No. 965-00315 and Below)

CHANGE H

Page 6-9, Table 6-1:
Change A8C17 to HP Part No. 0160-0174, C: FXD CER 0.47 UF +80 −20% 25VDCW.
Delete A8C18 .

Page 6-17, Table 6-1:
Delete A17C5 and A17C6.
Delete A17R19 and A17R20

Page 6-18, Table 6-1:
Delete A17R21 and A17R22.

Page 7-19, Figure 7-19:
Replace Figure 7-19 in Section VII of Manual with Figure 7-19 (Change H) in this Appendix.

Page 7-27, Figure 7-27:
Replace Figure 7-27 in Section VII of Manual with Figure 7-27 (Change H) in this Appendix.

Page 7-35, Figures 7-34 and 7-35:
Replace Figures 7-34 and 7-35 in Section VII of manual with Figures 7-34 and 7-35 (Change H) in this Appendix.

CHANGE I

Page 5-19, Table 5-5, under "Align Test (Table 5-5)" Change:

4	A14R16 (Selected value)	PLO OUTPUT	Adjusts PLO output level.

Page 6-13, Table 6-1:
Change A14 to HP Part No. 08407-60009 and also change all of the associated A14 board components per the attached parts list. If it is necessary to replace A14, it should be replaced with HP Part No. 08407-60123 or 08407-60107 (rebuilt). At the same time A13 must be replaced with 08407-60002 or 08407-60102 (rebuilt).

Page 7-15, Figures 7-14 and 7-15:
Change parts location photo and circuit board schematic of A14 per attached Figures 7-14 and 7-15.

CHANGE J

Page 7-33, Figure 7-33:
Connect together to a single ground XA8A pins 1, 3, and 6, and XA11A pin 3.

CHANGE K

Page 6-12, Table 6-1:
Change A13L4 to HP Part No. 9100-1623, COIL/CHOKE 27 UH 5%. Recommended Replacement is 9140-0237, 200 UH.
Change A13L5 to HP Part No. 9100-1627, COIL/CHOKE 39 UH 5%. Recommended Replacement is 9100-1646, 430 UH.

Page 7-13, Figure 7-13:
Change A13L4 to 27 UH
Change A13L5 to 39 UH.

CHANGE L

Page 6-12, Table 6-1:
Change A13 to HP Part No. 08407-60003 and also change all of the associated A13 board components per the attached parts list. If it is necessary to replace A13, it should be replaced with HP Part No. 08407-60002 or 08407-60102 (rebuilt). At the same time A14 must be replaced with 08407-60123 or 08407-60107 (rebuilt).

On A14 Parts List included with this appendix:
Add A14CR3, 4, and 5, HP Part No. 0122-0201, C: VOLTAGE VAR 15 pF 10% 30WV.
Delete A14C31, 32, and 33.
Change A14R16 to HP Part No. 0698-7224, R: FXD FLM 316 OHM 2% 1/8W.

Page 7-13, Figures 7-12 and 7-13:
Change parts location photo and circuit board schematic of A13 per attached Figure 7-12 and 7-13.

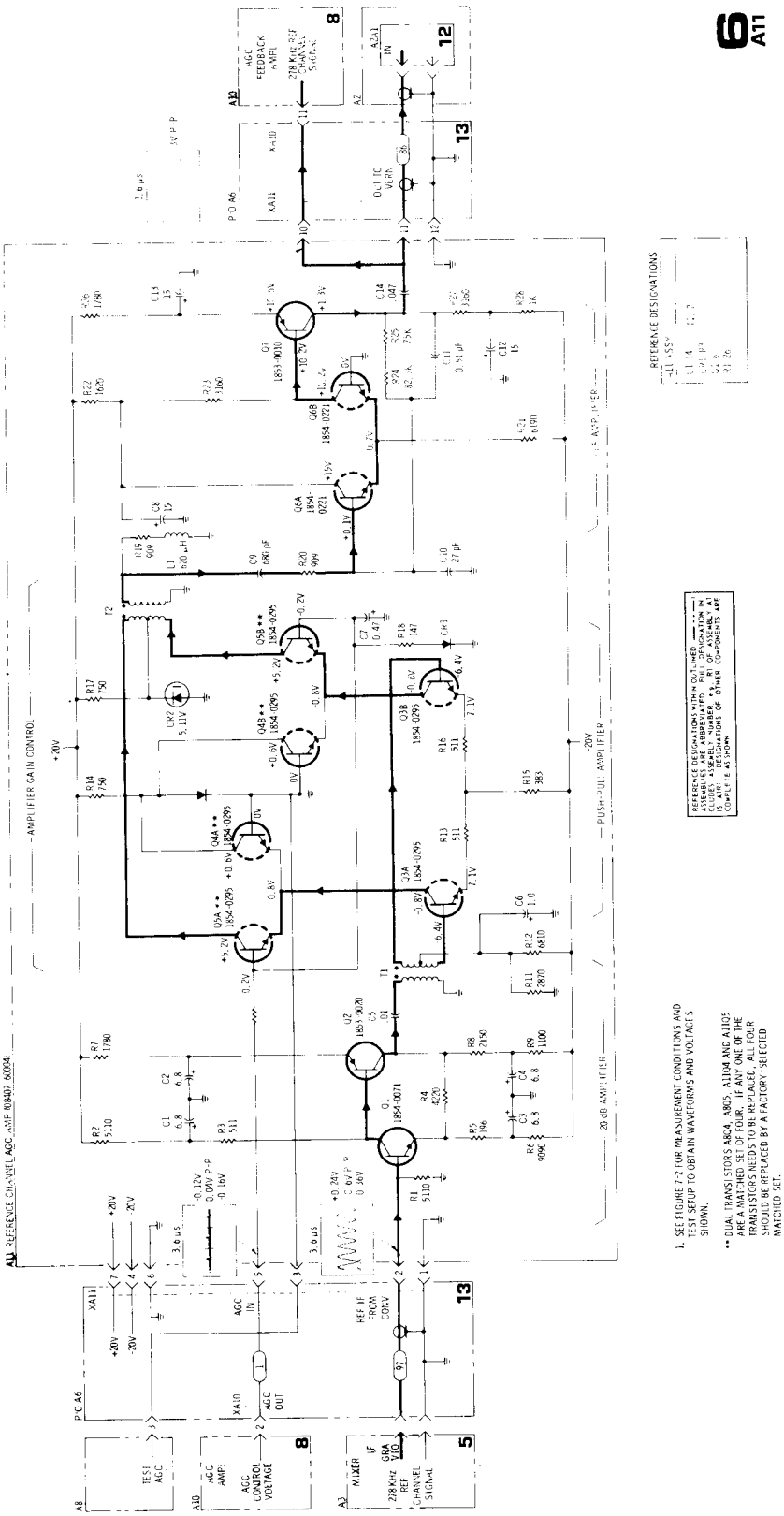


Figure 7-19. Reference Channel AGC Amplifier A11, Schematic (Change H, Serial No. 959-00245 and Below)

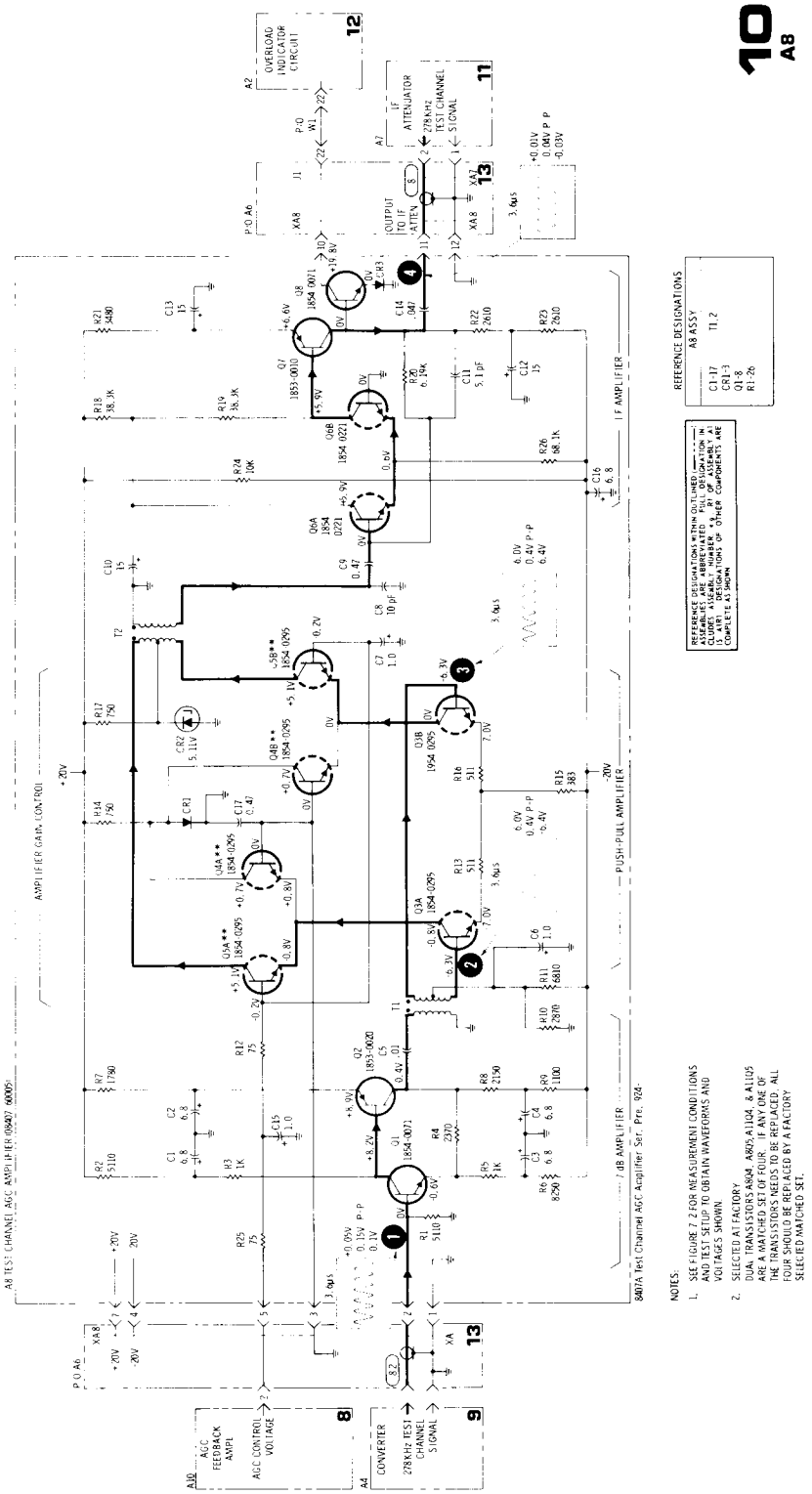


Figure 7-27. Test Channel AGC Amplifier A8, Schematic (Change H, Serial No. 959-00245 and Below)

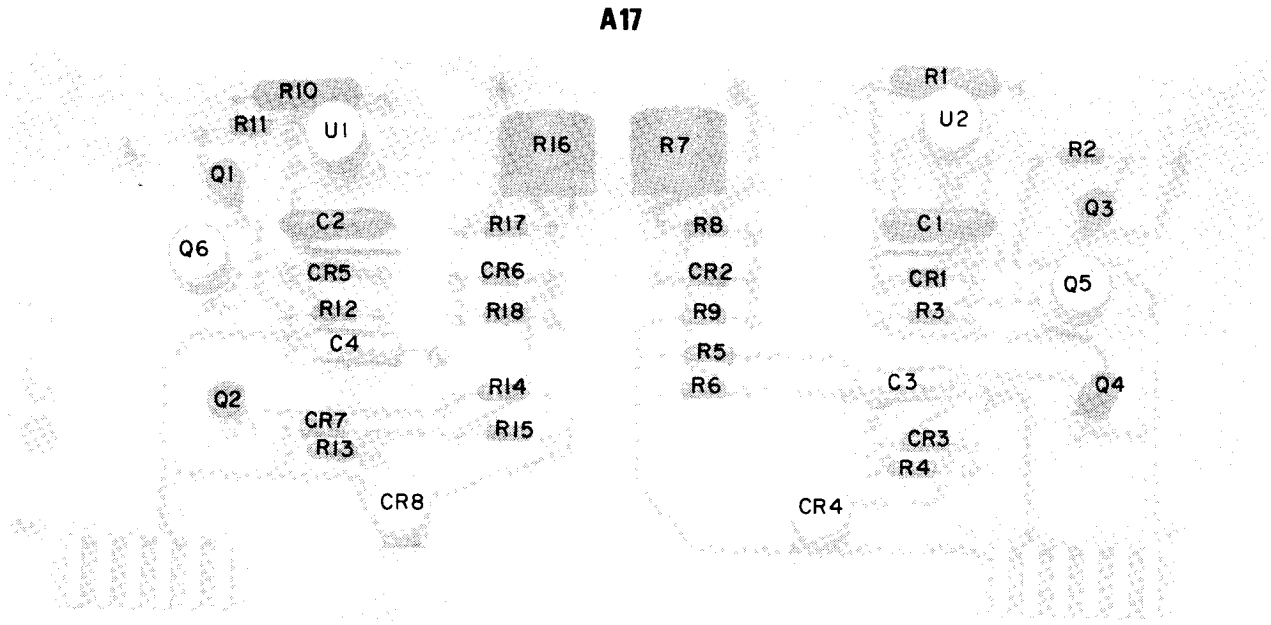


Figure 7-34. Parts Location for Diode Board A5 and Power Supply A17 (Change H, Serial No. 959-00245 and Below)

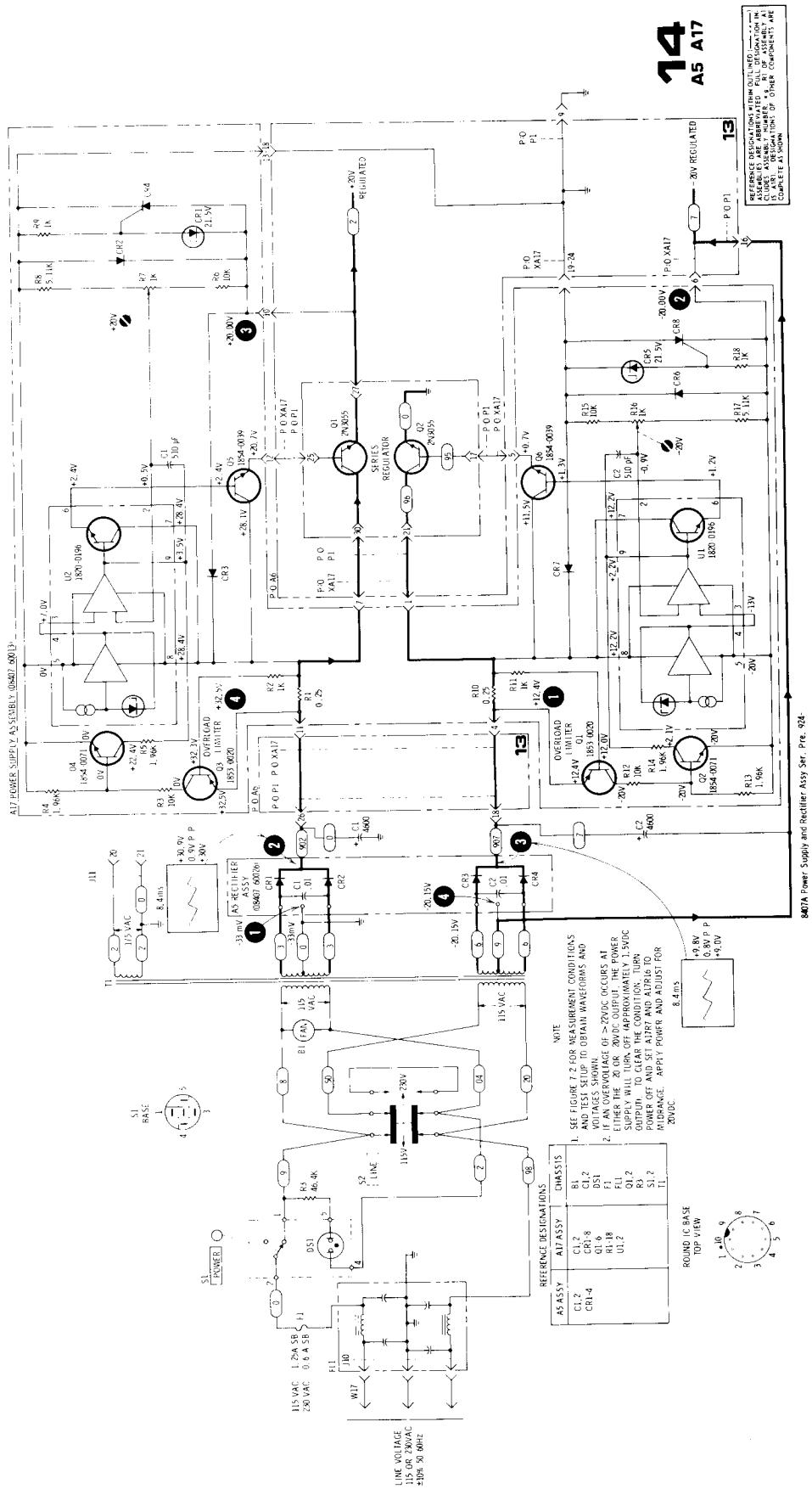


Figure 7-35. Power Supply A17,and Diode Board A5, Schematic (Change H, Serial No. 959-00245 and Below)

Table 6-1. Parts List for A13 in instruments with serial number 924-00130 and below; and A14 in instruments with serial number 948-00175 and below.

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13	08407-60003	1	ALC AMPLIFIER ASSY RECOMMENDED REPLACEMENT IS 08407-60002 OR 08407-60102(REBUILT). AT THE SAME TIME A14 MUST BE REPLACED WITH 08407-60123 OR 08407-60107(REBUILT)	28480	08407-60003
A13	08407-60102	1	REBUILT EXCHANGE ASSY	28480	08407-60102
A13C1	0180-0291	5	C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C2	0160-0174	5	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A13C3	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A13C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C5	0160-3060	16	C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C7	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A13C8	0160-0157	1	C:FXD MY 0.0047 UF 10% 200VDCW	56289	192P47292-PTS
A13C9	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A13C10	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C11	0160-0164	1	C:FXD MY 0.039 UF 10% 200VDCW	56289	192P39392-PTS
A13C12	0160-0156	1	C:FXD MY 0.0039 UF 10% 200VDCW	56289	192P39292-PTS
A13C13	0160-0301	1	C:FXD MY 0.012 UF 10% 200VDCW	56289	192P12392-PTS
A13C14	0160-0158	1	C:FXD MY 0.0056 UF 10% 200VDCW	56289	192P56292-PTS
A13C15	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C16	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C1187S-CML
A13C17	0180-1743	1	C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A13C18	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13C19	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A13C20	0170-0040	1	C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A13C21	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A13CR1	1901-0025	2	DIODE:SILICON 100MA/1V	07263	FD 2387
A13CR2	1901-0347	1	DIODE:SILICON 8V	28480	1901-0347
A13CR3	1902-3002	1	DIODE BREAKDOWN:2.37V 5%	28480	1902-3002
A13CR4	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A13CR5	1902-0064	1	DIODE BREAKDOWN:7.5V	28480	1902-0064
A13L1	9140-0096	2	COIL/CHOKE 1.00 UH 10%	99800	1537-12
A13L2	9140-0096		COIL/CHOKE 1.00 UH 10%	99800	1537-12
A13L3	9100-1612	1	COIL:FXD RF 0.33 UH 20%	28480	9100-1612
A13L4	9100-1623	1	COIL/CHOKE 27.0 UH 5%	99800	1537-48
A13L5	9100-1627	1	COIL/CHOKE 39 UH 5%	82142	15-1315-2J
A13Q1	1854-0345	4	TSTR:SI NPN	80131	2N5179
A13Q2	1854-0345		TSTR:SI NPN	80131	2N5179
A13Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A13Q4	1853-0018	1	TSTR:SI PNP(SELECTED FROM 2N4260)	28480	1853-0018
A13Q5	1853-0020	7	TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A13Q6	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A13Q7	1854-0071	10	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A13Q8	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A13R1	0757-0346	1	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A13R2	0757-0316	1	R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A13R3	0757-0422	1	R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A13R4	0698-3102	2	R:FXD MET FLM 237 OHM 1% 1/2W	28480	0698-3102
A13R5	0698-3447	1	R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A13R6	0683-1025	1	R:FXD COMP 1000 OHM 5% 1/4W	01121	CB 1025
A13R7	0698-3102		R:FXD MET FLM 237 OHM 1% 1/2W	28480	0698-3102
A13R8	0698-0084	2	R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A13R9	0698-3432	2	R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A13R10	0757-0280	2	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A13R11	0698-3432		R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A13R12	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A13R13	0757-0400	2	R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A13R14	0757-0400		R:FXD MET FLM 90.9 OHM 1% 1/8W	28480	0757-0400
A13R15	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A13R16	0757-0279	2	R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A13R17	0757-0416	1	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A13R18	0757-0401	1	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A13R19	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A13R20	0698-3434	3	R:FXD MET FLM 34.8 OHM 1% 1/8W	28480	0698-3434
A13R21	0698-3434		R:FXD MET FLM 34.8 OHM 1% 1/8W	28480	0698-3434
A13R22	0698-3434		R:FXD MET FLM 34.8 OHM 1% 1/8W	28480	0698-3434
A13R23	0698-3153	1	R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A13R24	0757-0421	1	R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A13R25	0698-3155	1	R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A13R26	0698-3446	1	R:FXD MET FLM 383 OHM 1% 1/8W	28480	0698-3446
A13R27	2100-1757	1	R:VAR WW 500 OHM 5% TYPE V 1W	28480	2100-1757
A13R28	0757-0442	1	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A13R29	0757-0438	1	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A13R30	0757-0420	1	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420

See introduction to this section for ordering information

Table 6-1. Parts List for A13 in instruments with serial number 924-00130 and below; and A14 in instruments with serial number 948-00175 and below.

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A13R31	0757-0278	1	R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A13R32	0698-0083	2	R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A13R33	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A13R34	0698-4037	2	R:FXD MET FLM 46.4 OHM 1% 1/8W	28480	0698-4037
A13R35	0698-4037		R:FXD MET FLM 46.4 OHM 1% 1/8W	28480	0698-4037
A13Z1	9170-0016	2	BEAD:MAGNETIC SHIELDING	02114	56-590-65/38
A14	08407-60009	1	BOARD ASSY:PHASE-LOCKED OSCILLATOR RECOMMENDED REPLACEMENT IS 08407-60123 OR 08407-60107(REBUILT). AT THE SAME TIME A13 MUST BE REPLACED WITH 08407-60002 OR 08407-60102(REBUILT)	28480	08407-60009
A14	08407-60107	1	REBUILT 08407-60123,REQUIRES EXCHANGE	28480	08407-60107
A14C1	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C2	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C3	0160-2206	2	C:FXD MICA 160 PF 5%	28480	0160-2206
A14C4	0160-2206		C:FXD MICA 160 PF 5%	28480	0160-2206
A14C5	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C6	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C7	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C8	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C9	0180-0116	4	C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C10	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C11	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C12	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C13	0160-2016	3	C:FXD MICA 62 PF 5% 500VDCW.	00853	RDM15E620J5S
A14C14	0150-0050	3	C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14C15	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14C16	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14C17	0160-2255	1	C:FXD CER 8.2 PF 500VDCW	72982	301-000-COHO-829C
A14C18	0150-0115	1	C:FXD CER 27 PF 10% 500VDCW	72982	301-000-U2J0-270K
A14C19	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C20	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C21	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C22	0160-2264	1	C:FXD CER 20 PF 5% 500VDCW	72982	301-000-COGO-200J
A14C23	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A14C24	0160-2016		C:FXD MICA 62 PF 5% 500VDCW	00853	RDM15E620J5S
A14C25	0160-0299	1	C:FXD MY 1800 PF 10% 200VDCW	56289	192P18292-PTS
A14C26	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C27	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A14C28	0180-2141	1	C:FXD ELECT 3.3 UF 10% 50VDCW	56289	150D335X9050B2-DYS
A14C29	0180-1745	1	C:FXD ELECT 1.5 UF 10% 20VDCW	28480	0180-1745
A14C30	0160-2016		C:FXD MICA 62 PF 5% 500VDCW	00853	RDM15E620J5S
A14CR1	0122-0263	1	C:VOLTAGE VAR 47 PF 10% 60WV	04713	1N5148
A14CR2	1902-0025	1	DIODE,BREAKDOWN:10.0V 5% 400 MW	28480	1902-0025
A14CR3	0122-0201	19	C:VOLTAGE VAR 15 PF 10% 30WV	04713	SMV315-201
A14CR4	0122-0201		C:VOLTAGE VAR 15 PF 10% 30WV	04713	SMV315-201
A14CR5	0122-0201		C:VOLTAGE VAR 15 PF 10% 30WV	04713	SMV315-201
A14J1	1250-1205	1	CONNECTOR:PC RT ANGLE	28480	1250-1205
A14L1	9100-1658	2	COIL/CHOKE 1600 UH 5%	99800	2500-38
A14L2	9100-1658		COIL/CHOKE 1600 UH 5%	99800	2500-38
A14L3	9100-2247	4	COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L4	9100-1643	2	COIL/CHOKE 300 UH 5%	28480	9100-1643
A14L5	9100-1643		COIL/CHOKE 300 UH 5%	28480	9100-1643
A14L6	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L7	08407-60028	1	COIL ASSY:ADJ	28480	08407-60028
A14L8	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14L9	9100-2249	2	COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A14L10	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A14L11	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q4	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q5	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q6	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A14Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q8	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q9	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q10	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q12	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q13	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A14Q14	1854-0431		TSTR:SI NPN	80131	2N5179
A14Q15	1854-0019	1	TSTR:SI NPN	28480	1854-0019
A14R1	0698-7255	4	R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255

See introduction to this section for ordering information

Table 6-1. Parts List for A13 in instruments with serial number 924-00130 and below; and A14 in instruments with serial number 948-00175 and below.

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14R2	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R3	0698-7248	3	R:FXD FLM 3.16K OHM 2% 1/8W	28480	0698-7248
A14R4	0698-7248		R:FXD FLM 3.16K OHM 2% 1/8W	28480	0698-7248
A14R5	0698-7265	2	R:FXD FLM 16.2K OHM 2% 1/8W	28480	0698-7265
A14R6	0698-7265		R:FXD FLM 16.2K OHM 2% 1/8W	28480	0698-7265
A14R7	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R8	0698-7255		R:FXD FLM 6.19K OHM 2% 1/8W	28480	0698-7255
A14R9	0698-7236	4	R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R10	0698-7250	1	R:FXD FLM 3.83K OHM 2% 1/8W	28480	0698-7250
A14R11	0698-7243	4	R:FXD FLM 1.96K OHM 2% 1/8W	28480	0698-7243
A14R12	0698-7212	1	R:FXD FLM 100 OHM 2% 1/8W	28480	0698-7212
A14R13	0698-7253	2	R:FXD MET FLM 5.11K OHM 2% 1/8W	28480	0698-7253
A14R14	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R15	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R16	0698-7233	1	R:FXD FLM 750 OHM 2% 1/8W	28480	0698-7233
A14R16			FACTORY SELECTED PART		
A14R17	0698-7267	5	R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R18	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R19	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R20	0757-0159	3	R:FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159
A14R21	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R22	0698-7222	2	R:FXD FLM 261 OHM 2% 1/8W	28480	0698-7222
A14R23	0698-7222		R:FXD FLM 261 OHM 2% 1/8W	28480	0698-7222
A14R24	0698-7243		R:FXD FLM 1.96K OHM 2% 1/8W	28480	0698-7243
A14R25	0698-7243		R:FXD FLM 1.96K OHM 2% 1/8W	28480	0698-7243
A14R26	0698-7243		R:FXD FLM 1.96K OHM 2% 1/8W	28480	0698-7243
A14R27	0698-7260	4	R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R28	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R29	0698-7267		R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A14R30	0698-7264	1	R:FXD FLM 14.7K OHM 2% 1/8W	28480	0698-7264
A14R31	0698-7253		R:FXD MET FLM 5.11K OHM 2% 1/8W	28480	0698-7253
A14R32	0698-7223	2	R:FXD FLM 287 OHM 2% 1/8W	28480	0698-7223
A14R33	0757-0159		R:FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159
A14R34	0757-0159		R:FXD MET FLM 1000 OHM 1% 1/2W	28480	0757-0159
A14R35	0698-7205	1	R:FXD FLM 51.1 OHM 2% 1/8W	28480	0698-7205
A14R36	0698-7247	1	R:FXD FLM 2.87K OHM 2% 1/8W	28480	0698-7247
A14R37	0698-7248		R:FXD FLM 3.16K OHM 2% 1/8W	28480	0698-7248
A14R38	0698-7245	1	R:FXD MET FLM 2.37K OHM 2% 1/8W	28480	0698-7245
A14R39	0698-7227	2	R:FXD FLM 422 OHM 2% 1/8W	28480	0698-7227
A14R40	0698-7227		R:FXD FLM 422 OHM 2% 1/8W	28480	0698-7227
A14R41	0698-7244	1	R:FXD FLM 2.15K OHM 2% 1/8W	28480	0698-7244
A14R42	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R43	0698-7260		R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A14R44	0698-7223		R:FXD FLM 287 OHM 2% 1/8W	28480	0698-7223
A14R45	0698-7251	1	R:FXD FLM 4.22K OHM 2% 1/8W	28480	0698-7251
A14R46	0698-7215	1	R:FXD FLM 133 OHM 2% 1/8W	28480	0698-7215
A14R47	0698-7254	1	R:FXD FLM 5.62K OHM 2% 1/8W	28480	0698-7254
A14R48	0698-7236		R:FXD FLM 1K OHM 2% 1/8W	28480	0698-7236
A14R49	2100-1761	1	R:VAR WW 10K OHM 5% TYPE V 1W	28480	2100-1761
A14XY1	1200-0770	1	SOCKET:CRYSTAL	91506	8000-AG-26
A14Y1	0410-0195	1	CRYSTAL:QUARTZ	28480	0410-0195
A14Y2	0410-0194	1	CRYSTAL:QUARTZ	28480	0410-0194
A14Z1	9170-0016		BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B

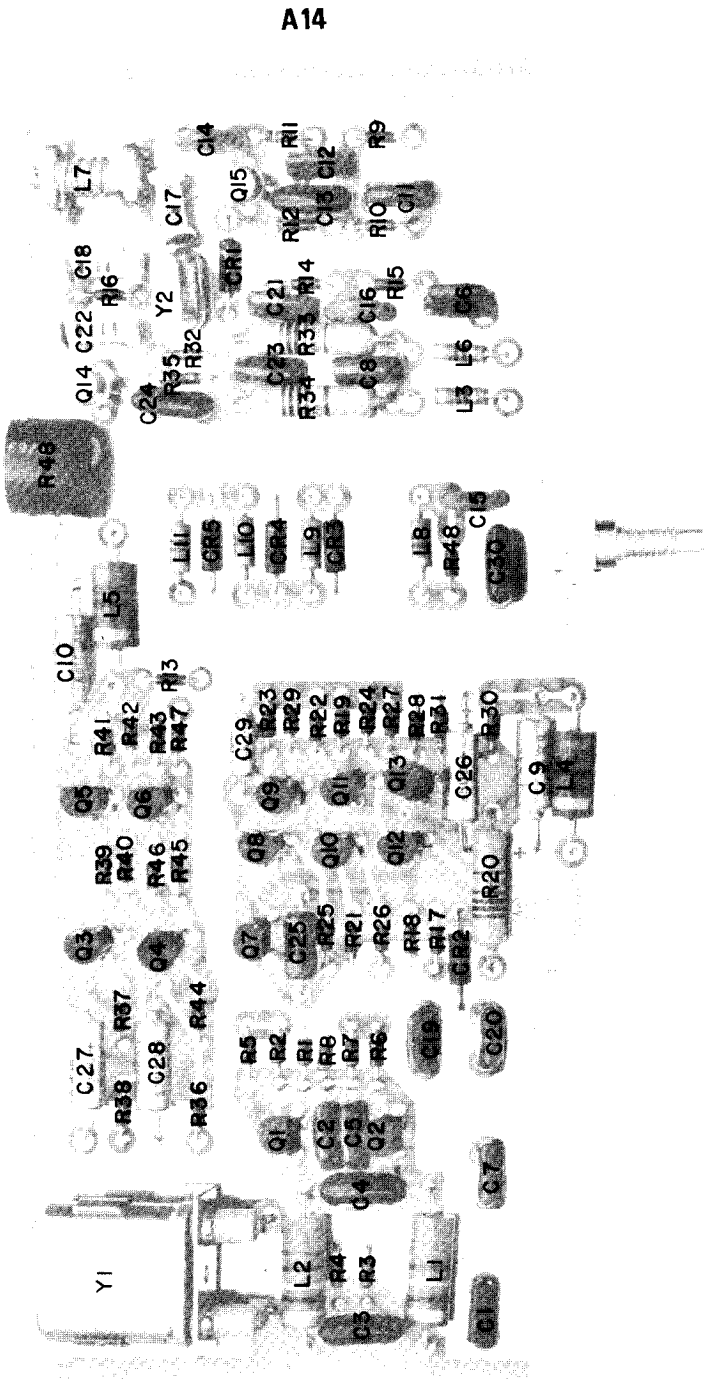


Figure 7-14. Parts Location for Phase-Locked Oscillator A14 (Change I, Serial No. 924-00131 thru 948-00175

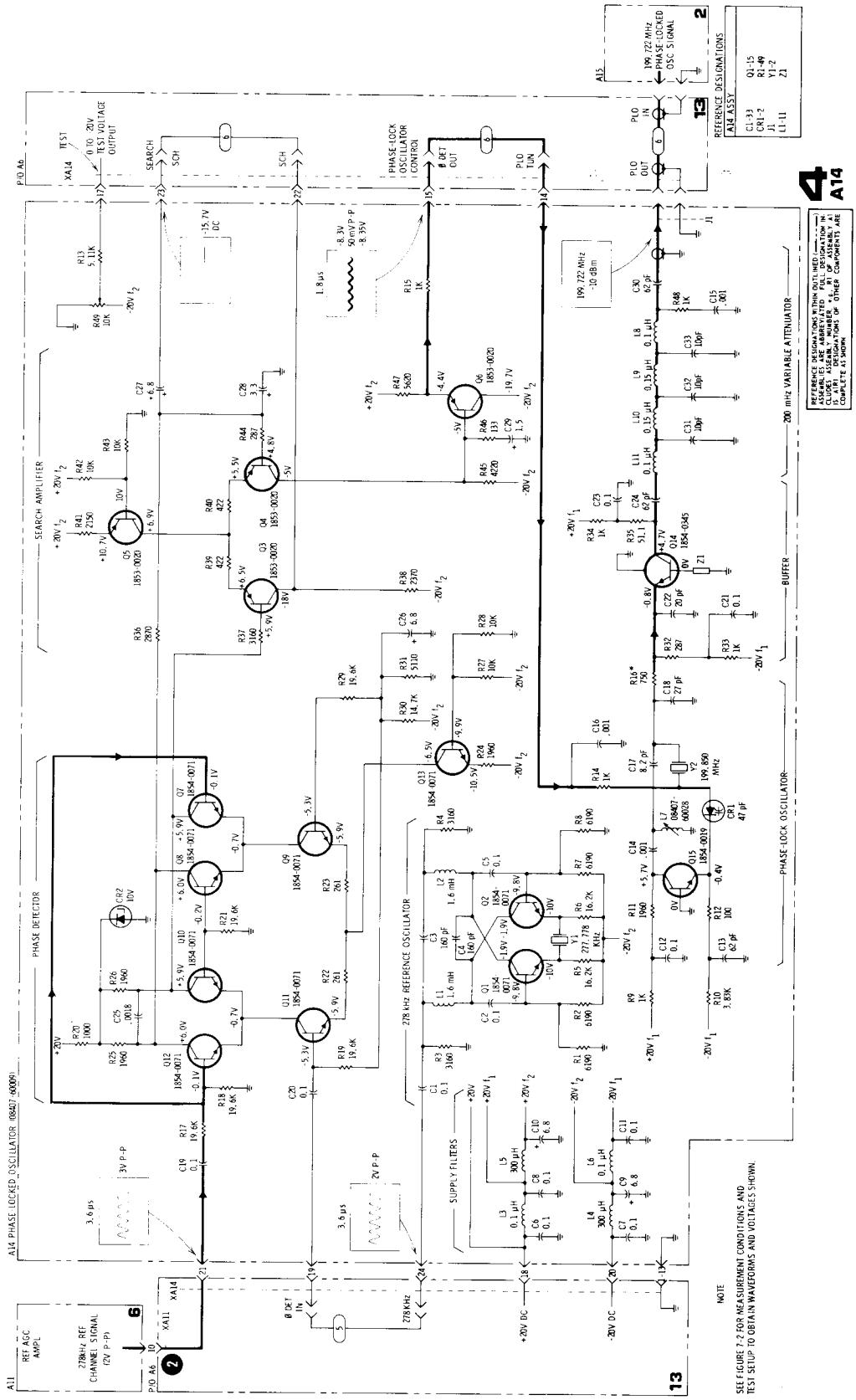


Figure 7-15. Phase-Locked Oscillator A14, Schematic (Change I, Serial No. 924-00131 thru 948-00175)

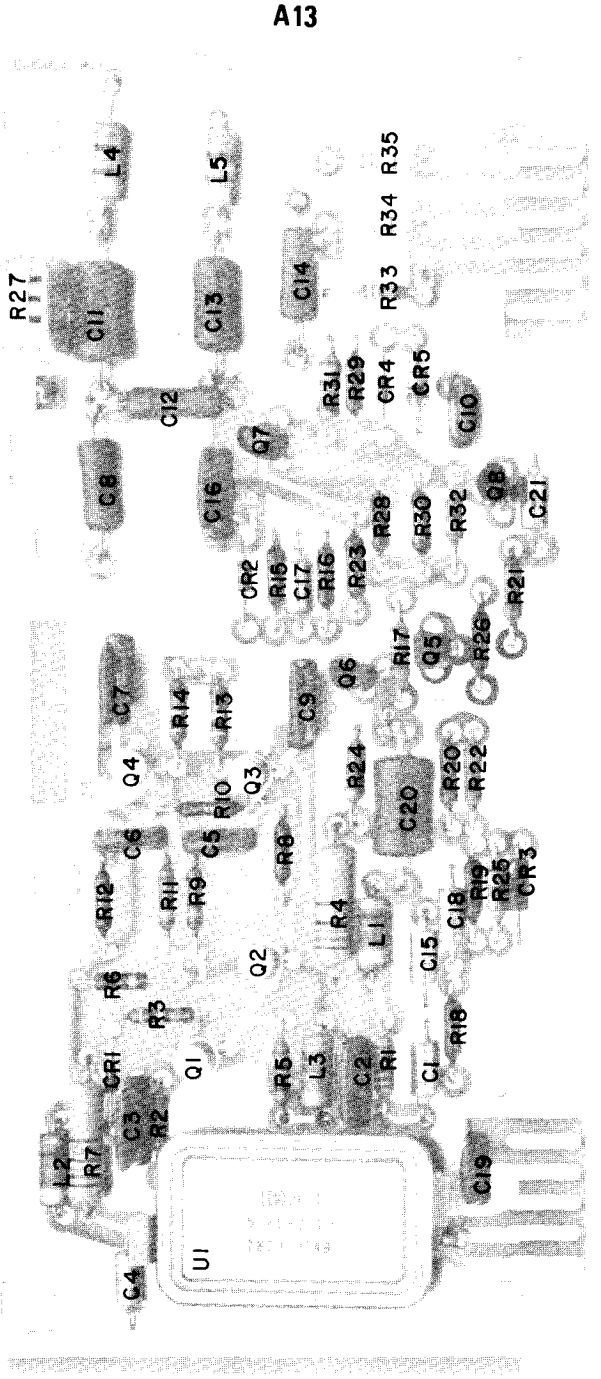


Figure 7-12. Parts Location for Automatic Level Control Amplifier A13 (Change L, Serial No. 924-00130 and Below)

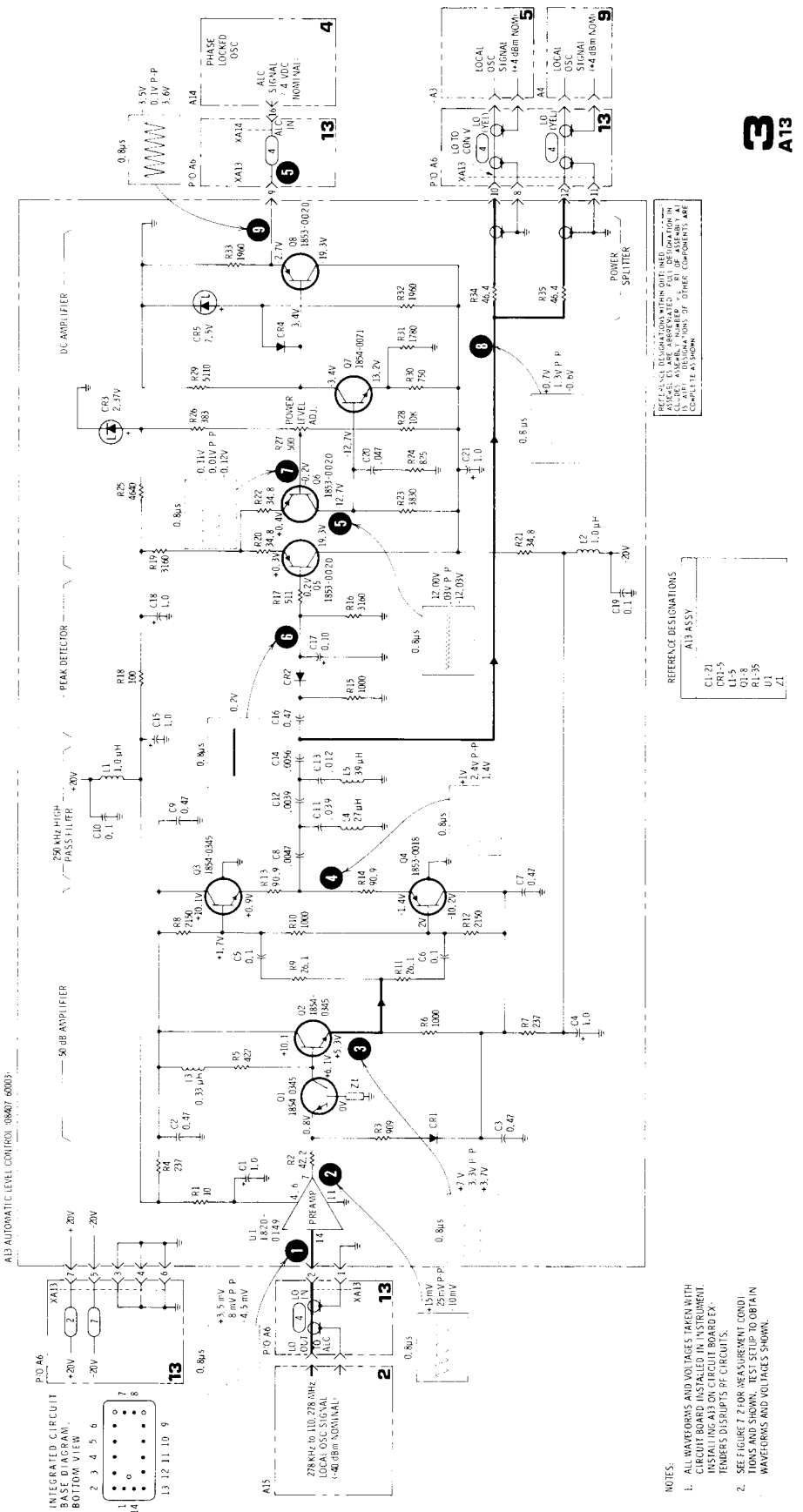


Figure 7-13. Automatic Level Control Amplifier A13, Schematic (Change L, Serial No. 924-00130 and Below)

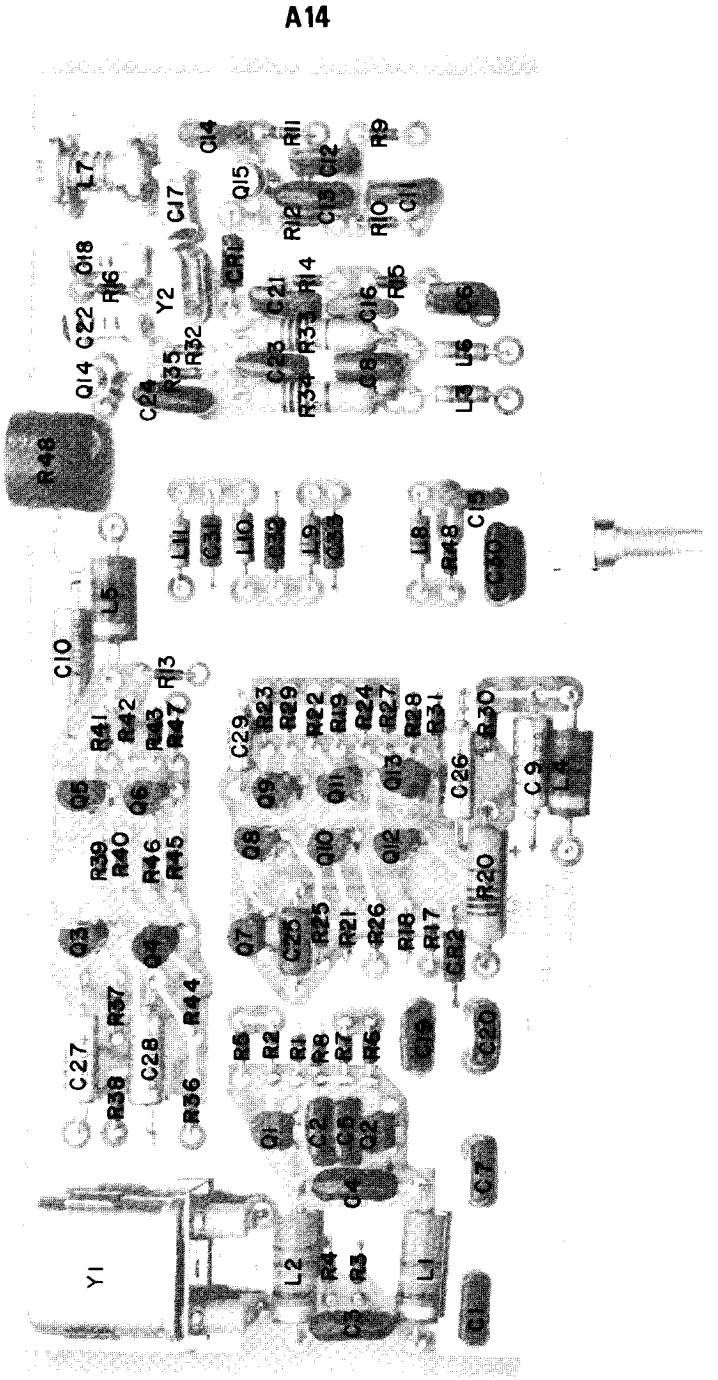


Figure 7-14. Parts Location for Phase-Locked Oscillator A14 (Change L, Serial No. 924-00130 and Below)

On Figure 7-15 (Change I) included with this appendix:
Delete A14C31, C32, and C33; put in their place A14CR3, CR4, and CR5; all 15 pF voltages variable capacitors with cathodes wired to ground.

Add a yellow wire connecting XA13 pin 9 to XA14 pin 16.

CHANGE M

Page 6-10, Table 6-1:
Delete A10CR14.

Page 6-17, Table 6-1:
Delete A17C3 and A17C4.

Page 7-23, Figure 7-23:
Delete A10CR14.

Page 7-35, Figure 7-35:
Delete A17C3 and A17C4.

APPENDIX II
OPTION 008, MANUAL SUPPLEMENT

INTRODUCTION

This supplement describes the differences in the Model 8407A Network Analyzer with Option 008 installed. In addition, it describes the manual changes necessary to document the addition of Option 008.

DESCRIPTION

The Model 8407A Option 008 Network Analyzer is used to test devices used in a 75-ohm system. The addition of Option 008 consists of installing four 50-to-75 ohm matching resistors (HP Part No. 11658-60001) in the 8407A front panel. In all other respects the instrument is a standard 8407A. The original front-panel 50-ohm BNC connectors mate with these adapters. Therefore, the 8407A can be converted to 50-ohm inputs at any time by removing the 50-to-75-ohm matching resistors and securing the original 50-ohm BNC connectors to the front panel. However, if frequent changes from 75 to 50 ohms are required, it would be more convenient to use two model 11658A 50-to-75-ohm matching resistors which are externally connected to the front panel.

NOTE

The front panel connectors not in use are terminated with 50-ohm terminations for both the standard instrument and Option 008. The resultant mismatch for the Option 008 does not affect the measurement because this mismatch is padded out by internal attenuators.

MODIFICATION KIT

Modification kit for field installation of this option is Part No. 08407-60145.

MANUAL CHANGES TO INCORPORATE OPTION

Page 1-2, Table 1-1:
Change TEST INPUT and REFERENCE INPUT impedance to 75 ohms.

Page 1-3, Paragraph 1-17:
Change (1) entry to: 11652A, Option 008 Reflection-Transmission Kit
Delete (2) 11654A Passive Probe Kit.

Page 1-3, Paragraph 1-18:
Delete entire paragraph.

Page 1-3, Paragraph 1-19:
Add "Option 008" after "11652A" and after "8721A."

Page 1-3, Paragraph 1-20 thru 1-23:
Delete paragraphs 1-20 thru 1-23.

Page 3-5, Figure 3-3:
Add "Option 008" after all references to 8407A and 11652A.

Change 11652-60009 to 11652-60019.

Page 3-6, Figure 3-4:
Add "Option 008" after all references to 8407A, 11652A and 8721A.

Change 11652-60009 to 11652-60019.

Page 5-3, Table 5-2:
Add "Option 008" after 8721A and 11652A in Transmission-Reflection Accessory Kit.

Change 11652-60009 to 11652-60019.

Pages 5-5, 5-6, 5-7, 5-9, 5-12, and 5-15:
Add "Option 008" to references to 8721A and 11652A.

Change 11652-60009 to 11652-60019.

Page 6-20, Table 6-1:
Add to the miscellaneous list the following:
11658-60001, 4 ea. matching resistor assy.
7120-2821, Identification Plate.
08407-20124, 4 each washers.
2950-0035, 4 each hexagon nuts.
2190-0068, 4 each washers.

Page 7-17, Figure 7-17:
Add a 50-to-75-ohm adapter at the end of Reference input connectors J1 and J3 consisting of a 25-ohm resistor in series with the line with a connector on both ends.

Page 7-25, Figure 7-25:
Add a 50-to-75-ohm adapter at the end of test channel input connectors J4 and J6 consisting of a 25-ohm resistor in series with the line with a connector on both ends.

HEWLETT hp PACKARD

Part of HP Part No. 08407-90038

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