HP Archive

This vintage Hewlett Packard document was preserved and distributed by

www. hparchive.com

Please visit us on the web !

Originally posted on BAMA

** For FREE Distribution Only ***

OPERATION AND SERVICE MANUAL

8554B SPECTRUM ANALYZER RF SECTION

HEWLETT PACKARD

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 instrument 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. 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.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

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.

HEWLETT PACKARD

OPERATION AND SERVICE MANUAL

8554B SPECTRUM ANALYZER RF SECTION

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1245A.

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

©Copyright HEWLETT-PACKARD COMPANY 1973
1400 FOUNTAIN GROVE PARKWAY, SANTA ROSA, CALIFORNIA, 95404, U.S.A.

MANUAL PART NO. 08554-90035

Manual Printed: SEPTEMBER 1974

CONTENTS

ILLUSTRATIONS

ILLUSTRATIONS (cont'd)

TABLES

Figure 1-1. Model 8554B Spectrum Analyzer RF Section and Accessories Supplied

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains the operating and service information for the Hewlett-Packard Model 8554B Spectrum Analyzer RF Section. The Spectrum Analyzer is shown in Figure 1-1 with all of its externally supplied accessories.

1-3. This section of the manual describes the instruments documented by this manual and covers instrument description, options, accessories, specifications and other basic information. The other sections provide the following information:

Section II, Installation: provides information about initial inspection, preparation for use, and storage and shipment.

Section III, Operation: provides information about panel features, and provides operating checks, instructions, and maintenance information.

Section IV, Performance Tests: provides the information required to verify that the instrument is performing as specified in Table 1-1.

Section V, Adjustments: provides the information required to properly adjust and align the instrument.

Section VI, Replaceable Parts: provides ordering information for all replaceable parts and assemblies.

Section VII, Manual Changes: this section is reserved to provide manual change information in future revisions of this manual.

Section VIII, Service: provides the information required to repair the instrument.

1-4. Packaged with this manual is an Operating Information Supplement. This is simply a copy of the first three sections of this manual. This supplement should stay with the instrument for use by the operator. Additional copies can be ordered through your nearest Hewlett-Packard Sales and Service Office; the part number is listed on the title page of this manual and on the rear cover of the supplement.

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

1-6. Instrument specifications are listed in Table 1-1. These specifications are the performance standards or limits against which the instrument can be tested. Table 1-2 lists some supplemental performance characteristics. Supplemental characteristics are not specifications but are typical characteristics included as additional information for the user.

1-7. INSTRUMENTS COVERED BY MANUAL

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

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

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

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

1-12. DESCRIPTION

1-13. The HP Model 8554B Spectrum analyzer RF Section covers the frequency range from 100 kHz to 1250 MHz. When it is combined with an IF Section and a Display Section it functions as the tuning section of an RF spectrum analyzer.

1-14. The analyzer electronically scans input signals and displays their frequency and amplitude on a CRT. The horizontal, x-axis, is calibrated in units of frequency and the vertical, y-axis, is calibrated in absolute units of voltage (μV or mV) or power (dBm). Absolute or relative measurements of both amplitude and frequency can be easily made.

1-15. The horizontal (frequency) axis can be swept three different ways:

a. The center of the CRT is set to a frequency determined by the dial and the analyzer is swept symmetrically about that frequency.

b. The analyzer is not swept but is used as a fixed frequency receiver. Signal amplitude can be read on the CRT and signal modulation can be viewed as with an oscilloscope.

c. The analyzer is swept from 0 Hz to 1250 MHz.

1-16. Typically, the Spectrum Analyzer is used to measure the frequency and amplitude of the various components of a complex electrical signal, as well as frequency response, harmonic and intermodulation distortion, gain, attenuation, modulation index, spectral purity, noise density, and other parameters. These measurements may be made on amplifiers, oscillators, mixers, modulators, etc., to evaluate their performance with respect to their design specifications.

1-17. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-18. The 8554B RF Section must be mated with an IF Section, such as the 8552A or the 8552B, and a Display Section, such as the 140T or the 141T, before the units can perform as a spectrum analyzer.

1-19. IF Sections

1-20. The 8552A IF Section features calibrated bandwidths, log and linear amplitude calibration, and calibrated scan times. The 8552B IF Section has all of the features of the 8552A and, in addition, manual scan, narrower bandwidth shape factors, 10 Hz video filter and an expanded log scale (2 dB per division).

1-21. Display Sections

1-22. The 140S and 140T Display Sections are equipped with a fixed persistence, non-storage CRT; the 141S and 141T Display Sections are equipped with a variable persistence, storage CRT. The 143S Display Section has a large screen (8 x 10 inch) CRT. Overlays are available for the standard 140A and 141A Oscilloscope Mainframes to provide log and linear graticule scales.

1-23. COMPATIBILITY

1-24. The HP 8554B RF Section is fully compatible with all HP 140S/T, 141S/T, and 143S Display Sections. The HP 8554B is also compatible with all HP 140A/B and 141A/B Oscilloscope Mainframes.

1-25. The HP 8554B RF Section is fully compatible with all current 8552A/B IF Sections. HP 8552A's with serial number prefixes 809, 821, 825, and 837 should be modified to ensure compatibility with the 8554B. This modification can be made with a kit, HP Part No. 08552-6048, which is available on request at no cost.

1-26. ACCESSORIES SUPPLIED

1-27. The HP 8554B is supplied with two HP 11593A 50Ω Coaxial Terminations (BNC). These connect to the LO outputs on the front panel.

1-28. OPERATING ACCESSORIES

1-29. The instruments listed below can be used to expand the analyzer's measurement capability. The brief descriptions list some of the features and applications of each instrument. For more information, contact your local Hewlett-Packard Sales and Service Office.

1-30. Tracking Generator. The HP 8444A Tracking Generator is a companion instrument to the 8554B/8552 Spectrum Analyzer. The tracking generator provides a CW signal that precisely tracks the analyzer's tuning frequency. The signal's amplitude is calibrated and can be adjusted from 0 dBm to −10 dBm. This signal can be used, with a frequency counter, to make precise frequency measurements (see HP 8444A manual). It can also be used to make frequency response and reflection coefficient measurements.

1-31. Preamplifiers. The HP 8447-series amplifiers cover various portions of the analyzer's frequency range and can be used to improve the sensitivity of the analyzer:

a. The HP 8447A; 0.1 - 400 MHz, 20 dB gain, < 5 dB noise figure.

b. HP 8447B; 0.4 - 1.3 GHz, > 20 dB gain, < 6 dB noise figure (< 5 dB below 1.0 GHz).

c. HP 8447D; 100 kHz - 1.3 GHz, 26 dB gain, < 8.5 dB noise figure.

1-32. Oscilloscope Cameras. The 196B, 197A and 123A Oscilloscope Cameras attach directly to the analyzer's CRT bezel and can be used to permanently record any signal displayed on the CRT (see paragraph 3-43).

1-33. TEST EQUIPMENT REQUIRED

1-34. Tables 1-3 and 1-4 list the test equipment and test equipment accessories to test, adjust and repair the 8554B.

1-35. WARRANTY

1-36. The HP 8554B Spectrum Analyzer RF Section is warranted and certified as indicated on the inner front cover. For further information, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

Table 1-1. Specifications

SPECIFICATIONS
8554B/8552A/8552B

FREQUENCY

Range: 100 kHz to 1250 MHz.

Scan Width (on 10-division CRT horizontal axis):

Per Division: 15 calibrated scan widths from 100 MHz/div to 2 kHz/div in a 1, 2, 5 sequence.

Preset: 0 - 1250 MHz, automatically selects 300 kHz bandwidth IF Filter.

Zero: Analyzer is fixed tuned receiver.

Accuracy:

Center Frequency Accuracy: The dial indicates the display center frequency within 10 MHz.

Scan Width Accuracy: Frequency error between two points on the display is less than 10% of the indicated separation.

Resolution:

Bandwidth: IF bandwidths of 0.1 to 300 kHz provided in a 1, 3 sequence.

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

Bandwidth Selectivity: 60 dB/3 dB IF bandwidth ratio < 20:1 for IF bandwidths from 10 kHz to 300 kHz. 60 dB/3 dB bandwidth ratio < 11:1 for IF bandwidths 100 Hz to 3 kHz.[1]

Stability:

Residual FM:

Stabilized: < 100 Hz peak-to-peak.

Unstabilized: < 10 kHz peak-to-peak.

Noise Sidebands: More than 70 dB below CW signal, 50 kHz or more away from signal, with 1 kHz IF bandwidth.

AMPLITUDE

Absolute Amplitude Calibration Range:

Log: From −122 to +10 dBm, 10 dB/div on a 70 dB display, or 2 dB/div on a 16 dB display.[2]

Linear: From 0.1 μV/div to 100 mV/div in a 1, 2 sequence on an 8-division display.

Dynamic Range:

Average Noise Level: < −102 dBm with 10 kHz IF Bandwidth.

Spurious Responses: All image and out-of-band mixing responses, harmonic and intermodulation distortion products are more than 65 dB[3] below a −40 dBm signal at the input mixer.*

Residual Responses (no signal present at input): With input attenuation at 0 dB: < −100 dBm.

Accuracy:	**Log**	**Linear**
Frequency Response (Flatness):		
100 kHz to 1250 MHz:	±1 dB	±12%
Switching Between Bandwidths (at 20°C):	±0.5 dB	±5.8%
Amplitude Display:	±0.25 dB/dB but not more than ±1.5 dB over the full 70 dB display range	2.8% of full 8 div deflection

RF INPUT SPECIFICATIONS

Input Impedance: 50Ω nominal. Reflection coefficient < 0.30 (1.85 SWR), input attenuator ⩾10 dB.

Maximum Input Level: Peak or average power +13 dBm (1.4 Vac peak), ±50 Vdc incident on input mixer and +33 dBm incident on input attenuator (in the 50 dB position for <1 dB gain compression).

GENERAL

Calibrator Output:

Amplitude: −30 dBm, ±0.3 dB.

Frequency: 30 MHz, ±3 kHz.[4]

Scan Time: 16 internal scan rates from 0.1 ms/div to 10 sec/div in a 1, 2, 5 sequence and manual scan.[5]

Scan Time Accuracy:

0.1 ms/div to 20 ms/div: ±10%.

50 ms/div to 10 s/div: ±20%.

Power Requirements: 100, 120, 220, 240V +5% −10%, 50 to 60 Hz, normally less than 225 watts (includes plug-ins used).

Dimensions: With Model 140T or 141T Display Section: 9-1/16 in. high (including height of feet) x 16-3/4 in. wide x 18-3/8 in. deep (229 x 425 x 467 mm).

Weight:

Model 8554B RF Section: Net, 10 lb, 4 oz (4.7 kg).

Model 8552A or 8552B IF Section: Net, 9 lb (4.1 kg).

Model 140T Display Section: Net, 37 lb (16.8 kg).

Model 141T Display Section: Net, 40 lb (18 kg).

*Signal level at input mixer = (signal level at input) — (input RF attenuation.

[1] 8552A IF Section: 60 dB/3 IF bandwidth ratio <20:1 from 1 1 kHz to 300 kHz and <25:1 for 300 Hz IF bandwidth.

[2] 8552A IF Section has 10 dB/division log display only.

[3] More than 55 dB below at 3 MHz ±100 kHz.

[4] ±0.3 MHz with 8552A IF section.

[5] 8552A IF Section does not provide manual scan.

Table 1-2. Supplemental Performance Characteristics

These Supplemental Performance Characteristics expand the 8554B/8552B specifications, describe the instruments' unique features and characteristics, and provide other information useful in applying the instrument.

FREQUENCY CHARACTERISTICS

Frequency Range: For operation of the analyzer outside the 100 kHz to 1250 MHz range, see Figure B.

Scan Width:

Preset 0 - 1250 MHz: Inverted marker identifies the frequency that becomes the center frequency for scan width per division and zero scan modes.

Zero: Analyzer becomes fixed-tuned receiver with frequency set by FREQUENCY and FINE TUNE controls and selectable bandwidths set by BANDWIDTH control. Amplitude variations are displayed versus time on the CRT.

Resolution: See Figure A for curves of typical Spectrum Analyzer resolution using different IF bandwidths.

Stability: First local oscillator can be automatically stabilized (phase-locked) to internal reference for scan widths of 200 kHz/div or less. Signal display shift with stabilization < 50 kHz.

Long Term Drift: (At fixed center frequency, after 2-hour warm-up).
Stabilized: ± 10 kHz/10 min.
Unstabilized: ± 50 kHz/10 min.

Temperature Drift:
Stabilized: 100 kHz/°C.
Unstabilized: 200 kHz/°C.

AMPLITUDE CHARACTERISTICS

The average noise level indicates the maximum sensitivity of the analyzer. For typical noise level versus input frequency curves from 100 kHz to 1250 MHz, see Figure B.

Dynamic Range: For dynamic range with other than −40 dBm input level, see Figure C.

Gain Compression: For < −10 dBm signal level to input mixer gain compression < 1 dB.

Amplitude Accuracy:

Measurement Accuracy: Largely determined by frequency response (± 1 dB) and display accuracy (± 1.5 dB) for general use. This ± 2.5 dB can be improved using IF substitution techniques.

Frequency Response (flatness): For typical frequency response characteristics, see Figure B.

Log Reference Level: Controls provide continuous Log Reference Levels from +10 dBm to −72 dBm (−50 dBm below 200 kHz).

Log Reference Level Control: Provides 70 dB range (60 dB below 200 kHz), in 10 dB steps. Accurate to ± 0.2 dB (± 2.3%, Linear Sensitivity).

Log Reference Level Vernier: Provides continuous 12 dB range, accurate to ± 0.1 dB (± 1.2%) in 0, −6, and −12 dB positions, otherwise ± 0.25 dB (± 2.8%).

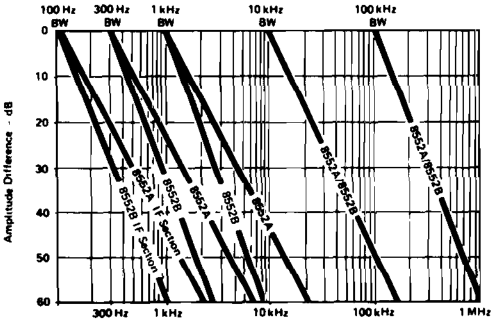


Figure A. Typical Spectrum Analyzer Resolution

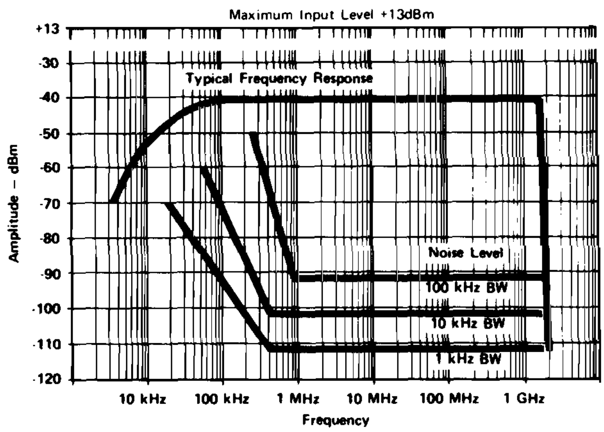


Figure B. Average Noise Level vs. Input Frequency

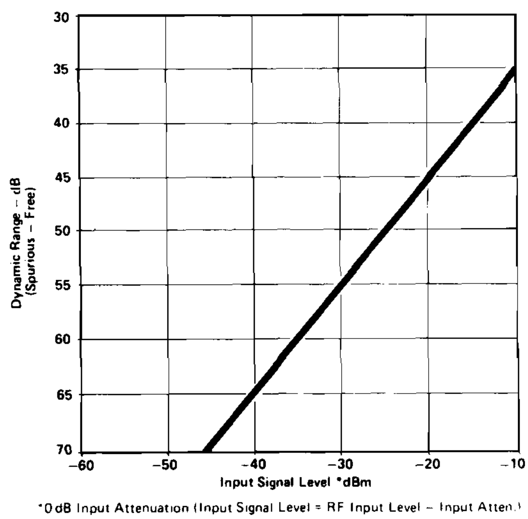


Figure C. Typical Dynamic Range Curve

Table 1-2. Supplemental Performance Characteristics (cont'd)

Amplitude Stability: ± 0.07 dB/°C in Log, ± 0.6%/°C in Linear.

Display Uncalibrated Light: Warns if a combination of control settings (IF or video bandwidth; scan width or time) degrades the absolute calibration.

Video Filter: Average displayed noise; 10 kHz and 100 Hz bandwidths. 10 Hz bandwidth also available on 8552B IF Section.

RF INPUT CHARACTERISTICS

Impedance: 50Ω nominal, Type N connector; for 75Ω use matching transformer, such as HP 11694A.

Reflection Coefficient: When analyzer is tuned to input signal $\rho \leqslant 0.4$ (2.33 SWR), for input attenuation = 0 dB; $\rho \leqslant 0.2$ (1.50 SWR), for input attenuation $\geqslant 10$ dB.

Attenuator: 0 to 50 dB in 10 dB steps, coupled to log reference level indicator to automatically maintain absolute amplitude calibration. Attenuator accuracy ± 1.0 dB but not more than ± 0.6 dB/step.

GENERAL CHARACTERISTICS

Scan Mode:

Int: Analyzer repetively scanned by internally generated ramp; synchronization selected by scan trigger.

Single: Single scan with reset actuated by front panel pushbutton.

Ext: Scan determined by 0 to +8 volt external signal; scan input impedance > 10 k Ω. Blanking: −1.5 V external blanking signal required.

Scan Trigger: For Internal scan mode, select between:

Auto: Scan free runs.

Line: Scan synchronized with power line frequency.

Ext: Scan synchronized with > 2 volt (20 volt max.) trigger signal (polarity selected by internally located switch in Model 8552A or 8552B IF Section, normally negative).

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

Auxiliary Outputs:

Vertical Output: Approximately 0 to −0.8 V for 8 division deflection on CRT display; approx. 100 Ω output impedance.

Scan Output: Approximately −5 to +5V for 10 division CRT deflection, 1 kΩ output impedance.

Pen Lift Output: 0 to 14 V (0 V, pen down). Output available in INT and SINGLE SCAN modes and AUTO, LINE, and VIDEO scan trigger.

CRT Baseline Clipper: Front panel control adjusts blanking of CRT trace baseline to allow more detailed analysis of low repetition-rate signals and improved photographic records to be made.

EMI: Conducted and radiated interference is within requirements of MIL-1-16910C and MIL-I-6181D and methods CE03, and RE02 of MIL-STD-461 (except 35 to 40 kHz) when 8554B and 8552A or 8552B are combined in a 140T or 141T Display Section.

Temperature Range: Operating, 0° to +55°C; storage, −40° to +75°C.

DISPLAY CHARACTERISTICS

Model 141T Variable Persistence/Storage Display:

Plug-ins: Accepts Model 8550-series Spectrum Analyzer plug-ins and Model 1400-series Oscilloscope plug-ins.

Cathode-ray Tube:

Type: Post-accelerator storage tube, 9000 volt accelerating potential; aluminized P31 phosphor; etched safety glass face plate reduces glare.

Graticule: 8 x 10 division (approximately 7.1 x 8.9 cm) parallax-free internal graticule; five subdivisions per major division on horizontal and vertical axes.

Persistence:

Normal: Natural persistence of P31 phosphor (approximately 0.1 second).

Variable:

Normal Writing Rate Mode: Continuously variable from less than 0.2 second to more than one minute (typically to two or three minutes).

Maximum Writing Rate Mode: Typically from 0.2 second to 15 seconds.

Erase: Manual; erasure takes approximately 350 ms; CRT ready to record immediately after erasure.

Storage Time: Normal writing rate; more than 2 hours at reduced brightness (typically 4 hours). More than one minute at maximum brightness.

Fast Writing Speed: More than 15 minutes (typically 30 minutes) at reduced brightness or more than 15 seconds at maximum brightness.

Functions Used with Oscilloscope Plug-ins Only: Intensity modulation, calibrator; beam finder.

Dimensions: 9-1/16 in. high (including height of feet) x 16-3/4 in. wide x 18-3/4 in. deep (229 x 425 x 467 mm).

Weight: Model 141T Display Section: Net, 40 lb (18 kg).

Model 140T Normal Persistence Display:

Plug-ins: Same as 141T.

Cathode-ray Tube:

Type: Post-accelerator, 7300 volt potential medium-short persistence (P7) phosphor; tinted and etched safety glass face plate reduces glare. (Normal persistence of P7 phosphor approximately 3 seconds).

Table 1-2. Supplemental Performance Characteristics (cont'd)

Graticule: 8 x 10 division (approximately 7,6 x 9,5 cm) parallax-free internal graticule; five subdivisions per major division on horizontal and vertical.

Functions Used with Oscilloscope Plug-ins Only: Same at 141T.

Dimensions: Same as 141T.

Weight: Model 140T Display Section: Net, 37 lb (16.8 kg).

Model 143S Normal Persistence Large Screen Display:

Plug-ins: Same as 141T.

Cathode-ray Tube:

Type: Post accelerator, 20 kV accelerating potential aluminized P31 phosphor. (Persistence approximately 0.1 second.)

Graticule: 8 x 10 divisions (approximately 8 x 10 inch) parallax-free internal graticule, five subdivisions per major division on horizontal and vertical axes.

Functions Used with Time Domain Plug-ins Only: Same as 141T.

Dimensions: 21 in. high (including height of feet) x 16-3/4 in. wide x 18-3/8 in. deep (533 x 425 x 467 mm).

Weight: Model 143S Display Section: Net, 62 lb (28,1 kg).

Table 1-3. Test Equipment

Item	Minimum Specifications	Suggested Model	Use*
Frequency Comb Generator	Frequency markers spaced 1, 10, 100 MHz apart; usable to 1200 MHz Frequency Accuracy: ± 0.01% Output Amplitude: > −40 dBm	HP 8406A Comb Generator	P,A
HF Signal Generator	Frequency Range: 1 - 50 MHz Output Amplitude: −20 dBm Output Amplitude Accuracy: ± 1% Frequency Accuracy: ± 1% Output Impedance: 50 ohms	HP 606B HF Signal Generator	P,T
VHF Signal Generator	Frequency Range: 40 - 455 MHz Frequency Accuracy: ± 1% Output Amplitude: > −20 dBm Output Impedance: 50 ohms	HP 608F VHF Signal Generator	P,T
Sweep Oscillator	Frequency Range: 1 - 110 MHz Output Flatness: ± 0.25 dB over full band Output Impedance: 50 ohms Output Amplitude: at least 0 dBm	HP 8601A Generator/ *Sweeper*	P
Crystal Detector (2)	Frequency Range: 10 - 1300 MHz Sensitivity: > 0.4 mV/μW Frequency Response: ± 0.2 dB Polarity: Negative	HP 423A Crystal Detector	P
UHF Signal Generator	Frequency Range: 450 - 1200 MHz Frequency Accuracy: 1% Output Amplitude: −20 dBm Output Impedance: 50 ohms	HP 612A UHF Signal Generator	A,T
Audio Oscillator	Frequency Range: 10 kHz Output Amplitude: 2 Vrms Frequency Accuracy: ± 2% Output Impedance: 600 ohms	HP 200 CD Audio Oscillator	P
Sweep Oscillator	Frequency Range: 100 - 1250 MHz Output Amplitude: +10 dBm Output Impedance: 50 ohms	HP 8690B/8699B Sweep Oscillator/ *RF Unit*	P
Frequency Counter	Frequency Range: 100 kHz - 3.0 GHz Accuracy: ± 0.001% Sensitivity: 100 mVrms Readout Digits: 7 digits	HP 5245L Frequency Counter with HP 5254C Plug-in	A,T
Tunable RF Voltmeter	Bandwidth: 1 kHz Frequency Range: 1 - 100 MHz Sensitivity: 10 mV - 1 Vrms Input Impedance: ≥ 0.1 megohms	HP 8405A Vector Voltmeter	T

*Use: Performance = p; Adjustment = A; Troubleshooting = T

Test 1-3. Test Equipment (cont'd)

Item	Minimum Specifications	Suggested Model	Use*
Digital Voltmeter	Voltage Accuracy: ± 0.2% Range Selection: Manual or Automatic Voltage Range: 1 - 1000 Vdc full scale Input Impedance: 10 megohms Polarity: Automatic indication	HP 3440A Digital Voltmeter with HP 3443A Plug-in	T
Oscilloscope	Frequency Range: dc to 50 MHz Time Base: 1 μs/div to 10 ms/div Time Base Accuracy: ± 3% Dual Channel, Alternate Operation ac or dc Coupling External Sweep Mode Voltage Accuracy: ± 3% Sensitivity: 0.005 V/div	HP 180A with HP 1801A Vertical Amplifier and HP 1821A Horizontal Amplifier HP 10004 10:1 Divider Probes (2)	P,A,T
Spectrum Analyzer	Frequency Range: 0 - 100 MHz Scan Width: 10 MHz	HP 8553B/8552A/141T Spectrum Analyzer	A
Volt-ohm-ammeter	Resistance Range: 1 Ω to 100 MΩ Accuracy: ± 10% of Reading	HP 412A	T

*Use: Performance = P; Adjustment = A; Troubleshooitng = T

Table 1-4. Test Accessories

Item	Required Features	Suggested Model	Use*
20 dB Attenuator	Frequency Range: 100 - 1250 MHz Flatness: ± 0.2 dB	HP 8491A Op 020	P
50-Ohm Tee	Type N female connectors on two ports, with the third port able to accept HP 8405A probe tips.	HP 11536A 50 ohm Tee	T
10 dB Fixed Attenuator	Frequency Range: 100 - 1250 MHz Flatness: ± 0.2 dB	HP 8491A, Option 010	P
Dual Directional Coupler	Frequency Range: 100 - 1250 MHz Directivity: 36 dB	HP 778D Dual Directional Coupler	P
BNC Tee	Two BNC Female Connectors, One Male BNC Connector	UG-274A/U HP 1250-0781	P,T
Adapter (two)	BNC Female to Type N Male	UG-201A/U HP 1250-0067	P,A
Voltage Probe	Dual Banana Plug-to-Probe Tip and Clip (Ground) Lead	HP 10025A Straight-Through Voltage Probe	T
Cable Assembly (5)	Male BNC Connectors, 48 inches long	HP 10503A	P,A,T
Cable Assembly	BNC Male to Dual Banana Plug, 45 inches long	HP 11001A	P
Tuning Tool, Blade	Nonmetallic Shaft, 6 inches long	General Cement 5003 (HP 8730-0013)	A
Tuning Tool, Slot	Nonmetallic, 6-inch shaft	Gowanda PC9668	A
Wrench	Open-end, 15/64-inch	HP 8710-0946	A
Wrench	Open-end, 5/16-inch	HP 8720-0030	A
Wrench	No. 6, Allen Driver	HP 5020-0289	A
Wrench	No. 10, Allen Driver	HP 5020-0291	A
Wrench	Nut Driver, 5/16-inch	HP 8720-0003	A
Screwdrivers	Phillips # 1 Phillips # 2 Pozidrive # 1 (Small) Stanley # 5531 Pozidrive # 2 (Medium) Stanley # 5332	 HP 8710-0899 HP 8710-0900	A,T
Tuning Tool, Slot	Nonmetallic, 2.5-inch shaft	HP 8710-0095	A
Cover Assembly	Modified display section cover, see Paragraph 5-12	Modified HP 5060-0470	A
Soldering Iron	47-1/2 watt	Ungar # 776 with # 4037 Heating Unit	A,T

*Use: Performance = P; Adjustment = A; Troubleshooting = T

Table 1-4. Test Accessories (cont'd)

Item	Required Features	Suggested Model	Use*
Adapter	Type N Tee Male Connector to Type N Female Connector	UG-107B/U	P
Adapter	Type N Male Connector to BNC Male Connector	UG-1034/U HP 1250-0082	P
Cable Assembly	Type N Connectors, 48 inches long	HP 11501A	P
Service Kit	Contents: Display Section to Spectrum Analyzer Extender Cable Assembly (HP 11592-60015) Tuning Section to IF Section Interconnection Cable Assembly (HP 11592-60016) Subminiature Female to BNC Male Test Cable, 3 each, 36 inches long (HP 11592-60001) Subminiature Male to Subminiature Female Test Cable, 2 each, 8 inches long (HP 11592-60003) Subminiature Female to Subminiature Female Test Cable, 2 each, 8 inches long (HP 11592-60002) Extender Board Assembly, 15 pins, 30 conductors, for plug-in circuit boards (HP 11592-60011) Fastener Assembly (2 each: HP 11592-20001 and HP 1390-0170) Subminiature Jack-to-Jack Adapter (HP 1250-0827) Wrench, open end, 15/16 inch (HP 8710-0946) BNC Jack-to-OSM Plug Adapter (HP 1250-1200) OSM Plug-to-Plug Adapter (HP 1250-1158) Cable Assembly R and P Connector (HP 11592-60013)	HP 11592A	A,T

*Use: Performance = P; Adjustment = A; Troubleshooting = T

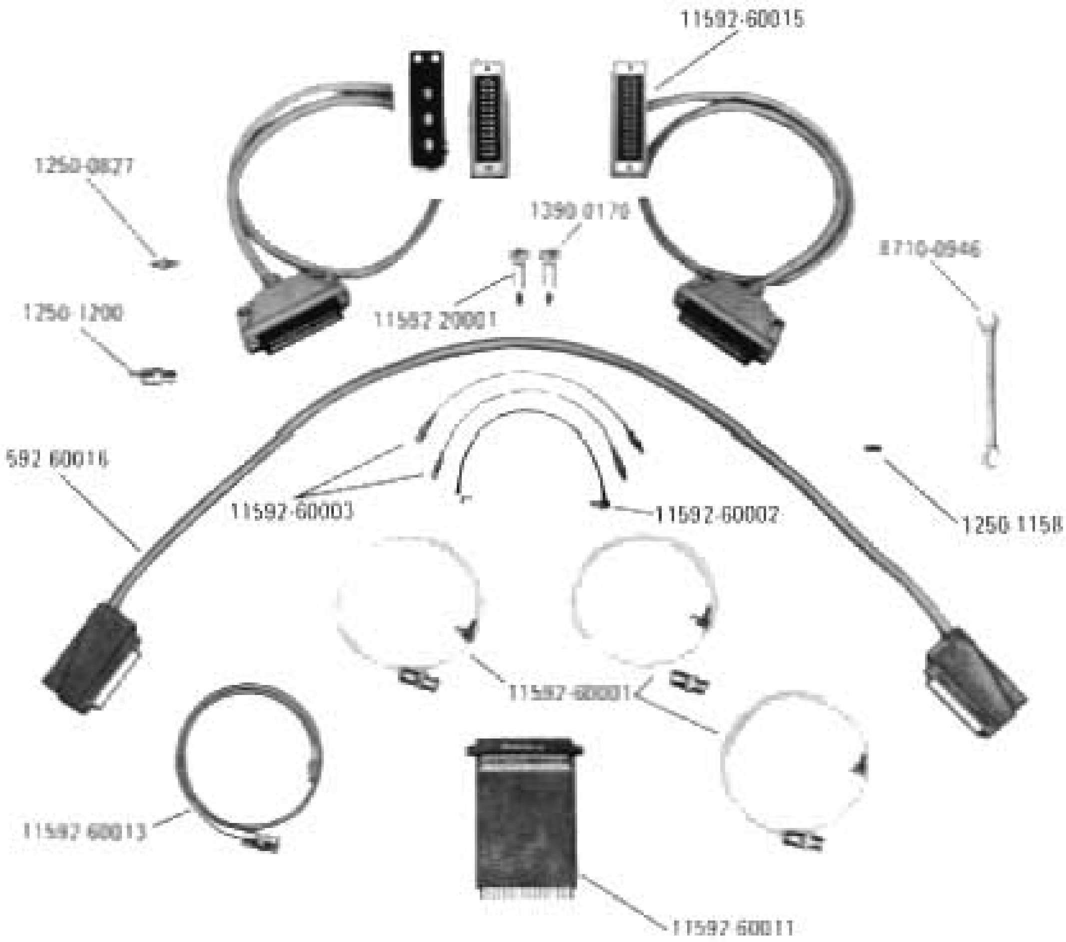


Figure 1-2. HP 11592A Service Kit

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section explains how to prepare the HP Model 8554B Spectrum Analyzer RF Section for use. It explains initial inspection, how to install the RF Section in a mainframe, and storage and shipment.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1, and procedures for checking electrical performance are given in Section IV. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the electrical performance test, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-5. PREPARATION FOR USE

CAUTION

Before applying power, check the rear panel on the Display Section for proper voltage selection.

2-6. Shipping Configuration

2-7. Since the RF and IF Sections are received separately, the plug-ins must be mechanically fitted together, electrically connected and inserted in display section or oscilloscope mainframe of the 140-series. For mechanical and electrical connections, refer to Figure 2-1 and paragraph 2-16.

2-8. Power Requirements

2-9. Consumed power varies with the plug-ins used but is normally less than 225 watts. Line power enters the Display Section or Mainframe, where it is converted to dc voltages, and then is distributed to the RF and IF Sections via internal connectors. The Display Section Operating and Service Manual covers such topics as available power cables, line power selection, bench operation, and rack mounting.

2-10. Mating Connectors

2-11. Mating connectors used with the Model 8554B should be either 50 ohm-type BNC male or Type N male connectors that are compatible with US MIL-C-39012.

2-12. Operating Environment

2-13. The Operating environment should be within the following limitations:

a. Temperature: 0°C to +55°C
b. Humidity: < 95% relative
c. Altitude: < 15,000 feet.

2-14. The Spectrum Analyzer uses a forced-air cooling system to maintain required operating temperatures within the instrument. The air intake and filter are located on the rear of the Display Section: air is exhausted through the side panel perforations. When operating the instrument, choose a location which provides at least three inches of clearance around the rear and both sides. Refer to the Display Section manual for maintenance instructions for the cooling system.

2-15. Interconnections

2-16. The RF and IF Sections are shipped separately; the plug-ins must be mechanically fitted together, electrically connected, and then inserted in the Display Section or mainframe. To make these connections refer to Figure 2-1 and proceed as follows:

a. Set the IF Section on a level bench. Locate slot near right rear corner of RF Section; also locate metal tab on IF Section that engages with this slot.

b. Grasp the RF Section near middle of chassis and raise until it is a few inches above the

IF Section.

c. Tilt RF Section until front is about 2 inches higher than the rear.

d. Engage assemblies in such a way that metal tab on the rear of the IF Section slips through the slot on RF Section.

e. With the preceding mechanical interface completed, gently lower RF Section until electrical plug and receptacle meet.

f. Position RF Section as required to mate the plug and receptacle. When plug and receptacle are properly aligned, only a small downward pressure is required to obtain a snug fit.

g. After the RF and IF Sections are joined mechanically and electrically, the complete assembly is ready to be inserted into the Display Section.

h. Pick up the RF/IF Sections and center in opening of Display Section. Push forward until assembly fits snugly into Display Section.

i. Push in front panel latch to securely fasten assembly in place.

2-17. To separate the RF/IF Sections from Display Section and to separate the RF Section from the IF Section, proceed as follows:

a. Push front panel latch in direction of arrow until it releases.

b. Firmly grasp the middle of latch flange and pull RF/IF Sections straight out.

c. Locate black press-to-release level near left front side of RF Section. Press this lever and simultaneously exert an upward pulling force on front edge of RF Section.

d. When the two sections separate at the front, raise RF Section two or three inches and slide metal tab at rear of IF Section out of the slot in which it is engaged.

2-18. LO Terminations

2-19. Two HP 11593A 50Ω Terminations are supplied with each HP 8554B. They should be connected to the FIRST LO OUTPUT and THIRD LO OUTPUT connectors on the front panel.

2-20. STORAGE AND SHIPMENT

2-21. Environment

2-22. The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment:

a. Temperature: −40°C to +75°C
b. Humidity: < 95% relative
c. Altitude: < 25,000 feet.

2-23. Packaging

2-24. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

2-25. Other Packaging. 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 office or service 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-inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

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

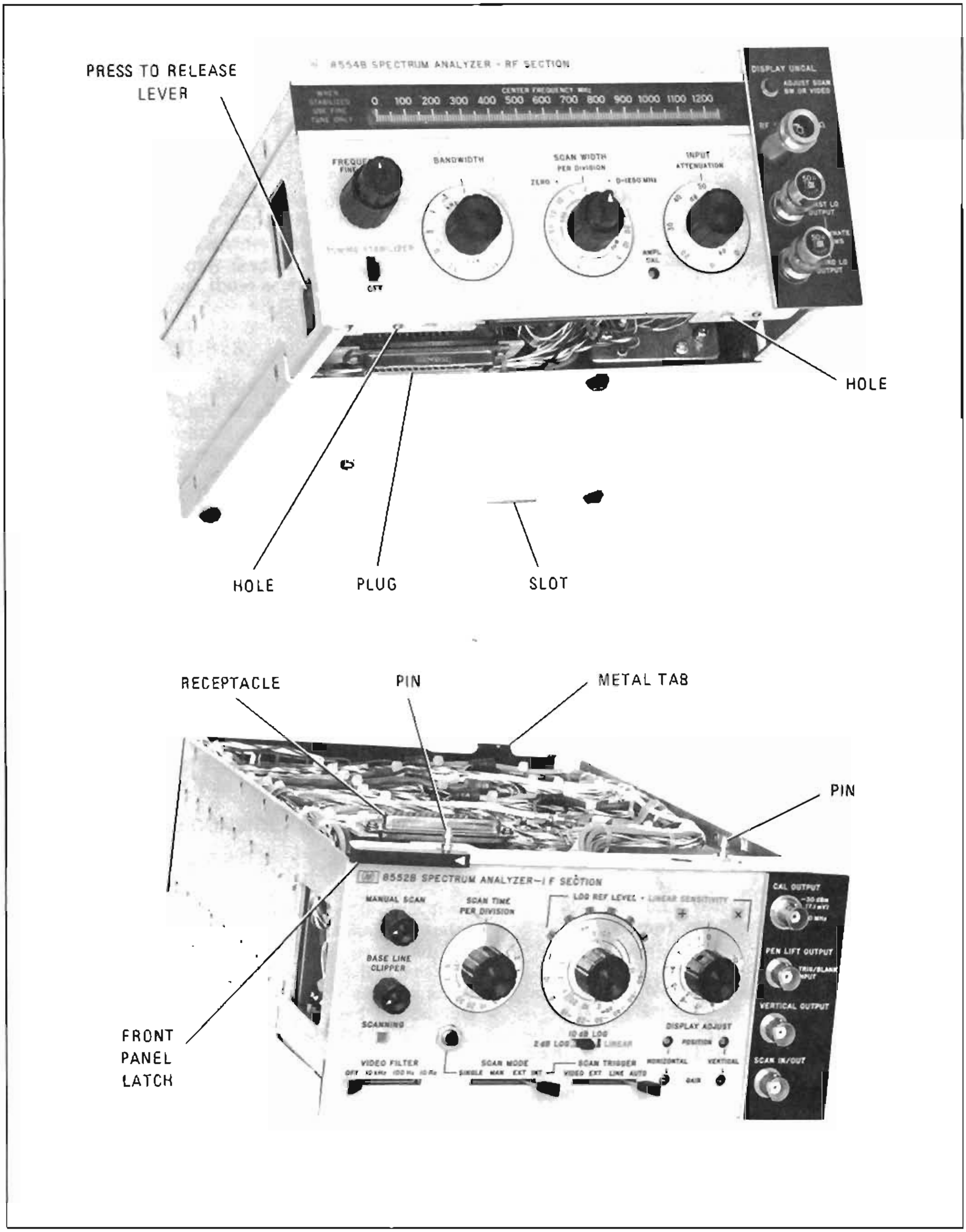


Figure 2-1. RF Section and IF Section Interconnections

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section provides complete operating instructions for the HP 8554B Spectrum Analyzer RF Section. It also provides a brief description of IF Section and Display Section controls; for a detailed description of these sections, refer to their manuals.

3-3. PANEL FEATURES

3-4. Front panel controls, indicators and connectors are shown and briefly described in Figure 3-6. Rear panel controls and connectors are shown and functionally described in Figure 3-7.

3-5. OPERATOR'S CHECKS

3-6. Upon receipt of the analyzer, or when any plug-in is changed, perform the operational adjustments listed in Figure 3-7. This procedure corrects for minor differences between units and ensures that the RF Section, IF Section and Display Section are properly matched.

3-7. If, after performing the operational adjustments, it is desired to further verify that the analyzer is operating correctly, perform the front panel check procedures listed in Table 4-1. Table 3-1 lists a few potential difficulties and their correction. Table 3-2 provides fuse replacement information.

3-8. OPERATING CONSIDERATIONS

3-9. RF Input

3-10. Input impedance is nominally 50 ohms from 100 kHz to 1250 MHz. A dc blocking capacitor (located between the RF INPUT jack and the analyzer's input attenuator) permits RF measurements in the presence of dc levels as high as 50 volts. An external pad must be used for circuits that require a dc return in their output.

3-11. Amplitude Characteristics

3-12. Absolute Voltage and Power Readings. There are two basic display modes, LOG and LINEAR. In LINEAR mode the analyzer measures voltage in mV or μV. In LOG mode the analyzer measures power in dBm (into 50 ohms).

3-13. The basic log display scale factor is 10 dB/div. With the 8552A IF Section this is selected by setting LOG/LINEAR to LOG. With the 8552B IF Section this is selected by setting LOG/LINEAR to 10 dB LOG.

3-14. The LOG/LINEAR switch on the 8552B also has a 2 dB LOG position. In this position, the log display scale factor is 2 dB/div. (The LOG REF graticule on the CRT represents the same power level in both positions).

3-15. The absolute power level represented by the LOG REF graticule on the CRT is set by the LOG REF LEVEL and INPUT ATTENUATION controls. When LOG/LINEAR is set to LOG, the black "+" lamp lights to indicate that the absolute power level represented by the LOG REF graticule is the algebraic sum of:

a. The black dBm reading (under the lit index lamp) on the LOG REF LEVEL switch, and

b. The black reading on the LOG REF LEVEL vernier.

3-16. When INPUT ATTENUATION is changed, the lit index lamp automatically switches position to indicate the change in absolute level of the LOG REF graticule line.

3-17. The LINEAR SENSITIVITY and INPUT ATTENUATION controls establish the linear display scale factor (volts/div). When LOG/LINEAR is set to LINEAR, the blue "X" lamp lights to indicate that the display scale factor is the product of:

a. The blue volts/div reading (under the lit index lamp) on the LINEAR SENSITIVITY switch, and

b. The blue reading on the LINEAR SENSITIVITY vernier.

3-18. When INPUT ATTENUATION is changed, the lit index lamp automatically switches position to indicate the change in scale factor.

3-19. Sensitivity. The analyzer's noise level varies with bandwidth; the narrower the bandwidth, the lower the noise level, and the higher the sensitivity. However, the bandwidth chosen is usually a compromise because narrow bandwidths require narrow scan widths or slow scan times. (The DISPLAY UNCAL lamp will be unlit when the scan

Table 3-1. Operational Difficulties and Their Correction

Difficulty	Corrections
Complete Failure or no vertical deflection	Check fuses. Refer to Table 3-2.
Amplitude Calibration	Recalibrate in accordance with paragraph 2-16.
Insufficient horizontal gain	Adjust HORIZONTAL GAIN.
Incorrect horizontal position	Adjust HORIZONTAL POSITION.
Incorrect vertical position	Adjust VERTICAL POSITION.
No Scan	Set SCAN MODE to INT and SCAN TRIGGER to LINE. Check fuses.
Display skewed.	Adjust trace align.
Erratic tuning for narrow (blue-coded) scan widths.	Tune TUNING STABILIZER to OFF or use FINE TUNE only.
DISPLAY UNCAL light on	Increase SCAN TIME or reduce SCAN WIDTH or increase BANDWIDTH or VIDEO FILTER

Table 3-2. Fuse Information

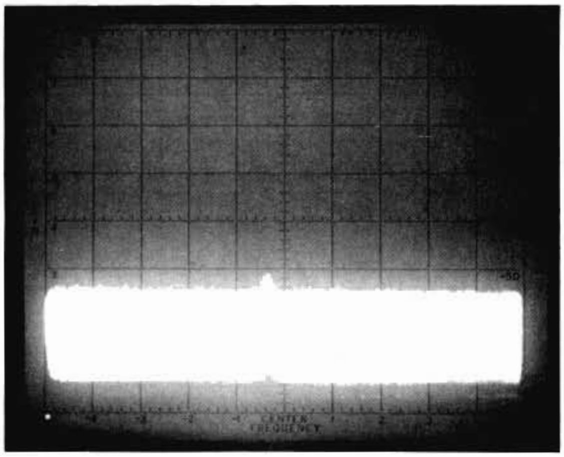
Designation/ Rating	Location	Indication
F1 1 Amp F2 1 Amp	Rear panel of IF Section.	If F1 opens because of overload, instrument may function normally until excessive current opens F2. (Generally, this will occur at turn on or during a sharp line surge). If a short develops in or if excessive current is drawn form the −10 volt supply, both F1 and F2 will open. When both fuses are open or when only F2 is open, the front panel indications are as follows: a. No display. b. All front panel indicator lamps, except SCANNING will function.
F481 3 Amp	See inside bottom cover display section.	No display. All indicator lamps function, except SCANNING. (SCANNING cannot be turned on in any scan mode.)
F461 1/2 Amp	Same as above	Nothing works, except POWER ON lamp.
F441 3/4 Amp	Same as above	Same as above
F421 1/4 Amp	Same as above	Same as above
F401 4 Amp Slo-Blo	Same as above	Nothing works.

width and scan time are satisfactory for the bandwidth chosen).

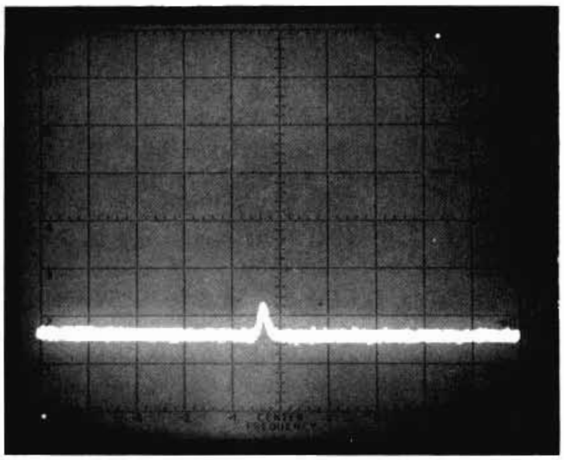
3-20. For a given sensitivity requirement, the widest possible bandwidth should be used. Effective sensitivity can be increased by using the video filter. The filter averages the noise, making it possible to see small signals that would otherwise be obscured by noise peaks (see Figure 3-1).

3-21. Loss or gain in the signal path will affect sensitivity. For maximum sensitivity, set INPUT ATTENUATION to 0 dB. Sensitivity can be increased by the use of appropriate low-noise preamplifiers (see OPERATING ACCESSORIES in Section I).

3-22. Dynamic Range. Dynamic range is defined as the difference between the minimum and maximum signal levels that can be simultaneously displayed on the analyzer's CRT; with the 8554B/8552/140 analyzer, this range is 70 dB.



a. Video Filter OFF



b. Video Filter 100 Hz

Figure 3-1. Increasing Effective Sensitivity Using the Video Filter

However, in practice any analyzer's dynamic range has system noise (which depends upon bandwidth) as the lower limit, and the input signal level that causes spurious responses to appear above the noise level as the upper limit.

3-23. Since spurious responses are generated by overdriving the analyzer, the operator can use the INPUT ATTENUATION control to tell if the analyzer is overloaded. Simply increase the attenuation by 10 dB; input signals will drop 10 dB while internal distortion responses will drop more than 10 dB. (See Figure 3-2). To ensure that harmonic and intermodulation responses are not visible on the display, keep level at input mixer* below that indicated in Figure 3-3. For example, if noise level is −105 dBm, the maximum input level for a spurious free display is −40 dBm (for a dynamic range of 65 dB). If the noise level is −115 dBm, then the maximum input is −45 dBm and the dynamic range is 70 dB.

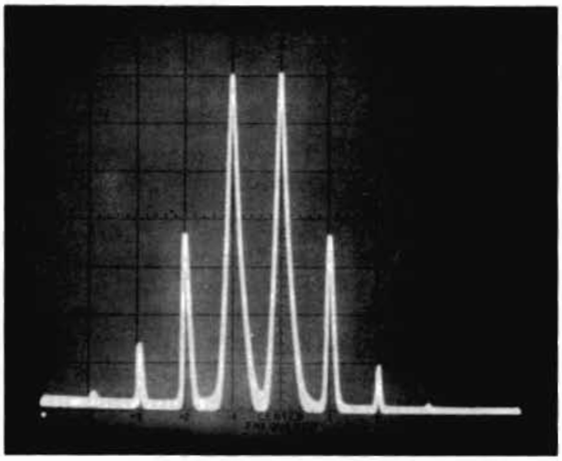
3-24. Although spurious responses may be generated for large input signals, the analyzer is still calibrated. Gain compression is less than 1 dB for a signal level to the input mixer* of −10 dBm. Therefore, with 20 dB of input attenuation, the analyzer remains absolutely calibrated for input levels as high as +10 dBm. Note, however, that the maximum input level under any circumstances is +13 dBm. A signal level greater than this may damage the input attenuators or mixers of the analyzer. External pads, or directional couplers can be used to reduce a high level signal to a lower level compatible with the analyzer.

3-25. Residual and leakage responses are signals that appear on the display when there is no input to the analyzer. These signals may be identified by simply disconnecting the input. When working in high RF environments, stray signals can also be picked up by leakage through the input cable. Signals such as these can generally be eliminated by using cables with better shielding.

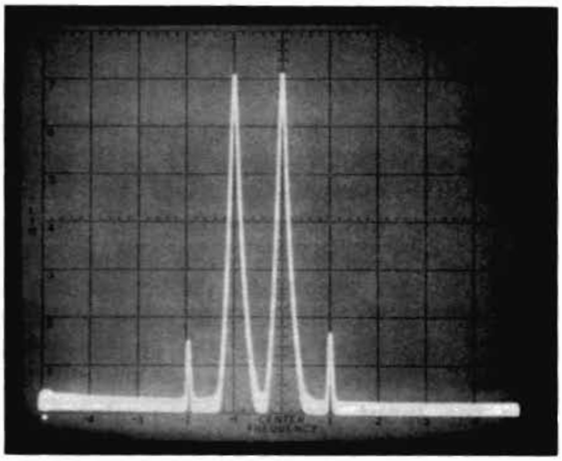
3-26. Amplitude Accuracy. Amplitude accuracy depends upon the measurement technique used. The factors involved in amplitude accuracy measurements are listed below.

	LOG	LINEAR
Frequency Response (Flatness)	±1 dB	±12%
INPUT ATTENUATOR (Excluding Flatness)	± 1 dB	± 12%

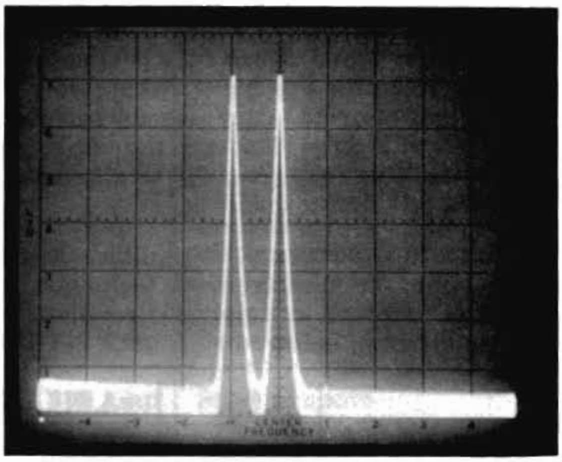
* Signal level at input mixer = (signal level at INPUT) − (INPUT ATTENUATION)



a. INPUT ATTENUATION = 0 dB
LOG REF LEVEL = 0 dBm



b. INPUT ATTENUATION = 10 dB
LOG REF LEVEL = 0 dBm



c. INPUT ATTENUATION = 20 dB
LOG REF LEVEL = 0 dBm

Figure 3-2. Intermodulation Responses

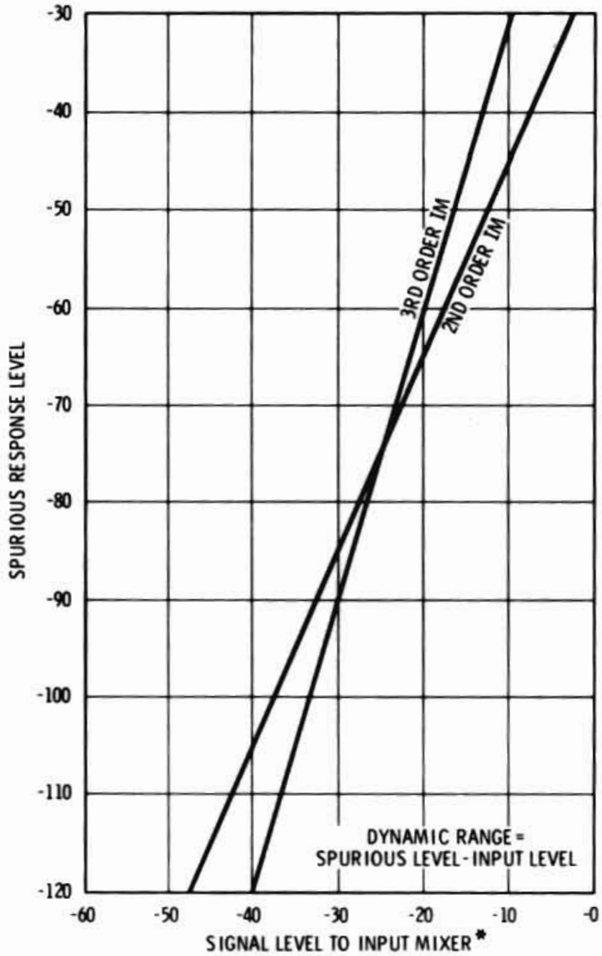


Figure 3-3. Dynamic Range

* Signal level at input mixer - (signal level at INPUT) - (INPUT ATTENUATION).

	LOG	LINEAR
Calibrator	±0.3 dB	±3.5%
LOG REF LEVEL· LINEAR SENSITIVITY	±0.2 dB	±2.3%
LOG REF LEVEL* Vernier	±0.1 dB	±1.2%
Switching between bandwidths (20/°C)	±0.5 dB	±5.8%
Amplitude Stability	±0.07 dB/°C	±0.6%/°C
Amplitude Display	±0.25 dB/dB but not more than ±1.5 dB over full 70 dB display range.	±2.8% of full 8 division deflection.

3-27. For general use, the amplitude measurement accuracy is determined by the frequency response flatness and the amplitude display accuracy. It is evident from the above chart that better accuracy can be obtained by moving the signal to be measured to the same display level as the calibrator, thus eliminating the amplitude display error of ± 1.5 dB. The frequency response error of 1 dB can also be eliminated by calibrating the display with a laboratory standard at the frequency of interest. To ensure maximum accuracy, the analyzer should be calibrated in the bandwidth used to make the measurement; also, the DISPLAY UNCAL light must be off.

3-28. Frequency Characteristics

3-29. **Stabilization.** The analyzer is stabilized when the TUNING STABILIZER is set to ON (up), and the PER DIVISION scan is set to any one of the scan widths that are blue color-coded (2 through 200 kHz per division). Coarse tuning the analyzer in the stabilized mode will cause the analyzer to jump lock points. When the analyzer is stabilized use FINE TUNE only.

3-30. **Frequency Scanning.** Any segment of the frequency range can be presented on the CRT. Any of the three scanning modes can be selected from the front panel: full scan (0 - 1250 MHz), PER DIVISION scan (scan width selectable from 1000 MHz to 20 kHz), and ZERO scan. Switching between scanning modes makes it possible to periodically monitor the entire spectrum while individual signals are examined in detail as is done in surveillance and circuit-stability analysis. In the following paragraphs, the three scanning modes are described in their usual order of use.

3-31. 0 - 1250 MHz Scan: for a quick view of the entire frequency range, the preset, 0 - 1250 MHz scan mode can be selected. A marker identifies the center frequency of the CRT display for the other scan modes (PER DIVISION and ZERO) and since the marker is inverted, it cannot be confused with input signals. The marker can be tuned to any frequency by setting the tuning dial. When the marker is centered on a particular signal, the signal amplitude will dip to a minimum.

3-32. SCAN WIDTH PER DIVISION: in the PER DIVISION scan mode, the scan width is selected by the front panel SCAN WIDTH control. Scan widths of 1000 MHz to 20 kHz (100 MHz to 2 kHz per division) are selectable by the PER DIVISION control. The ten-division scan is symmetrical about the center frequency selected by the FREQUENCY control. Since the scan widths are calibrated, frequency separation is read directly from the CRT. The spectrum may be scanned in small or large segments, depending upon the application.

3-33. ZERO Scan: in the ZERO scan mode, the analyzer is a fixed-tuned receiver and is manually tuned by the FREQUENCY control. Using this mode and the calibrated time base, the demodulated waveform of a signal can be examined in the time-domain.

3-34. **Frequency Accuracy.** The frequency accuracy of a Spectrum Analyzer is related to both the center frequency accuracy and the scan width accuracy. The absolute frequency of any displayed signal is a function of the center frequency accuracy. The precision of a frequency difference measurement is determined by the scan width accuracy.

3-35. Since the frequency scan is very linear, absolute frequency can be determined by comparing the unknown signal to a known reference frequency. (The HP 8406A Comb Generator provides a comb of reference signals spaced at 100, 10 and 1 MHz for reference purposes). The reference and unknown signals are simultaneously applied to the analyzer; both frequencies can then be read directly from the CRT. A typical example is shown in Figure 3-4; the reference frequency was derived from the HP 8406A. The unknown frequency was read from the analyzer dial as about 380 MHz. The comb reference is known to be 385 MHz ± 0.01% (±38.5 kHz) and the scan width is 50 kHz per

* Vernier accuracy at 0, 6, and 12 dB; otherwise ± 0.25 dB (± 2.8%).

division (signal separation is 150 kHz ± 10%, that is 150 kHz ±15 kHz). Thus, the frequency of the unknown can be calculated to be 385.15 MHz ±53.5 kHz. Greater detail on "Accuracy Frequency Measurements" is given in Application Note AN63D. There is also a procedure for making precision frequency measurements using the HP 8444A Tracking Generator. (See the HP 8444A manual.)

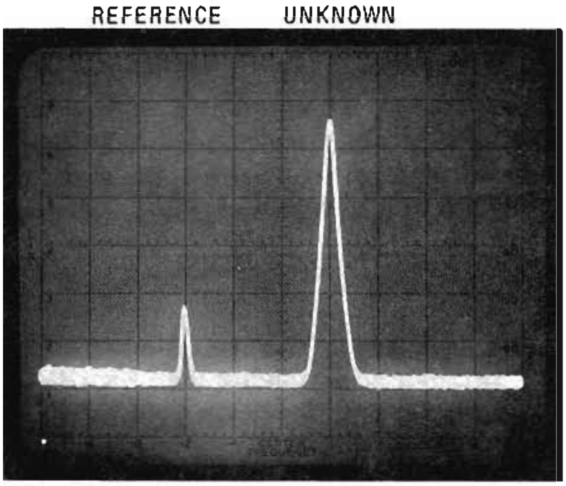


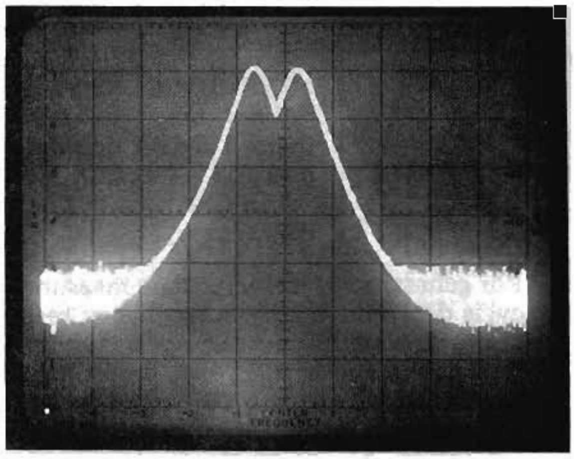
Figure 3-4. Using a Reference Signal to Measure An Unknown Frequency

3-36. Frequency Resolution. The resolution of the analyzer is a measure of its ability to separate two closely spaced signals. This characteristic is largely determined by the IF passband.

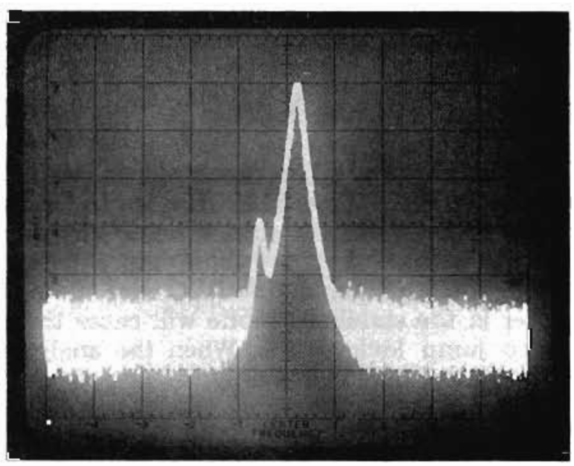
3-37. Two signals of equal amplitude can be resolved if their frequencies differ by more than the 3 dB bandwidth of the analyzer (Figure 3-5a). If the signals are unequal in amplitude, the frequency separation must be greater or the bandwidth must be narrower (Figure 3-5b). Figure 1-3 in Table 1-2 shows a typical resolution chart for the Spectrum Analyzer. For a given bandwidth setting the chart shows the frequency resolving capability of the analyzer for two signals. For instance, two signals differing by 40 kHz and 30 dB can be resolved using the 10 kHz bandwidth. Maximum resolution can be obtained with a narrower bandwidth. If in the preceding example, the bandwidth is reduced to 1 kHz, the frequency resolution is improved by a factor of eight - to 5 kHz. A more narrow bandwidth than that required to resolve the frequency of the viewed signals should not be used, since a longer scan time will be required to maintain a calibrated amplitude display. (The DISPLAY UNCAL light is off when the scan time is compatible with the scan width and bandwidth selected). Eight calibrated bandwidths from 100 Hz to 300 kHz permit selection of the optimum bandwidth for maximum sensitivity, resolution, or a choice of scan width and scan time.

3-38. Variable Persistence and Storage Functions

3-39. With the 141T Display Section the operator can set trace persistence for a bright, steady trace that does not flicker, even on the slow sweeps required for narrow band analysis. The variable persistence also permits the display of low repetition rate pulses without flickering and, using the longest persistence, intermittent signals can be captured and displayed. The storage capability allows side-by-side comparison of changing signals.



a. Signals of Equal Amplitude: SCAN WIDTH PER DIVISION = 2 kHz; BANDWIDTH = 1 kHz



b. Signals Differing in Amplitude by 30 dB: SCAN WIDTH PER DIVISION = 2 kHz; BANDWIDTH = 0.3 kHz

Figure 3-5. Resolving Two Signals That Are Close Together

3-40. Persistence and Intensity. The persistence and intensity determine how long a written signal will be visible. Specifically, PERSISTENCE controls the rate at which a signal fades and INTENSITY controls the trace brightness as the signal is written. With a given PERSISTENCE setting, the actual time of trace visibility can be increased by greater INTENSITY. Since the PERSISTENCE control only sets the fade rate, it follows that a brighter trace will fade more slowly. Conversely, a display of low intensity will disappear more rapidly. The same principle applies to a stored display of high and low intensity.

CAUTION

Excessive INTENSITY will damage the CRT storage mesh. The INTENSITY setting for any sweep speed should just eliminate trace blooming with minimum PERSISTENCE setting.

3-41. Storage. The storage controls select the storage mode in which the CRT functions. In ERASE, the WRITING SPEED function is disconnected and all written signals are removed from the CRT. The STORE selector disconnects the WRITING SPEED and ERASE functions and implements signal retention at reduced intensity. In the STORE mode, PERSISTENCE and INTENSITY have no effect.

3-42. Writing Speed. In the FAST mode, the fade rate is decreased, the entire screen becomes illuminated more rapidly, and the display is obscured. The effective persistence and storage time are considerably reduced.

3-43. Photographic Techniques

3-44. Excellent signal photography is possible when the Spectrum Analyzer is used with an oscilloscope camera and when proper techniques are employed. Both the HP 196B and the 197A Oscilloscope Cameras attach directly to the anlayzer's CRT bezel without adapters. Both cameras also have an Ultra-Violet light source that causes a uniform glow of the CRT phosphor. This gives the finished photograph a gray background that contrasts sharply with the white trace and the black graticule lines. Ulta-Violet illumination is normally used only when the CRT is of the non-storage and fixed persistence type (140T Display Section). For a storage or variable persistence CRT (141T Display Section), a uniform gray background can be obtained by simply taking the photograph in STORE rather than in VIEW.

FRONT PANEL FEATURES

1. **FREQUENCY:** coarse tunes CENTER FREQUENCY in SCAN WIDTH PER DIVISION and ZERO scan modes. In 0 to 1250 MHz scan mode it tunes inverted marker on CRT to indicate CENTER FREQUENCY for other scan modes.

2. **FINE TUNE:** fine tunes CENTER FREQUENCY.

3. **TUNING STABILIZER:** when set to up position, analyzer is phase locked if SCAN WIDTH is also set to ZERO or PER DIVISION and SCAN WIDTH PER DIVISION is set to any blue numeral. Use FINE TUNE to tune frequency. Coarse tune control (FREQUENCY) will cause analyzer to jump lock points (1 MHz jumps).

4. **BANDWIDTH:** selects resolution bandwidth of Spectrum Analyzer.

5. **CENTER FREQUENCY:** dial indicates center frequency to which analyzer is tuned by FREQUENCY in SCAN WIDTH PER DIVISION and ZERO scan modes (FINE TUNE does not move dial pointer). Indicates frequency of inverted marker in 0 - 1250 MHz scan mode.

6. **SCAN WIDTH:** selects frequency scan mode. PER DIVISION mode scans the analyzer symetrically about the CENTER FREQUENCY with a scan width set by the PER DIVISION control. 0 - 1250 MHz mode scans analyzer from 0 to 1250 MHz; inverted marker and dial identify CENTER FREQUENCY for other scan modes. in ZERO scan mode analyzer becomes a fixed frequency receiver at the CENTER FREQUENCY.

7. **PER DIVISION:** selects the CRT horizontal calibration (frequency scale) in SCAN WIDTH PER DIVISION mode.

8. **AMPL CAL:** sets overall gain of analyzer for absolute amplitude calibration.

9. **INPUT ATTENUATION:** adjusts the input signal level to the input mixer to maximize dynamic range.

Figure 3-6. Front Panel Features (1 of 4)

See page 3-9 for Illustration.

FRONT PANEL FEATURES

Set for −40 dBm at mixer (level at mixer = level − INPUT ATTENUATION).

(10) **DISPLAY UNCAL:** warning light indicates that the CRT display is uncalibrated due to incompatible settings of SCAN WIDTH PER DIVISION, SCAN TIME PER DIVISION, BANDWIDTH, and VIDEO FILTER.

(11) **RF INPUT:** 50 ohm female Type N coaxial input connector.

CAUTION

To prevent mixer burnout, attenuator damage, or both, the RF INPUT level should never exceed 1 Vrms (+13 dBm) or ± 50 Vdc.

(12) **FIRST LO OUTPUT:** 2050 MHz to 3300 MHz from YIG oscillator; female BNC connector. Terminate in 50 ohm load when not in use.

(13) **THIRD LO OUTPUT:** 500 MHz from third LO, female BNC connector. Terminate in 50 ohm load when not in use.

(14) **INDICATOR LAMPS:** When "+" is lit, absolute level (in dBm) of LOG REF graticule on CRT is sum of LOG REF LEVEL controls. When "X" is lit, linear scale factor (in mV or μV) on CRT is product of LINEAR SENSITIVITY controls.

(15) **CAL OUTPUT:** 30 MHz, −30 dBm signal for amplitude calibration of analyzer; signal also contains harmonics: 60 MHz, 90 MHz, etc.

(16) **PEN LIFT OUTPUT, TRIG/BLANK INPUT:** provides +14 V pen lift signal during retrace (for use with X-Y recorders); present with SCAN MODE set to SINGLE or INT and SCAN TRIGGER set to VIDEO, LINE, or AUTO. Serves as input for external blanking signal (−1.5V) with SCAN MODE set to EXT. Serves as input for external trigger signal (see (22)) with SCAN MODE set to INT and SCAN TRIGGER set to EXT.

(17) **VERTICAL OUTPUT:** provides output proportional to vertical deflection on CRT. Approximately 100 mV per major division with 100 ohm output impedance (0 V = bottom, 800 mV = top).

(18) **SCAN IN/OUT:** provides output voltage proportional to CRT horizontal deflection. 0 volts equals center screen with 1 volt per division (−5 to +5 V full screen). Output voltage available with SCAN MODE set to SINGLE, INT, and MAN (on 8552B). With SCAN MODE set to EXT, connector used as input for 0 to +8 V external scan signal.

(19) **DISPLAY ADJUST:** the controls adjust deflection circuit gain and offset levels to calibrate CRT.

(20) **LOG REF LEVEL · LINEAR SENSITIVITY:** these controls set the absolute amplitude calibration of CRT display. In LOG mode, sum of two control settings gives absolute level (in dBm) of LOG REF graticule on CRT. In LINEAR mode, product of two control settings gives CRT scale factor in volts per division (in μV or mV).

(21) **LOG/LINEAR:** selects display mode, LOG (logarithmic) or LINEAR. Also selects LOG scale factor with 8552B, either 10 dB/div or 2 dB/div (with 8552A, scale factor is 10 dB/div). In LINEAR mode, scale factor is selected by LINEAR SENSITIVITY controls.

(22) **SCAN TRIGGER:** selects synchronizing trigger when in the INT SCAN MODE.

AUTO: scan free runs.

LINE: scan synchronized to power line frequency.

EXT : scan initiated by external positive or negative pulses (2-20V normally negative) applied to TRIG/BLANK INPUT (polarity set by switch in IF Section).

VIDEO: scan internal synchronized to envelope of RF input signal. Signal amplitude of 1.5 divisions peak-to-peak (min.) required on display section CRT.

(23) **SCAN MODE:** selects scan source.

INT.: analyzer repetitively scanned by internally generated ramp; synchronization selected by SCAN TRIGGER. SCANNING lamp indicates time during which analyzer is being scanned.

EXT.: scan determined by externally applied 0 to +8 V signal at SCAN IN/OUT.

MAN: scan determined by MANUAL SCAN control; scan continuously variable across CRT in either direction. (Not available with 8552A).

SINGLE: single scan initiated by front panel pushbutton. SCANNING lamp indicates time during which analyzer is being scanned.

Figure 3-6. Front Panel Features (2 of 4)

FRONT PANEL FEATURES

24 Initiates or resets scan when SINGLE SCAN MODE is selected.

25 **SCAN TIME PER DIVISION:** selects time required to scan one major division on CRT display. Control acts as time base for time domain operation in ZERO scan.

26 **VIDEO FILTER:** post detection low pass filter for effective averaging of distributed signals such as noise. Bandwidths of 10 kHz, 100 Hz, and 10 Hz selectable; nominal bandwidth 400 kHz in OFF position. (10 Hz position not available with 8552A).

27 **BASE LINE CLIPPER:** allows blanking of the bright base line area of the CRT for better photography and improved display of transient phenomena.

28 **MANUAL SCAN:** controls spectrum analyzer horizontal scan in the MAN SCAN MODE. (Not available on 8552A).

29 **CAL 10 V and 1 V:** 10 V or 1 V square wave used to calibrate time domain plug-ins *only*.

30 **FOCUS:** focuses CRT spot for best definition.

31 **BEAM FINDER:** returns CRT trace to the center of the screen regardless of deflection potentials with time domain plug-ins *only*.

32 **NON STORAGE, CONV:** defeats the storage and variable persistence features of the CRT. Persistence is that of the standard P31 phosphor.

33 **INTENSITY:** adjusts the intensity of the trace on the CRT.

CAUTION

Excessive INTENSITY will damage the CRT storage mesh. Whenever trace blooming occurs, turn INTENSITY down.

34 **ERASE:** erases the CRT in the WRITING SPEED FAST or STD mode of operation. CRT ready to record immediately after erasure.

35 **PERSISTENCE:** adjusts the trace fade rate from 0.1 sec to more than 2 minutes in the WRITING SPEED FAST or STD modes of operation.

36 **WRITING SPEED FAST, STD:** these controls select the writing speed of the CRT in the PERSISTENCE mode of operation. The WRITING SPEED STD mode is almost always selected for spectrum analysis applications.

37 **STORE TIME:** controls the storage time and relative brightness of the display in the STORE mode of operation. Storage time more than 2 minutes at maximum brightness, more than 2 hours at minimum brightness.

38 **STORE:** stores the display on the CRT for extended viewing or photography. The CRT does not write in the STORE mode.

39 **POWER:** controls power to the mainframe and to both plug-ins.

40 **ASTIG:** adjusts the shape of the CRT spot.

41 **TRACE ALIGN:** used to adjust the CRT trace to align with the horizontal graticule lines.

42 **CRT Graticule with LOG and LIN scales.** LOG REF is the level used to reference the amplitude of displayed signals in the LOG display mode. LINEAR display amplitude is referenced from the baseline.

Figure 3-6. Front Panel Features (3 of 4)

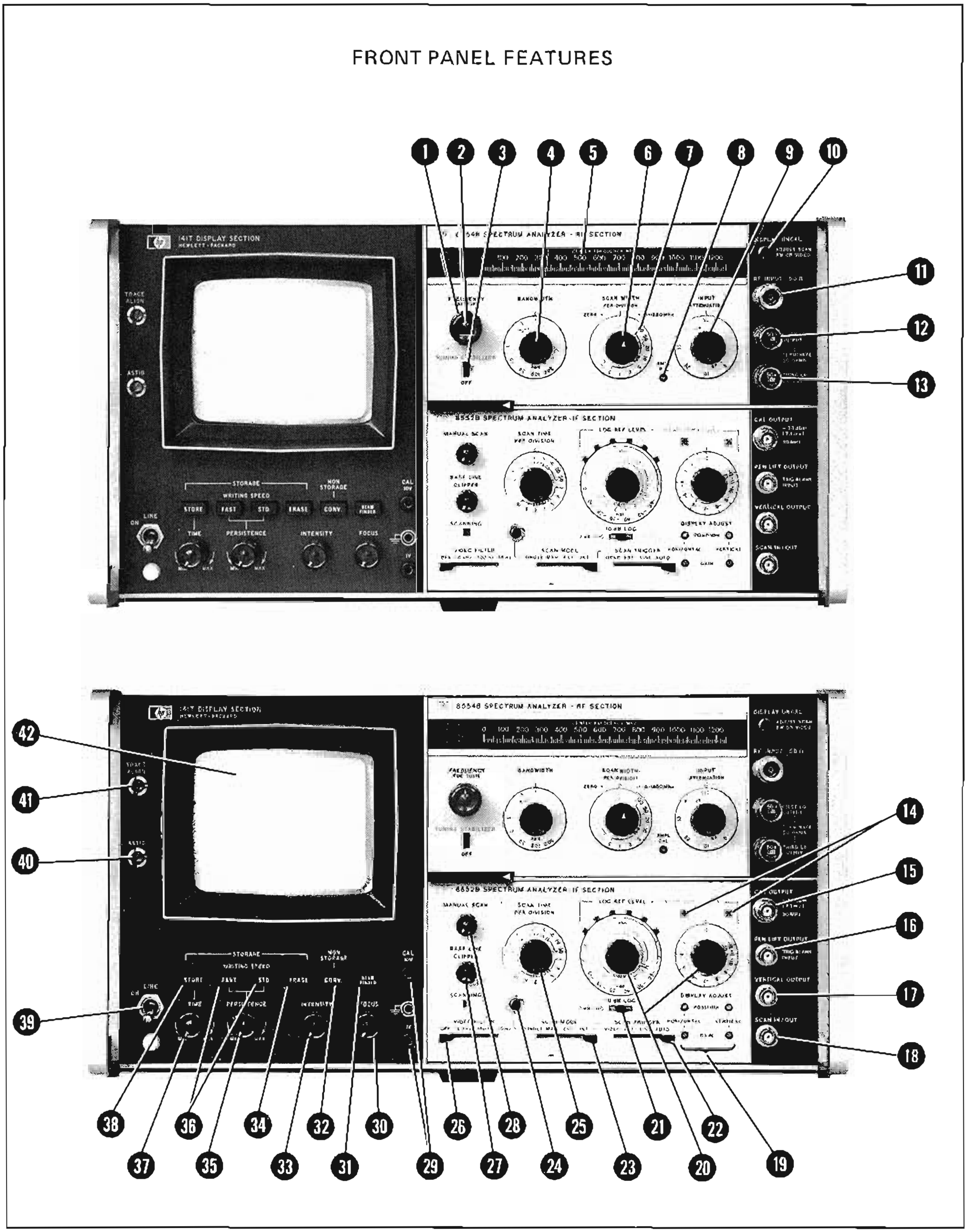


Figure 3-6. Front Panel Features (4 of 4)

OPERATIONAL ADJUSTMENTS

1 INPUT POWER

a. Set to correspond with available input voltage. (The instrument, as supplied, is fused for 120 volt, 50/60 Hz operation; if some other line voltage is used, refer to the Display Section service manual for power selection and fuse replacement procedures).

b. Connect line power cord to instrument jack and to a line power outlet.

2 ITENSITY MODULATION

Set INT/EXT switch to INT. (Set to EXT only if CRT Z axis is to be externally modulated - normally only used with 1400 series oscilloscope plug-ins).

3 FOCUS AND ASTIGMATISM

a. Make the following instrument control settings:

FREQUENCY	30 MHz
FINE TUNE	Centered (1½ turns from stop)
BANDWIDTH	100 kHz
SCAN WIDTH	PER DIVISION
PER DIVISION	5 MHz
INPUT ATTENUATION	10 dB
TUNING STABILIZER	On (up)
SCAN TIME PER DIVISION	10 MILLISECONDS
LOG REF LEVEL	−30 dBm
Vernier	ccw
LOG/LINEAR	10 dB LOG
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO
BASE LINE CLIPPER	ccw
WRITING SPEED	STD
PERSISTENCE	MIN
INTENSITY	12 o'clock
POWER	ON

b. Adjust INTENSITY as needed. (Whenever blooming occurs on CRT, turn INTENSITY down). Set LOG REF LEVEL maximum counterclockwise. Using the VERTICAL POSITION control, bring the trace to the −40 dB graticule line.

c. Set SCAN TIME PER DIVISION to 10 SECONDS. Adjust FOCUS and ASTIG for the smallest round dot possible. Then set SCAN TIME PER DIVISION to 10 MILLISECONDS.

4 TRACE ALIGNMENT

Adjust TRACE ALIGN to set the trace parallel to the horizontal graticule lines.

5 HORIZONTAL POSITION AND GAIN

a. Alternately adjust HORIZONTAL GAIN and HORIZONTAL POSITION so that the trace just fills the horizontal graticule line.

b. Using the VERTICAL POSITION control, bring the trace to the bottom graticule line (ignore any slight misalignment of the trace).

c. Set LOG REF LEVEL to −30 dBm

6 VERTICAL POSITION AND GAIN

a. Connect CAL OUTPUT to RF INPUT.

b. Set SCAN WIDTH to 0 - 1250 MHz.

c. Tune FREQUENCY until inverted marker is below 30 MHz signal (see *Display a).*

NOTE

Signal at far left graticule is LO feedthrough (0 Hz marker). First signal to right is 30 MHz, second signal to right is 60 MHz, etc. Use BASE LINE CLIPPER, if necessary, to prevent base line blooming.

d. Set SCAN WIDTH to PER DIVISION. Center 30 MHz signal with FREQUENCY (see *Display b).*

e. Reduce SCAN WIDTH PER DIVISION to 0.5 MHz; keep signal centered with FREQUENCY (see *Display c).*

f. Set LOG REF LEVEL full counterclockwise. Adjust VERTICAL POSITION control to set trace to bottom graticule line, if necessary.

g. Adjust LOG REF LEVEL and Vernier to set signal peak to −60 dB graticule line.

h. Rotate LOG REF LEVEL 6 steps clockwise. Adjust VERTICAL GAIN until signal peak is at LOG REF graticule line.

Figure 3-7. Operational Adjustments (1 of 3)

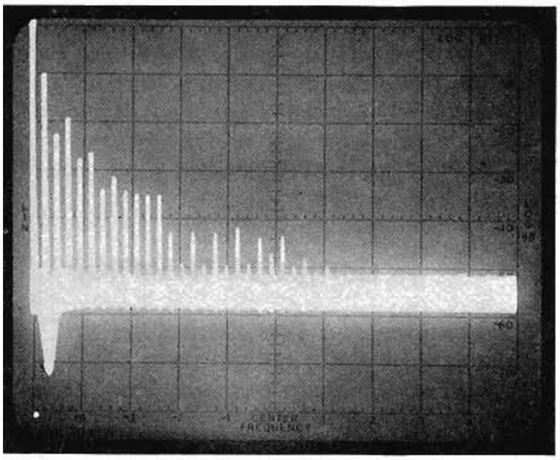
OPERATIONAL ADJUSTMENTS

i. Reduce SCAN WIDTH PER DIVISION to 50 kHz. Repeat steps f, g and h until signal moves one major division for each step of LOG REF LEVEL control as shown on *Display d*.

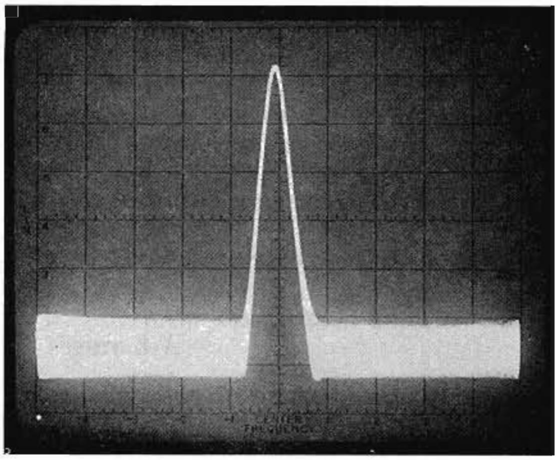
7 AMPLITUDE CALIBRATION

a. Set LOG REF LEVEL to −30 dBm and set Vernier to 0 (full ccw). Adjust AMPL CAL until signal peak is at LOG REF graticule line.

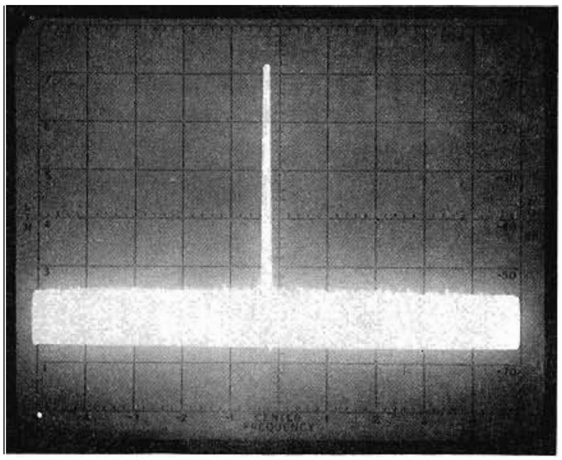
b. Set LOG/LINEAR to LINEAR, and set LINEAR SENSITIVITY to 1 mV/DIV (Vernier should read 1 on blue scale · full ccw). Adjust AMPL CAL until signal peak is 7.1 divisions from bottom (−30 dBm calibrator output is actually 7.07 mV across 50 ohms).



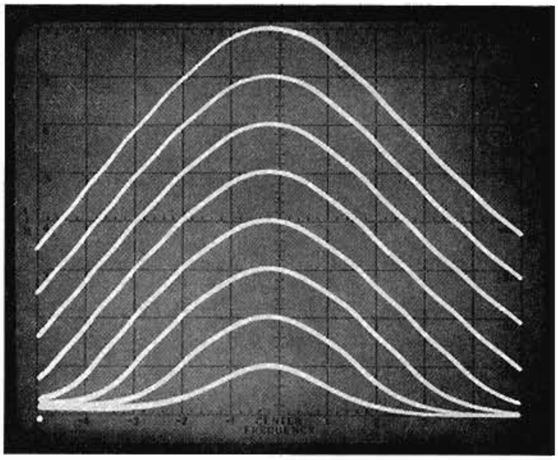
Display a. 30 MHz Calibrator Signal with SCAN WIDTH at 0 - 1250 MHz



Display c. 30 MHz Calibrator Signal with SCAN WIDTH PER DIVISION at 0.5 MHz



Display b. 30 MHz Calibrator Signal with SCAN WIDTH PER DIVISION at 5 MHz



Display d. Amplitude Calibration Steps in LOG Mode

Figure 3-7. Operational Adjustments (2 of 3)

OPERATIONAL ADJUSTMENTS

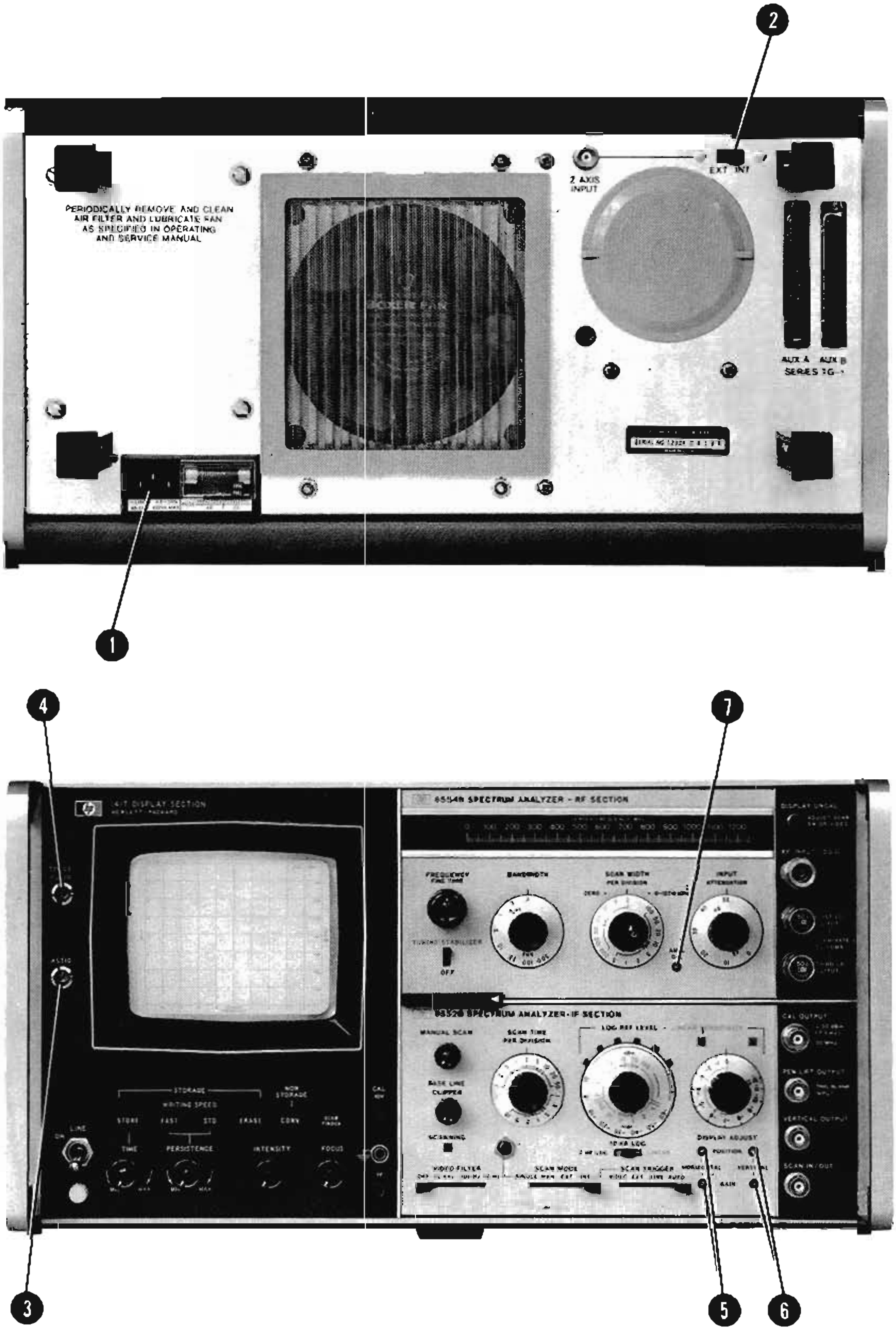


Figure 3-7. Operational Adjustments (3 of 3)

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. This section provides instructions for performance testing the Model 8554B Spectrum Analyzer RF Section. The performance tests verify that the instrument meets the specifications listed in Table 1-1. Front panel checks for routine inspection are given in Table 4-1.

4-3. Perform the tests in procedural order with the test equipment called for, or with its equivalent. During the tests, all circuit boards, shields, covers and attaching hardware must be in place, and the RF and IF Sections must be installed in the Display Section. Allow the analyzer to warm up at least one hour before performing the tests.

4-4. EQUIPMENT REQUIRED

4-5. Test equipment and test equipment accessories for the performance tests (designated "P" in the "use" column) are specified in Tables 1-4 and 1-5. Equipment other than that listed may be used providing that it meets or exceeds the minimum specifications listed in the tables.

4-6. OPERATIONAL ADJUSTMENTS

4-7. Before proceeding to the performance tests, perform the operational adjustments specified in Figure 3-7 (in Section III). These adjustments correct for minor differences between units and ensure that the RF Section, IF Section and Display Section are properly calibrated.

4-8. FRONT PANEL CHECKS

4-9. The front panel checks provide a quick method for verifying that the RF Section is operating correctly. After performing the operational adjustments described in Figure 3-7, set the analyzer's controls as specified in Table 4-1 and perform the checks.

4-10. TEST SEQUENCE

4-11. The performance tests are suitable for incoming inspection, troubleshooting, and preventive maintenance. A test card for recording data is included at the back of this section.

4-12. Perform the tests in the following order:

a. Allow analyzer to warm up one hour.

b. Perform operational adjustments listed in Figure 3-7.

c. Perform front panel checks listed in Table 4-1.

d. Perform the performance tests in the order given.

4-13. PERFORMANCE TEST PROCEDURES

4-14. Each test is arranged so that the specification is written as is appears in Table 1-1. Next is a description of the test that includes any special instructions. Each test that requires test equipment has a test setup drawing and a list of required equipment.

Table 4-1. Front Panel Checks

Function	Procedure	Result
Calibration	1. Perform Operational Adjustments specified in Section III (Figure 3-7), then set analyzer as follows (CAL OUTPUT should be connected to RF INPUT): FREQUENCY . . . 30 MHz FINE TUNE . . . Centered BANDWIDTH . . 100 kHz SCAN WIDTH . . . . PER DIVISION SCAN WIDTH PER DIVISION . . . . . 5 MHz INPUT ATTENUATION 20 dB TUNING STABILIZER . On SCAN TIME PER DIVISION . . . . 5 MILLISECONDS LOG/LINEAR . . . . LOG LOG REF LEVEL −10 dBm Vernier . . . . ccw VIDEO FILTER . . 10 kHz SCAN MODE . . . . . . INT SCAN TRIGGER . . AUTO BASE LINE CLIPPER . ccw	1. Analyzer calibrates normally.
Base Line Clipper	2. Turn BASE LINE CLIPPER cw.	2. At least the bottom two divisions should be blank.
	3. Return clipper to ccw.	
Scan	4. SCAN TIME PER DIVISION across its range	4. Scan should occur in all positions.
	5. Set to 5 MILLISECONDS.	
Scan Width	6. Turn SCAN WIDTH PER DIVISION to 10 MHz.	6. LO feedthrough, 30 MHz signal and second harmonic visible.
	7. Center CAL OUTPUT (30 MHz) signal on display.	
	8. Reduce SCAN WIDTH PER DIVISION to 200 kHz; use FINE TUNE to center display.	
Phase Lock	9. Carefully turn FREQUENCY.	9. Signal jumps to left or right edge of CRT (± 1 MHz). (This corresponds to the 1 MHz reference oscillator in the automatic phase control circuit).
	10. Turn TUNING STABILIZER to OFF; use FREQUENCY to center display	10. Signal should jump ≤ 1 MHz when TUNING STABILIZER is turned off.

Table 4-1. Front Panel Checks (cont'd)

Function	Procedure	Result
	11. Turn TUNING STABILIZER on, use FINE TUNE to center display.	11. Signal should jump ⩽ 1 MHz.
Bandwidth and Display Uncal Light	12. Reduce BANDWIDTH and SCAN TIME PER DIVISION using FINE TUNE to center display.	12. Display should be stable and viewable so long as DISPLAY UNCAL is unlit.
	13. Return BANDWIDTH to 10 kHz and SCAN TIME PER DIVISION to 5 MILLISECONDS.	
Calibration	14. Setting under lit index light on LOG REF LEVEL control corresponds to top line of graticule; with input attenuation at 20 dB and LOG REF LEVEL at −10 dBm, signal level is −30 dBm.	14. Calibrator signal is at −30 dBm level (two divisions down from top of graticule).
Gain Vernier	15. Turn LOG REF LEVEL Vernier cw.	15. Signal level increases by amount marked on vernier dial.
Attenuators	16. Turn INPUT ATTENUATION and LOG REF LEVEL in 10 dB steps.	16. Signal increases or decreases one vertical division per 10 dB step.

PERFORMANCE TESTS

4-15. Input Impedance

SPECIFICATION: 50 Ohms nominal. Reflection coefficient < 0.3 (1.85 SWR with INPUT ATTENUATION ⩾ 10 dB).

DESCRIPTION: The Spectrum Analyzer RF input impedance is verified by measuring the return loss in a 50-ohm system as the RF input is swept by an external source from 100 - 1250 MHz. The analyzer is checked with input attenuation settings of 10 and 20 dB.

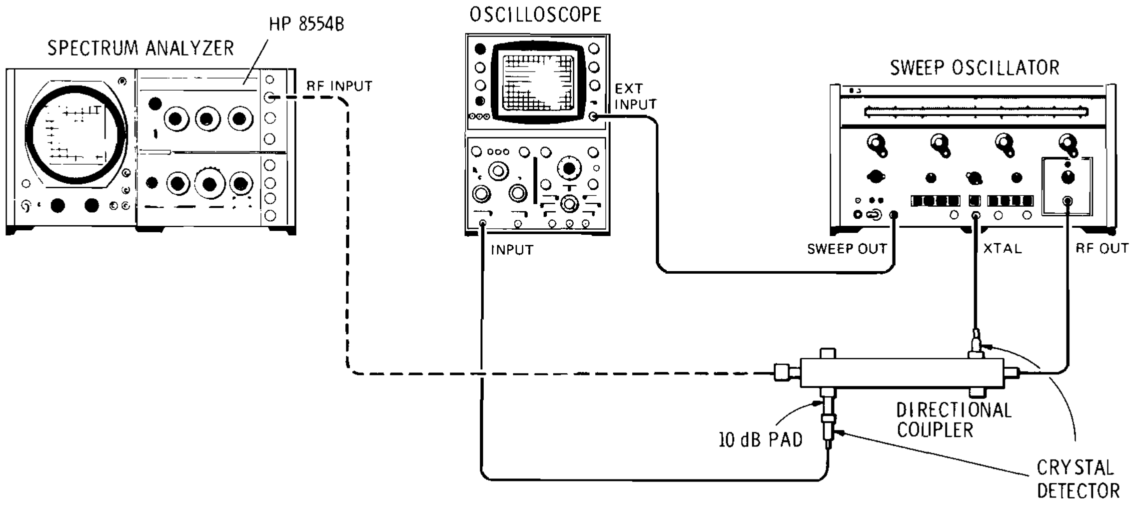


Figure 4-1. Return Loss Test Setup

EQUIPMENT:

Sweep Oscillator	HP 8690B
Oscilloscope	HP 180A/1801A/1821A
Dual Directional Coupler	HP 778D
Crystal Detector (2)	HP 423A
10 dB Attenuator	HP 8491A OP 010

PROCEDURE:

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

Spectrum Analyzer:

INPUT ATTENUATION	10 dB

8690B/8699B:

FUNCTION	START/STOP
SWEEP SELECTOR	AUTO
START/CW	0.1 GHz
STOP/ΔF	1.25 GHz
ALC	Depressed (on)
AMPLITUDE MOD	All Released (off)

PERFORMANCE TESTS

4-15. Input Impedance (cont'd)

SWEEP TIME (SEC) . . . . 1 - 0.1
VERNIER . . . . Full cw
RANGE . . . . 0.1 - 2 GHz
POWER LEVEL 10

180A/1801A/1821A:

DISPLAY . . . . A
INPUT . . . . DC
POLARITY . . . . —UP
VOLTS/DIV 005

2. Adjust the oscilloscope EXT SENS and HORIZONTAL POSITION to give a full ten division horizontal CRT deflection.

3. Reduce the sweeper POWER LEVEL until UNLEVELED indicator is not lit.

4. With the analyzer RF INPUT *not* connected, observe the 10 dB reference return loss represented by the CRT vertical deflection.

5. Remove the 10 dB pad, but reconnect the crystal detector to the directional coupler. Connect the directional coupler output to the analyzer RF INPUT.

6. Measure the return loss of the analyzer by observing the CRT display. The vertical deflection should be less than the reference level established in step 4.

Return loss: 10 dB ________________

7. Repeat step 6 with analyzer INPUT ATTENUATION set to 20 dB through 50 dB.

Return loss: 10 dB ________________

PERFORMANCE TESTS

4-16. Average Noise Level

SPECIFICATION: < —102 dBm with 10 kHz IF bandwidth.

DESCRIPTION: Average noise level is checked by observing the average noise power level of the analyzer with the instrument vertically calibrated and no signal input. The test is made using a 10 kHz IF bandwidth.

PROCEDURE:
1. Check the analyzer to make sure it is vertically calibrated. Refer to Figure 3-7.

2. Make the following analyzer control settings:

FREQUENCY	1250 MHz
BANDWIDTH	10 kHz
SCAN WIDTH	ZERO
INPUT ATTENUATION	0 dB
BASE LINE CLIPPER	ccw
SCAN TIME PER DIVISION	50 MILLISECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	—60 dBm
LOG REF LEVEL Vernier	0
VIDEO FILTER	100 Hz
SCAN MODE	INT
SCAN TRIGGER	AUTO

3. Observe the average noise power level on the CRT. It should be lower than —102 dBm as shown in Figure 4-2 as FREQUENCY is tuned from 1250 MHz to 100 kHz. Make sure the LOG REF LEVEL Vernier is set at 0 during the measurement.

_________ —102 dBm

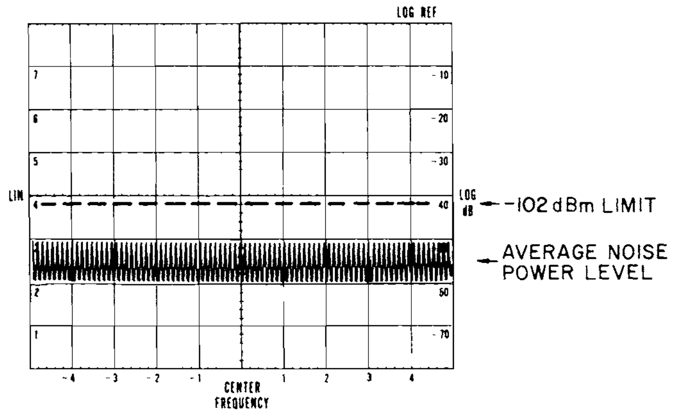


Figure 4-2. Average Noise Level

PERFORMANCE TESTS

4-17. Frequency Response

SPECIFICATION: ± 1 dB; 100 kHz to 1250 MHz.

DESCRIPTION: A very flat signal source is applied to the RF INPUT of the spectrum analyzer. As the source is slowly tuned across the spectrum analyzer's frequency range, the analyzer CRT display is observed in the LINEAR mode for amplitude flatness versus frequency. This test is performed in two segments; 100 MHz to 1250 MHz and 100 kHz to 100 MHz.

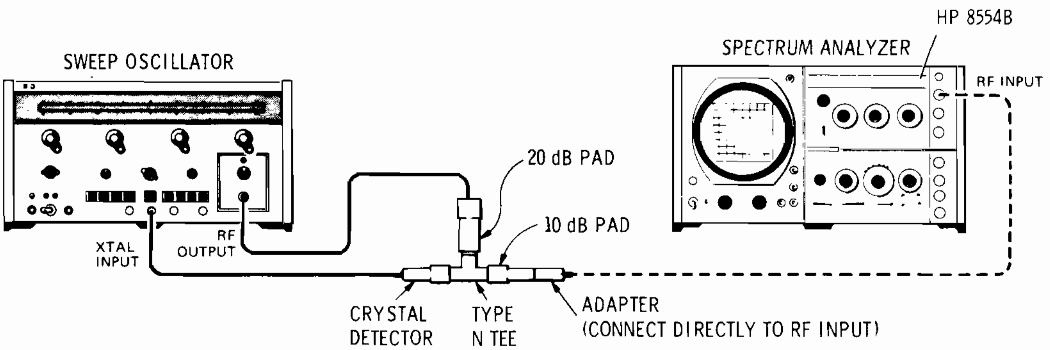


Figure 4-3. Frequency Response Test: 100 - 1250 MHz

EQUIPMENT:

Sweep Oscillator/RF Unit	HP 8690B/8699B
Generator/Sweeper	HP 8601A
Crystal Detector	HP 423A
10 dB Attenuator	HP 8491A (OP 010)
20 dB Attenuator	HP 8491A (OP 020)
Type N Tee	UG-107B/U
Adapter N Male Both Ends	HP 1250-0778

PROCEDURE:

1. To check the analyzer's frequency response from 100 MHz to 1250 MHz, connect the test setup shown in Figure 4-3. Make the following control settings:

Spectrum Analyzer:

FREQUENCY	0
BANDWIDTH	300 kHz
SCAN WIDTH	0 - 1250 MHz
INPUT ATTENUATION	20 dB
LINEAR SENSITIVITY	1 mV/DIV

8690B/8699B:

FUNCTION	START/STOP
SWEEP SELECTOR	CW
START/CW	1 GHz
ALC	Depressed (On)
AMPLITUDE MOD	All released (Off)

PERFORMANCE TESTS

4-17. Frequency Response (cont'd)

2. Adjust the HP 8699B RF Unit frequency range to 0.1 GHz - 2 GHz and adjust POWER LEVEL for a 7 mV (7 division) CRT display.

3. Tune the HP 8690B START/CW from 0.1 GHz to 1.25 GHz and note the frequency at which the signal level is maximum. Readjust VERNIER for 8 mV at this frequency.

4. Slowly tune START/CW from 0.1 GHz to 1.25 GHz. Signal amplitude should be within:

6.3 ________ 8.0 div

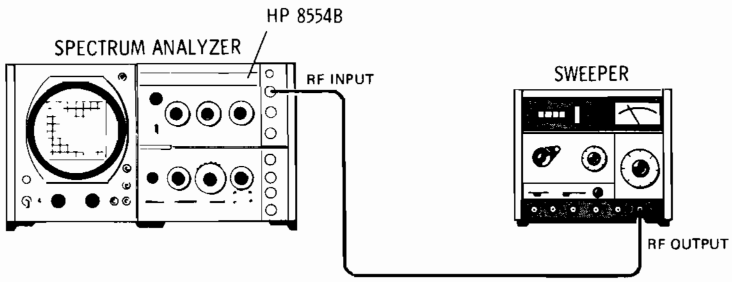


Figure 4-4. Frequency Response Test: 100 kHz to 100 MHz

5. Note the signal amplitude at 0.1 GHz.

6.3_____8.0 div

6. To check the frequency response from 100 kHz to 100 MHz, connect the test shown in Figure 4-4. Make the following control settings:

Spectrum Analyzer:

FREQUENCY	50 MHz
BANDWIDTH	100 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	10 MHz
INPUT ATTENUATION	10 dB
SCAN TIME PER DIVISION	5 MILLISECONDS
LOG/LINEAR	LINEAR
LINEAR SENSITIVITY	1 mV/DIV
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	LINE

8601A

FREQUENCY	100 MHz
RANGE	110
SWEEP	CW
1 kHz MOD	OFF
OUTPUT LEVEL	—30 dBm

7. Adjust the HP 8601A VERNIER for signal amplitude as measured in step 5.

PERFORMANCE TESTS

4-17. Frequency Response (cont'd)

8. Slowly tune HP 8601A FREQUENCY from 100 MHz to 100 kHz (switch HP 8601A RANGE to 11 to check 1 MHz to 100 kHz). Signal amplitude should be within:

100 kHz - 100 MHz: 6.3_____ 8.0 div

4-18. Spurious Responses

SPECIFICATION: All image and out-of-band mixing responses, harmonic and intermodulation distortion products are more than 65 dB* below a —40 dBm signal at the input mixer.

DESCRIPTION: To verify spurious response level, the two-tone method of measuring intermodulation distortion is used. The outputs of two signal generators, tuned 50 kHz apart, are applied to the analyzer INPUT. Their levels are adjusted for a total power level of —40 dBm at the analyzer's input mixer. Second and third order intermodulation products are then measured on the CRT.

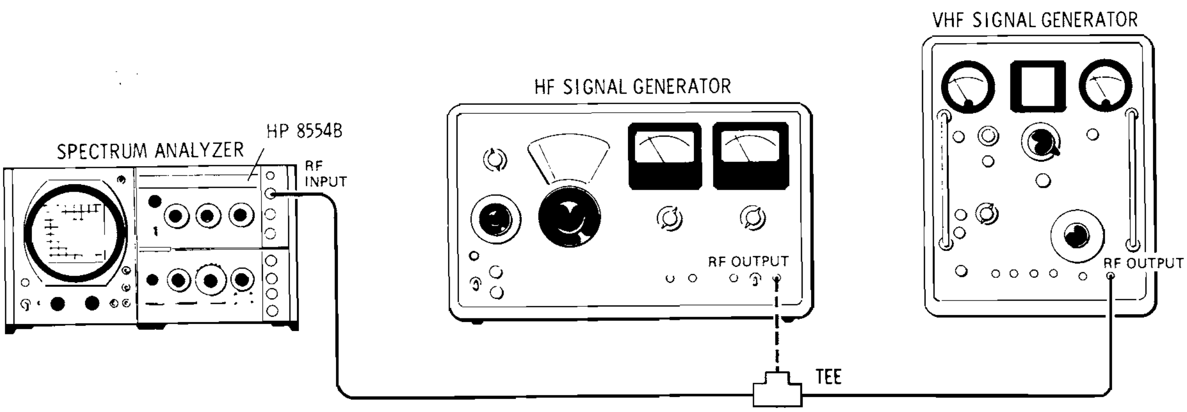


Figure 4-5. Spurious Responses Test Setup

EQUIPMENT:

HF Signal Generator . . . . HP 606B
VHF Signal Generator . . . . HP 608F

PROCEDURE:

1. Connect the test setup shown in Figure 4-5 and set the analyzer as follows:

FREQUENCY . . . . 10 MHz
FINE TUNE . . . . Centered
BANDWIDTH . . . . 1 kHz

* More than 55 dB below at 3 MHz ± 100 kHz.

PERFORMANCE TESTS

4-18. Spurious Responses (cont'd)

INPUT ATTENUATION	0 dB
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	0.5 MHz
BASE LINE CLIPPER	ccw
SCAN TIME PER DIVISION	0.1 SECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	−40 dBm
LOG REF LEVEL Vernier	0 dB (ccw)
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO

2. Adjust the HP 608F for a 10 MHz, CW, −43 dBm signal (f_2); adjust the HP 606B for a 9.95 MHz, CW, −43 dBm signal (f_1). Center the signals (they will appear as one) on the CRT.

3. Reduce SCAN WIDTH PER DIVISION to 50 kHz, keeping the signals centered with FINE TUNE. Adjust the signal generators so that the signals are separated by 50 kHz (one division) and are 3 dB below the LOG REF graticule line (see Figure 4-6).

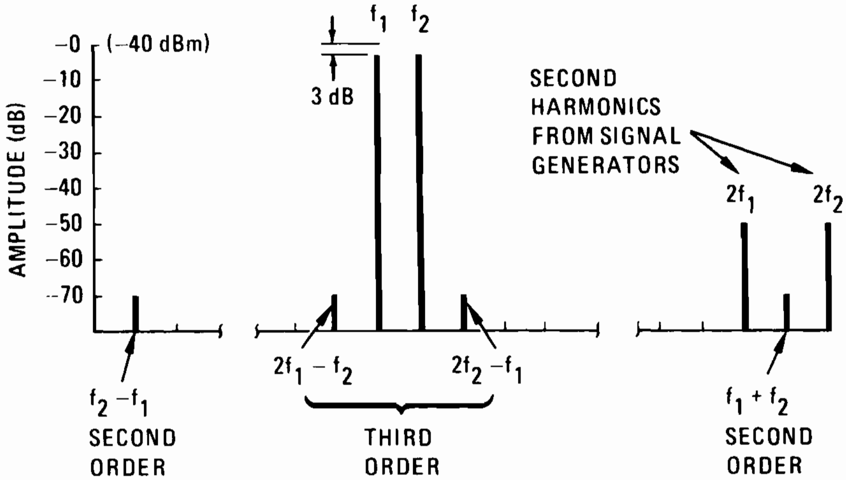


Figure 4-6. Intermodulation Distortion Products

4. Check for third order intermodulation products at 10.050 MHz and at 9.900 MHz. They should be below −65 dB (−105 dBm) on the CRT.

Third Order:______−65 dB

5. Tune the analyzer to 19.95 MHz and check for a second order intermodulation product (it will be between the signal generator second harmonics). It should be below −65 dB (−105 dBm).

Second Order:______−65 dB

NOTE

Signal generators exhibit harmonic distortion, typically about 35 dB below fundamental level. Harmonic distortion will occur at multiples of 9.950 and 10 MHz. Care must be taken not to confuse harmonic distortion produced by the source with intermodulation distortion produced by the input mixer.

PERFORMANCE TESTS

4-19. Residual Responses

SPECIFICATION (no signal present at input): With input attenuation at 0 dB: < —100 dBm.

DESCRIPTION: Signals present on the display with no input are called residual responses. To measure residual responses, a reference is selected so that —100 dBm is easily determined. The display is searched for residual responses under the various test conditions called out.

PROCEDURE:

1. Set the analyzer controls as follows:

FREQUENCY . . . . 250 MHz
FINE TUNE . . . . Centered
BANDWIDTH . . . . 10 kHz
INPUT ATTENUATION . . . . 0 dB
SCAN WIDTH . . . . . PER DIVISION
SCAN WIDTH PER DIVISION 50 MHz
BASE LINE CLIPPER . . . . Max ccw
SCAN TIME PER
DIVISION . . . . . . 10 SECONDS
LOG REF LEVEL . . . . —60 dBm
LOG REF LEVEL Vernier 0
VIDEO FILTER . . . . 100 Hz
SCAN MODE . . . . INT
SCAN TRIGGER . . . . AUTO

NOTE

Ignore Display Uncal light temporarily.

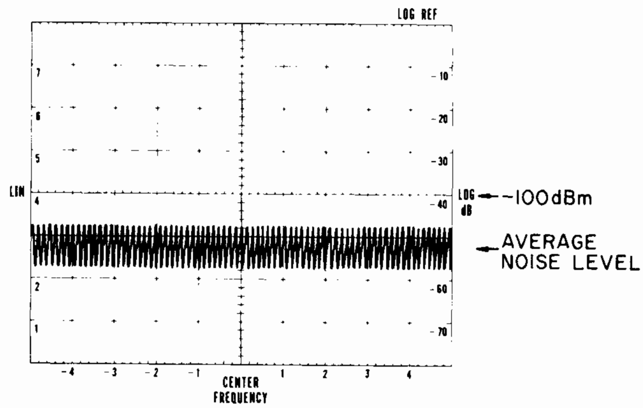


Figure 4-7. Residual Response Test

2. Terminate the RF INPUT jack in 50 ohms.

3. Observe the display as the analyzer scans from 0 to 500 MHz. The average noise level should be less than —100 dBm, and no residual responses should occur. Figure 4-7 represents a scan with no residual responses and with the average nose level indicated.

Residual Responses: 100 kHz - 500 MHz _____—100 dBm

4. If residual responses appear at an apparent level between —105 dBm and —100 dBm, center FREQUENCY about the residual and reduce SCAN WIDTH PER DIVISION to 10 MHz (DISPLAY UNCAL should become unlit). Again note the residual response level; it should remain below —100 dBm.

_____—100 dBm

5. Repeat step 3 with original SCAN WIDTH PER DIVISION setting and step 4 with FREQUENCY at 750 MHz and 1000 MHz.

Residual Responses: 500 - 1000 MHz _____—100 dBm
Residual Responses: 750 - 1250 MHz _____—100 dBm

PERFORMANCE TESTS

4-20. Noise Sidebands

SPECIFICATION: More than 70 dB below CW signal, 50 kHz or more away from signal for a 1 kHz IF Bandwidth.

DESCRIPTION: A stable −40 dBm CW signal is applied to the spectrum analyzer and displayed on the CRT. The amplitude of the noise associated sidebands and unwanted responses close to the signal are measured.

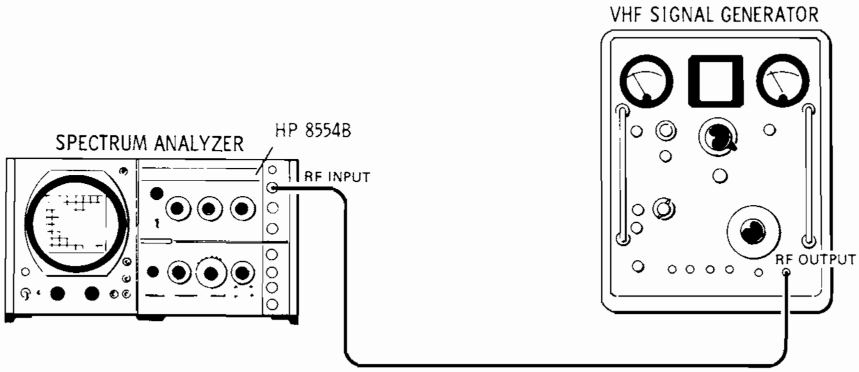


Figure 4-8. Noise Sideband Test

EQUIPMENT:

Signal Generator	HP 608F

PROCEDURE:

1. Connect the test setup shown in Figure 4-8 and make the following control settings:

Spectrum Analyzer:

FREQUENCY	400 MHz
BANDWIDTH	1 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	0.5 MHz
SCAN TIME PER DIVISION	10 MILLISECONDS
INPUT ATTENUATION	0 dB
LOG/LINEAR	LOG
LOG REF LEVEL	−40 dBm
TUNING STABILIZER	On
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO

608F:

MODULATION	CW
FREQUENCY RANGE	E
MEGACYCLES	400
ATTENUATION	−40 dBm

2. Tune the analyzer to center the signal on the CRT display.

PERFORMANCE TESTS

4-20. Noise Sidebands (cont'd)

3. Keeping the display centered, reduce SCAN WIDTH PER DIVISION to 20 kHz. Reduce SCAN TIME PER DIVISION to 0.2 SECONDS and set VIDEO FILTER to 100 Hz. Then adjust HP 608F output vernier so that the signal peak is at the LOG REF graticule line.
4. Observe the noise level 2.5 divisions (i.e. 50 kHz) or greater away from the signal. The average noise level should be at least seven divisions below the signal peak (i.e. below the −70 dB graticule line):

7 div ________

4-21. Scan Width Accuracy

SPECIFICATION: Frequency error between two points on the display is less than ten percent of the indicated separation.

DESCRIPTION: Wide scan widths are checked directly using a comb generator. Narrow scan widths are checked using a comb generator modulated by an audio oscillator. Comb generator frequency components line up opposite graticule lines, and the amount of error is measured at the +3 graticule line.

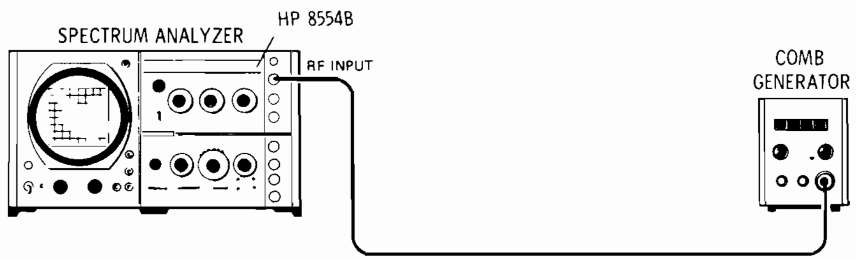


Figure 4-9. Scan Width Accuracy Tests 100 MHz/Div

EQUIPMENT:

Comb Generator	HP 8406A
Audio Oscillator	HP 200CD

PROCEDURE:

1. Connect the test setup in Figure 4-9 and make the following control settings:

Spectrum Analyzer:

FREQUENCY	600 MHz
BANDWIDTH	300 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	100 MHz
INPUT ATTENUATION	0 dB
SCAN TIME PER DIVISION	10 MILLISECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	−20 dBm
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO

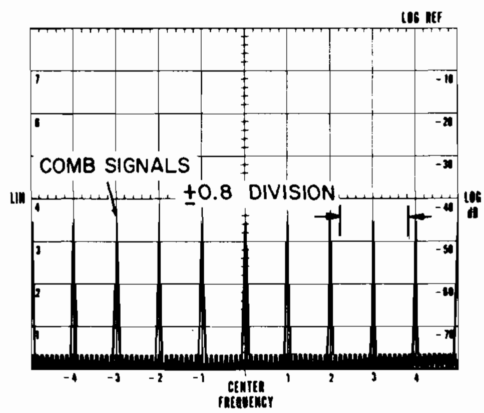


Figure 4-10. Scan Width Accuracy Measurement

PERFORMANCE TESTS

4-21. Scan Width Accuracy (cont'd)

VIDEO FILTER . . . . OFF
SCAN MODE . . . . INT
SCAN TRIGGER . . . . AUTO

8406A:

COMP FREQUENCY - MC . . . . 100 MC
INTERPOLATION AMP . . . . OFF
OUTPUT AMPLITUDE . . . . 3 o'clock

2. With control settings as in step 1 above, a comb signal occurs every 100 MHz on the display (see Figure 4-10). Tune FREQUENCY and FINE TUNE to line up a comb signal with the far left graticule line.

3. Measure the amount of error in divisions that the comb signal deviates from the +3 graticule line. The comb signal should occur on the +3 line ±0.8 division.

+2.2_____+3.8 div

4. Repeat steps 2 and 3 with SCAN WIDTH PER DIVISION set to 10 MHz and a comb frequency of 10 MHz.

2.2 _____+3.8 div

5. Repeat steps 2 and 3 with SCAN WIDTH PER DIVISION set to 1 MHz, BANDWIDTH at 10 kHz and a comb frequency of 1 MHz.

+2.2_____ +3.8 div

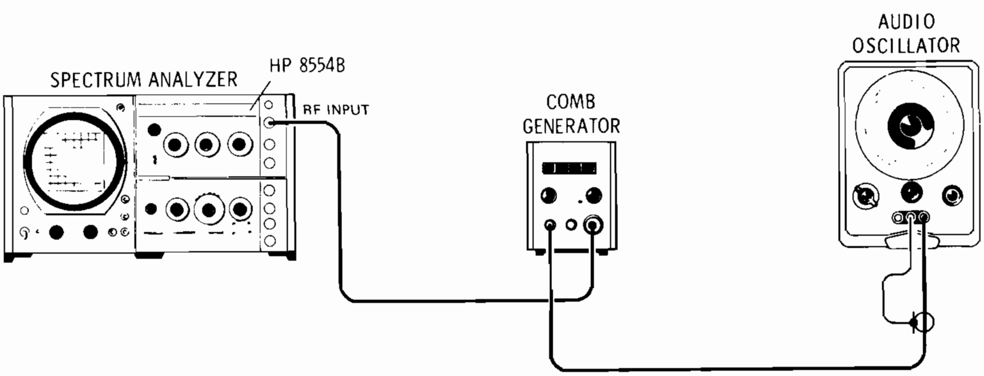


Figure 4-11. Scan Width Accuracy Test: 50 kHz/Div

6. To test the 50 kHz SCAN WIDTH PER DIVISION setting, connect the test setup shown in Figure 4-11. Set controls as follows:

Spectrum Analyzer:

BANDWIDTH . . . . 3 kHz
SCAN TIME PER DIVISION . . . . 10 MILLISECONDS
SCAN WIDTH PER DIVISION . . . . 50 kHz

PERFORMANCE TESTS

4-21. Scan Width Accuracy (cont'd)

200CD:

RANGE X1K
FREQUENCY . . . . 50 kHz
AMPLITUDE . . . . 3 o'clock

8406A:

COMB FREQUENCY - MC . . . . 10 MC

7. Maximize the comb signal amplitudes using the comb generator and audio oscillator output amplitude controls.

8. With controls set as in step 6 above, a comb signal occurs every 50 kHz on the display. Turn FINE TUNE to line up a comb signal with the far left graticule line.

9. Measure the amount of error, in divisions, that the comb signal deviates from the +3 graticule line. The comb signal should occur on the +3 line ± 0.8 division.

+2.2 _____ +3.8 div

10. To test the 20 kHz SCAN WIDTH PER DIVISION position, set the test equipment as follows:

Spectrum Analyzer:

BANDWIDTH . . . . 3 kHz
SCAN TIME PER DIVISION . . . . 5 MILLISECONDS
SCAN WIDTH PER DIVISION . . . . 20 kHz

200CD:

RANGE X1K
FREQUENCY . . . . 20 kHz
AMPLITUDE . . . . 3 o'clock

8406A:

COMB FREQUENCY - MC . . . . 10 MC

11. With the control settings as in step 10 above, a comb signal occurs every 20 kHz on the display. Turn FINE TUNE to line up a comb signal with the far left graticule line.

12. Measure the amount of error, in divisions, that the comb signal deviates from the +3 graticule line. The comb signal should occur on the +3 line ± 0.8 division.

+2.2 _____ +3.8 div

PERFORMANCE TESTS

4-22. Center Frequency Accuracy

SPECIFICATION: The dial indicates the display center frequency within 10 MHz.

DESCRIPTION: Center frequency accuracy is verified by displaying test singals of known frequency accuracy. Test signals are the fundamental and harmonics of a 100 MHz comb generator.

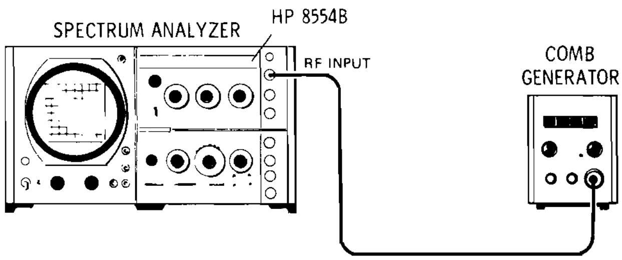


Figure 4-12. Center Frequency Accuracy Test Setup

EQUIPMENT:

Comb Generator . . . . HP 8406A

PROCEDURE:

1. Connect the equipment as shown in Figure 4-12. Make the following control settings:

Spectrum Analyzer:

FREQUENCY	100 MHz
BANDWIDTH	30 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	10 MHz
INPUT ATTENUATION	10 dB
SCAN TIME PER DIVISION	10 MILLISECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	−30 dBm
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	LINE

8406A:

COMB FREQUENCY - MC	100 MC
OUTPUT AMPLITUDE	3 o'clock

2. Tune FREQUENCY to 100 MHz; a comb signal should be displayed ± 1 division of center graticule line.

3. Tune FREQUENCY to the remaining dial calibration points to verify accuracy.

a.	200 MHz	−1	________	+1 div
b.	300 MHz	−1	________	+1 div
c.	400 MHz	−1	________	+1 div
d.	500 MHz	−1	________	+1 div
e.	600 MHz	−1	________	+1 div
f.	700 MHz	−1	________	+1 div
g.	800 MHz	−1	________	+1 div
h.	900 MHz	−1	________	+1 div
i.	1000 MHz	−1	________	+1 div
j.	1100 MHz	−1	________	+1 div
k.	1200 MHz	−1	________	+1 div

PERFORMANCE TESTS

4-23. Local Oscillator Stability and Residual Frequency Modulation

SPECIFICATION:
Stabilized: less than 100 Hz peak-to-peak. Unstabilized: less than 10 kHz peak-to-peak.

DESCRIPTION: The linear portion of the analyzer IF filter skirt is used to slope detect low-order residual FM. The analyzer is stabilized, and the detected FM is displayed in the time domain.

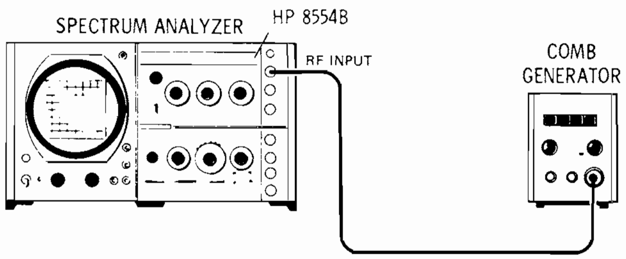


Figure 4-13. Stability Test for Local Oscillator

EQUIPMENT:
Comb Generator . . . . HP 8406A

PROCEDURE:
1. Connect the test setup as shown in Figure 4-13 and make the following control settings:

Spectrum Analyzer:
FREQUENCY . . . . 100 MHz
BANDWIDTH . . . . 1 kHz
SCAN WIDTH . . . . PER DIVISION
SCAN WIDTH PER DIVISION . . 2 kHz
INPUT ATTENUATION . . . . 0 dB
SCAN TIME PER DIVISION
. . . . 50 MILLISECONDS
LOG/LINEAR . . . . .LINEAR
LINEAR SENSITIVITY . . . . Step 2
TUNING STABILIZER . . . . ON
VIDEO FILTER . . . . OFF
SCAN MODE . . . . INT
SCAN TRIGGER . . . . AUTO

8406A:
COMB FREQUENCY - MC . . . 100 MC
OUTPUT AMPLITUDE . . . . . 3 o'clock

2. Adjust LINEAR SENSITIVITY and its vernier for a full eight-division display.

3. Refer to Figure 4-14. Tune FREQUENCY so that the upward slope of the display intersects the CENTER FREQUENCY graticule line one division from the top.

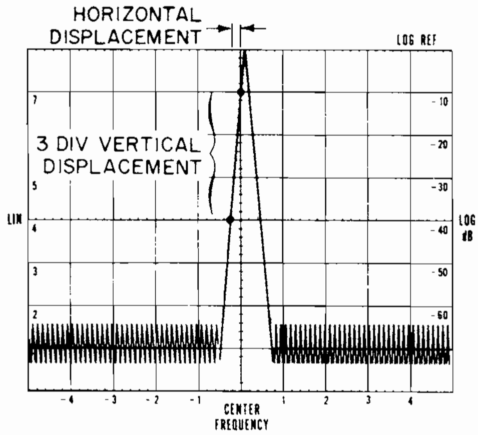


Figure 4-14. Demodulation Sensitivity Measurement

PERFORMANCE TESTS

4-23. Local Oscillator Stability and Residual Frequency Modulation (cont'd)

4. Note where the slope intersects the middle horizontal graticule line:

Horizontal Displacement:_____divisions

5. Use the horizontal displacement to calculate demodulation sensitivity.

   a. Convert the horizontal displacement (divisions) into hertz.

   Example: (2 kHz SCAN WIDTH x (0.2 div) = 400 Hz

   b. Calculate demodulation sensitivity by dividing the vertical displacement in divisions into the horizontal displacement in Hz:

   Example: $\frac{400 \text{ Hz}}{3 \text{ divisions}} = 133 \text{ Hz/div}$

6. Turn SCAN WIDTH to ZERO scan. Set FINE TUNE for a response level within the calibrated three division range (one division from the top to the center horizontal graticule line).

7. Measure the peak-to-peak deviation, and multiply it by the demodulation sensitivity obtained in step 5b above.

   Example: 0.5 div pk-pk signal deviation x 133 Hz/div = 66.5 Hz Residual FM

______ 100 Hz peak-to-peak

8. To measure unstabilized residual FM, repeat the test with the following control settings:

   TUNING STABILIZER . . . . OFF
   BANDWIDTH . . . . 10 kHz
   SCAN WIDTH . . . . PER DIVISION
   SCAN WIDTH PER DIVISION . . . . 20 kHz
   SCAN TIME PER DIVISION . . . . 2 MILLISECONDS

9. Calculate demodulation sensitivity as in steps 2 through 5.

10. Switch to ZERO scan, TUNING STABILIZER to OFF, and set FINE TUNE so that the display occurs in the calibration three-division range (one division from the top, to the center horizontal graticule line).

11. Measure the vertical displacement and multiply it by the demodulation sensitivity obtained in step 9 above.

______10 kHz peak-to-peak

Table 4-2. Performance Test Record

Hewlett-Packard Model 8554B
Spectrum Analyzer RF Section

Test Performed by ____________

Serial No. ____________________

Date ____________

Para. No.	Test Description	Measurement Units	Min.	Actual	Max.
4-15.	**Input Impedance** Return Loss: 10 dB INPUT ATTENUATION 20-50 dB INPUT ATTENUATION	 dB dB	 10 10	 ________ ________	
4-16.	**Average Noise Level** At 10 kHz BANDWIDTH: –102 dBm; 100 kHz to 1250 MHz	dBm		________	–102
4-17.	**Frequency Response** Flatness 100 kHz to 1250 MHz: ± 1 dB	Linear Div	6.3	________	8.0
4-18.	**Spurious Responses** –40 dBm Input Signal Level: IM products down –65 dB Third Order Second Order	 dB dB	 –65 –65	 ________ ________	
4-19.	**Residual Responses** 100 kHz - 1250 MHz; Residual Responses down –100 dBm	dB		________	–100
4-20.	**Noise Sidebands** Noise Level 50 kHz away from signal: >70 dB down	Log Divisions below carrier	7	________	
4-21.	**Scan Width Accuracy** Frequency error between two points: ±10%	Divisions at +3 graticule	+2.2	________	+3.8
4-22.	**Center Frequency** Accuracy at 100 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 200 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 300 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 400 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 500 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 600 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 700 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 800 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 900 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 1000 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 1100 MHz: ± 10 MHz	Divisions	–1	________	+1
	at 1200 MHz: ± 10 MHz	Divisions	–1	________	+1

Table 4-2. Performance Test Record (cont'd)

Para No.	Test Description	Measurement Units	Min.	Actual	Max.
4-23.	**Local Oscillator Stability and Residual Frequency Modulation**				
	Stabilized: 100 Hz peak-to-peak	Hz pk-pk		______	100
	Unstabilized: 10 kHz peak-to-peak	kHz pk-pk		______	10

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section describes adjustments required to return the analyzer RF Section to peak operating condition when repairs are required. Included in this section are test setups, and check and adjustment procedures. Adjustment location photographs are contained in foldouts in Section VIII.

5-3. Record data, taken during adjustments, in the spaces provided. Comparison of initial data with data taken during periodic adjustments assists in preventive maintenance and troubleshooting.

5-4. EQUIPMENT REQUIRED

5-5. Tables 1-4 and 1-5 contain a tabular list of test equipment and test accessories required in the adjustment procedures. In addition, the tables contain the required minimum specifications and a suggested manufacturers model number.

5-6. In addition to the test equipment and test accessories in Tables 1-4 and 1-5, a Display Section and an IF Section are required. Perform the Display Section and IF Section adjustments prior to performing the RF Section adjustments.

5-7. Posidriv Screwdrivers

5-8. Many screws in the instrument appear to be Phillips, but are not. Table 1-5 gives the name and number of the Posidriv screwdrivers designed to fit these screws. To avoid damage to the screw slots, Posidriv screwdrivers should be used.

5-9. Blade Tuning Tools

5-10. For adjustments requiring a non-metallic metal-blade tuning tool, use the J.F.D. Model No. 5284 (HP 8710-1010). In situations not requiring non-metallic tuning tools, an ordinary small screwdriver or other suitable tool is sufficient. No matter what tool is used, never try to force any adjustment control in the analyzer. This is especially critical when tuning variable slug-tuned inductors, and variable capacitors.

5-11. HP 11592A Service Kit

5-12. The HP 11592A Service Kit is an accessory item available from Hewlett-Packard for use in maintaining both the RF and IF Sections of the Spectrum Analyzer. Some adjustments can be made without this kit by removing the top covers from both the RF Section and the Display Section. However, this procedure exposes dangerous potentials in the Display Section chassis and should not be used unless absolutely necessary. All adjustments can and should be performed with the analyzer plug-ins installed on the extender cables provided in the service kit, or using a Display Section cover that has the area over the RF Section cut out. The kit can be obtained by contacting the nearest Hewlett-Packard Sales and Service Office. An extra cover can be obtained from Hewlett-Packard and modified.

5-13. Table 1-5, Test Equipment Accessories, contains a detailed description of the contents of the service kit, and any item in the kit may be ordered separately. In the case of the 11592-60015 Extender Cable Assembly, the wiring is especially critical and fabrication should not be attempted. However, other items in the kit may be built if desired.

5-14. Extender Cable Installations

5-15. Push the front panel latch in the direction indicated by the arrow until the latch disengages and pops out from the panel. Pull the plug-ins out of the instrument. Remove the top cover of the RF Section.

5-16. Place the plate end of the HP 11592-60015 Extender Cable Assembly in the Display Section and press firmly into place so that the plugs make contact. The plate and plugs cannot be installed upside down as the plate has two holes corresponding to the two guide rods in the mainframe.

5-17. Connect the upper cable plug to the RF Section and the lower cable plug to the IF Section. The plugs are keyed so that they will go on correctly and will not make contact upside down.

5-18. FACTORY SELECTED COMPONENTS

5-19. Table 5-2 contains a list of factory selected components by reference designation, basis of selection, and schematic diagram location. Factory selected components are designated by an asterisk (*) on the schematic diagrams in Section VIII.

5-20. RELATED ADJUSTMENTS

5-21. These adjustments should be performed when the troubleshooting information in Section VIII indicates that an adjustable circuit is not operating correctly. Perform the adjustments after repairing or replacing the circuit. The troubleshooting procedures specify the required adjustments.

5-22. Many adjustments are interrelated. The adjustments are listed below by related set, and if one adjustment in a set is made, the other adjustments in that set should be made:

Third Converter Circuits

1. 500 MHz Local Oscillator (Third LO) - Paragraph 5-25.
2. 550 MHz Amplifier and Bandpass Filter - Paragraph 5-26.

First and Second Converter Circuits

1. 1500 MHz Local Oscillator (Second LO) - Paragraph 5-27.
2. YIG Oscillator (First LO) - Paragraph 5-28.
3. 2050 MHz Bandpass Filter - Paragraph 5-29.
4. 1500 MHz Notch Filter and Low Pass Filter - Paragraph 5-30.

0 - 1250 MHz Scan and Marker Shift - Paragraph 5-31.

Phase Lock Circuits

1. Sampler Balance and Sampler Bias - Paragraph 5-32.
2. Full Scan Sampler Output - Paragraph 5-33.
3. Search Oscillator - Paragraph 5-34.
4. Lock Range - Paragraph 5-35.

50 MHz Amplifier Gain - Paragraph 5-36.

Analogic Checks - Paragraph 5-37.

5-23. CHECK AND ADJUSTMENT PROCEDURES

5-24. Table 5-1 is a cross reference from adjustable component to adjustment procedure. Table 5-2 lists the factory selected components. Paragraphs 5-25 through 5-37 give the adjustment procedures and checks for the 8554B.

Table 5-1. Adjustable Components

Adjustable Component	Adjustment Paragraph	Service Sheet	Description
A4R10 SEARCH LOOP GAIN ADJ	5-34	7	Adjusts response time of search loop.
A4R15 LOCK RANGE ADJ	5-35	7	Adjusts phase lock circuits for minimum signal shift when lock is initiated.
A5R9 MARKER SHIFT	5-31	9	Calibrates inverted marker in 0 - 1250 MHz SCAN WIDTH mode.
A4R22 FULL SCAN CENTER ADJ	5-31	9	Calibrates center frequency in 0 - 1250 MHz SCAN WIDTH mode.
A6R7 2 GHz ADJ	5-28	4	Calibrates CENTER FREQUENCY dial at low end.
A6R2 3 GHz ADJ	5-28	4	Calibrates CENTER FREQUENCY dial at high end.
A6R18 SWEEP CAL	5-28	4	First LO scan width adjustment.
A8 IF ADJ 1, 2, 3	5-29	3	Adjusts gain and flatness of 2050 MHz band pass filter.
A8 LO ADJ	5-27	3	Adjusts second LO for 1500 MHz ± 100 kHz.
A9C7, C8, C9	5-26	5	Adjusts bandwidth and flatness of 550 MHz filter.
A9A2R11 SCAN LINEARITY ADJ	5-25	5	Third LO fine scan linearity adjustment.
A9A2R12 SCAN WIDTH ADJ	5-25	5	Third LO scan width adjustment.
A9A3C1 50 MHz IF FILTER ADJ	5-26	5	Adjusts impedance of 550 MHz filter
A9A4C4 500 MHz FREQ ADJ	5-25	5	Adjusts third LO center frequency for 500 MHz ± 150 kHz.
A10A1R14 SAMPLER BIAS	5-32	6	Sets sampler for maximum efficiency.
A10A2R4 SAMPLER BAL ADJ	5-32	6	Sets sampler output for 0 Vdc with no RF input to sampler.
A12A1R5 GAIN ADJ	5-36	5	Adjusts gain of 50 MHz amplifier to achieve —2 to —4 dB overall conversion loss of 8554B.

Table 5-2. Factory Selected Components

Component	Service Sheet	Range of Values	Basis of Selection
A4R3	7		See Paragraph 5-33.
A5R4	9	1 k to 2.5 kΩ	Adjusts frequency at which gain compensation starts (point at which A5CR5 start to conduct). Value selected to give best frequency response flatness at high end of band.
A5R8	9	3 k to 11 kΩ	Value selected to give best frequency response flatness at high end of band.
A6R34	4	27 k to 35 k Ω.	Coarse sweep width adjust. Centers range of A6R18 SWEEP CAL ADJ.
A6R38	4	27 k to 35 k Ω.	Value selected to equal the value of A6R34.
A8A3C1	3	0.2 to 0.7 pF	Selected for maximum power out of oscillator.
A9A2R17	5		See Paragraph 5-25.
A12A1R6	5	100 to 200 Ω.	Coarse gain adjust. Centers the range of A12A1R5 50 MHz GAIN ADJ.
A9A4C3	5	2 to 4 pF	See Paragraph 5-25.

ADJUSTMENTS

5-25. 500 MHz Local Oscillator (Third LO)

REFERENCE: Service Sheet 5.

DESCRIPTION: Third LO is adjusted for a center frequency of 500 MHz. Then a comb signal is centered on the CRT and used as a 500 MHz reference. The SCAN WIDTH ADJ is temporarily mis-adjusted to sweep the LO 4 MHz (500 MHz ± 2 MHz); this puts five 1 MHz comb signals on the CRT. A9A4C3 and A9A2R17 are selected, and A9A2R11 is adjusted for even comb spacing, then SCAN WIDTH ADJ is adjusted for a correct LO sweep.

EQUIPMENT:

Frequency Counter . . . . HP 5245L/5254C
Comb Generator . . . . HP 8406A

Modified Display Section Cover
Non-metallic Tuning Tool

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the Display Section with a cutout above the RF Section.

ADJUSTMENTS

5-25. 500 MHz Local Oscillator (Third LO) (cont'd)

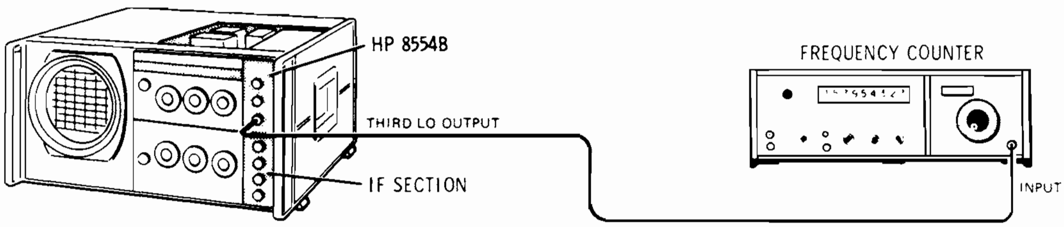


Figure 5-1. 500 MHz Local Oscillator Adjustment Test Setup

2. Connect the frequency counter to the THIRD LO OUTPUT as shown in Figure 5-1.

3. Set the analyzer as follows:

FREQUENCY	650 MHz
FINE TUNE	Centered (1½ turns from stop)
BANDWIDTH	30 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	2 MHz
INPUT ATTENUATION	0 dB
TUNING STABILIZER	OFF
SCAN TIME PER DIVISION	10 MILLISECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	–40 dBm
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO
BASE LINE CLIPPER	12 o'clock

4. Adjust the frequency counter to measure 500 MHz. Adjust A9A4C4 (500 MHz FREQ ADJ) for 500 MHz ± 150 kHz.

Center Frequency: 499.850 ____ 500.150 MHz

5. Connect the comb generator to RF INPUT (see Figure 5-6); keep the counter connected to the third LO. Adjust the comb generator for 10 MHz comb signals, visible on the analyzer CRT.

ADJUSTMENTS

5-25. 500 MHz Local Oscillator (Third LO) (cont'd)

6. Center one of the comb signals on the CRT with the FREQUENCY control (leave FINE TUNE centered).

7. Set SCAN WIDTH PER DIVISION to 200 kHz, keeping the signal centered with FREQUENCY; do not use FINE TUNE. (This signal is at the center of the third LO frequency scan —500 MHz).

8. Add 1 MHz comb signals using the INTERPOLATION AMPLITUDE - 1 MHz control; leave them low in amplitude so that the 10 MHz comb signal can be easily discerned.

9. Adjust A9A2R12 (SCAN WIDTH ADJ) clockwise until five comb signals (one 10 MHz comb and four 1 MHz combs) are visible on the CRT. Keep the 10 MHz comb signal centered with FINE TUNE; leave FREQUENCY set as it was in step 7. The display should resemble Figure 5-2.

10. There should be a comb signal every 2.5 major divisions ± 0.25 major divisions. If not within tolerance, adjust A9A2R11 (SCAN LINEARITY ADJ) and recenter 10 MHz comb with A9A4C4 (FREQUENCY ADJ). If linearity cannot be correctly adjusted, select values of A9A2R17 and A9A4C3 until it can (repeat steps 1 through 9 after each selection).

Comb Spacing: 2.25_____2.75 DIV

11. Adjust A9A2R12 (SCAN WIDTH ADJ) until three comb signals are visible on the CRT (SCAN WIDTH PER DIVISION should be 200 kHz). Keep the 10 MHz comb centered with FINE TUNE. There should be 1 MHz comb signals centered on the extreme left and right graticule lines and the 10 MHz comb should be centered.

12. Center FINE TUNE; frequency counter should read 500 MHz ± 150 kHz in ZERO scan. If not, carefully adjust A9A2R11 (SCAN LINEARITY ADJ) until it does.

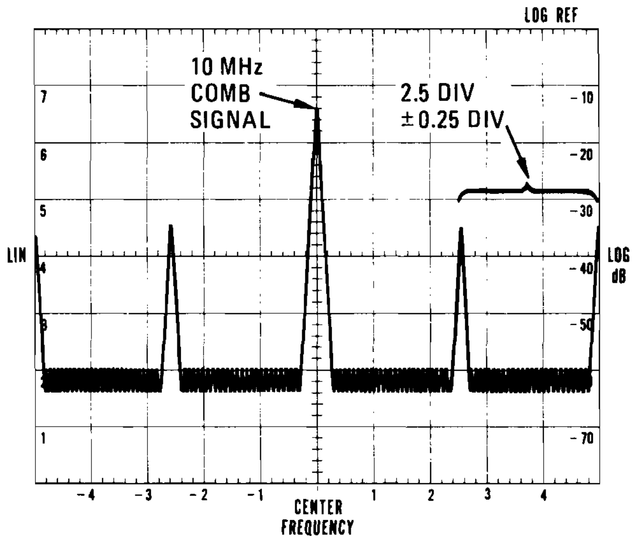


Figure 5-2. 500 MHz LO Linearity Display

ADJUSTMENTS

5-26. 550 MHz Amplifier and Bandpass Filter

REFERENCE: Service Sheet 5.

DESCRIPTION: A variable 550 MHz signal is connected to the 550 MHz amplifier input and the 50 MHz converter output is observed for gain and bandpass shape. Prior to adjusting 550 MHz bandpass filter, perform 500 MHz LO Check, Paragraph 5-25.

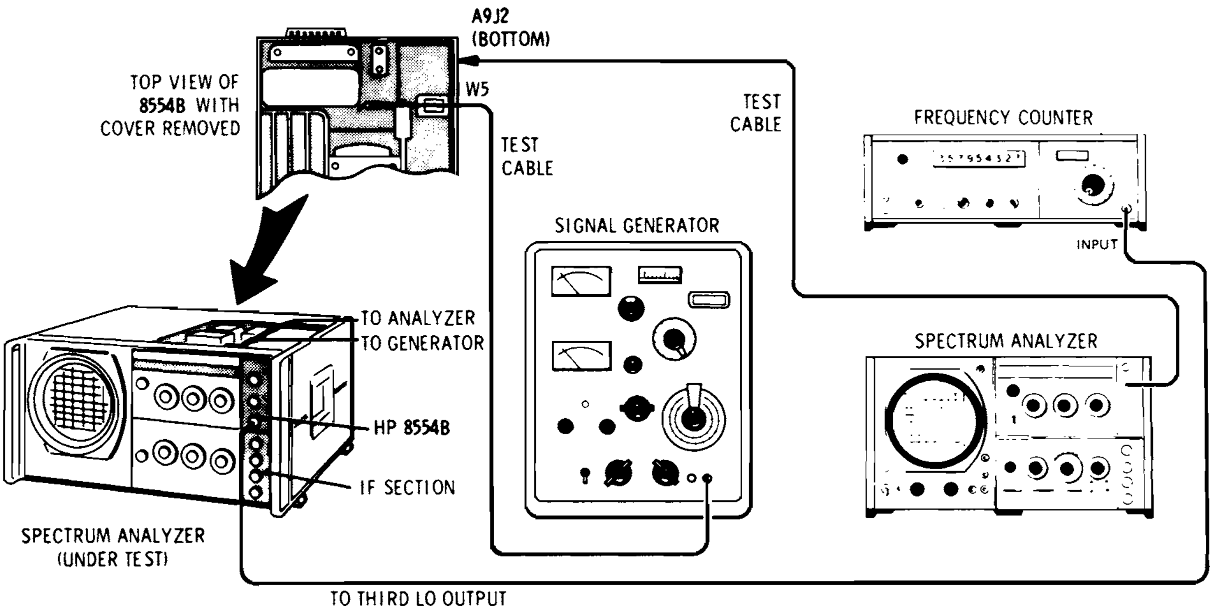


Figure 5-3. 550 MHz Amplifier and Bandpass Filter Adjustment Test Setup

EQUIPMENT:

Frequency Counter	HP 5245L/5254C
Signal Generator	HP 612A
Spectrum Analyzer	HP 8553B/8552A/141T
Test Cable (2)	HP 11592-60001

PROCEDURE:

1. Connect the equipment as shown in Figure 5-3 and make the following control settings:

ADJUSTMENTS

5-26. 550 MHz Amplifier and Bandpass Filter (cont'd)

Spectrum Analyzer (under test):

FINE TUNE	Centered
TUNING STABILIZER	OFF
SCAN WIDTH	ZERO
SCAN MODE	INT
SCAN TRIGGER	AUTO

Frequency Counter:

SAMPLE RATE	8 o'clock
SENSITIVITY	PLUG-IN
LEVEL	PRESET
TIME BASE	10 ms
FUNCTION	FREQUENCY

8553B/8552A/141T Analyzer:

FREQUENCY	50 MHz
SCAN WIDTH PER DIVISION	1 MHz
BANDWIDTH	100 kHz
INPUT ATTENUATION	10 dB
BASELINE CLIPPER	2 o'clock
SCAN TIME PER DIVISION	2 MILLISECONDS
LOG/LINEAR	LINEAR
LINEAR SENSITIVITY	2 mV/DIV
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO

Signal Generator:

FREQUENCY	550 MHz
OUTPUT	CW
OUTPUT LEVEL	—30 dBm

2. Adjust 8554B FINE TUNE control for a frequency indication of 500 MHz on the frequency counter.

3. Adjust 8553B/8552A/141T Spectrum Analyzer LINEAR SENSITIVITY controls for a seven division vertical deflection.

4. Vary the signal generator ± 5 MHz around a center frequency of 550 MHz.

5. Check 3 dB bandwidth (see Figure 5-4).

8 _______ 11 MHz

6. Select 0.5 MHz SCAN WIDTH PER DIVISION on 8553B RF Section.

7. Repeat step 4 and abserve CRT display for flatness over a 3 MHz range (see Figure 5-4).

_______ ±0.2 dB

8. If steps 5 and 7 are not within limits, repeat step 4 and adjust A9C7, A9C8 and A9C9 for correct bandpass. Adjust A9A3C1 for maximum signal level.

9. Repeat steps 4 through 8 as required.

ADJUSTMENTS

5-26. 550 MHz Amplifier and Bandpass Filter (cont'd)

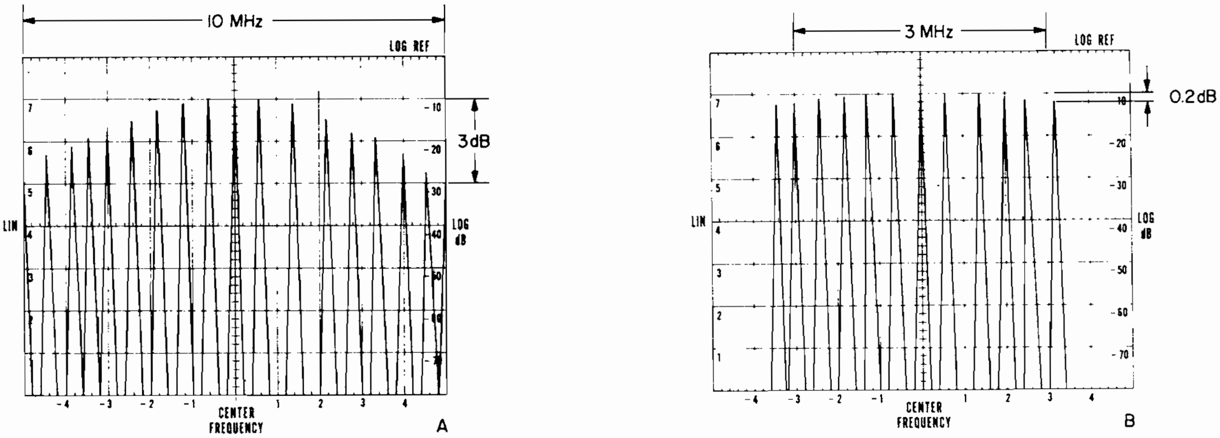


Figure 5-4. Bandpass Flatness Display

5-27. 1500 MHz Local Oscillator (Second LO)

REFERENCE: Service Sheet 3.

DESCRIPTION: The second (1500 MHz) local oscillator is checked for a center frequency of 1500 MHz ±100 kHz. The notch filter, connected to the 500 MHz output of the A8 First and Second Converter Assembly, is removed and the second LO feedthru signal is checked using a frequency counter. Allow at least two hours for instrument to warm up and stabilize.

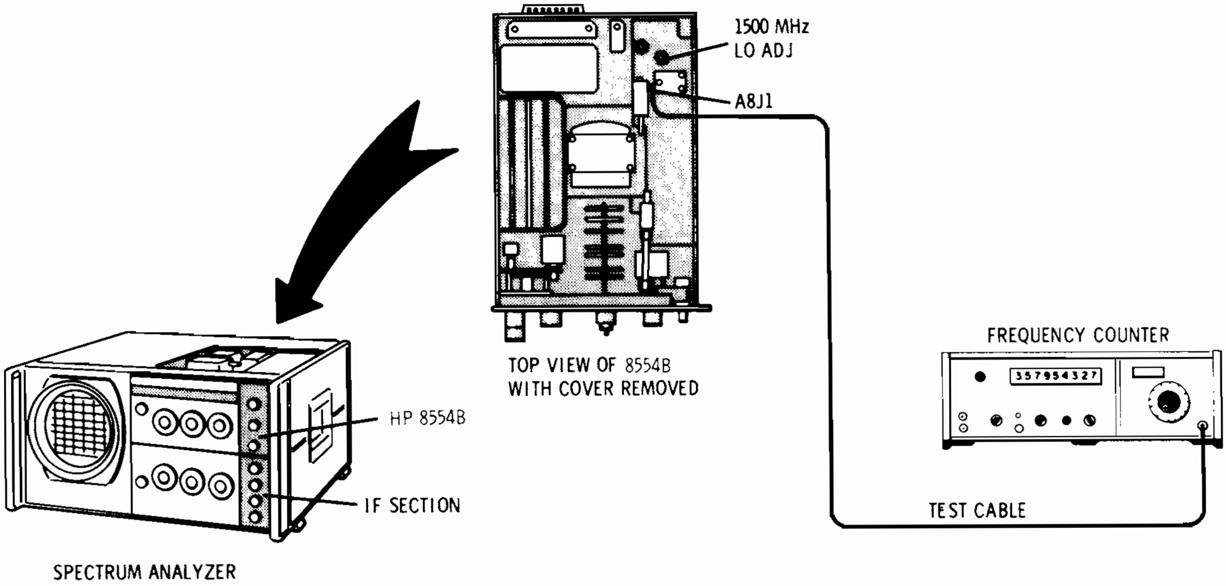


Figure 5-5. 1500 MHz Local Oscillator Adjustment Test Setup

ADJUSTMENTS

5-27. 1500 MHz Local Oscillator (Second LO) (cont'd)

EQUIPMENT:

Frequency Counter	HP 5245L/5254C
Test Cable	HP 11592-60001
Modified Display Section Cover	
No. 10 Allen Driver	
5/16 inch open-end wrench	

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Remove plug-ins form Display Section and remove top cover from 8554B RF Section. Install plug-ins in Display Section.

2. Install a cover on the Display Section with a cutout above the analyzer plug-ins.

3. Apply power to the analyzer and allow at least two hours for stabilization.

4. With test setup shown in Figure 5-5, make the following control settings:

Frequency Counter:

SAMPLE RATE	9 o'clock
SENSITIVITY	PLUG-IN
TIME BASE	10 ms
FUNCTION	FREQUENCY

5. Tune the 5254C frequency control for a maximum meter indication around 1.45 GHz.

6. Measure the second LO feedthru signal. If necessary adjust LO ADJ tune slug (both if unit has two) for a frequency of 1500 MHz ± 100 kHz.

1,499,900 _______ 1,500,100 kHz

ADJUSTMENTS

5-28. YIG-Tuned Oscillator (First LO)

REFERENCE: Service Sheet 4.

DESCRIPTION: The YIG-tuned Oscillator (first LO) is checked and adjusted, if necessary, at the 0 and 1 GHz dial points. Tuning linearity over the full tuning range is checked in 100 MHz increments. The 1500 MHz Local Oscillator Check and Adjustment, Paragraph 5-27, should be performed before adjusting the YIG Oscillator.

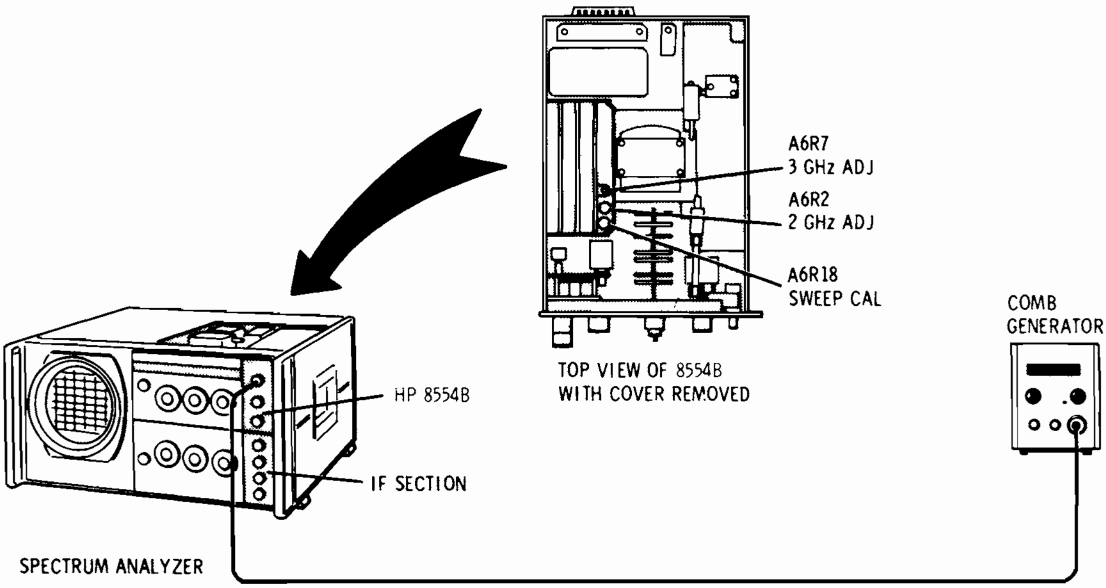


Figure 5-6. YIG-Tuned Oscillator Adjustment Test Setup

EQUIPMENT:

Frequency Comb Generator . . . . HP 8406A
Modified Display Section Cover

WARNING

If the following procedure is attempted without the modified Display Section Cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the Display Section with a cutout above the analyzer plug-ins.

2. Remove plug-ins from Display Section and remove top cover from 8554B RF Section. Reinstall plug-ins in Display Section.

3. Apply power to analyzer and allow at least two hours for stabilization.

ADJUSTMENTS

5-28. YIG-Tuned Oscillator (First LO) (cont'd)

4. Connect the test setup in Figure 5-6 and make the following control settings:

Spectrum Analyzer:

FREQUENCY	0 MHz
FINE TUNE	Centered (1½ turns from stop)
TUNING STABILIZER	OFF
BANDWIDTH	100 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	20 MHz
INPUT ATTENUATION	0 dB
BASE LINE CLIPPER	9 o'clock
LOG REF LEVEL	—10 dBm
LOG/LINEAR	LOG
SCAN TIME PER DIVISION	20 MILLISECONDS
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	LINE

Comb Generator:

COMB FREQUENCY - MC	100 MC
OUTPUT AMPLITUDE	3 o'clock

5. With FINE TUNE centered and FREQUENCY set to "0" on frequency dial, adjust A6R7 (2 GHz ADJ) to locate feedthru signal at CENTER FREQUENCY graticule line.

6. Rotate FREQUENCY for indicated dial frequency, of 1000 MHz. Center FINE TUNE and adjust A6R2 (3 GHz ADJ) to center the 1 GHz comb signal at the CENTER FREQUENCY graticule line.

7. Set SCAN WIDTH PER DIVISION to 2 MHz and repeat steps 5 and 6 until signal is within one division of CENTER FREQUENCY graticule at a frequency dial indication of 0 and 1000 MHz.

8. Rotate FREQUENCY from 0 to 1200 MHz in 100 MHz steps. Check signal, in relation to CENTER FREQUENCY, at each step. With dial pointer aligned with 100 MHz dial markers and FINE TUNE control centered; displayed signal should be within four divisions of CENTER FREQUENCY graticule.

________ divisions

9. Set BANDWIDTH to 300 kHz, and set SCAN WIDTH PER DIVISION to 100 MHz. Adjust frequency controls on RF Section to center LO feedthru signal on left hand graticule line.

10. Observe 1000 MHz comb signal at the right hand graticule line.

11. If necessary adjust SWEEP CAL A6R18 to position marker signals on the vertical graticule lines. Some adjustment of FINE TUNE control may be necessary to position the comb markers when adjusting A6R18.

12. Set SCAN WIDTH PER DIVISION to 50 MHz. Adjust frequency controls to align left hand comb signal with —4 graticule line. Record spacing of right hand comb signal at or near the +4 graticule line.

________ ± 0.15 div

3. If spacing of comb signals is not within limits, perform IF Section Horizontal Scan Checks and Adjustments in IF Section manual.

ADJUSTMENTS

5-29. 2050 MHz Bandpass Filter

REFERENCE: Service Sheet 3.

DESCRIPTION: Allow at least two hours for instrument to warm up and stabilize before adjusting 2050 MHz bandpass filters. With the second LO set to 1500 MHz and third LO at 500 MHz, the first LO is tuned to a center frequency of 2050 MHz. The first LO is swept over a 10 MHz range and the resultant feedthru signal at the output of the 50 MHz amplifier is displayed on the CRT of a separate analyzer. The three tunable cavities in the first and second converter are adjusted for amplitude and flatness over a 2 MHz bandpass.

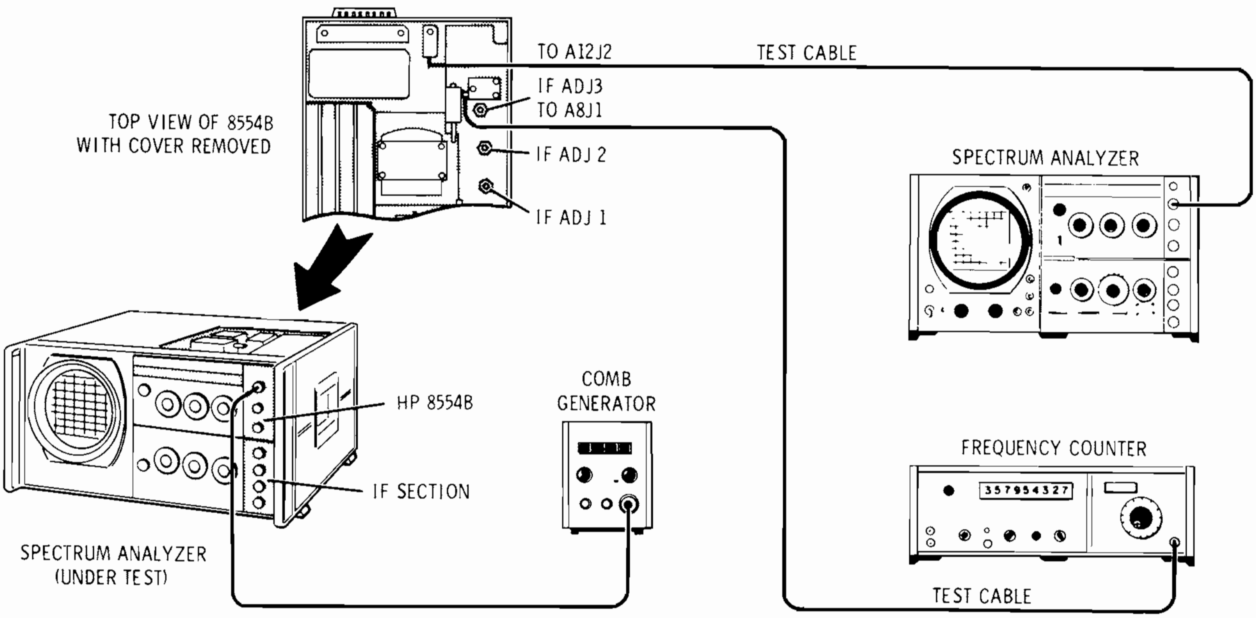


Figure 5-7. 2050 MHz Bandpass Filter Adjustment Test Setup

EQUIPMENT:

Frequency Counter	HP 5245L/5254C
Comb Generator	HP 8406A
Spectrum Analyzer	HP 8553B/8552A/141T
Test Cable (2)	HP 11592-60001
Modified Display Section Cover	
No. 10 Allen Driver	
5/16 inch Open End Wrench	

WARNING

If the following procedure is attempted without the modified Display Section Cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the display section with a cutout above the analyzer plug-ins.

NOTE

Allow at least two hours warmup time for instrument to stabilize prior to making frequency adjustments.

ADJUSTMENTS

5-29. 2050 MHz Bandpass Filter (cont'd)

2. Perform 500 MHz LO Frequency Check and Adjustment, Paragraph 5-25. Leave FINE TUNE control centered.

3. Perform 1500 MHz LO Frequency Check and Adjustment, Paragraph 5-27.

4. Perform YIG Oscillator Frequency Check and Adjustment, Paragraph 5-28. Tune FREQUENCY control for YIG oscillator frequency of 2050 MHz (read on counter).

5. With the test setup connected as shown in Figure 5-7, make the following control settings:

Spectrum Analyzer (under test):

FREQUENCY	See step 4
FINE TUNE	See step 2
TUNING STABILIZER	OFF
INPUT ATTENUATION	10 dB
SCAN WIDTH PER DIVISION	2 MHz
SCAN TIME PER DIVISION	2 MILLISECONDS
SCAN MODE	INT
SCAN TRIGGER	LINE

Comb Generator:

COMB FREQUENCY - MC	10 MC
OUTPUT AMPLITUDE	3 o'clock

Spectrum Analyzer:

FREQUENCY	50 MHz
FINE TUNE	Centered
BANDWIDTH	300 kHz
SCAN WIDTH PER DIVISION	1 MHz
INPUT ATTENUATION	10 dB
BASE LINE CLIPPER	9 o'clock
SCAN TIME PER DIVISION	5 SECONDS
SCAN MODE	INT
SCAN TRIGGER	LINE
LOG/LINEAR	LINEAR
LINEAR SENSITIVITY	2 mV/DIV

6. Center 50 MHz comb signal on CRT display of 8553B/8552A/141T analyzer. Disconnect comb generator from analyzer.

7. Connect 50 MHz output signal from the 8554B to RF INPUT on the 8553B and adjust LINEAR SENSITIVITY controls for a 7.2 division vertical deflection on the CRT.

8. Adjust the cavity tuning slugs (IF ADJ 1, IF ADJ 2 and IF ADJ 3) for maximum gain and flatness. (See Figure 5-8a).

9. Change 8553B/8552A/141T analyzer SCAN WIDTH PER DIVISION to 0.5 MHz. Repeat cavity tuning adjustments (see Figure 5-8b).

10. Change 8553B/8552A/141T analyzer SCAN WIDTH PER DIVISION to 0.2 MHz. Repeat cavity tuning adjustments (see Figure 5-8c).

Flatness: 2 MHz Bandwidth ________ ± 0.4 div

ADJUSTMENTS

5-29. 2050 MHz Bandpass Filter (cont'd)

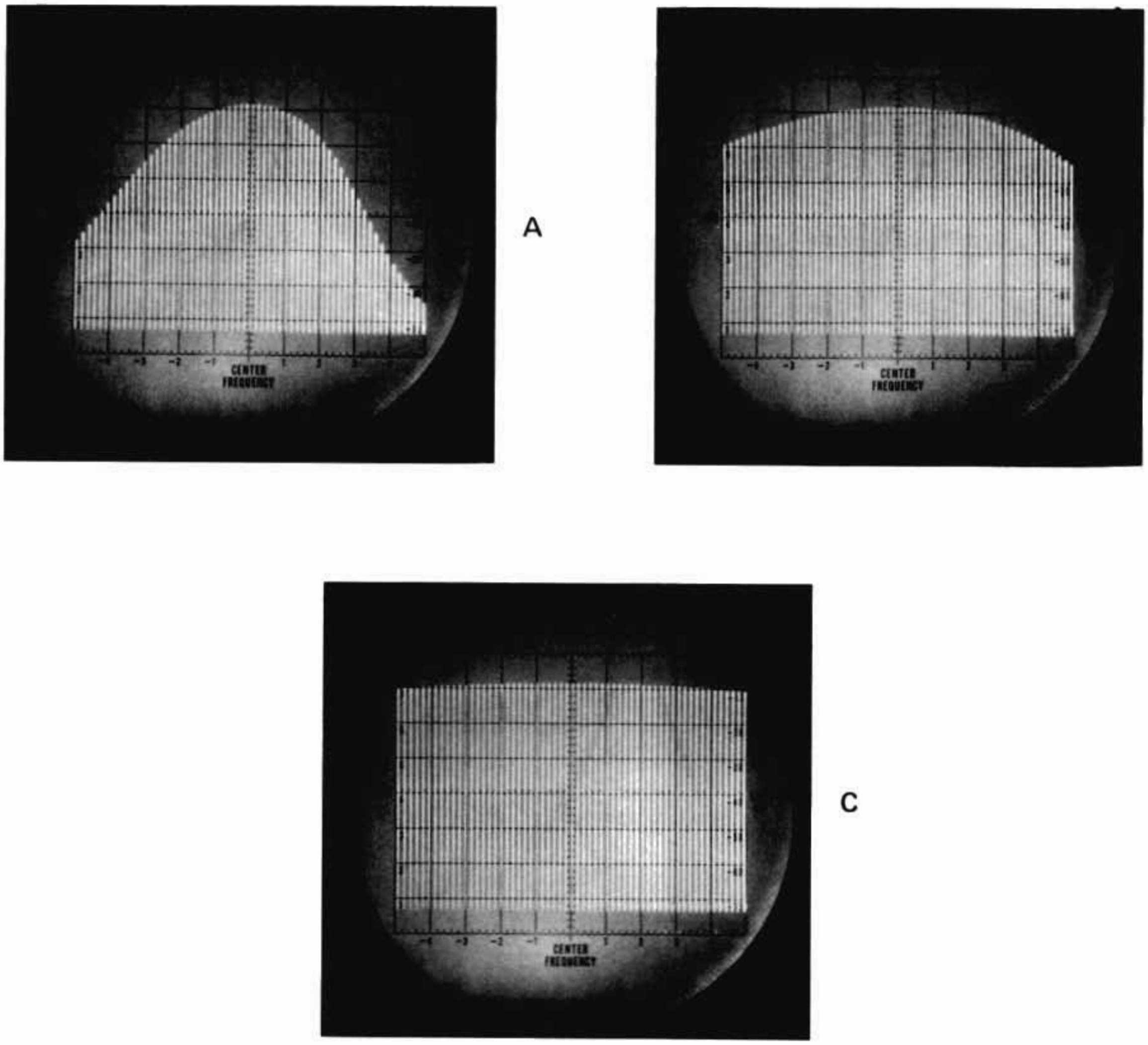


Figure 5-8. CRT Display, 1 MHz, 0.5 MHz and 0.2 MHz Per Division

ADJUSTMENTS

5-30. 1500 MHz Notch Filter and Low Pass Filter

REFERENCE: Service Sheets 2 and 3.

DESCRIPTION: The notch filter is checked by removing the filter from its normal location, connecting it to the RF INPUT and comparing the resultant CRT display of a comb signal both through the filter and without the filter. The low pass filter is checked by comparing the CRT display with the filter in its normal position against the display with the filter replaced by a feedthru connector. An optional method would be to use a higher frequency analyzer such as the 8555A/8552/140 and a swept signal source.

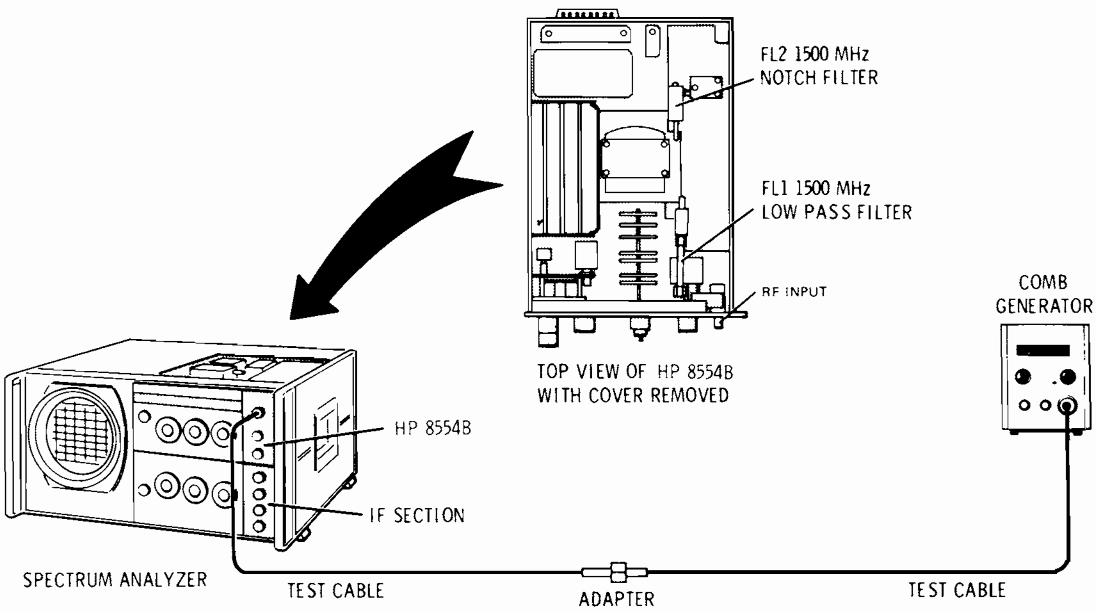


Figure 5-9. 1500 MHz Notch Filter and Low Pass Filter Test Setup

EQUIPMENT:

Frequency Comb Generator	HP 8406A
Adapter	HP 1250-0827
Adapter	HP 1250-1200
Adapter	HP 1250-1158
Test Cable (2)	HP 11592-60001
Cable Assembly	HP 11592-60003
Cable Assembly	HP 10503A
Modified Display Section Cover	

WARNING

If the following procedure is attempted without the modified Display Section Cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the display section with a cutout above the analyzer plug-ins.

ADJUSTMENTS

5-30. 1500 MHz Notch Filter and Low Pass Filter (cont'd)

2. Remove 1500 MHz Notch Filter FL2 from analyzer and connect HP 11592-60003 cable between A8J1 and W5 cable to third converter.

3. Connect equipment as shown in Figure 5-9 and make the following control settings:

Spectrum Analyzer:

FREQUENCY	1200 MHz
FINE TUNE	Centered
BANDWIDTH	300 kHz
SCAN WIDTH PER DIVISION	100 MHz
INPUT ATTENUATION	10 dB
BASE LINE CLIPPER	10 o'clock
SCAN TIME PER DIVISION	0.1 SECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	−10 dBm
VIDEO FILTER	10 kHz
SCAN MODE	INT
SCAN TRIGGER	LINE

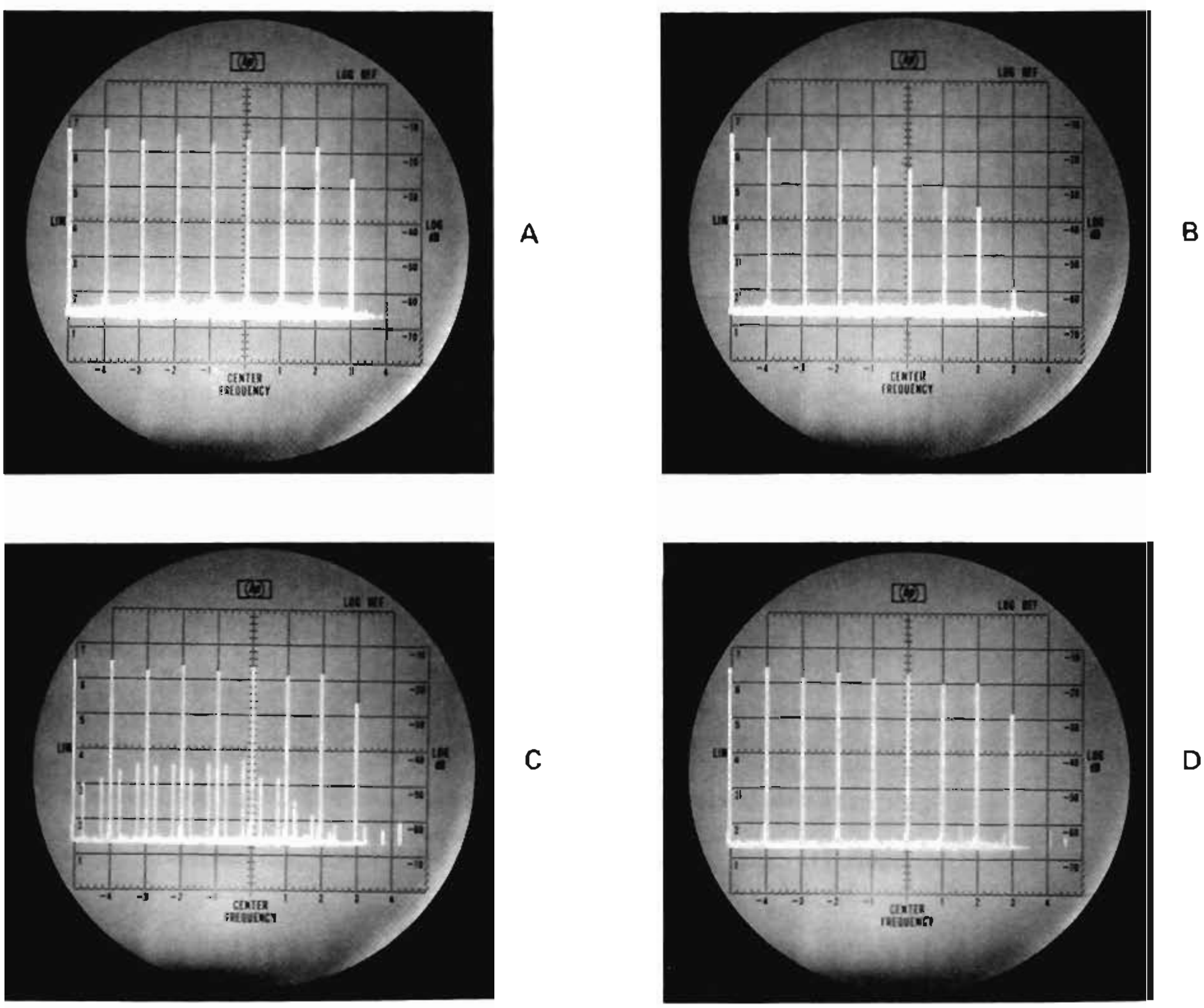


Figure 5-10. CRT Display Without and With Notch Filter and Low Pass Filter

ADJUSTMENTS

5-30. 1500 MHz Notch Filter and Low Pass Filter (cont'd)

Comb Generator:

COMB FREQUENCY - MC . . . . 100 MC
OUTPUT AMPLITUDE . . . . 3 o'clock

4. Observe CRT for a display similar to Figure 5-10a. With a grease pencil mark level of comb signals on CRT.

5. Install Notch Filter FL2 between HP 1250-0827 and HP 11592-60001 cable to comb generator.

6. Observe CRT display level of comb signals (see Figure 5-10b). The 1500 MHz comb signal (three graticule line) should be at least 20 dB below signal level observed in step 4 above.

20 dB________

7. Remove HP 11592-60003 cable and reinstall notch filter FL2.

8. Remove 1500 MHz Low Pass Filter FL1 and replace with OSM Jack-to-Jack Adapter HP 1250-1158.

9. Observe CRT for a display similar to Figure 5-10c. With a grease pencil mark level of comb signals, harmonic mixing products and image responses.

10. Install low pass filter and observe CRT for a display similar to Figure 5-10d. Harmonic mixing products and image responses should be below —70 dBm.

________ —70 dBm

ADJUSTMENTS

5-31. 0–1250 MHz Scan and Marker Shift

REFERENCE: Service Sheet 9.

DESCRIPTION: The 0 - 1250 MHz scan alignment adjusts the center frequency around which the analyzer tunes in the full scan mode. Perform the YIG Oscillator adjustment, paragraph 5-28, prior to adjusting the 0 - 1250 MHz center frequency.

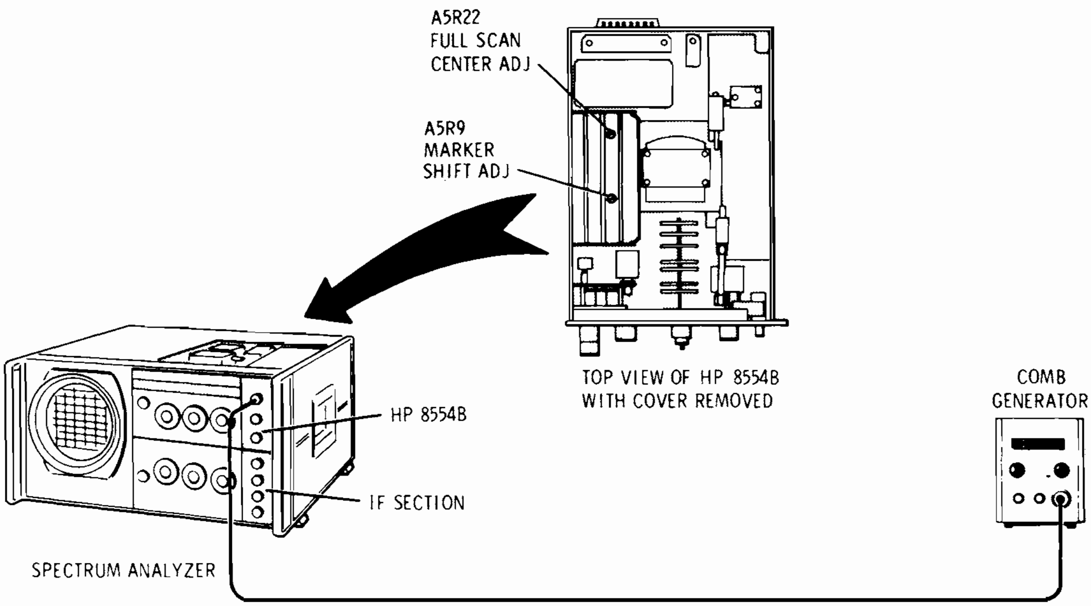


Figure 5-11. 0—1250 MHz Scan and Marker Shift Adjustment Test Setup

EQUIPMENT:

Comb Generator	HP 8406A
Modified Display Section Cover	

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the display section with a cutout above the anlayzer plug-ins.

2. Remove plug-ins from display section and remove top cover from RF Section. Install plug-ins in display section.

3. Apply power to analyzer and allow at least two hours for stabilization. With the test setup as shown in Figure 5-11, make the following control settings:

Spectrum Analyzer:

FREQUENCY . . . . 600 MHz

ADJUSTMENTS

5-31. 0–1250 MHz Scan and Marker Shift (cont'd)

FINE TUNE	Centered
TUNING STABILIZER	OFF
BANDWIDTH	30 kHz
SCAN WIDTH	0 - 1250 MHz
SCAN WIDTH PER DIVISION	1 MHz
INPUT ATTENUATION	0 dB
BASE LINE CLIPPER	8 o'clock
SCAN TIME PER DIVISION	20 MILLISECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	–10 dBm
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	LINE

Comb Generator:

COMB FREQUENCY - MC	100 MC
OUTPUT AMPLITUDE	3 o'clock

4. Adjust FULL SCAN CENTER ADJ A5R22 to align LO feedthru signal on the left hand graticule line. Observe the 500 MHz comb marker at the –1 graticule line. The comb marker should be within ± 0.2 division of the –1 graticule line.

–0.2 ________ +0.2 div

5. Observe the 1000 MHz comb marker at the +3 graticule line. The comb marker should be within ± 0.4 division of the +3 graticule line.

–0.4 ________ +0.4 div

6. With the test setup and controls set as in step 3 above, center the frequency marker under the 600 MHz comb signal. Set SCAN WIDTH to PER DIVISION and record the difference between the CENTER FREQUENCY graticule line and the 600 MHz comb marker. The comb marker should be within ± 5 divisions (5 MHz) of the center graticule.

–5 ________ +5 div

7. If comb marker is not within ± 5 divisions tune FREQUENCY control to center 600 MHz marker on CRT. Set SCAN WIDTH to 0 - 1250 MHz and adjust A5R9 MARKER SHIFT to center marker under the 600 MHz comb signal. Repeat step 6 above.

ADJUSTMENTS

5-32. Sampler Balance and Sampler Bias

REFERENCE: Service Sheet 6.

DESCRIPTION: The amplifier output of the sampler is checked for zero balance with the YIG oscillator signal disconnected between Circulatior Assembly A13 and Sampler Assembly. SAMPLER BAL ADJ A10A2R4 is adjusted for a zero output level as displayed on an oscilloscope.

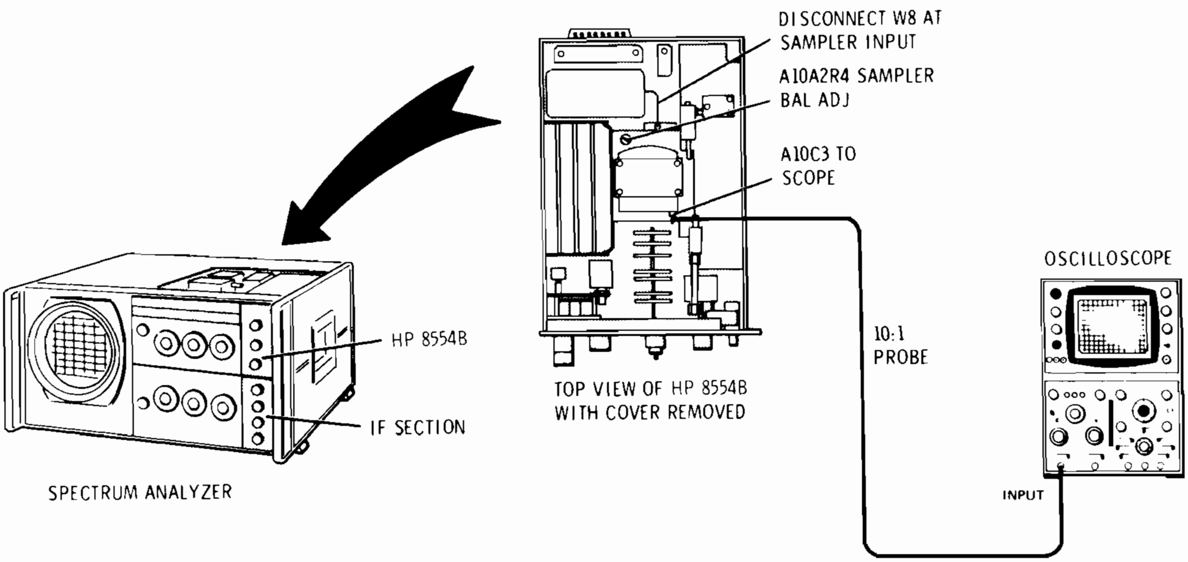


Figure 5-12. Sampler Balance Check and Adjustment Test Setup

EQUIPMENT:

Oscilloscope . . . . HP 180A/1801A/1821A
10:1 Divider Probe . . . . HP 10004
Modified Display Section Cover
Tuning Tool

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the Display Section with a cutout above the analyzer plug-ins.
2. Connect equipment shown in test setup, Figure 5-12, and make the following control settings:

Spectrum Analyzer:

SCAN WIDTH . . . . 0 - 1250 MHz

Oscilloscope:

VOLTS/DIV 005
INPUT . . . . DC coupled
TIME/DIV . . . . 5 msec

3. Adjust A10A2R4 SAMPLER BAL ADJ for minimum output. It should be 0 ± 25 mV. If not, perform steps 4 through 7.

—25________+25 mV

ADJUSTMENTS

5-32. Sampler Balance and Sampler Bias (cont'd)

4. Remove and extend RF and IF Sections from Display Section (use Extender Cable Assembly HP 11592-60015). Separate RF and IF Sections and connect with Interconnection Cable Assembly HP 11592-60016.

5. Remove bottom cover from 8554B; remove cover from A10 assembly. Connect oscilloscope probe to A10A2TPD and set VOLTS/DIV to 0.1.

6. Adjust A10A1R14 SAMPLER BIAS for a maximum, noise-free indication on the oscilloscope.

7. Replace A10 cover and RF Section bottom cover. Re-install RF and IF Sections in Display Section and repeat steps 1 through 3.

5-33. Full Scan Sampler Output

REFERENCE: Service Sheets 6 and 7.

DESCRIPTION: The full scan sampler signal is checked for VSWR and peak-to-peak voltage level. This check should not be required unless components associated with the phase lock circuitry are changed. To check the sampler signal, remove assembly A4 and connect oscilloscope to A10C3. Trigger the oscilloscope externally by connecting the analyzer SCAN OUT to EXT INPUT on the oscilloscope. The resulting display contains the sampling signals over the full scan range of the analyzer. A detailed examination of the sampling signals can be made by selecting a narrow scan width and tuning over the frequency range of interest.

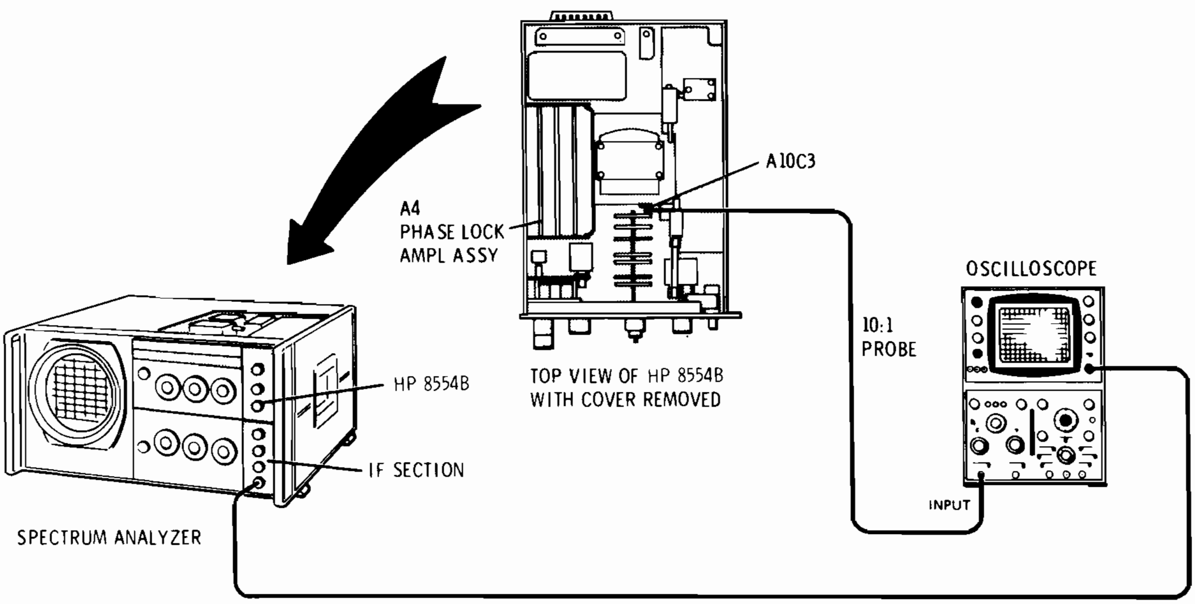


Figure 5-13. Full Scan Sampler Output Check and Adjustment

ADJUSTMENTS

5-33. Full Scan Sampler Output (cont'd)

EQUIPMENT:

Oscilloscope . . . . HP 180A/1801A/1821A
10:1 Divider Probe . . . . HP 10004A
Modified Display Section Cover

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the Display Section with a cutout above the analyzer plug-ins.

2. With analyzer power off, remove the A4 assembly from the analyzer RF Section.

3. Connect test setup shown in Figure 5-13 and make the following control settings:

Spectrum Analyzer:

SCAN WIDTH . . . . 0 - 1250 MHz
SCAN TIME PER DIVISION . . . . 5 MILLISECONDS
SCAN MODE . . . . INT
SCAN TRIGGER . . . . AUTO

Oscilloscope:

DISPLAY . . . . EXT CAL
VOLTS/DIV 05

4. Observe oscilloscope CRT display for a presentation similiar to Figure 5-14.

5. Tune analyzer to approximately the frequency of the lowest peak-to-peak sampling signal displayed on the oscilloscope (see sample, Figure 5-14a).

6. Set analyzer SCAN WIDTH PER DIVISION to 1 MHz and tune FREQUENCY control for minimum peak-to-peak signal display on oscilloscope. Record peak-to-peak signal level.

   ________ V

7. Tune FREQUENCY control for nearest maximum peak-to-peak signal display on oscilloscope. Record peak-to-peak signal level.

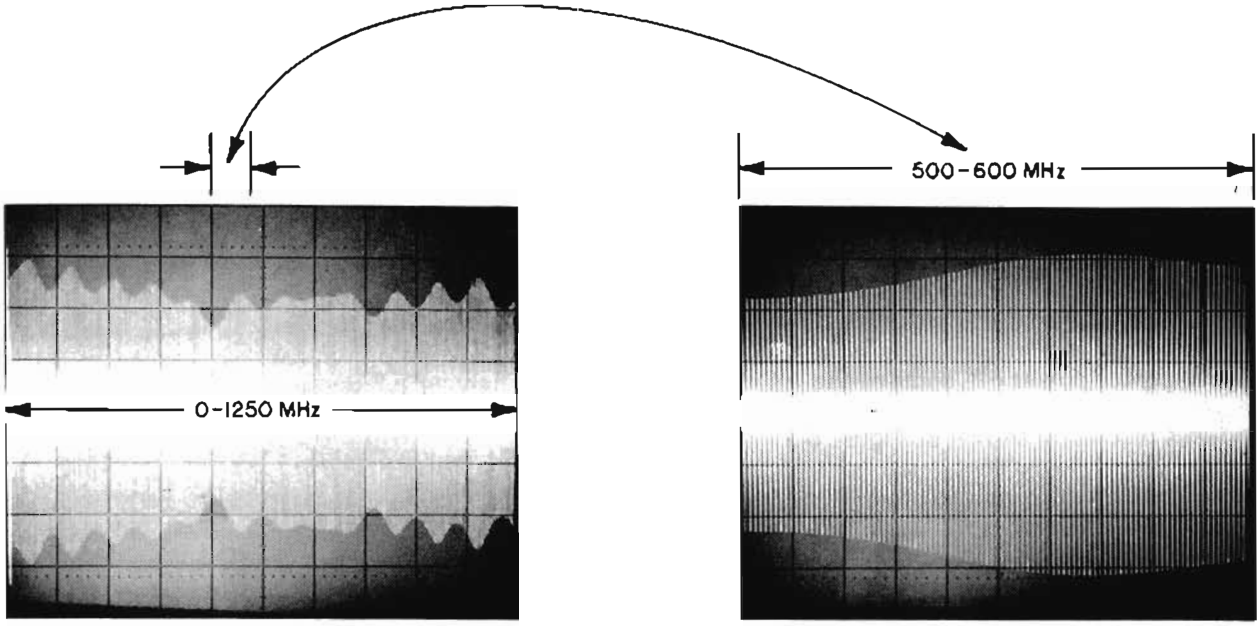
   ________ V

8. Divide voltage obtained in step 6 into voltage obtained in step 7. If results exceed 1.6 check RF cabling, circulator and sampler termination.

9. Figure 5-14b illustrates a typical display of the minimum and maximum peak-to-peak voltage levels.

10. If the sampler assembly, cabling or components in the phase lock amplifier are replaced, determine the value of resistor A4R3 by multiplying the voltage level obtained in step 6 by 17KΩ (i.e., 1.8 x 17KΩ = 30.6KΩ value for A4R3).

5-33. Full Scan Sampler Output (cont'd)



a. Full Scan Display (0 - 1250 MHz, 5 Milliseconds per div)

b. 100 MHz Display (10 MHz per div, 0.5 seconds per div)

Figure 5-14. Typical Display of Sampling Signals

ADJUSTMENTS

5-34. Search Oscillator

REFERENCE: Service Sheet 7.

DESCRIPTION: The sampling signal input to the phase lock equalizer circuit is disconnected at A10C3 and the input to the equalizer is then grounded. When the TUNING STABILIZER is turned ON, the equalizer circuit functions as a free running oscillator. The TUNING STABILIZER is switched OFF and On and A4R10, SEARCH LOOP GAIN ADJ, is adjusted to ensure the search oscillations will start and the signal level reaches full amplitude within one second. (See Lock Range Adjustment, Paragraph 5-35).

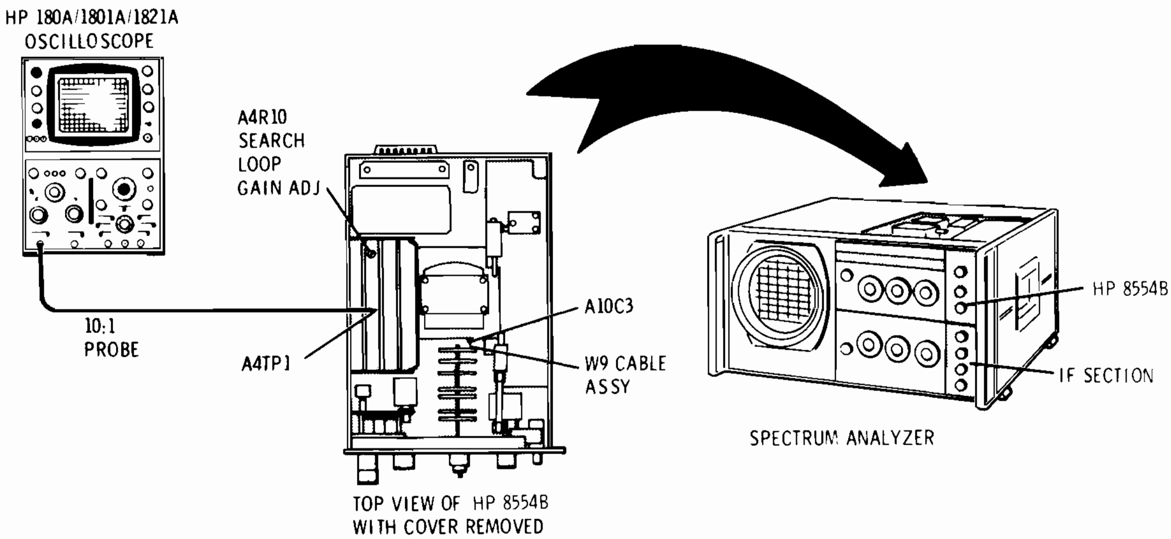


Figure 5-15. Search Oscillator Check and Adjustment Test Setup

EQUIPMENT:

Oscilloscope . . . . HP 180A/1801A/1821A
10:1 Divider Probe . . . . HP 10004A
Ground Strap with clips
Soldering iron
Modified Display Section Cover

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:

1. Install a cover over the Display Section with a cutout above the analyzer plug-ins.

2. With analyzer power off, unsolder center conductor of cable W9 from A10C3. Connect a jumper between W9 center conductor and chassis ground. Do *not* ground A10C3.

3. With the test setup connected as shown in Figure 5-15, make the following control settings:

ADJUSTMENTS

5-34. Search Oscillator (cont'd)

Spectrum Analyzer :

FREQUENCY	0 MHz
BANDWIDTH	30 kHz
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	200 kHz
TUNING STABILIZER	On

Oscilloscope:

VOLTS/DIV	.02
TIME/DIV	20 MSEC
Channel A Input	DC coupled

4. Observe oscilloscope display for a search signal. The signal should be approximately a 1.2-volt peak-to-peak sine wave with noticeable distortion.

5. Switch TUNING STABILIZER to OFF. Oscillations should stop.

6. Set oscilloscope scan time (TIME/DIV) to 0.1 SEC. Switch analyzer TUNING STABILIZER to On. Oscillations should reach full amplitude in less than one second. Switch TUNING STABILIZER OFF and On several times while noting time required for signal to reach peak value.

7. If time required for oscillations to reach full value exceeds one second, adjust A4R10 SEARCH LOOP GAIN ADJ to increase signal amplitude.

8. Repeat steps 6 and 7 until oscillations reach peak value in less than one second.

ADJUSTMENTS

5-35. Lock Range

REFERENCE: Service Sheet 7.

DESCRIPTION: See description in Paragraph 5-34. In addition to the conditions established for search oscillator check, the offset memory relay is energized to apply the search signal to the third LO. With the first and third local oscillators being swept in opposite directions, the LO feedthru signal is observed and the LOCK RANGE ADJ A4R15 set for the least amount of frequency variation.

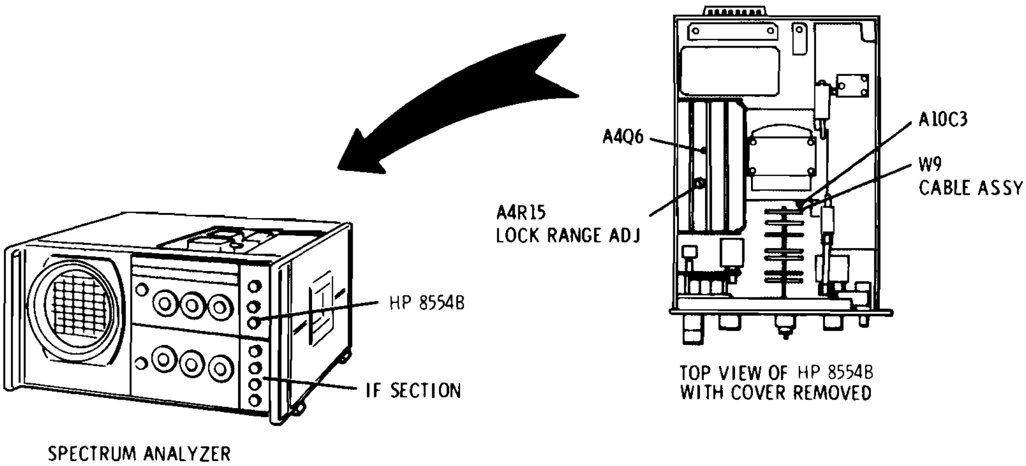


Figure 5-16. Lock Range Check and Adjustment Test Setup

EQUIPMENT:
- Soldering Iron
- Ground Strap with clips (2)
- Modified Display Section Cover

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:
1. Install a cover over the Display Section with a cutout above the analyzer plug-ins.

2. With analyzer power off, unsolder center conductor of cable W9 from A10C3. Connect a jumper between W9 center conductor and chassis ground. Do *not* ground A10C3. Connect a jumper between collector of A4Q6 (case) and chassis ground.

3. With the test setup connected as shown in Figure 5-16, make the the following control settings:

Spectrum Analyzer:

FREQUENCY . . . . 0 MHz
FINE TUNE . . . . Centered

ADJUSTMENTS

5-35. Lock Range (cont'd)

BANDWIDTH	10 kHz
TUNING STABILIZER	On
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	200 kHz
BASE LINE CLIPPER	9 o'clock
SCAN TIME PER DIVISION	2 MILLISECONDS
LOG/LINEAR	LOG
LOG REF LEVEL	0 dBm
VIDEO FILTER	OFF
SCAN MODE	INT
SCAN TRIGGER	AUTO

4. Set analyzer POWER switch to ON position.

5. Tune FREQUENCY control to center LO feedthru signal on CRT display.

6. Reduce SCAN WIDTH PER DIVISION to 20 kHz and center LO feedthru signal on CRT display.

7. Adjust A4R15 for least amount of frequency variation. Set SCAN WIDTH PER DIVISION to 10 kHz and repeat A4R15 adjustment. Frequency variation should not exceed 20 kHz.

   ________ 20 kHz

8. Remove ground jumpers and connect cable removed in step 2.

ADJUSTMENTS

5-36. 50 MHz Amplifier Gain

REFERENCE: Service Sheet 5.

DESCRIPTION: With the IF Section vertically calibrated, a —30 dBm signal is applied to the RF INPUT and the AMPL CAL potentiometer R4 is checked for a range of 7 to 10 dB. The input signal is reduced by 3 dB and the AMPL CAL pot is checked for sufficient range to increase signal level to —30 dBm. If not the 50 MHz gain adjustment A12A1R5 is adjusted to set signal at —30 dBm.

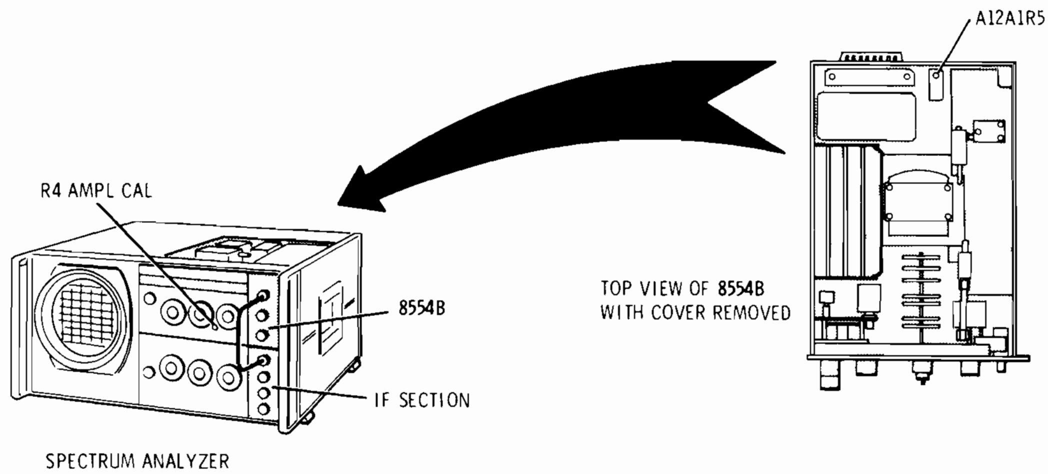


Figure 5-17. · AMPL CAL and 50 MHz Gain Check and Adjustment Test Setup

EQUIPMENT:
Modified Display Section Cover

WARNING

If the following procedure is attempted without the modified Display Section cover, dangerous potentials (up to 7000 Vdc) will be exposed. Exercise extreme caution.

PROCEDURE:
1. Install a cover over the Display Section with a cutout above the analyzer plug-ins.

2. With the test setup connected as shown in Figuer 5-17, make the following control settings:

Spectrum Analyzer:

FREQUENCY . . . . . 30 MHz
FINE TUNE . . . . . Centered
BANDWIDTH . . . . . 100 kHz
SCAN WIDTH . . . . . PER DIVISION
SCAN WIDTH PER DIVISION . . . . . 2 MHz
ATTENUATION . . . . . 10 dB
SCAN TIME PER DIVISION . . . . . 5 MILLISECONDS
BASE LINE CLIPPER . . . . . Max ccw

ADJUSTMENTS

5-36. 50 MHz Amplifier Gain (cont'd)

LOG/LINEAR . . . . LOG
LOG REF LEVEL . . . . −20 dBm
VIDEO FILTER . . . . OFF
SCAN MODE . . . . INT
SCAN TRIGGER . . . . AUTO

3. Vary AMPL CAL potentiometer for minimum and maximum vertical deflection of the 30 MHz CAL OUTPUT signal. Signal level should be adjustable over a 7 to 10 dB range.

7 ________ 10 dB

4. Adjust AMPL CAL potentiometer for maximum vertical deflection of 30 MHz CAL OUTPUT signal. Signal level should be at least −27 dBm.

______ (√)

5. If signal level (in step 4 above) is below −27 dBm, adjust 50 MHz gain adjustment A12A1R5 for −27 dBm.

ADJUSTMENTS

5-37. Analogic Checks

REFERENCE: IF Section Operating and Service Manual.

DESCRIPTION: Perform the display calibration check tabulated below. If adjustment is required refer to IF Section Operating and Service Manual for adjustment procedure. When performing the display calibration check, if the table indicates the DISPLAY UNCAL light to be "off", it is acceptable for light to be "on" if the light subsequently goes "off", when either the SCAN TIME PER DIVISION or SCAN WIDTH PER DIVISION control is switched one position counterclockwise.

Table 5-3. Display Calibration Conditions

VIDEO FILTER	SCAN TIME PER DIVISION	BANDWIDTH	SCAN WIDTH PER DIVISION	SCAN WIDTH	DISPLAY UNCAL LIGHT
OFF	5 MILLISECONDS	300 kHz	200 MHz	PER DIVISION	ON
OFF	5 MILLISECONDS	300 kHz	100 MHz	PER DIVISION	OFF
OFF	5 MILLISECONDS	100 kHz	100 MHz	PER DIVISION	ON
OFF	5 MILLISECONDS	100 kHz	20 MHz	PER DIVISION	OFF
OFF	5 MILLISECONDS	20 kHz	20 MHz	PER DIVISION	ON
OFF	5 MILLISECONDS	30 kHz	2 MHz	PER DIVISION	OFF
OFF	5 MILLISECONDS	10 kHz	2 MHz	PER DIVISION	ON
OFF	5 MILLISECONDS	10 kHz	0.2 MHz	PER DIVISION	OFF
OFF	5 MILLISECONDS	3 kHz	0.2 MHz	PER DIVISION	ON
OFF	5 MILLISECONDS	3 kHz	20 kHz	PER DIVISION	OFF
OFF	5 MILLISECONDS	1 kHz	20 kHz	PER DIVISION	ON
OFF	5 MILLISECONDS	1 kHz	2 kHz	PER DIVISION	OFF
OFF	5 MILLISECONDS	0.3 kHz	2 kHz	PER DIVISION	ON
OFF	50 MILLISECONDS	0.3 kHz	2 kHz	PER DIVISION	OFF
OFF	50 MILLISECONDS	0.1 kHz	2 kHz	PER DIVISION	ON
OFF	0.2 SECOND	0.1 kHz	2 kHz	PER DIVISION	OFF
100 Hz	5 SECONDS	300 kHz	200 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	100 kHz	200 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	100 kHz	50 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	30 kHz	50 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	30 kHz	20 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	10 kHz	20 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	10 kHz	5 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	3 kHz	5 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	3 kHz	1 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	1 kHz	1 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	1 kHz	0.2 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	0.3 kHz	0.2 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	0.3 kHz	50 MHz	PER DIVISION	OFF
100 Hz	5 SECONDS	0.1 kHz	50 MHz	PER DIVISION	ON
100 Hz	5 SECONDS	0.1 kHz	10 MHz	PER DIVISION	OFF
100 Hz	2 SECONDS	—	—	FULL	ON
100 Hz	5 SECONDS	—	—	FULL	OFF
100 Hz	5 MILLISECONDS	Any	Any	ZERO	OFF
OFF	5 MILLISECONDS	—	—	FULL	ON
OFF	10 MILLISECONDS	—	—	FULL	OFF

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

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

6-3. EXCHANGE ASSEMBLIES

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

6-5. ABBREVIATIONS

6-6. Table 6-2 gives a list of abbreviations used in the parts list, schematics, and throughout the manual. In some cases, two forms of the abbreviation are given, one all capital letters, and one partial or no capitals. This occurs because the abbreviations in the parts list are always all capitals. However, in the schematics and other parts of the manual, other abbreviation forms are used with both lower case and upper case letters.

6-7. REPLACEABLE PARTS LIST

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

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

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

c. Miscellaneous parts.

d. Illustrated parts breakdown.

The information given for each part consists of the following:

a. The Hewlett-Packard part number.

b. The total quantity (Qty) in the instrument.

c. The description of the part.

d. The typical manufacturer of the part in a five-digit code.

e. Manufacturer code number for the part.

6-9. The total quantity for each part is given only once — at the first appearance of the part number in the list.

6-10. ORDERING INSTRUCTIONS

6-11. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate quantity required, and address the order to the nearest Hewlett-Packard office.

6-12. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Part Numbers for Exchange Assemblies

Reference Designation	Description	Part Number	
		Exchange Assy	New Assy
A8	First and Second Converter Assy	08554-60051	08554-60012

Table 6-2. Reference Designations and Abbreviations (1 of 2)

REFERENCE DESIGNATIONS

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

ABBREVIATIONS

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

NOTE

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

Table 6-2. Reference Designations and Abbreviations (2 of 2)

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

NOTE

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

MULTIPLIERS

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

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08555-60009	1	SWITCH ASSY:BANDWIDTH	28480	08555-60009
A1CR1	1901-0040	1	DIODE:SILICON 50 MA 30 WV	07263	FDG1088
A1Q1	1854-0042	4	TRSTR:SI NPN	28480	1854-0040
A1Q2	1854-0042		TRSTR:SI NPN	28480	1854-0040
A1Q3	1853-0018	1	TRSTR:SI PNP	28480	1853-0018
A1Q4	1854-0354	2	TRSTR:SI NPN	28480	1854-0354
A1R1	0757-0346	13	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A1R2	0757-0401	3	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A1R3	0757-0462	3	R:FXD MET FLM 75.0K OHM 1% 1/8W	28480	0757-0462
A1R4	0698-4534	3	R:FXD MET FLM 309K OHM 1% 1/8W	28480	0698-4534
A1R5	0698-4534		R:FXD MET FLM 309K OHM 1% 1/8W	28480	0698-4534
A1R6	0698-4521	4	R:FXD MET FLM 154K OHM 1% 1/8W	28480	0698-4521
A1R7	0698-4521		R:FXD MET FLM 154K OHM 1% 1/8W	28480	0698-4521
A1R8	0698-4521		R:FXD MET FLM 154K OHM 1% 1/8W	28480	0698-4521
A1R9	0698-4534		R:FXD MET FLM 309K OHM 1% 1/8W	28480	0698-4534
A1R10	0698-4521		R:FXD MET FLM 154K OHM 1% 1/8W	28480	0698-4521
A1R11	0757-0420	5	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A1S1	3100-2677	1	SWITCH:ROTARY, SINGLE INDEX	28480	3100-2677
A2	08554-60024	1	SWITCH ASSY:SCAN WIDTH	28480	08554-60024
A2Q1	1855-0050	2	TRSTR:N-CHAN JFET	28480	1855-0050
A2Q2	1853-0020	10	TRSTR:SI PNP	28480	1853-0020
A2Q3	1853-0020		TRSTR:SI PNP	28480	1853-0020
A2Q4	1854-0071	18	TRSTR:SI NPN	28480	1854-0071
A2R1	0698-6204	1	R:FXD FLM 9.9K OHM 1% 1/8W	28480	0698-6204
A2R2	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A2R3	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2R4	0757-0424	3	R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A2R5	0698-3223	1	R:FXD FLM 1.24K OHM 1% 1/8W	28480	0698-3223
A2R6	0757-0446	1	R:FXD MET FLM 15.0K OHM 1% 1/8W	28480	0757-0446
A2R7	0698-4002	1	R:FXD MET FLM 5K OHM 1% 1/8W	28480	0698-4002
A2R8	0757-0449	1	R:FXD FLM 20K OHM 1% 1/8W	28480	0757-0449
A2R9	0698-3158	1	R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A2R10	0757-0450	1	R:FXD MET FLM 22.1K OHM 1% 1/8W	28480	0757-0450
A2R11	0698-4510	1	R:FXD MET FLM 84.5K OHM 1% 1/8W	28480	0698-4510
A2R12	0698-3260	9	R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R13	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R14	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R15	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R16	0698-3490	1	R:FXD FLM 66K OHM 1% 1/8W	28480	0698-3490
A2R17	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R18	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R19	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R20	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A2R21	0698-0077	2	R:FXD MET FLM 93.1K OHM 1% 1/8W	28480	0698-0077
A2R22	0698-0077		R:FXD MET FLM 93.1K OHM 1% 1/8W	28480	0698-0077
A2R23	0698-3162	3	R:FXD MET FLM 46.4K OHM 1% 1/8W	28480	0698-3162
A2R24	0698-3162		R:FXD MET FLM 46.4K OHM 1% 1/8W	28480	0698-3162
A2S1	3100-2443	1	SWITCH:ROTARY	28480	3100-2443
A3	08554-60061	1	INPUT ATTENUATOR ASSY	28480	08554-60061
A3R1	0698-3400	1	R:FXD MET FLM 147 OHM 1% 1/2W	28480	0698-3400
A3S1	3130-0193	1	SECTION:ROTARY SWITCH	28480	3130-0193
A3A1	0950-0533	1	ATTENUATOR:0-50 DB	28480	0950-0533
A4	08554-60003	1	PHASE LOCK ASSY	28480	08554-60003
A4C1	0180-0116	3	C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A4C2	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A4C3	0160-0939	1	C: FXD MICA 430 PF 5% 300 VDCW	28480	0160-0939
A4C4	0160-0889	1	C:FXD MY 0.33 UF 10% 80VDCW	28480	0160-0889
A4C5	0180-0373	1	C:FXD ELECT 0.68 UF 10% 35VDCW	56289	150D684X9035A2-DYS
A4C6	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A4C7	0180-1735	1	C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A4C8	0180-1743	1	C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A4C9	0160-0174	1	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A4C10	0180-1745	1	C:FXD ELECT 1.5 UF 10% 20VDCW	28480	0180-1745
A4C11	0170-0069	1	C:FXD POLY 0.1UF 2% 50VDCW	56289	114P1042R5S3
A4CR1	1901-0025	11	DIODE:SILICON 100MA/1V	07263	FD 2387
A4CR2	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A4CR3	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A4K1	0490-0399	1	RELAY:REED ASSY, 1200 OHM 12VDC	28480	0490-0399
A4Q1	1855-0098	1	TSTR:SI FET	28480	1855-0098
A4Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q4	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A4Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q6	1853-0001	1	TSTR:SI PNP(SELECTED FROM 2N1132)	28480	1853-0001
A4Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q8	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q9	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q10	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4R1	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A4R2	0698-3430		R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A4R3	0757-0462		R:FXD MET FLM 75.0K OHM 1% 1/8W	28480	0757-0462
A4R3			FACTORY SELECTED PART		

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4R4	0757-0123	3	R:FXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
A4R5	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A4R6	0757-0458	1	R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A4R7	0757-0465	2	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A4R8	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A4R9	0757-0123		R:FXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
A4R10	2100-1759	2	R:VAR WW 2K OHM 5% TYPE V 1W	28480	2100-1759
A4R11	0698-3156	4	R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A4R12	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A4R13	0757-0416	3	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A4R14	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A4R15	2100-1761	1	R:VAR WW 10K OHM 5% TYPE V 1W	28480	2100-1761
A4R16	0757-0441	3	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A4R17	0757-0441		R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A4R18	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A4R19	0757-0462		R:FXD MET FLM 75.0K OHM 1% 1/8W	28480	0757-0462
A4R20	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A4R21	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A4R22	0698-3155	4	R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A4R23	0698-3454	1	R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A4R24	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A4R25	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A4R26	0698-3450	1	R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A4R27	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A4R28	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A4R29	0698-3162		R:FXD MET FLM 46.4K OHM 1% 1/8W	28480	0698-3162
A4R30	0757-0444	4	R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A4R31	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A4U1	1826-0013	3	IC:LINEAR	28480	1826-0013
A5	08554-60070	1	BOARD ASSY:MARKER GENERATOR	28480	08554-60070
A5C1	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A5C2	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A5CR1	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR2	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR3	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR4	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR5	1910-0016	1	DIODE:GE 60 WIV	28480	1910-0016
A5CR6	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5CR7			NOT ASSIGNED		
A5CR8	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A5Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5Q5	1854-0053	1	TSTR:SI NPN	80131	2N2218
A5R1	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A5R2	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A5R3	0698-3449		R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A5R4	0757-0317	2	R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A5R4			FACTORY SELECTED PART		
A5R5	0698-3154	2	R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A5R6	0757-0288	2	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A5R7	0698-3457	2	R:FXD MET FLM 316K OHM 1% 1/8W	28480	0698-3457
A5R8	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A5R9	2100-1757	1	R:VAR WW 500 OHM 5% TYPE V 1W	28480	2100-1757
A5R10	0757-0139	1	R:FXD MET FLM 1.1 MEGOHM 2% 1/2W	28480	0757-0139
A5R11	0698-3457		R:FXD MET FLM 316K OHM 1% 1/8W	28480	0698-3457
A5R12	0757-0123		R:FXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
A5R13	0683-3055	1	R:FXD COMP 3 MEGOHM 5% 1/4W	01121	CB 3055
A5R14	0698-3438	1	R:FXD MET FLM 147 OHM 1% 1/8W	28480	0698-3438
A5R15	0757-0447	1	R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A5R16	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A5R17	0757-0289	1	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A5R18	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A5R19	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A5R20	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A5R21	0698-3151	2	R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A5R22	2100-1758	1	R:VAR WW 1K OHM 5% TYPE V 1W	28480	2100-1758
A5R23	0757-0439	3	R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A5R24			NOT ASSIGNED		
A5R28			NOT ASSIGNED		
A5R29	0764-0015	1	R:FXD MET FLM 560 OHM 5% 2W	28480	0764-0015
A5R30	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A5R31	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A5U1	1826-0013		IC:LINEAR	28480	1826-0013

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5VR1	1902-3139	1	DIODE:BREAKDOWN 8.25V 5%	04713	SZ10939-158
A6	08554-60001	1	YIG POWER SUPPLY ASSY	28480	08554-60001
A6C1	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A6C2	0180-0374	3	C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A6C3	0180-0229	1	C:FXD ELECT 33 UF 10% 10VDCW	28480	0180-0229
A6C4	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A6C5	0160-0162	1	C:FXD MY 0.022 UF 10% 200VDCW	56289	192P22392-PTS
A6C6			NOT ASSIGNED		
A6C7	0180-0159	1	C:FXD ELECT 220 UF 20% 10VDCW	28480	0180-0159
A6C8	0150-0023	1	C:FXD CER 2000 PF 20% 1000VDCW	56289	20C295A2-CDH
A6C9	0180-0100	1	C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A6C10	0140-0198	1	C:FXD MICA 200 PF 5%	72136	RDM15F201J3C
A6CR1	1902-0033	1	DIODE:BREAKDOWN 6.2V	04713	1N823
A6CR2	1902-0048	1	DIODE:BREAKDOWN 6.81V 5%	04713	SZ10939-134
A6CR3	1901-0025		DIODE:SILICON 100MA/1V	07263	FD 2387
A6Q1	1854-0221	1	TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A6Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A6Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A6Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A6Q5	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A6Q6	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A6Q7	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A6Q8	1854-0063	1	TSTR:SI NPN	80131	2N3055
A6R1	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A6R2	2100-1759		R:VAR WW 2K OHM 5% TYPE V 1W	28480	2100-1759
A6R3	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A6R4	0757-0467	2	R:FXD MET FLM 121K OHM 1% 1/8W	28480	0757-0467
A6R5	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A6R6	0698-3132		R:FXD FLM 261 OHM 1% 1/8W	28480	0698-3132
A6R7	2100-1754	1	R:VAR WW 50 OHM 5% TYPE V 1W	28480	2100-1754
A6R8	0757-0415	1	R:FXD MET FLM 475 OHM 1% 1/8W	28480	0757-0415
A6R9	0698-3159	1	R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A6R10	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A6R11	0698-3442	1	R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A6R12	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A6R13	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A6R14	0757-0279	2	R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A6R15	0683-5145	1	R:FXD COMP 510K OHM 5% 1/4W	01121	CB 5145
A6R16	0698-5465	1	R:FXD FLM 4.725K OHM 1% 1/8W	28480	0698-5465
A6R17	0757-0467		R:FXD MET FLM 121K OHM 1% 1/8W	28480	0757-0467
A6R18	2100-1760	1	R:VAR WW 5K OHM 5% TYPE V 1W	28480	2100-1760
A6R19	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A6R20	0757-0441		R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A6R21	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A6R22	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A6R23	0698-3437		R:FXD MET FLM 133 OHM 1% 1/8W	28480	0698-3437
A6R24	0757-0466	1	R:FXD MET FLM 110K OHM 1% 1/8W	28480	0757-0466
A6R25	0698-3154		R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A6R26	0757-0290	1	R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A6R27	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A6R28	0683-9145	1	R:FXD COMP 910K OHM 5% 1/4W	01121	CB 9145
A6R29	0757-0288		R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A6R30	0698-3445	1	R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A6R31			NOT ASSIGNED		
A6R32	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A6R33	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A6R34	0698-3160	2	R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A6R34			FACTORY SELECTED PART		
A6R35	0757-0418	1	R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A6R36	0757-0439		R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A6R37	0757-0439		R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A6R38	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A6R38			FACTORY SELECTED PART		
A6R39	0698-3151		R:FXD MET FLM 2.87K OHM 1% 1/8W	28480	0698-3151
A6U1	1826-0013		IC:LINEAR	28480	1826-0013
A7	08554-60074	1	YIG OSCILLATOR ASSY	28480	08554-60074
A7	08554-60075	1	REBUILT 08554-60074, REQUIRES EXCHANGE	28480	08554-60075
A7AT1	08554-60058	1	ATTENUATOR:2DB	28480	08554-60058
A8	08554-60012	1	FIRST AND SECOND CONVERTER ASSY	28480	08554-60012
A8	08554-60051	1	FIRST/SECOND CONVERTER EXCHANGE ASSY	28480	08554-60051
A8C1	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A8C2	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A8C3	0140-0080	1	C:FXD MICA 15 PF 10% 500VDCW	00853	TYPE M100 E10
A8C4	0140-0069	1	C:FXD MICA 550 PF 10% 500VDCW	00853	TYPE M 100E10
A8C5	0160-0345	2	C:FXD CER FEED-THRU 1000 PF 500VDCW	01121	FB2B-102W

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A8CR1	1901-0535	1	DIODE:HYBRID HOT CARRIER	28480	1901-C535
A8J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-C45-4610
A8J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	5C-045-4610
A8MP1	08554-00016	1	COVER:FIRST & SECOND CONVERTER	28480	08554-00016
A8MP2			NOT ASSIGNED		
A8MP3	08554-00005	1	COVER:550 MHZ IF	28480	08554-00005
A8MP4	08554-20019	1	BODY:FIRST & SECOND CONVERTER	2848C	08554-20019
A8MP5	08555-00033	1	INPUT-OUTPUT LOOP	28480	08555-0C033
A8MP6	08555-20040	1	CAP:OUTER ELEMENT	28480	08555-20040
A8MP7	08555-20041	1	CAP:INNER ELEMENT	28480	08555-20041
A8MP8	08555-20042	1	CAP:DIELECTRIC	28480	08555-20042
A8R1	0757-042C		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A8A1	08554-60042	1	FIRST MIXER ASSY	2848C	08554-60042
A8A1CR1	1901-0385	2	DIODE:SI, MATCHED PAIR, HOT CARRIER	28480	1901-0385
A8A1CR2	1901-0385		DIODE:SI, MATCHED PAIR, HOT CARRIER	28480	1901-0385
A8A1J1	1250-1157	1	CONNECTOR:RF SMA SERIES	16179	OSM 22C
A8A1J2	1250-0828	4	CONNECTOR:RF 5C-OHM SCREW ON TYPE	98291	5C-043-4610
A8A1MP1	08554-20015	1	COVER:INPUT MIXER	28480	08554-20015
A8A2	5086-7082	1	FILTER:LOW-PASS, 5 GHZ	28480	0960-0060
A8A3	08554-60021	1	SECOND LOCAL OSCILLATOR ASSY	28480	08554-60021
A8A3C1	0160-4052	1	C:FXD PORC. 0.6 PF 500VDCW FACTORY SELECTED PART; TYPICAL VALUE GIVEN	28480	0160-4052
A8A3MP1	08554-00012	1	COUPLING:SECOND LOCAL OSC LOOP	28480	08554-00012
A8A3Q1	1854-0292	3	TSTR:SI NPN	28480	1854-C292
A8A3Q2	1854-0292		TSTR:SI NPN	2848C	1854-C292
A8A3R1	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-C424
A8A3R2	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A8A3R3	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	2848C	0757-0424
A9	08554-60081	1	BOARD ASSY:THIRD CONVERTER	28480	08554-60081
A9C1	0160-0345		C:FXD CER FEED-THRU 1000 PF 500VDCW	01121	FB28-102W
A9C2	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A9C3	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A9C4	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A9C5	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A9C6	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A9C7	3030-0382	3	SCREW:SET(LOCKING)	72962	850063
A9C8	3030-0382		SCREW:SET(LOCKING)	72962	850063
A9C9	3030-0382		SCREW:SET(LOCKING)	72962	850063
A9J1	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A9J2	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A9J3	1250-0828		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-043-4610
A9L1	9100-2839	3	INDUCTOR:FXD	2848C	9100-2839
A9L2	9100-2839		INDUCTOR:FXD	28480	9100-2839
A9L3	9100-2839		INDUCTOR:FXD	28480	9100-2839
A9MP1	08554-00008	1	COVER:500MHZ OSCILLATOR	28480	08554-0C008
A9MP2	08554-00009	1	COVER:MIXER-AMPLIFIER	28480	08554-00009
A9MP3	08554-00015	1	COUPLING:LO OUTPUT	28480	08554-0C015
A9MP4	08554-20032	1	HOUSING:THIRD CONVERTER	28480	08554-20032
A9MP5	08554-20035	1	SUPPORT:FILTER COIL	28480	08554-20035
A9MP6	08554-20038	1	CONTACT:FILTER	28480	08554-20038
A9MP7	08554-60017	1	COUPLING:500MHZ	28480	08554-60017
A9R1	0698-7200	1	R:FXD FLM 31.6 OHM 2% 1/8W	28480	0698-7200
A9A1	08554-60009	1	AMPLIFIER ASSY:550MHZ	28480	08554-60009
A9A1C1			NOT ASSIGNED		
A9A1C2	0160-2248	1	C:FXD CER 4.3 PF 500VDCW	28480	0160-2248
A9A1C3	0150-0093	1	C:FXD CER 0.01 UF +80-20% 100VDCW	72982	801-K800011
A9A1C4	0160-2266	1	C:FXD CER 24 PF 5% 500VDCW	72982	301-000-COGO-240J
A9A1C5	0160-2247	2	C:FXD CER 3.9 PF 500VDCW	72982	301-NPO-3.9 PF
A9A1J1	1250-1220	2	CONNECTOR:RF 50 OHM SCREW-ON TYPE	98291	50-051-0109
A9A1MP1	2190-0326	1	WASHER:FLAT 0.115" ID	00000	OBD
A9A1Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9A1Q2	1854-0292		TSTR:SI NPN	28480	1854-0292
A9A1R1	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A9A1R2	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9A1R3	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	2848C	0698-3155
A9A1R4	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	2848C	0757-0280
A9A1R5	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A9A2	08554-60080	1	LO DRIVE ASSY:500 MHZ	2848C	08554-60080
A9A2C1	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A9A2C2	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A9A2C3	0170-0066	1	C:FXD MY 0.027 UF 10% 200VDCW	56289	192P27392-PTS
A9A2C4	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A9A2CR1	1901-0025		DIODE:SILICON 10CMA/1V	07263	FD 2387
A9A2Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-C020

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9A2Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9A2Q3	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9A2Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9A2R1	0698-7260	1	R:FXD FLM 10K OHM 2% 1/8W	28480	0698-7260
A9A2R2	0698-7188	1	R:FXD MET FLM 10 OHM 2% 1/8W	28480	0698-7188
A9A2R3	0698-3155		R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A9A2R4	0757-0454	1	R:FXD MET FLM 33.2K OHM 1% 1/8W	28480	0757-0454
A9A2R5	0698-7277	1	R:FXD MET FLM 51.1K OHM 2% 1/8W	28480	0698-7277
A9A2R6	0698-7282	1	R:FXD MET FLM 82.5K OHM 2% 1/8W	28480	0698-7282
A9A2R7	0698-7195	1	R:FXD MET FLM 19.6 OHM 2% 1/8W	28480	0698-7195
A9A2R8	0698-7267	1	R:FXD MET FLM 19.6K OHM 2% 1/8W	28480	0698-7267
A9A2R9	0698-7245	1	R:FXD MET FLM 2.37K OHM 2% 1/8W	28480	0698-7245
A9A2R10	0698-7248	1	R:FXD FLM 3.16K OHM 2% 1/8W	28480	0698-7248
A9A2R11	2100-1774		R:VAR WW 2K OHM 5% TYPE H 1W	28480	2100-1774
A9A2R12	2100-1775	1	R:VAR WW 5K OHM 5% TYPE H 1W	28480	2100-1775
A9A2R13	0698-7247	1	R:FXD FLM 2.87K OHM 2% 1/8W	28480	0698-7247
A9A2R14	0698-7253	1	R:FXD MET FLM 5.11K OHM 2% 1/8W	28480	0698-7253
A9A2R15	0698-7240	2	R:FXD MET FLM 1.47K OHM 2% 1/8W	28480	0698-7240
A9A2R16	0698-7240		R:FXD MET FLM 1.47K OHM 2% 1/8W	28480	0698-7240
A9A2R17	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W FACTORY SELECTED PART; TYPICAL VALUE GIVEN	28480	0757-0420
A9A2R18	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A9A3	08554-60005	1	MIXER/AMPLIFIER ASSY:550/50MHZ	28480	08554-60005
A9A3C1	0121-0061	1	C:VAR CER 5.5-18 PF NPO	72982	538-011A 5.5-18
A9A3CR1	5080-0271	1	DIODE:SILICON MATCHED QUAD	28480	5080-0271
A9A3CR2			NSR PART OF A9A3CR1		
A9A3CR3			NSR PART OF A9A3CR1		
A9A3CR4			NSR PART OF A9A3CR1		
A9A3J1	1250-1220		CONNECTOR:RF 50 OHM SCREW-ON TYPE	98291	50-051-0109
A9A3T1	08554-60014	1	INDUCTOR ASSY:50MHZ	28480	08554-60014
A9A3T2	08554-60015	1	INDUCTOR ASSY:500MHZ	28480	08554-60015
A9A4	08554-60006	1	LOCAL OSCILLATOR ASSY:500MHZ	28480	08554-60006
A9A4C1	0160-2357	2	C:FXD CER FEED-THRU 1000 PF +80-20%	28480	0160-2357
A9A4C2	0160-2357		C:FXD CER FEED-THRU 1000 PF +80-20%	28480	0160-2357
A9A4C3	0160-2247		C:FXD CER 3.9 PF 500VDCW FACTORY SELECTED PART; TYPICAL VALUE GIVEN	72982	301-NPO-3.9 PF
A9A4C4	0121-0414	1	C:VAR AIR TRIMMER 1.9 TO 8.5 PF	28480	0121-0414
A9A4L1	08554-00007	1	INDUCTOR:500MHZ OSCILLATOR	28480	08554-00007
A9A4MP1	08554-20016	1	INDUCTOR MOUNTING:500MHZ OSCILLATOR	28480	08554-20016
A9A4Q1	1854-0323	2	TSTR:SI NPN	02735	2N2857
A9A4Q1	1205-0031	2	HEAT SINK:TRANSISTOR	28480	1205-0031
A9A4Q2	1854-0323		TSTR:SI NPN	02735	2N2857
A9A4Q2	1205-0031		HEAT SINK:TRANSISTOR	28480	1205-0031
A9A4R1	0698-3447	1	R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A9A4R2	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9A4R3	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10	08554-60020	1	PHASE LOCK AMPLIFIER ASSY	28480	08554-60020
A10C1	0160-2437	13	C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A10C2	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A10C3	0160-2152	1	C:FXD CER 10 PF 20% 500VDCW	28480	0160-2152
A10C4	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A10C5	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A10MP1	08554-00010	1	COVER:LOCK BOX	28480	08554-00010
A10MP2	08554-20034	1	HOUSING:PHASE LOCK	28480	08554-20034
A10A1	08554-60018	1	SAMPLER PULSE GENERATOR ASSY	28480	08554-60018
A10A1C1	0180-0197	12	C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A1C2	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A1C3	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A1C4	0160-0161	1	C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A10A1C5	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A1C6	0160-2204	1	C:FXD MICA 100PF 5%	72136	RDM15F101J3C
A10A1C7	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A1C8	0160-2201	1	C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A10A1CR1	1901-0081		DIODE:SILICON 50 VOLTS WORKING	07263	FD1415
A10A1CR2	1901-0081		DIODE:SILICON 50 VOLTS WORKING	07263	FD1415
A10A1L2	9140-0129		COIL:FXD RF 220 UH	28480	9140-0129
A10A1L3	9100-1612	1	COIL:FXD RF 0.33 UH 20%	28480	9100-1612
A10A1Q1	1854-0042		TSTR:SI NPN	28480	1854-0042
A10A1Q2	1854-0042		TSTR:SI NPN	28480	1854-0042
A10A1Q3	1853-0018	1	TSTR:SI PNP(SELECTED FROM 2N4260)	28480	1853-0018
A10A1Q4	1854-0354	1	TSTR:SI NPN	28480	1854-0354
A10A1R1	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A10A1R2	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A10A1R3	0698-3132	2	R:FXD FLM 261 OHM 1% 1/8W	28480	0698-3132
A10A1R4	0698-3153	5	R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10A1R5	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10A1R6	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A10A1R7	0757-0280	9	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10A1R8	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10A1R9	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10A1R10	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A10A1R11	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10A1R12	0698-3408	1	R:FXD MET FLM 2.15K OHM 1% 1/2W	28480	0698-3408
A10A1R13	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A10A1R14	2100-1774	2	R:VAR WW 2K OHM 5% TYPE H 1W	28480	2100-1774
A10A1XY1	1200-0770	1	SOCKET:CRYSTAL	91506	8000-AG-26
A10A1Y1	0410-0013	1	CRYSTAL:QUARTZ 1MHZ	28480	0410-0013
A10A2	08554-60004	1	PHASE LOCK AMPLIFIER ASSY	28480	08554-60004
A10A2C1	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A2C2	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A10A2C3	0160-3153	2	C:FXD GLASS 0.01 UF 20% 50VDCW	14674	CYK01 BT 103M
A10A2C4	0160-3153		C:FXD GLASS 0.01 UF 20% 50VDCW	14674	CYK01 BT 103M
A10A2C5	0160-2259	1	C:FXD CER 12 PF 5% 500VDCW	72982	301-000-C0G0-120J
A10A2C6	0160-0153	1	C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
A10A2C7	0160-2257	1	C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A10A2Q1	1855-0050		TSTR:SI FET DUAL	28480	1855-0050
A10A2Q2	1853-0020	10	TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A10A2Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A10A2Q4	1854-0071	18	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10A2R1	0698-3430	3	R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A10A2R2	0698-3430		R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
A10A2R3	0757-0488	2	R:FXD MET FLM 909K OHM 1% 1/8W	28480	0757-0488
A10A2R4	2100-2650	1	R:VAR FLM 200K OHM 10% LIN 1/2W	28480	2100-2650
A10A2R5	0757-0488		R:FXD MET FLM 909K OHM 1% 1/8W	28480	0757-0488
A10A2R6	0757-0199	3	R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A10A2R7	0698-0082	1	R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A10A2R8	0757-0443	5	R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A10A2R9	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A10A2R10	0698-0084	4	R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A10A2R11	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A10A2R12			NOT ASSIGNED		
A10A2R13	0757-0442	6	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10A2R14	0698-3157	2	R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A10A2R15	0698-3437	2	R:FXD MET FLM 133 OHM 1% 1/8W	28480	0698-3437
A10A2R16	0698-3161		R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161
A10A2R17	0757-0438	4	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A10A3	5086-7042	1	SAMPLER ASSY:2-3.3GHZ	28480	5086-7042
A11			NOT ASSIGNED		
A12	08554-60048	1	AMPLIFIER ASSY:50 MHZ	28480	08554-60048
A12C1	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P
A12C2	0160-2437		C:FXD CER 5000 PF +80-20% 200VDCW	72982	2425-000-X5V-502P

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A12J1	1250-0829	4	CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A12J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A12Q1	1853-0020		TRSTR:SI PNP	28480	1853-0020
A12Q2	1854-0247		TRSTR:SI NPN	28480	1854-0247
A12A1			NSR, ORDER A12.		
A12A1C1	0160-2039	1	C:FXD MICA 120 PF 5% 500VDCW	28480	0160-2039
A12A1C2	0160-2055	1	C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A12A1C3	0160-2543	3	C:FXD MICA 500 PF 1% 300VDCW	28480	0160-2543
A12A1C4	0150-0050	3	C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A12A1C5	0160-2543		C:FXD MICA 500 PF 1% 300VDCW	28480	0160-2543
A12A1C6	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A12A1C7	0160-2543		C:FXD MICA 500 PF 1% 300VDCW	28480	0160-2543
A12A1C8	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A12A1L1	9100-2247	1	COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A12A1Q1	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A12A1Q2	1854-0247	1	TSTR:SI NPN	28480	1854-0247
A12A1R1	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A12A1R2	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A12A1R3	0698-3449	2	R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A12A1R4	0698-0085	1	R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A12A1R5	2100-2632	1	R:VAR FLM 100 OHM 10% LIN 1/2W	28480	2100-2632
A12A1R6	0757-0394	1	R:FXD MET FLM 51.1 OHM 1% 1/8W FACTORY SELECTED PART; TYPICAL VALUE GIVEN	28480	0757-0394
A12A1R7	0757-0402	1	R:FXD MET FLM 110 OHM 1% 1/8W	28480	0757-0402
A12A1R8	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A12A1R9	0757-0397	1	R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A12A1R10	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A12A1R11	0698-3429	1	R:FXD MET FLM 19.6 OHM 1% 1/8W	28480	0698-3429
A13	0960-0046	1	CIRCULATOR ASSY:3-PORT 2.0-3.3GHZ	28480	0960-0046

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CHASSIS PARTS		
AT1	08554-60071	1	ATTENUATOR:COAX, SMA	28480	08554-60071
AT2	11593A	2	TERMINATION:50 OHM	28480	11593A
AT3	11593A		TERMINATION:50 OHM	28480	11593A
C1			PART OF J1(J1MP8).		
C2	0180-0155	1	C:FXD ELECT 2.2 UF 20% 20VDCW	56289	150D225X0020A2-DYS
C3	0180-0094	1	C:FXD ELECT 100 UF +75-10% 25VDCW	56289	30D107G025DD2-DSM
DS1	2140-0259	1	LAMP:INCANDESCENT 12V 0.06A	71744	CM8-1099
DS1			DISPLAY UNCAL		
DS1	1450-0153	1	LAMPHOLDER:FOR T-1 SERIES	08717	102SR
DS1	1450-0371	1	LENS:LAMPHOLDER, AMBER	08717	102-A(LENS)
FL1	5086-7051	1	FILTER:LOW PASS 1.56 GHZ	28480	0960-0059
FL2	08554-60049	1	FILTER:NOTCH	28480	08554-60049
J1	08554-60059	1	INPUT CONNECTOR ASSY(INCL W1 AND C1)	28480	08554-60059
J1MP1	1250-0914	1	BODY:RF CONNECTOR	02660	131-150
J1MP2	1250-0915	1	CONTACT:RF CONNECTOR	02660	131-149
J1MP3	5040-0306	1	INSULATOR	28480	5040-0306
J1MP4	08558-20076	1	CONDUCTOR:INNER-N TO CAPACITOR	28480	08558-20076
J1MP5	08558-20077	1	DIELECTRIC FOR CONDUCTOR	28480	08558-20077
J1MP6	08558-20078	1	HOLDER:CAPACITOR BOARD	28480	08558-20078
J1MP7	08558-20026	1	BOARD:CAPACITOR	28480	08558-20026
J1MP8	0160-0546	1	C:FXD CER 0.1 UF 20% 100VDCW	28480	0160-0546
J1MP9	3050-0253	1	WASHER:SPRING	28480	3050-0253
J1MP10	08558-20079	1	SHELL:TYPE-N CAPACITOR	28480	08558-20079
J1MP11	08554-20083	1	CABLE:CAPACITOR TO ATTENUATOR(W1).	28480	08554-20083
J2			PART OF W13.		
J3			PART OF W14.		
L1	9100-1642	1	COIL/CHOKE 270.0 UH 5%	28480	9100-1642
P1			NOT ASSIGNED		
P2	1251-0055	1	CONNECTOR:MALE 24 CONTACTS	28480	1251-0055
P2	08555-00002	1	SHIELD:CONNECTOR	28480	08555-00002
P3	1251-2081	1	CONNECTOR:R AND P 41 MALE CONTACT	71468	DDM-43W2-P
R1			NOT ASSIGNED		
R2			NOT ASSIGNED		
R3	2100-2944	1	R:VAR WW 10K OHM 5% LIN 1W	28480	2100-2944
R4	2100-2488	1	R:VAR COMP 10K OHM 20% LIN 1/2W	28480	2100-2488
R5			NOT ASSIGNED		
R6	2100-2619	1	R:VAR CERMET 2K OHM 10% LIN 2W	28480	2100-2619
R7			NOT ASSIGNED		
R8			NOT ASSIGNED		
R9	0811-2788	1	R:FXD WW 31.6 OHM 1% 25W	28480	0811-2788
R9	08554-00019	1	RESISTOR SHIELD HOUSING	28480	08554-00019
R9	08554-00026	1	RESISTOR HOUSING COVER	28480	08554-00026
R10	0698-3397	1	R:FXD MET FLM 42.2 OHM 1.0% 1/2W	28480	0698-3397
R11	1250-0839	1	TERMINATION:RF 50 OHM SCREW ON TYPE	98291	60-001-0101
S1	3101-1560	1	SWITCH:SLIDE DPDT MINIATURE	28480	3101-1560
W1			PART OF J1(J1MP11).		
W2	08554-20082	1	CABLE ASSY:ATTENUATOR TO FILTER	28480	08554-20082
W3	08554-20069	1	CABLE ASSY:PD-IN MIXER	28480	08554-20069
W4	08554-20050	1	CABLE ASSY:CIRCULATOR-IN MIXER	28480	08554-20050
W5	08554-20048	1	CABLE ASSY:MIXER-550 AMP	28480	08554-20048
W6	08554-60053	1	WIRING HARNESS:YIG	28480	08554-60053
W7	08554-60034	1	CABLE:OUTPUT 50 MHZ	28480	08554-60034
W7	08554-60035	1	CABLE ASSY	28480	08554-60035
W8	08554-20053	1	CABLE ASSY:CIRCULATOR-SAMPLER	28480	08554-20053
W9	08554-60045	1	CABLE ASSY:PHASE LOCK TO SEARCH MEMORY	28480	08554-60045
W10	08554-60037	1	CABLE ASSY:FREQUENCY TUNE	28480	08554-60037
W11	08554-20079	1	CABLE ASSY:CIRCULATOR	28480	08554-20079
W12	08554-20065	1	CABLE ASSY:50 MHZ INPUT	28480	08554-20065
W13	08554-20071	1	CABLE ASSY:FIRST LO	28480	08554-20071
W13			(INCLUDES J2).		
W14	08554-60055	1	CABLE ASSY:THIRD LO	28480	08554-60055
W14			(INCLUDES J3).		
W15	08554-60046	1	CABLE ASSY:SCAN WIDTH ATTENUATOR	28480	08554-60046
XA1 THRU					
XA3			NOT ASSIGNED		
XA4	1251-0135	3	CONNECTOR:PC EDGE 15 CONTACT	95354	91-6915-1500-00
XA5	1251-0135		CONNECTOR:PC EDGE 15 CONTACT	95354	91-6915-1500-00
XA6	1251-0135		CONNECTOR:PC EDGE 15 CONTACT	95354	91-6915-1500-00
			MISCELLANEOUS		
	6960-0016	2	PLUG:NYLON 0.125" DIA HOLE	00000	OBD
	5040-0274	3	FOOT,PLUG-IN	28480	5040-0274
	08554-00020	1	DECK:PC BOARD	28480	08554-00020
	08554-00021	1	COVER:TOP	28480	08554-00021

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
	08554-00022	1	COVER:BOTTOM	28480	08554-00022
	08554-00023	1	PANEL:REAR	28480	08554-00023
	08554-00024	1	REAR WALL:PC BOX	28480	08554-00024
	08554-00025	1	FRONT WALL:PC BOX	28480	08554-00025
	08554-00032	1	BRACKET:CONVERTER	28480	08554-00032
	08554-00034	1	BRACKET:CIRCULATOR	28480	08554-00034
	08554-20013	2	MOUNT:YIG OSCILLATOR	28480	08554-20013
	0370-0102	1	KNOB:RED BAR 0.125" SHAFT 0.500"DIA (SCAN WIDTH)	28480	0370-0102
	0370-0114	1	KNOB:RED W/ARROW 5/8" OD 1/8" SHAFT (FINE TUNE)	28480	0370-0114
	0370-0116	1	KNOB:BLACK ROUND(FREQUENCY)	28480	0370-0116
	08555-00011	1	DIAL/KNOB(BANDWIDTH)	28480	08555-00011
	08554-00003	1	DIAL-KNOB ASSY:SCAN WIDTH	28480	08554-00003
	08553-0014	1	DIAL:KNOB ASSY(INPUT ATTENUATION)	28480	08553-0014

See introduction to this section for ordering information

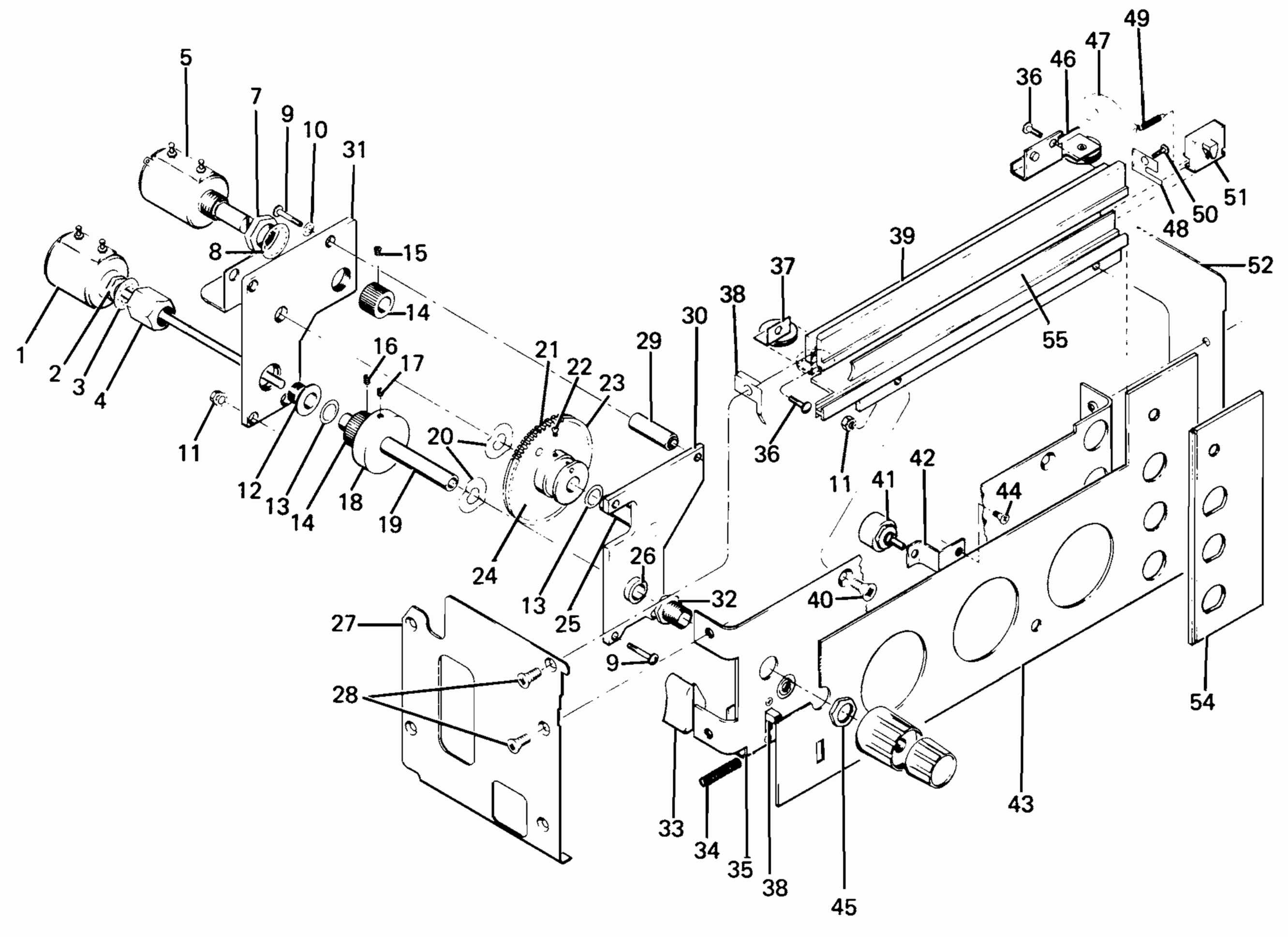


Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			FRONT PANEL PARTS		
1			FINE TUNE CONTROL, SEE R3.		
2	2950-0006	1	NUT:HEX 1/4-32 THREAD	73734	9000
3	2190-0067	1	WASHER:LOCK FOR 1/4" HDW	28480	2190-0067
4	08553-2029	1	BUSHING:FINE TUNE POT	28480	08553-2029
5			FREQUENCY TUNE CONTROL, SEE R6		
6			NOT ASSIGNED		
7	2950-0001	1	NUT:HEX BRS NP 3/8-32 X 1/2	73734	9002
8	2190-0016	1	WASHER:LOCK PH BRZ NP	00000	OBD
9	2360-0133	1	SCREW:PAN HD POZI DR 6-32 X 1-1/4"	00000	OBD
10	2190-0007	1	WASHER:INT LOCK #6	28480	2190-0007
11	2420-0001	1	NUT:HEX ST NP 6-32 X 5/16 W/LOCKWASHER	78189	OBD#
12	08553-2028	1	BUSHING:TUNING SHAFT	28480	08553-2028
13	3050-0017	1	WASHER:FLAT PHCS BRONZE	00000	OBD
14	08553-2039	2	SPUR GEAR:29T	28480	08553-2039
15	3030-0145	1	SCREW:SET 6-32 X 1/8" LG	70276	OBD
16	3030-0342	2	SCREW:SET 6-32 X 5/32" LG	00000	OBD
17	3030-0007	1	SCREW:SET SST 4-40 X 1/8"	00000	OBD
18	08553-2020	1	FLYWHEEL	28480	08553-2020
19	08553-2021	1	SHAFT:MAIN TUNING	28480	08553-2021
20	5000-0206	2	SPRING:WASHER	28480	5000-0206
21	1460-0299	1	WIREFORM:ANTI-BACKLASH	28480	1460-0299
22	0520-0127	1	SCREW:PAN HD POZI DR 2-56 X 3/16"	00000	OBD
23	08553-2040	1	SPUR GEAR,112T	28480	08553-2040
24	08553-6034	1	GEAR AND HUB ASSY	28480	08553-2034
25	5020-3349	1	SHAFT:SST	28480	5020-3349
26	1410-0088	1	BUSHING:1/4 " DIA	71041	846-2
27	08554-00017	1	DECK:LEFT SIDE	28480	08554-00017
28	2360-0193	3	SCREW:PAN HD POZI DR 6-32 X 1/4"	00000	OBD
29	08553-2022	4	SPACER:GEARBOX	28480	08553-2022
30	08553-2018	1	PLATE:FRONT	28480	08553-2018
31	08553-2019	1	PLATE:REAR	28480	08553-2019
32	08553-2016	1	BUSHING:PANEL	28480	08553-2016
33	00197-47403	3	BUTTON:DETENT	28480	00197-47403
34	1460-0199	1	SPRING:EXTENSION	28480	1460-0199
35	08553-0002	1	SUB-PANEL	28480	08553-0002
36	2200-0103	1	SCREW:SST PHH POZI DR 4-40 X 1/4"W/LK	00000	OBD
37	08553-6029	1	PULLEY ASSY:LEFT	28480	08553-6029
38		1	TUNING STABILIZER SWITCH, SEE S1.		
39	08554-20081	1	EXTRUSION:MINT GRAY	28480	08554-20081
40	2360-0200	1	SCREW:FLAT HD POZI DR 6-32 X 1/2"	00000	OBD
41			AMPLIFIER CAL CONTROL, SEE R4.		
42	08553-0009	1	BRACKET:POT	28480	08553-0009
43	08554-00042	1	PANEL:FRONT, MINT GRAY	28480	08554-00042
44	2200-0165	1	SCREW:FLAT HD POZI DR 4-40 X 1/4"	00000	OBD
45	2950-0052	1	NUT:HEX BRASS 1/4-40	04009	OBD#
46	08553-6030	1	PULLEY ASSY:RIGHT	28480	08553-6030
47	8200-0049	1	DIAL CORD	82110	STYLE 164
48	08553-0016	1	SPRING:WINDOW	28480	08553-0016
49	1460-0195	1	SPRING:EXTENSION	28480	1460-0195
50	2360-0193		SCREW:PAN HD POZI DR 6-32 X 1/4"	00000	OBD
51	08553-4001	1	POINTER	28480	08553-4001
52	08554-00018	1	DECK:RIGHT SIDE	28480	08554-00018
53			NOT ASSIGNED		
54	08554-00043	1	PLATE:CONNECTOR, OLIVE BLACK	28480	08554-00043
55	08554-20075	1	WINDOW:DIAL, OLIVE BLACK	28480	08554-20075

See introduction to this section for ordering information

Table 6-3. Replaceable Parts

MFR NO.	MANUFACTURER NAME	ADDRESS	ZIP CODE
00000	U.S.A. COMMON	ANY SUPPLIER OF U.S.A.	
00853	SANGAMO ELECTRIC CO.PICKENS DIV.	PICKENS, S.C.	29671
01121	ALLEN BRADLEY CO.	MILWAUKEE, WIS.	53204
02660	AMPHENOL CORP.	BROADVIEW, ILL.	60153
02735	RCA SOLID STATE & RECEIVING TUBE DIV.	SOMERVILLE, N.J.	08876
04009	ARROW, HART & HEGEMAN ELECT. CO.	HARTFORD, CONN.	06106
04713	MOTOROLA SEMICONDUCTOR PROD.INC.	PHOENIX, ARIZ.	85008
07263	FAIRCHILD CAMERA & INST. CORP. SEMICONDUCTOR DIV.	MOUNTAIN VIEW, CALIF.	94040
08717	SLOAN CO. THE	SUN VALLEY, CALIF.	91352
14674	CORNING GLASS WORKS	CORNING, N.Y.	14830
16179	OMNI-SPECTRA INC.	FARMINGTON, MICH.	48024
28480	HEWLETT-PACKARD CO. CORPORATE HQ	YOUR NEAREST HP OFFICE	
56289	SPRAGUE ELECTRIC CO.	N. ADAMS, MASS.	01247
70276	ALLEN MFG. CO.	HARTFORD, CONN.	06101
71041	BOSTON GEAR WORKS DIV N. AMERICAN ROCKWELL CORP.	QUINCY, MASS.	02171
71468	ITT CANNON ELECT. INC.	LOS ANGELES, CALIF.	90031
71744	CHICAGO MINIATURE LAMP WORKS	CHICAGO, ILL.	60640
72136	ELECTRO MOTIVE MFG. CO. INC.	WILLIMANTIC, CONN.	06226
72962	ELASTIC STOP NUT DIV. AMERACE ESNA CORP.	UNION, N.J.	07083
72982	ERIE TECHNOLOGICAL PROD. INC.	ERIE, PA.	16512
73734	FEDERAL SCREW PROD. INC.	CHICAGO, ILL.	60618
78189	SHAKEPROOF DIV. ILLINOIS TOOL WORKS	ELGIN, ILL.	60120
80131	ELECTRONIC INDUSTRIES ASSOCIATION	WASHINGTON D.C.	20006
82110	GUDEBROD BROS. SILK CO. INC.	PHILADELPHIA, PA.	19107
91506	AUGAT INC.	ATTLEBORO, MASS.	02703
95354	METHODE MFG. CO.	ROLLING MEADOWS, ILL.	60008
98291	SEALECTRO CORP.	MAMARONECK, N.Y.	10544

See introduction to this section for ordering information

SECTION VII
MANUAL CHANGES

7-1. INTRODUCTION

7-2. This section normally contains information for adapting this manual to instruments for which the content does not apply directly. Since this manual does apply directly to instruments having serial numbers listed on the title page, no change information is given here. Refer to INSTRUMENTS COVERED BY MANUAL in Section I for additional important information about serial number coverage.

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section provides instructions for troubleshooting and repairing the Hewlett-Packard Model 8554B Spectrum Analyzer RF Section.

8-3. THEORY OF OPERATION

8-4. Theory of operation appears on the foldout pages opposite the block diagram on the Service Sheets. The block diagram on Service Sheet 1 is keyed to the remaining service sheets so that the reader may quickly locate the schematic and theory concerning any specific circuit.

8-5. RECOMMENDED TEST EQUIPMENT

8-6. Test equipment and test equipment accessories required to maintain the RF Section are listed in Tables 1-4 and 1-5. Equipment other than that listed may be used if it meets the listed minimum specifications.

8-7. The HP 11592A Service Kit is an accessory item available from Hewlett-Packard for use in maintaining both the RF and IF Sections of the Spectrum Analyzer. Some maintenance can be performed without this kit by removing the top covers from both the RF Section and the Display Section. However, this procedure exposes dangerous potentials in the Display Section chassis and should not be used unless absolutely necessary.

8-8. All maintenance can and should be performed with the analyzer plug-ins installed on the extender cables provided in the service kit, or using a Display Section cover that has the area over the RF Section cut out. The kit can be obtained by contacting the nearest Hewlett-Packard Sales and Service Office. An extra cover can be obtained from Hewlett-Packard and modified.

8-9. TROUBLESHOOTING

8-10. The System Test and Troubleshooting Procedure (Table 8-3) is designed to isolate trouble to the circuit board or assembly level. It should be used in conjunction with the top and bottom internal views on the first fold-out in this manual. It should also be used in conjunction with the block diagram on Service Sheet 1.

8-11. Circuit level troubleshooting and analysis is provided on the foldout page opposite each schematic. After the cause of a trouble has been isolated and corrected, check the troubleshooting information associated with that circuit for any adjustments that may have to be performed.

8-12. GENERAL SERVICE INFORMATION

8-13. Part Location Aids

8-14. The locations of chassis-mounted parts and major assemblies are shown in Figure 8-5. The locations of individual components mounted on printed circuit boards or other assemblies are shown on the appropriate schematic diagram page or on the page opposite it. The part reference designator is the assembly designator plus the part designator. (Example: A6R9 is R9 on the A6 assembly). For specific component description and ordering information refer to the parts list in Section VI.

8-15. Factory Selected Components

8-16. Some component values are selected at the time of final checkout at the factory (see Table 5-2). Usually these values are not extremely critical; they are selected to provide optimum compatibility with associated components. These components are identified on individual schematics by an asterisk (*). The recommended procedure for replacing a factory-selected part is as follows:

a. Try the original value, then perform the calibration test specified for the circuit in the performance and adjustment sections of this manual.

b. If calibration cannot be accomplished, try the typical value shown in the parts list, if different, and repeat the test.

c. If the test results are still not satisfactory, substitute various values within the tolerances specified in Table 5-2 until the desired result is obtained.

8-17. Diagram Notes

8-18. Table 8-2, Schematic Diagram Notes, provides information relative to symbols and

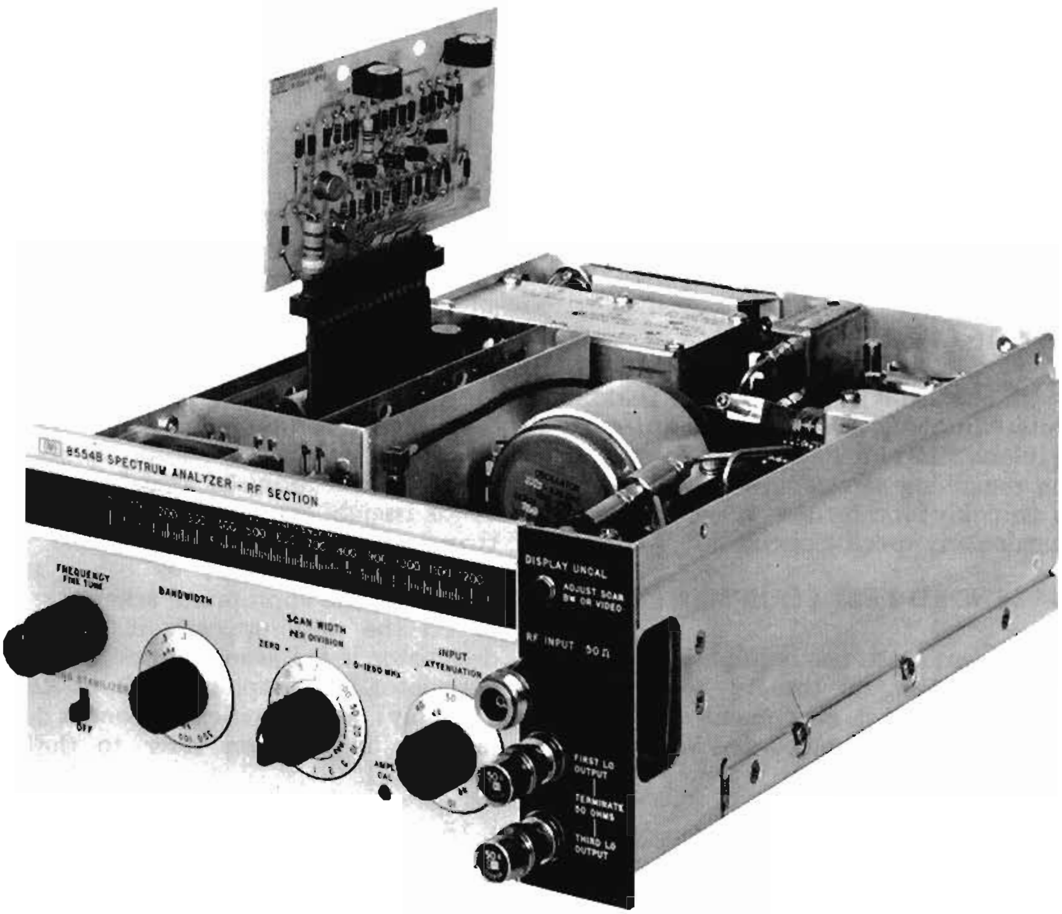


Figure 8-1. 8554B RF Section with Circuit Board Extended

measurements units shown in schematic diagrams.

8-19. Servicing Aids on Printed Circuit Boards

8-20. The servicing aids include test points, transistor and integrated circuit designations, adjustment callouts and assembly stock numbers.

8-21. REPAIR

8-22. Etched Circuits

8-23. The etched circuit boards in the RF Section are of the plated-through type consisting of metallic conductors bonded to both sides of insulating material. The metallic conductors are extended through the component mounting holes by a plating process. Soldering can be done from either side of the board with equally good results. Table 8-1 lists recommendations and precautions pertinent to etched circuit repair work.

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

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

c. Use a suction device (Table 8-1) or wooden toothpick to remove solder from component mounting holes. DO NOT USE A SHARP METAL OBJECT SUCH AS AN AWL OR TWIST DRILL FOR THIS PURPOSE. SHARP OBJECTS MAY DAMAGE THE PLATED-THROUGH CONDUCTOR.

d. After soldering, remove excess flux from the soldered areas and apply a protective coating to prevent contamination and corrosion. See Table 8-1 for recommendation.

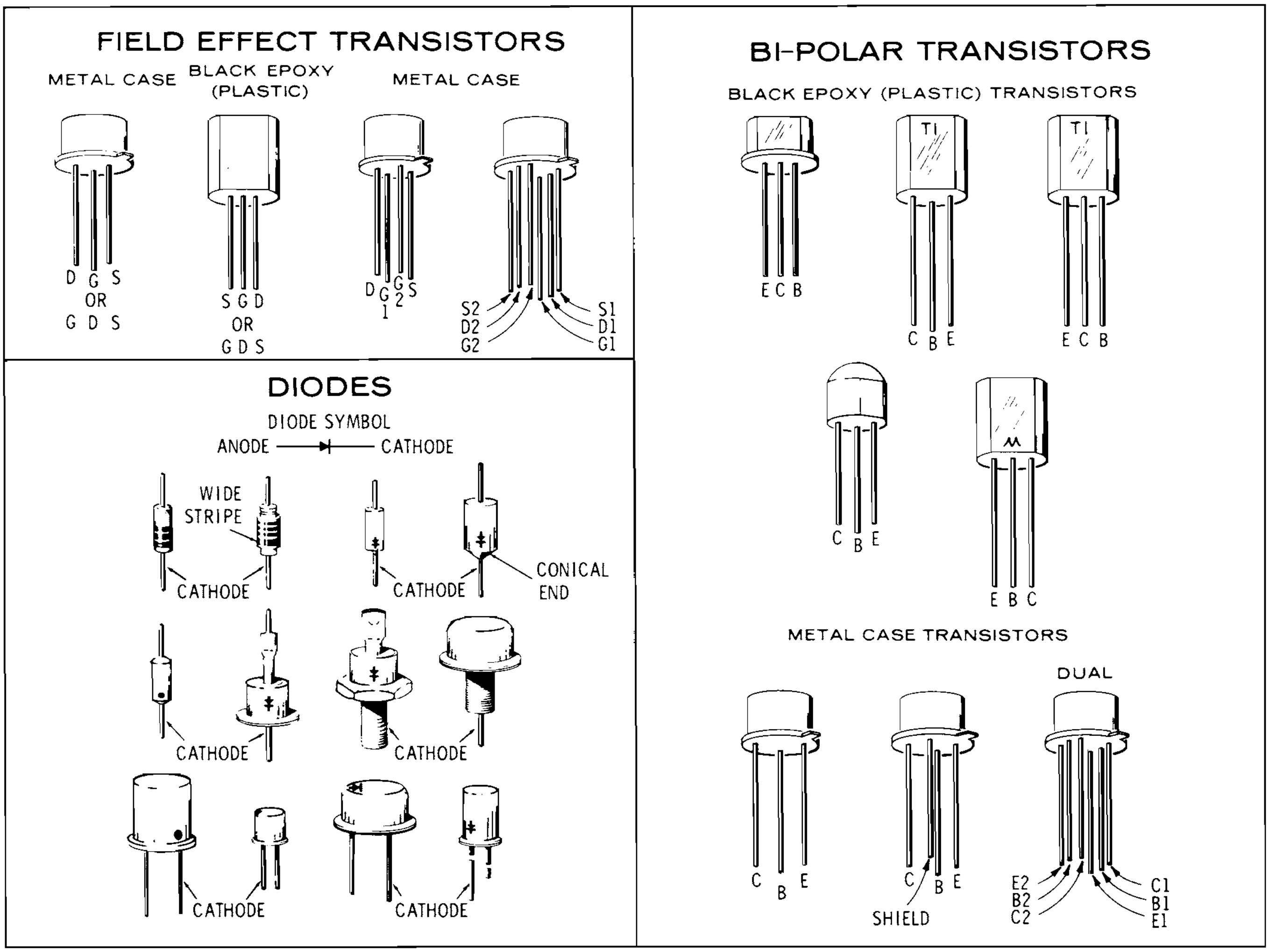


Figure 8-2. Examples of Diode and Transistor Marking Methods

Table 8-1. Etched Circuit Soldering Equipment

ITEM	USE	SPECIFICATION	ITEM RECOMMENDED
Soldering tool	Soldering, unsoldering	Wattage rating: 37–50; Tip Temp: 750-800°	Ungar #766 handle w/*Ungar #1237 heating unit
Soldering Tip	Soldering, unsoldering	*Shape: pointed	*Ungar # PL111
De-soldering Aid	To remove molten solder from connection	Suction device	Soldapullt by Edsyn Co., Arleta, California
Resin (flux) Solvent	Remove excess flux from soldered area before application of protective coating	Must not dissolve etched circuit base board	Freon; Acetone; Lacquer Thinner
Solder	Component replacement Circuit board repair Wiring	Resin (flux) core, high tin content (60/40 tin/lead), 18 gauge (SWG) preferred	
Protective Coating	Contamination, corrosion protection	Good electrical insulation, corrosion-prevention properties	Silicone Resin such as GE DRI-FILM**88

*For working on circuit Boards: for general purpose work, use Ungar No. 4037 Heating Unit (47½—56½W) tip temperature of 850-900 degrees) and Ungar No. PL113 1/8" chisel tip.
**General Electric Co., Silicone Products Dept., Waterford, New York, U.S.A.

8-24. Etched Conductor Repair

8-25. A broken or burned section of conductor can be repaired by bridging the damaged section with a length of tinned copper wire. Allow adequate overlay and remove any varnish from etched conductor before soldering wire into place.

8-26. Component Replacement

8-27. Remove defective component from board.

NOTE

Although not recommended, axial lead components, such as resistors and tubular capacitors, can be replaced without unsoldering. Clip leads near body of defective component, remove component and straighten leads left in board. Wrap leads of replacement component one turn around original leads. Solder wrapped connection, and clip off excess lead.

8-28. If component was unsoldered, remove solder from mounting holes, and position component as orginal was positioned. DO NOT FORCE LEADS INTO MOUNTING HOLES; sharp lead ends may damage plated-through conductor.

8-29. Transistor Replacement. Transistors are packaged in many physical forms. This sometimes results in confusion as to which lead is the collector, which is the emitter, and which is the base. Figure 8-2 shows typical epoxy and metal case transistors and the means of identifying the leads.

8-30. To replace a transistor, proceed as follows:

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

b. If possible, use long-nose pliers between transistor and hot soldering tools.

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

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

8-31. Some transistors are mounted on heat sinks for good heat dissipation. This requires good thermal contact with mounting surfaces. To assure good thermal contact for a replacement transistor, coat both sides of the insulator with Dow Corning No. 5 silicone compound or equivalent before fastening the transistor to the chassis. Dow Corning No. 5 compound is available in 8 oz. tubes from Hewlett-Packard; order HP Part No. 8500-0059.

8-32. Diode Replacement. Solid state diodes have many different physical forms. This sometimes results in confusion as to which lead or connection is the cathode (negative) and which lead is the anode (positive), since not all diodes are marked with the standard symbols. Figure 8-2 shows examples of some diode marking methods. If doubt exists as to polarity, an ohmmeter may be used to determine the proper connection. It is necessary to know the polarity of the ohms lead with respect to the common lead for the ohmmeter used. (For the HP Model 410B Vacuum Tube Voltmeter, the ohms lead is negative with respect to the common; for the HP Model 412A DC Vacuum Tube Voltmeter, the ohms lead is positive with respect to the common). When the ohmmeter indicates the least diode resistance, the cathode of the diode is connected to the ohmmeter lead which is negative with respect ot the other lead.

NOTE

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

8-33. OPERATIONAL AMPLIFIERS

8-34. Circuits and Symbols

8-35. Operational amplifiers are widely used as summing amplifiers, offset amplifiers, buffers and level detectors in regulated power supplies. The particular function is determined by external circuit connections.

8-36. Figure 8-3 shows a typical operational amplifier. Circuit A is a non-inverting buffer amplifier with a gain of 1. Circuit B is a non-inverting amplifier with gain determined by the resistance of R1 and R2. Circuit C is an inverting amplifier with gain determined by R2 and R1. Circuit D shows typical circuit connections and parameters. It is assumed that the amplifier has high gain, low output impedance and high input impedance.

8-37. Troubleshooting

8-38. An operational amplifier can be characterized as an ideal voltage amplifier having low output impedance, high input impedance, and very high gain. Also the output voltage is proportional to the difference in the voltages *applied* to the two input terminals. In use, the amplifier drives the input voltage difference close to zero.

8-39. When troubleshooting an operational amplifier, measure the voltages at the two inputs with no

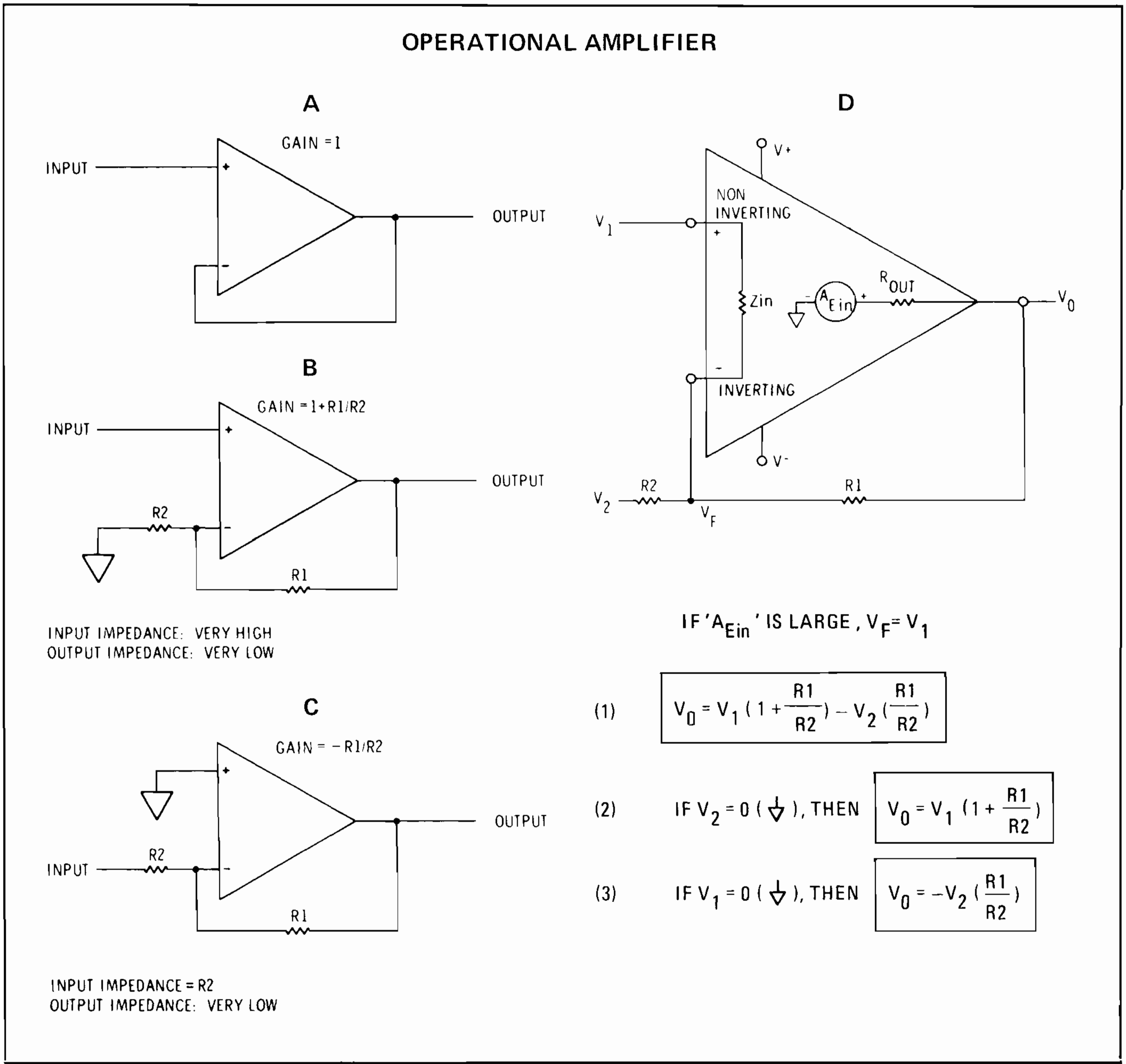


Figure 8-3. Operational Amplifier Equivalent Circuit

signal applied; the difference between these voltages should be less than 10 mV. A difference voltage much greater than 10 mV indicates trouble in the amplifier or its external circuitry. Usually this difference will be several volts and one of the inputs will be very close to an applied circuit operating voltage (for example, +20 V, −12V).

8-40. Next, check the amplifier's output voltage. It will probably also be close to one of the applied circuit potentials: ground, +20V, −12V, etc. Check to see that the output conforms to the inputs. For example, if the inverting input is positive, the output should be negative; if the non-inverting input is positive, the output should be positive. If the output conforms to the inputs, check the amplifier's external circuitry. If the amplifier's output does not conform to its inputs, it is probably defective.

8-41. DIAL CALIBRATION PROCEDURE

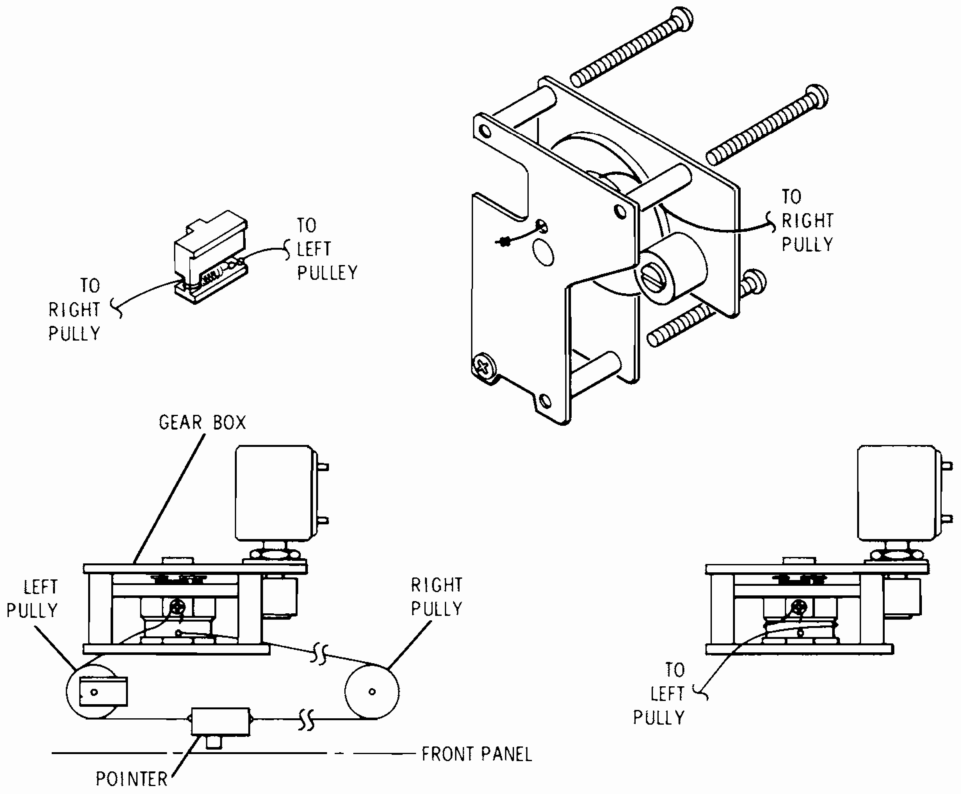
8-42. To restring the frequency dial, follow the procedure outlined in Figure 8-4. After the dial is restrung, or after the frequency tuning pot R6 is replaced, perform the following adjustments:

a. Turn FREQUENCY full counterclockwise. The dial pointer should indicate ¾ to 1¼ small divisions to the left of 0 MHz.

b. Turn FREQUENCY full clockwise. The dial pointer should indicate at least ¾ of a small difision to the right of 1250 MHz.

c. If necessary, loosen the set screws on the gear shaft of the FREQUENCY pot and re-position the gear slightly by turning the FREQUENCY knob while the pot is at either stop. Then retighten the set screws and repeat steps a and b.

e. Perform the frequency calibration adjustments specified in Section V.



1. Remove top cover.
   a. Tune to low end of scale.
   b. Remove front panel assembly from side panels.
   c. Remove scale assembly.
   d. Remove tuning knobs.
   e. Remove 2 screws which hold gearbox to panel assembly.
   f. Remove left pully at left end of pointer slot.

2. To replace string on RIGHT side of pointer:
   a. Remove pointer from slot, detach old string.
   b. Access to fixed end of string is through the hole in the front gearbox plate. Line up dial drum with this hole so that old string may be withdrawn.
   c. Pass a new piece of dial string (about 15½") through the hole and double knot the fixed end. Clip off excess string and draw the knot into the hole.
   d. Reset the tuning shaft fully ccw.
   e. Pass the free end of the string into the right end of the pointer slot. Tie it to the pointer spring where it is attached to the pointer.
   f. Replace pointer in slot.
   g. Replace gearbox screws.
   h. Turn shaft fully cw.
   i. Loosen fixing screw at opposite end of string and adjust string tension so that pointer is stretched 3/16" when string is on pulleys.
   j. Reassemble, using reverse of procedure in 1.

3. To replace string on LEFT side of pointer:
   a. Remove pointer from slot and remove old string.
   b. Tie approximately 12" of dial string (use double knot) to the pointer spring and replace pointer in slot.
   c. Replace gearbox screws.
   d. Turn shaft fully cw.
   e. Place dial string on pulleys.
   f. Wrap string around dial drum, and tie under screw-head, while maintaining about 3/16" stretch on pointer spring.
   g. Reassemble, using reverse of procedure in 1.

4. Check calibration; adjust by moving the 29 tooth gear on the tuning pot shaft. Perform dial calibration procedure.

Figure 8-4. Dial Restringing Procedure

Table 8-2. Schematic Diagram Notes (1 of 3)

SCHEMATIC DIAGRAM NOTES

R,L,C	Resistance is in ohms, inductance is in microhenries, capacitance is in picofarads unless otherwise noted.
P/O	Part Of.
*	Asterisk denotes a factory-selected value. Value shown is typical. Capacitors may be omitted or resistors jumpered.
○	Panel control.
	Screwdriver adjustment.
	Encloses front panel designations.
	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.
CW	Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.
1	Numbers in stars on circuit assemblies show locations of test points.
A	Lettered test point; no measurement provided.
	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.
	Tunable resonator (or cavity).
	Loop coupling to coaxial path.
E	E-plane coupling by aperture (H-plane coupling indicated by H in symbol): E (H) indicates that the physical plane of the aperture is perpendicular to the transverse component of the major E (H) lines.
	Circulator (isolator): arrowhead indicates direction of power flow is from any arm to next adjacent arm but not to any other arm. Power does not flow between arms separated by resistor symbol.
	Short circuit. (Not a fault).
2A	Letter = off page connection. Number = Service Sheet number for off-page connection.
1	Block numbers reference between text and schematic.

Table 8-2. Schematic Diagram Notes (2 of 3)

SWITCH DESIGNATIONS

EXAMPLE: A3S1-1F (2 - 1/2)

A3S1 = SWITCH S1 WITHIN ASSEMBLY A3

1 = 1ST WAFER FROM FRONT

R = REAR OF WAFER (F = FRONT)

(2 - 1/2) = TERMINAL LOCATION (2 - 1/2) (VIEWED FROM FRONT

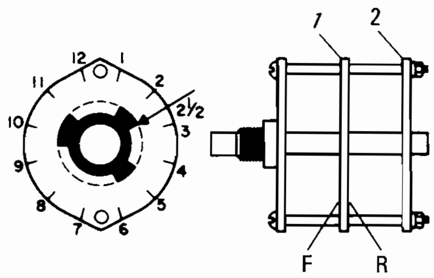


Table 8-2. Schematic Diagram Notes (3 of 3)

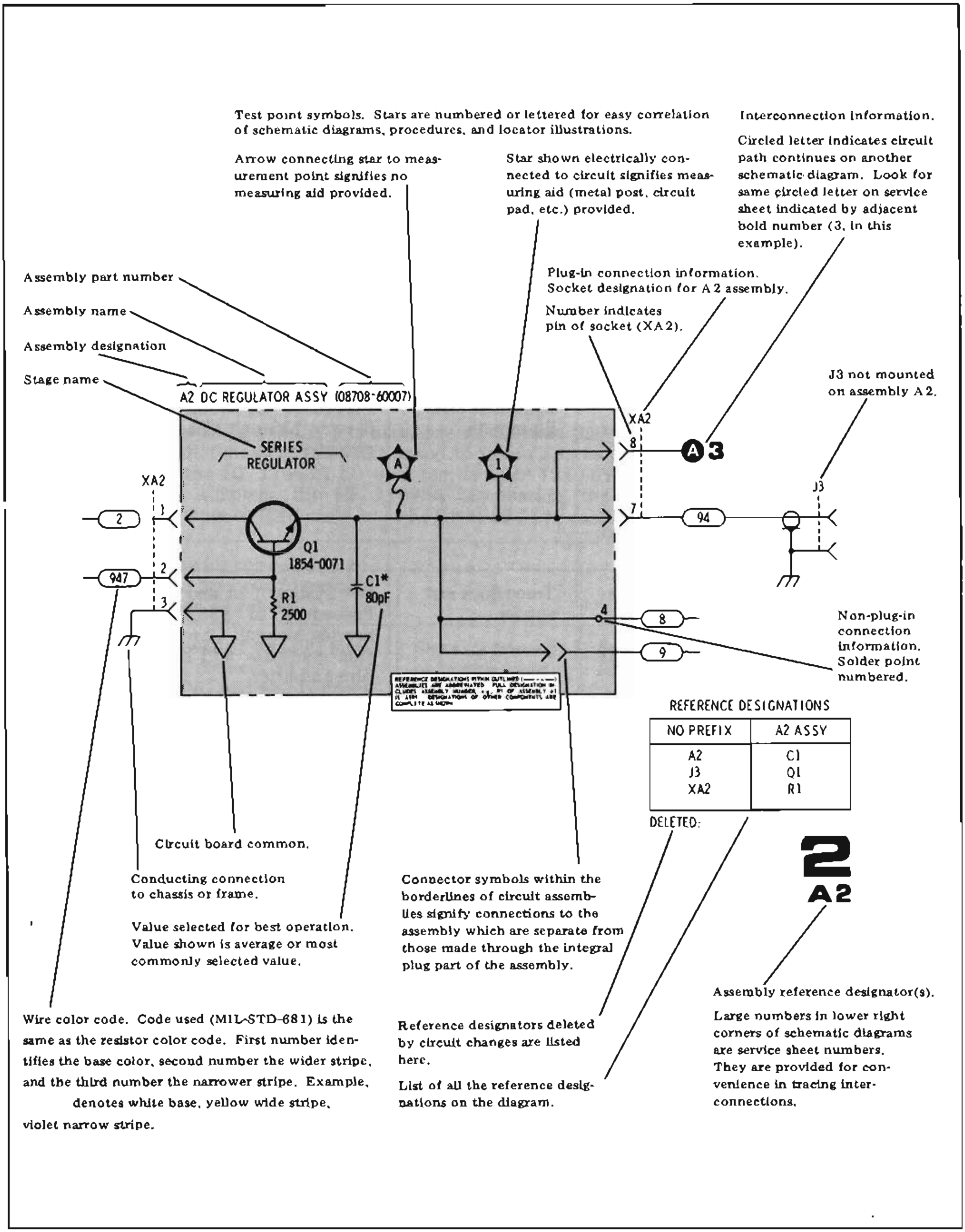


Table 8-3. System Test and Troubleshooting Procedure

TEST	FAULT	PROCEDURE
1. Set POWER switch to ON. Power lamp on, fan operates. Proceed to test 2.	Light not on and/or fan inoperative.	Check Display Section.
2. Rotate INPUT ATTENUATION control and observe LOG REF LEVEL index lights.	Some, but not all lights illuminate.	Check the −12.6 volt supply from Display Section. If voltage is present see Service Sheet 4. If voltage is not present, check the Display Section power supply.
Lights operate properly. Proceed to test 3.	Some, but not all lights illuminate.	Check light bulbs and see Service Sheet 4.
3. Set Analyzer controls as follows: SCAN TIME PER DIVISION . . . 5 ms SCAN MODE . . . . INT SCAN TRIGGER . . . AUTO and observe SCANNING light. Light operates normally. Proceed to test 4.	SCANNING light does not illuminate.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual. Check power supply circuits.
4. Adjust Display Section for a baseline trace. Baseline trace is normal. Proceed to test 5.	Trace does not appear.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual. Check scan amplifier, scan generator and horizontal deflection amplifier.
5. Set analyzer controls as follows: SCAN WIDTH . . 0-1250 MHz SCAN TIME PER DIVISION . . . 2 ms LOG REF LEVEL . . −10 dBm Connect CAL OUTPUT to RF INPUT.	Signal does not appear on Display Section CRT.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual. Check calibration oscillator. If calibration oscillator is operating properly, go to test 6.
6. Set analyzer controls as follows: BANDWIDTH . . . . . 10 kHz FINE TUNE . . . . . Centered SCAN WIDTH . PER DIVISION SCAN WIDTH PER DIVISION . . 20 kHz INPUT ATTENUATION 0 dB TUNING STABILIZER . OFF BASELINE CLIPPER . . . ccw LOG REF LEVEL . . −30 dBm LOG REF LEVEL Vernier . . . . . . ccw LOG/LINEAR . . . . . . LOG VIDEO FILTER . . . . . OFF SCAN TIME PER DIVISION . . . 2 ms		

Table 8-3. System Test and Troubleshooting Procedure (cont'd)

TEST	FAULT	PROCEDURE
Connect a 50 MHz — 33 dBm signal from the signal generator to the W7 jack (located between green coaxial cable W7A and clear coaxial cable W7B) using the 11592-60001 cable. Tune the signal generator slightly around 50 MHz until the signal is centered on the CRT display. With the AMPL CAL centered the signal should read —30 dBm ± 2 dB. If signal is correct, reconnect W7A and proceed to test 7.	Signal incorrect or missing.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual.
NOTE In steps 7a and 7e it is necessary to simulate the input impedance of the circuit following the point tested to insure accuracy of the meter readings. Use the HP 11563A 50 ohm tee, two HP 1250-0780 BNC jack to type N Plug Adapters, the HP 11593A termination, the HP 11592-60001 subminiature to BNC cable, and the HP 1250-0827 Jack-to-jack adapter.		
7. Perform following sub-tests until a malfunction has been found and corrected, then repeat test 5.		
7a. Set signal generator for 400 MHz at —10 dBm and connect to RF INPUT through a BNC tee; also connect Channel A input of tunable RF voltmeter to BNC tee. Connect Channel B input of voltmeter to output of AT1, 3 dB pad (use 50 ohm tee and adapter cable). Set INPUT ATTENUATION to 10 dB. Adjust signal generator for —10 dBm on Channel A of voltmeter. Channel B should read about —14.5 dBm. Rotate INPUT ATTENUATION and check for correct attenuation. Reconnect AT1 and proceed to test 7b.	Signal is missing or level is incorrect.	See Service Sheet 2. Check A3, FL1, and AT1.
7b. Remove the output connector from the notch filter FL2 and connect the tunable RF Voltmeter Channel A input to the notch filter using a 50 ohm dummy load. With the signal generator connected as in 7a and the analyzer tuned for maximum (in ZERO scan) the tunable RF Voltmeter should indicate about —28.5 dBm. If correct reading is obtained, proceed to test 7f.	Signal is missing.	Proceed to test 7c.

Table 8-3. System Test and Troubleshooting Procedure (cont'd)

TEST	FAULT	PROCEDURE
7c. Connect the frequency counter to FIRST LO OUTPUT on front panel. With the analyzer operating in ZERO scan mode the first LO output should be 2050 MHz above the frequency indicated on the CENTER FREQUENCY scale. Check at 100, 600 and 900 MHz. If correct readings are observed, proceed to test 7d.	Signal is missing or incorrect.	Check the input voltages to A7 (the YIG oscillator assembly). If proper dc levels are not present check A6 (the YIG power supply) and the FREQUENCY control circuits. If proper dc levels are present at the A7 assembly, repeat the test with the counter connected directly to the output of the YIG oscillator. If correct readings are obtained, replace circulator A13. If not, replace the A7 assembly and repeat 7b. See Service Sheet 4.
7d. Open the cover over the second mixer output port A8J1 and connect the frequency counter to the output terminal. Counter should indicate the presence of the second LO signal, 1500 MHz. If correct signal is present, proceed to test 7e.	Signal is missing or off frequency.	Check dc inputs to the second LO. If dc levels are wrong, check connections to power sources. If dc levels are correct, see Service Sheet 3 and repair as required.
7e. Use the RF voltmeter, at A8J1, to check for the presence of the 550 MHz IF signal. Typical signal level is −25 dBm. If correct level is present, replace the notch filter and repeat test 5.	Signal is missing or incorrect.	See Service Sheet 3 and repair as required.
7f. Disconnect the dummy load from the THIRD LO OUTPUT and connect the RF voltmeter to the LO output (use 50 ohm load). Meter should read about +6 dBm. If the correct reading is observed, proceed to test 7g.	Signal is missing or incorrect.	See Service Sheet 5 and repair the third LO or the LO drive circuit as required.
7g. Disconnect the output of the third mixer assembly (W14 from A9A3J2) and reconnect it using a Tee connector. Connect the RF voltmeter to the other leg of the Tee. With a 400 MHz −10 dBm signal in and the analyzer tuned for maximum, the RF voltmeter should indicate approximately −21 dBm. If the correct signal is obtained, see Service Sheet 7 and repair the 50 MHz amplifier.	Signal is missing or incorrect.	See Service Sheet 5 and repair the third mixer or IF amplifiers as required.

Table 8-3. System Test and Troubleshooting Procedure (cont'd)

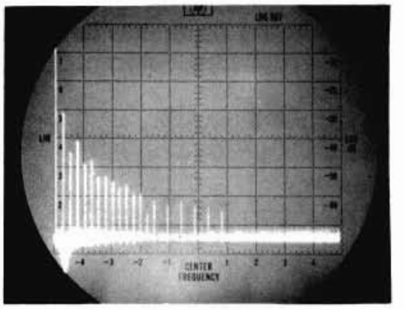
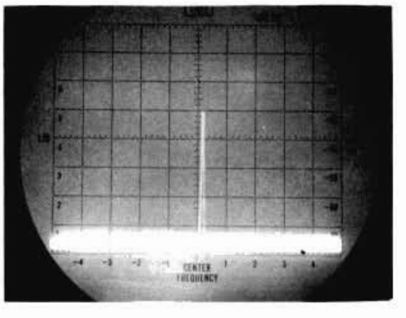
TEST	FAULT	PROCEDURE
8. Set analyzer controls and connections same as test 5. Rotate BASE LINE CLIPPER to 10 o'clock. The display should be similar to that shown in the Procedure column. Return BASE LINE CLIPPER to full ccw.		
	Sweep does not extend to full width of graticule.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual. Check Scan Generator and Deflection Amplifier assy's.
	Signals not all present or improperly spaced.	Same as above. Also refer to Service Sheet 3. YIG power supply may be defective.
Vary VERTICAL POSITION control to center baseline trace on bottom CRT graticule. Signal amplitude is unimportant in this test. Proceed to test 9.	Baseline trace does not vary.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual. Check vertical deflection circuit.
9. Set LOG REF LEVEL maximum ccw. Set SCAN TIME PER DIVISION to 10 SECONDS and adjust focus and astigmatism. Adjust trace align to center trace on bottom CRT graticule. Return SCAN TIME to 3 ms/div. Proceed to test 10.	Focus and astigmatism inoperative or trace will not align.	Refer to Display Section Manual and repair as required.
10. Turn the FREQUENCY control and observe the marker. Marker should move as FREQUENCY is tuned. Proceed to test 11.	Marker is missing.	Refer to Display Section Manual and repair as required.
11. Tune the FREQUENCY control to move the marker exactly under the 30 MHz signal. The signal will null when the marker is tuned to the exact frequency of the signal. Set analyzer controls as follows: BANDWIDTH . . . . 10 kHz SCAN WIDTH . . . PER DIVISION SCAN WIDTH PER DIVISION 2 MHz LOG REF LEVEL . . . . −10 dBm Center 30 MHz signal on the CRT. Signal should be similar to that shown in the procedure column. Proceed to test 12.	30 MHz signal does not appear on Display CRT.	Check calibration and alignment of the analyzer. 

Table 8-3. System Test and Troubleshooting Procedure (cont'd)

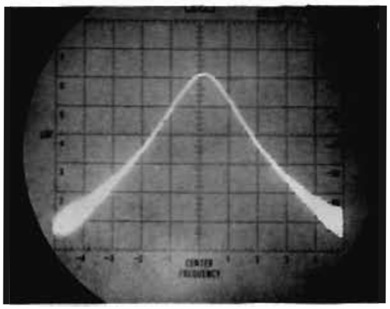
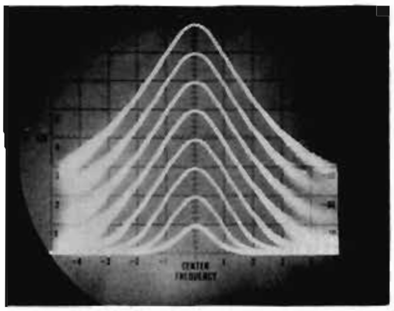
TEST	FAULT	PROCEDURE
12. Reduce SCAN WIDTH PER DIVISION to 10 kHz and recenter the display with the FINE TUNE control. Signal should be similar to that shown in the Procedure column. Proceed to test 13.	Signal is unstable. FINE TUNE does not vary signal position.	Refer to Service Sheets 6 and 7 and repair APC or reference signal circuits. Refer to Service Sheet 5 and check third LO circuit and third LO drive circuits. 
13. Turn LOG REF LEVEL control fully ccw and INPUT ATTENUATION to 10 dB. Rotate LOG REF LEVEL control seven steps clockwise. CRT display should be as shown in the Procedure column.	No increase in gain, not 10 dB gain, or loss of gain.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual. 
Rotate LOG REF LEVEL to 0 dBm. Rotate LOG REF LEVEL Vernier to full cw. Signal should increase by 12 dB.	No change in signal level or change is not 12 dB.	See System Test and Troubleshooting Procedure in 8552 Operating and Service Manual.

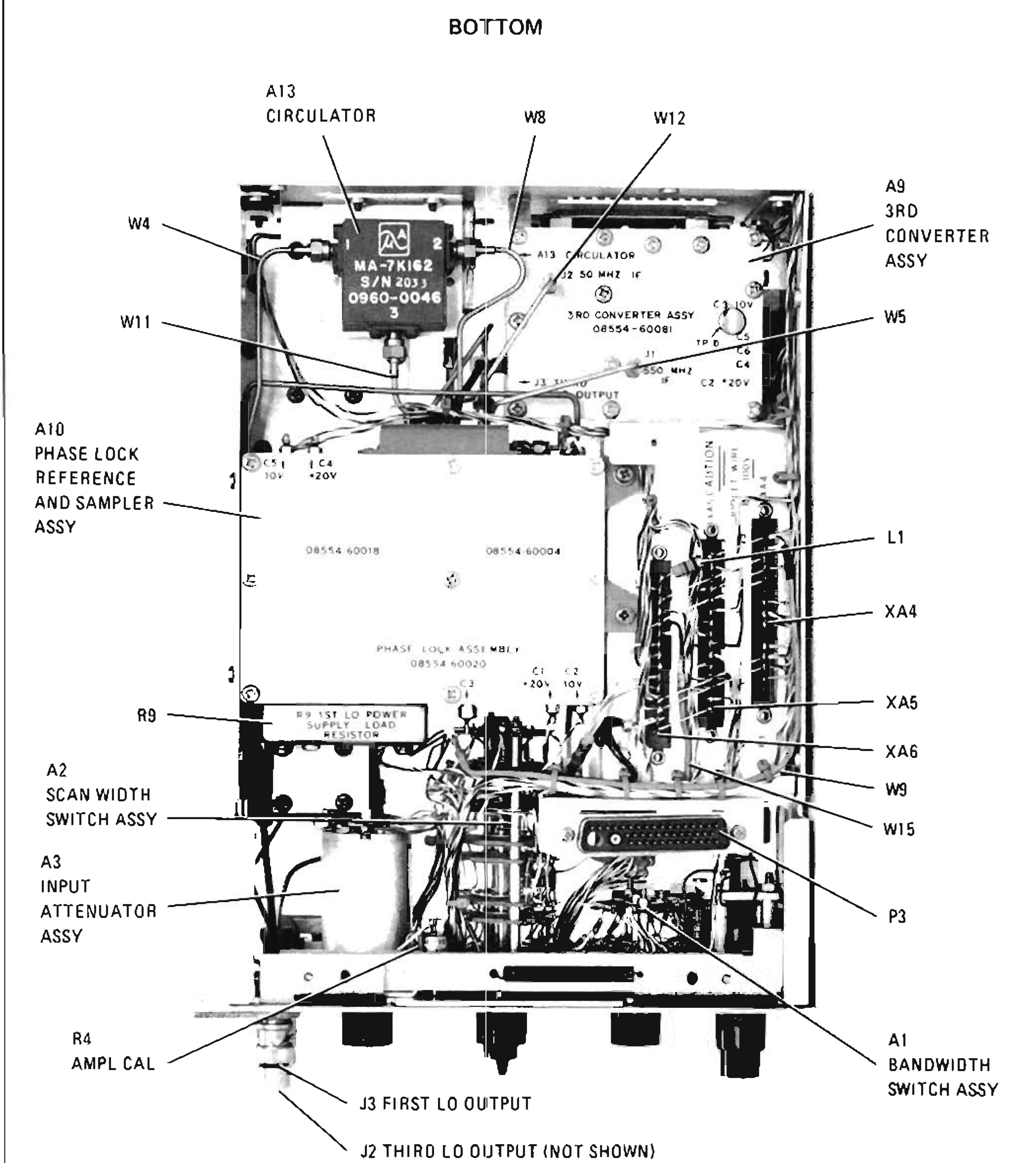
Table 8-4. Assembly and Component Locations

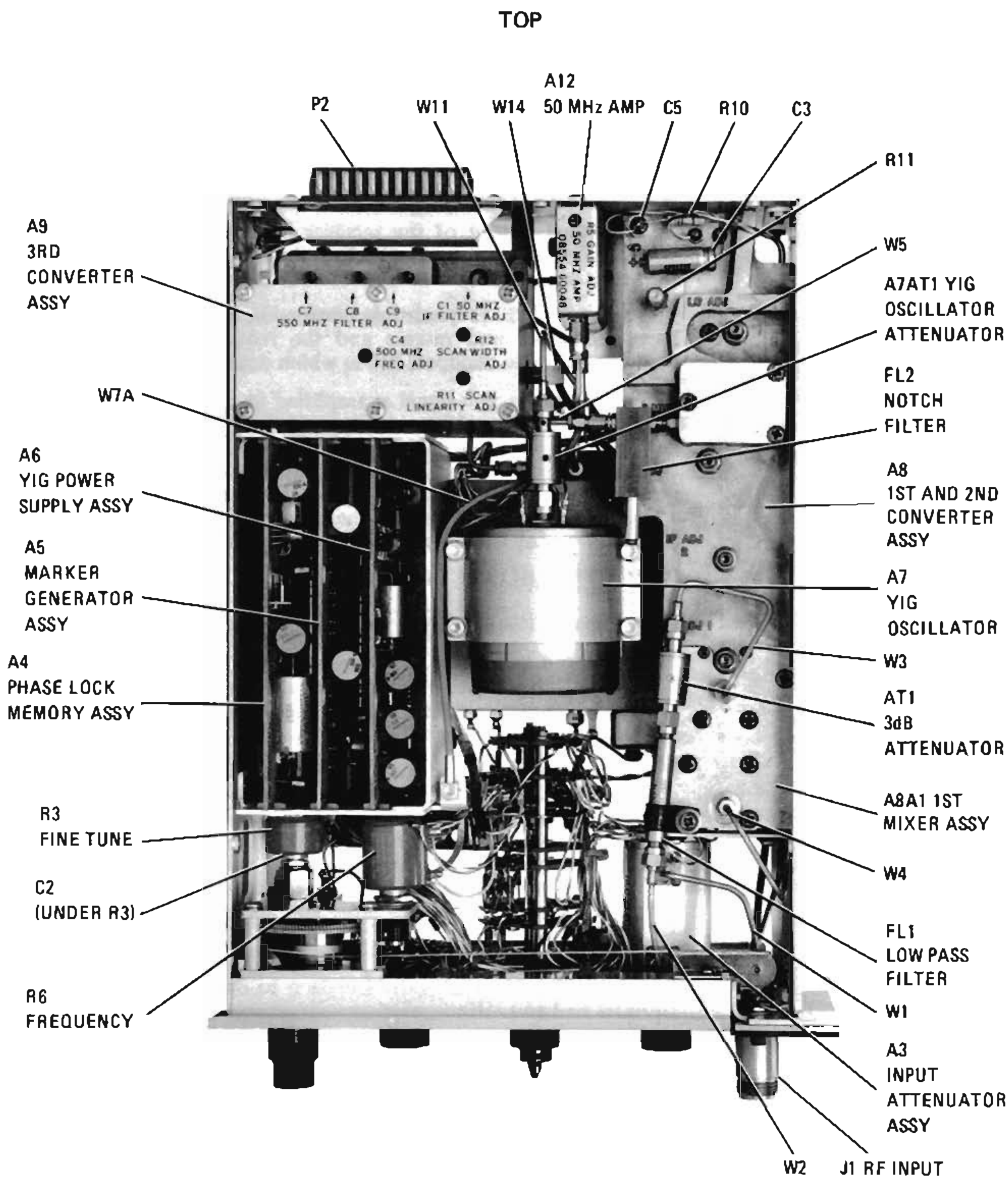
ASSEMBLY		SCHEMATIC	PHOTO
A1	Bandwidth Switch	Service Sheet 10, 11	Figure 8-37, 8-40
A2	Scan Width Switch	Service Sheet 4, 7, 8, 10, 11	Figure 8-33, 8-41
A3	Input Attenuation Switch	Service Sheet 2	Figure 8-8
A4	Search Loop and Phase Lock Memory Amplifier	Service Sheet 7	Figure 8-31
A5	Marker Generator	Service Sheet 9	Figure 8-35
A6	YIG Power Supply	Service Sheet 4	Figure 8-16
A7	YIG Oscillator (First LO)	Service Sheet 4	Figure 8-5
A8	First and Second Converter	Service Sheet 3	Figure 8-10 through 8-12
A9	Third Converter	Service Sheet 5	Figure 8-18 through 8-23
A10	Reference Oscillator and Phase Lock Amplifier	Service Sheet 6	Figure 8-27
A11	Not Assigned		
A12	50 MHz Amplifier	Service Sheet 5	Figure 8-24
A13	Circulator	Service Sheet 4	Figure 8-5

COMPONENT		SCHEMATIC	PHOTO
C1		Service Sheet 2	Figure 8-8
C2		Service Sheet 5	Figure 8-5
C3		Service Sheet 3	Figure 8-11
DS1	DISPLAY UNCAL	Service Sheet 10	Figure 8-5
FL1		Service Sheet 2	Figure 8-5
FL2		Service Sheet 3	Figure 8-5
J1	RF INPUT	Service Sheet 2	Figures 8-5 & 8-8
J2	FIRST LO OUTPUT	Service Sheet 6	Figure 8-5
J3	THIRD LO OUTPUT	Service Sheet 5	Figure 8-5
L1		Service Sheet 4	Figure 8-5
P1	Not assigned		
P2		Service Sheet 9, 10	Figure 8-5
P3		Service Sheet 2,5,8,9,10,11	Figure 8-5
R1, 2	Not assigned		
R3	FINE TUNE	Service Sheet 5	Figure 8-5

Table 8-4. Assembly and Component Locations (cont'd)

COMPONENT	SCHEMATIC	PHOTO
R4 AMPL CAL	Service Sheet 10	Figure 8-5
R5 Not Assigned		
R6 FREQUENCY	Service Sheet 4	Figure 8-5
R7, 8 Not Assigned		
R9	Service Sheet 4	Figure 8-5
R10, 11	Service Sheet 3	Figure 8-11
S1 TUNING STABILIZER	Service Sheet 7	Figure 8-5
W1	Service Sheet 2	Figure 8-5 & 8-8
W2	Service Sheet 2	Figure 8-5
W3	Service Sheet 2, 3	Figure 8-5
W4	Service Sheet 3, 4	Figure 8-5
W5	Service Sheet 3, 5	Figure 8-5
W6	Service Sheet 4	Figure 8-5
W7	Service Sheet 5	Figure 8-5
W8	Service Sheet 4, 6	Figure 8-5
W9	Service Sheet 6	Figure 8-5
W10, 11	Service Sheet 4	Figure 8-5
W12, 13, 14	Service Sheet 5	Figure 8-5
W15	Service Sheet 4, 8	Figure 8-5
AT1	Service Sheet 2	Figure 8-5
AT2	Service Sheet 6	Figure 8-5
AT3	Service Sheet 5	Figure 8-5


BOTTOM
A13 CIRCULATOR
W8
W12
W4
A9 3RD CONVERTER ASSY
W11
W5
A10 PHASE LOCK REFERENCE AND SAMPLER ASSY
L1
XA4
XA5
R9
XA6
W9
A2 SCAN WIDTH SWITCH ASSY
W15
A3 INPUT ATTENUATOR ASSY
P3
R4 AMPL CAL
A1 BANDWIDTH SWITCH ASSY
J3 FIRST LO OUTPUT
J2 THIRD LO OUTPUT (NOT SHOWN)
MA-7K162
S/N 2033
0960-0046
3RD CONVERTER ASSY
08554-60081
08554-60018
08554-60004
PHASE LOCK ASSEMBLY
08554-60020
R9 1ST LO POWER SUPPLY LOAD RESISTOR



TOP
P2
W11
W14
A12
50 MHz AMP
C5
R10
C3
R11
W5
A7AT1 YIG
OSCILLATOR
ATTENUATOR
FL2
NOTCH
FILTER
A8
1ST AND 2ND
CONVERTER
ASSY
A7
YIG
OSCILLATOR
W3
AT1
3dB
ATTENUATOR
A8A1 1ST
MIXER ASSY
W4
FL1
LOW PASS
FILTER
W1
A3
INPUT
ATTENUATOR
ASSY
W2
J1 RF INPUT
A9
3RD
CONVERTER
ASSY
C7
550 MHZ
C8
FILTER
C9
ADJ
C1 50 MHZ
IF FILTER ADJ
C4
500 MHZ
FREQ ADJ
R12
SCAN WIDTH
ADJ
R11 SCAN
LINEARITY ADJ
W7A
A6
YIG POWER
SUPPLY ASSY
A5
MARKER
GENERATOR
ASSY
A4
PHASE LOCK
MEMORY ASSY
R3
FINE TUNE
C2
(UNDER R3)
R6
FREQUENCY

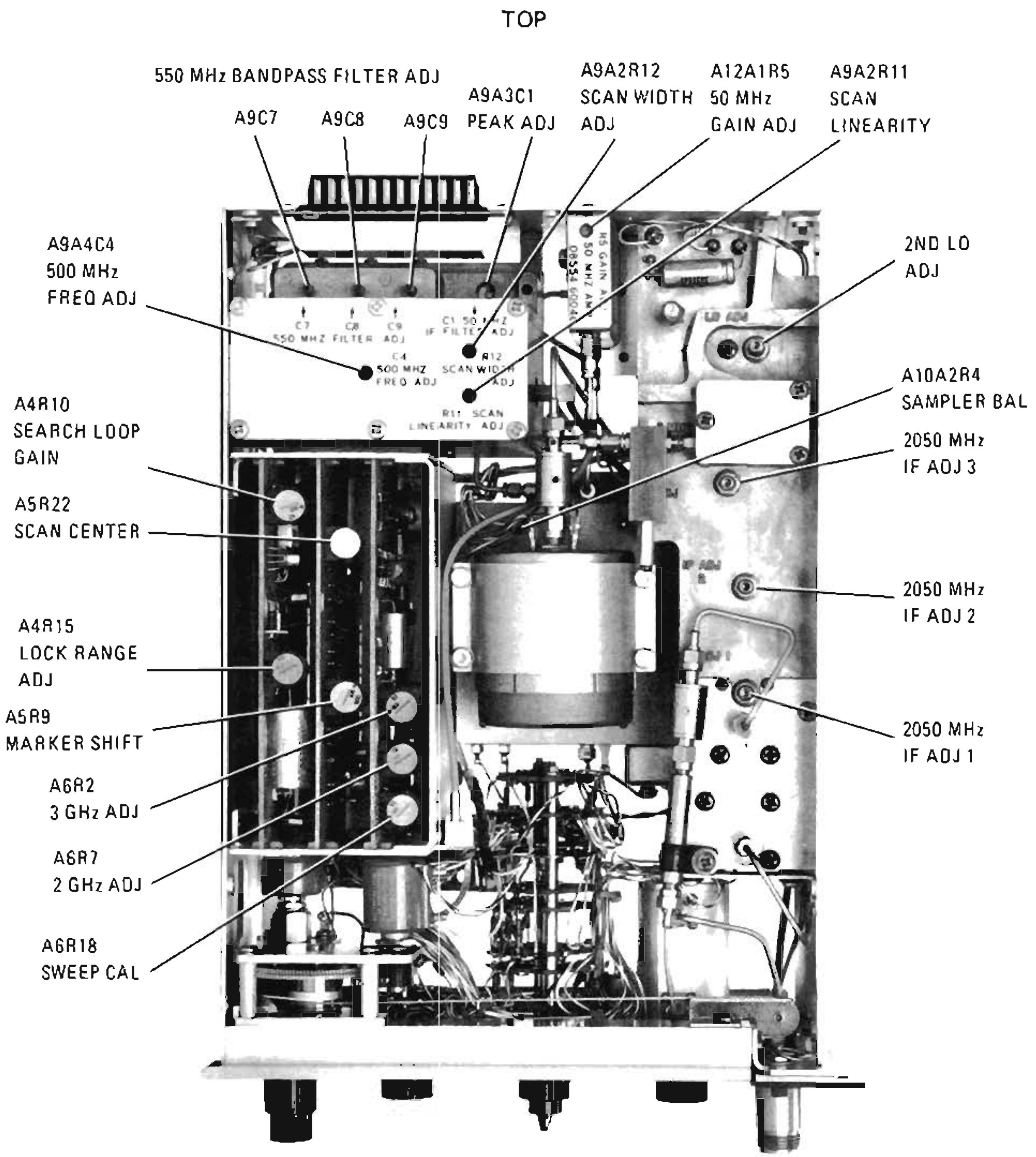


Figure 8-5. Assembly and Adjustment Locations

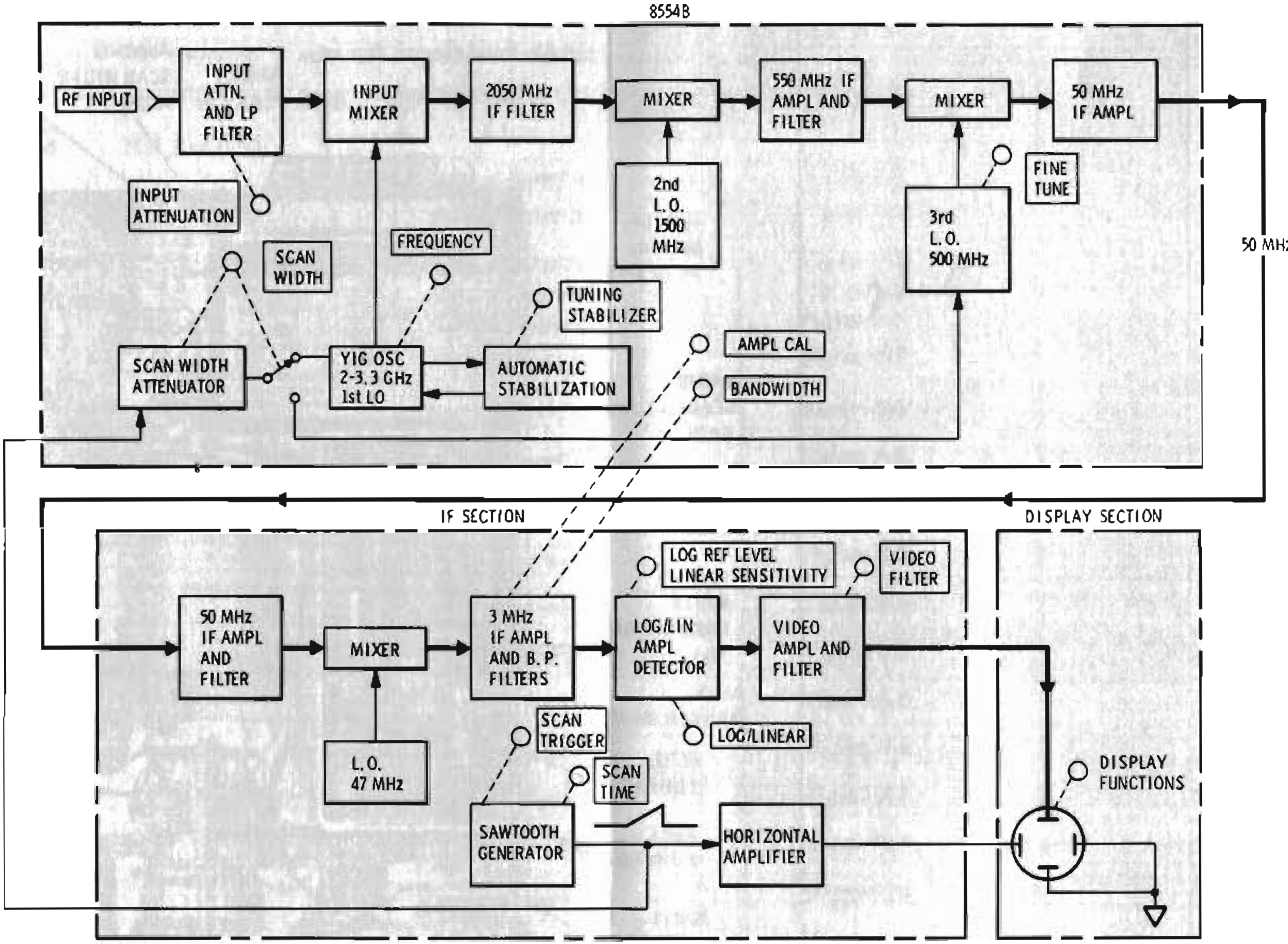


Figure 8-6. Simplified Analyzer Block Diagram

SERVICE SHEET 1

SIMPLIFIED ANALYZER BLOCK DIAGRAM

The Spectrum Analyzer is basically a superheterodyne receiver which may be manually tuned to a fixed frequency or swept tuned through a selected span of frequencies. The "receiver" output is applied to a calibrated CRT resulting in a visual amplitude-vs-frequency display.

A simplified block diagram of the analyzer is illustrated in Figure 8-6. The sawtooth generator provides the time base for both CRT horizontal deflection and receiver local oscillator tuning. Shaping circuits modify the sawtooth ramp, which tunes the local oscillators, to ensure that frequencies displayed on the CRT are separated linearly with respect to the time base of the CRT display.

The detected output of the receiver is applied to the vertical deflection plates. When a signal is received, a vertical deflection proportional to the amplitude of the signal is displayed.

The analyzer utilizes quadruple conversion and the block in Figure 8-6 shows the local oscillators and mixers and the required IF amplifiers. The final stages contain selectable bandpass filters which determine the analyzer bandwidth.

Before detection, the signal is amplified in circuitry which provides (at operator option) a display which is either linearly or logarithmically proportional in amplitude to the input RF signal. The signal is detected and amplified to drive the vertical plates of the CRT. The vertical deflection of the CRT beam is thus proportional to the input signal level. Since the horizontal plates of the CRT are driven by the same voltage that drives the local oscillators, the horizontal deflection of the CRT is proportional to frequency.

RF SECTION BLOCK DIAGRAM

Input Circuits (Service Sheet 2)

The RF input is coupled into the analyzer through a capacitor to protect diodes in the first mixer from damage when signals containing dc components are to be analyzed. Signals containing dc components as high as 50 volts may be directly coupled to the analyzer without harming the first mixer diodes.

The input attenuator provides 0 to 50 dB of attenuation to the input RF signal to expand the signal handling capability of the analyzer. Ganged with the attenuator control, but not a part of the attenuation circuit, are wafers to provide power to index lamps adjacent to the LOG REF LEVEL control (in the IF Section) and to aid in programming the step gain of the linear scale factor amplifier (in the IF Section) when the analyzer is operated in the LINEAR mode.

The Low Pass Filter provides FL1 rejection to signals above 1500 MHz to prevent responses from signals outside the passband of the analyzer.

The 3 dB attenuator provides isolation to optimize flatness of the passband from 100 kHz to 1250 MHz.

First and Second Converter (Service Sheet 3)

The first mixer is driven by the output from the first local oscillator (a YIG controlled oscillator) which may be swept tuned from 2050 to 3300 MHz, portions of this range, or fixed tuned. The output of the first mixer (2050 MHz) is applied to the second mixer through a three-cavity 2050 MHz filter and a thin-film low pass filter.

The second mixer is driven by two signals: a fixed second local oscillator frequency of 1500 MHz and the first IF frequency of 2050 MHz. The output of the second mixer is an IF frequency of 550 MHz which is applied through a notch

◀ INTERNAL VIEWS

SERVICE SHEET 1 (cont'd)

filter (which offers maximum rejection to the 1500 MHz second local oscillator frequency) to the third mixer and IF amplifier assembly.

First LO and Control Circuits (Service Sheet 4)

A YIG sphere is a resonant element whose resonant frequency changes with a change in the magnetic field which surrounds it. In the 8554B the magnetic field surrounding the YIG is closely controlled to provide a swept tuning range of 2050 MHz to 3300 MHz, any portion of this frequency range (down to 5 MHz segments) or a fixed frequency.

The output of the YIG oscillator-amplifier is applied to the first mixer through a circulator. The circulator also routes reflected power from the first mixer to a sampler for use when the analyzer is operated in stabilized (phase locked) modes.

The YIG frequency is directly controlled by the output of the tune amplifier circuit which is driven by the scan ramp, selected portions of the scan ramp or a dc level from the FREQUENCY control. The tune amplifier also provides an output for use in the marker generator when the analyzer is operated in the 0 - 1250 MHz scan mode.

The sweep amplifier shapes the scan ramp to provide the proper ramp to drive the tune amplifier. It also processes the phase lock error signal when the analyzer is operated in the stabilized mode.

Third Converter (Service Sheet 5)

The 550 MHz IF signal is amplified approximately 11 dB before being applied through the 550 MHz bandpass filter to the third mixer.

The third mixer is a double balanced mixer using a matched diode quad for mixing.

The third local oscillator is a voltage controlled oscillator which is swept in narrow-scan stabilized modes. When the analyzer is operated in wide scan modes (0.5 MHz/DIV or more) the third local oscillator frequency is fixed at a nominal 500 MHz, determined by the ±500 kHz range of the FINE TUNE control. When the analyzer is operated in narrow-scan modes (200 kHz/DIV or less) the third local oscillator is swept five times the SCAN WIDTH PER DIVISION setting on both sides of the center frequency; the center frequency is determined by the amount of first local oscillator shift required to achieve phase lock, and the setting of the FINE TUNE control. As an example, if the analyzer is operated at 200 kHz/DIV in stabilized mode and the first local oscillator is down shifted 100 kHz to achieve phase lock, the third local oscillator will sweep 2 MHz centered at 499.9 MHz. The offset in third local oscillator frequency is required to retain display accuracy.

The third local oscillator driver amplifier combines the FINE TUNE voltage, the attenuated scan ramp and the offset voltage to control operation of the third local oscillator.

Phase Lock Reference and Sampler (Service Sheet 6)

When the analyzer is operated in the stabilized (phase locked) mode, the first local oscillator is locked to a stable reference.

In the 8554B the required reference signal is provided by a crystal controlled 1 MHz pulse generator. The 1 MHz pulse is used to enable a gate in the 2 to 3.3 GHz sampler.

In the 2 to 3.3 GHz sampler the first local oscillator frequency is sampled and the sampler output is used in the search loop and phase lock circuits to find a point in the first local oscillator range that is harmonically related to the 1 MHz reference oscillator. Once a phase lock point is found, the sampler output signal is used to maintain phase lock.

The output of the lock amplifier is used to maintain the first local oscillator phase lock and is also processed to provide an offset to the third local oscillator to compensate for the initial frequency shift required to attain first local oscillator phase lock.

SERVICE SHEET 1 (cont'd)

Phase Lock Memory (Service Sheet 7)

In order to phase lock the first local oscillator a frequency must be found in which the 1 MHz sample pulses and negative-going positive half cycles of the first local oscillator are in time coincidence.

When the same point on the negative-going slope of the first local oscillator positive half cycles is sampled each time the sampler gate is opened, the system is phase locked and the first local oscillator frequency is fixed.

When consecutive sample gates sample the negative-going slope of the first local oscillator positive cycles at a different point on the negative-going slopes, the level of the signals differ and an error voltage is generated to shift the first local oscillator to a phase lock point.

While the first local oscillator is being tuned by the search loop to find a phase lock point, the phase lock offset memory amplifier is tracking the search scan and error signal. Approximately 0.5 second after a phase lock mode has been initiated a relay is energized to remove the output of the phase lock memory amplifier from the offset amplifier. The signal level present at the time the relay contacts open is stored in a capacitor which is between the base of the offset amplifier, an FET amplifier (source follower), and ground. Since the input impedance of a FET is very high the memory capacitor cannot discharge and the stored dc level in the capacitor maintains the FET conduction at the level present when the relay contacts opened. The output from the offset amplifier is used to shift the third local oscillator, in frequency, by an amount equal to the frequency shift required to phase lock the first local oscillator. This prevents signal shift on the CRT display when phase lock is enabled. The scan width and tuning stabilizer switches are used to disable the phase lock capabilities of the analyzer when not selected or in wide scan width modes.

Scan Width Attenuator (Service Sheet 8)

This portion of the scan width attenuator assembly contains the resistive network and switching required to attenuate the scan ramp for the various SCAN WIDTH PER DIVISION modes.

Marker Generator (Service Sheet 9)

When the analyzer is operated in the 0 to 1250 MHz mode, the marker generator compares the scan ramp and the dc level from the FREQUENCY control to provide an inverted marker on the display section CRT which represents the center frequency to which the analyzer is tuned (in ZERO and PER DIVISION scan width modes).

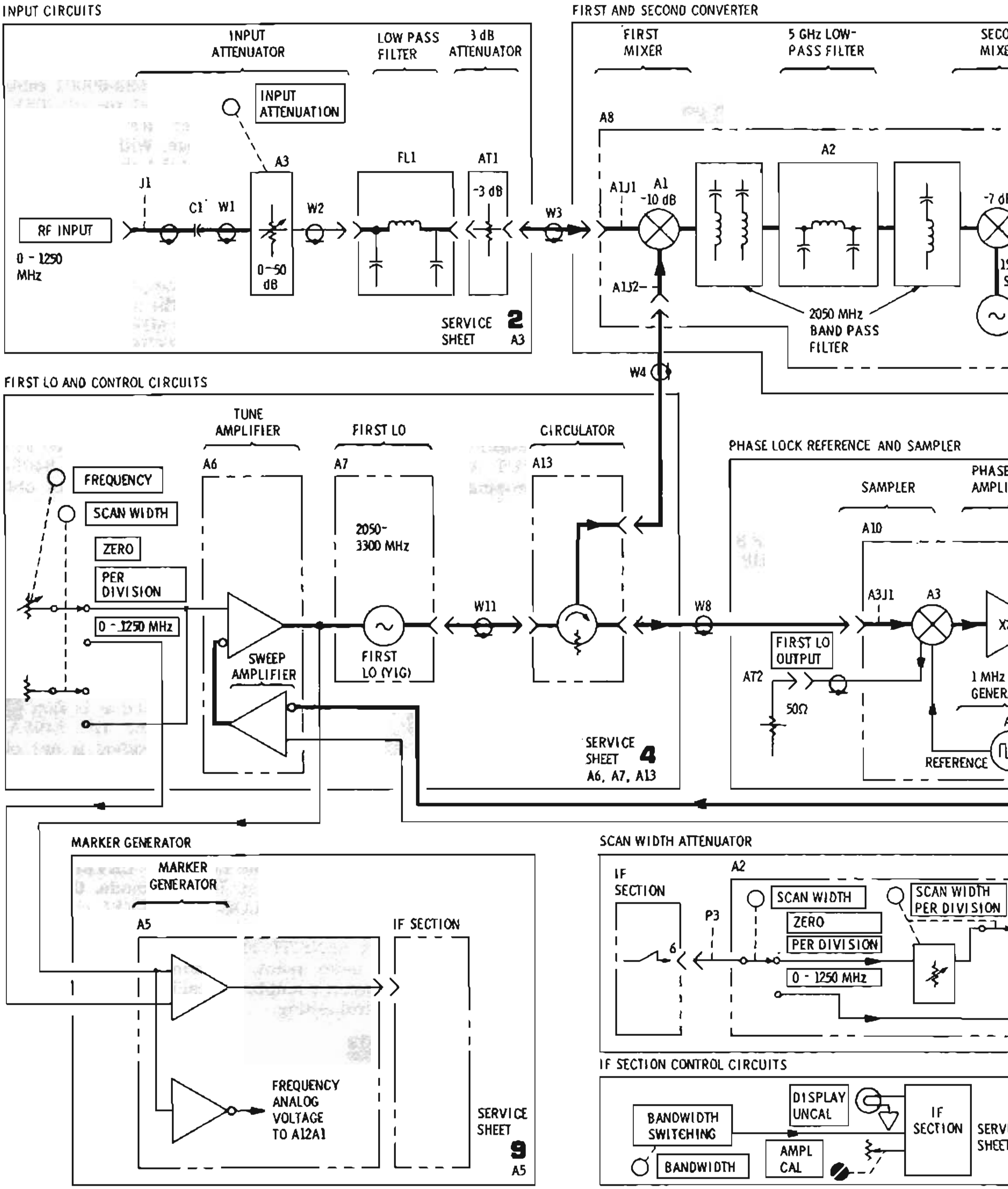
The scan width switch disables the marker generator when the analyzer is operated in PER DIVISION or ZERO scan modes.

IF Section Control Circuits (Service Sheet 10)

The BANDWIDTH switch and the AMPL CAL adjustment both control circuitry in the IF Section.

Analogic (Service Sheet 11)

The DISPLAY UNCAL lamp is lit whenever SCAN WIDTH, BANDWIDTH, SCAN TIME PER DIVISION, and VIDEO FILTER are set at any combination of positions which does not permit accurate calibration of the analyzer. The switches all have wafers devoted to the analogic circuitry that controls the lamp. The analogic portion of SCAN WIDTH and BANDWIDTH is shown.



SERIAL PREFIX: 1248A

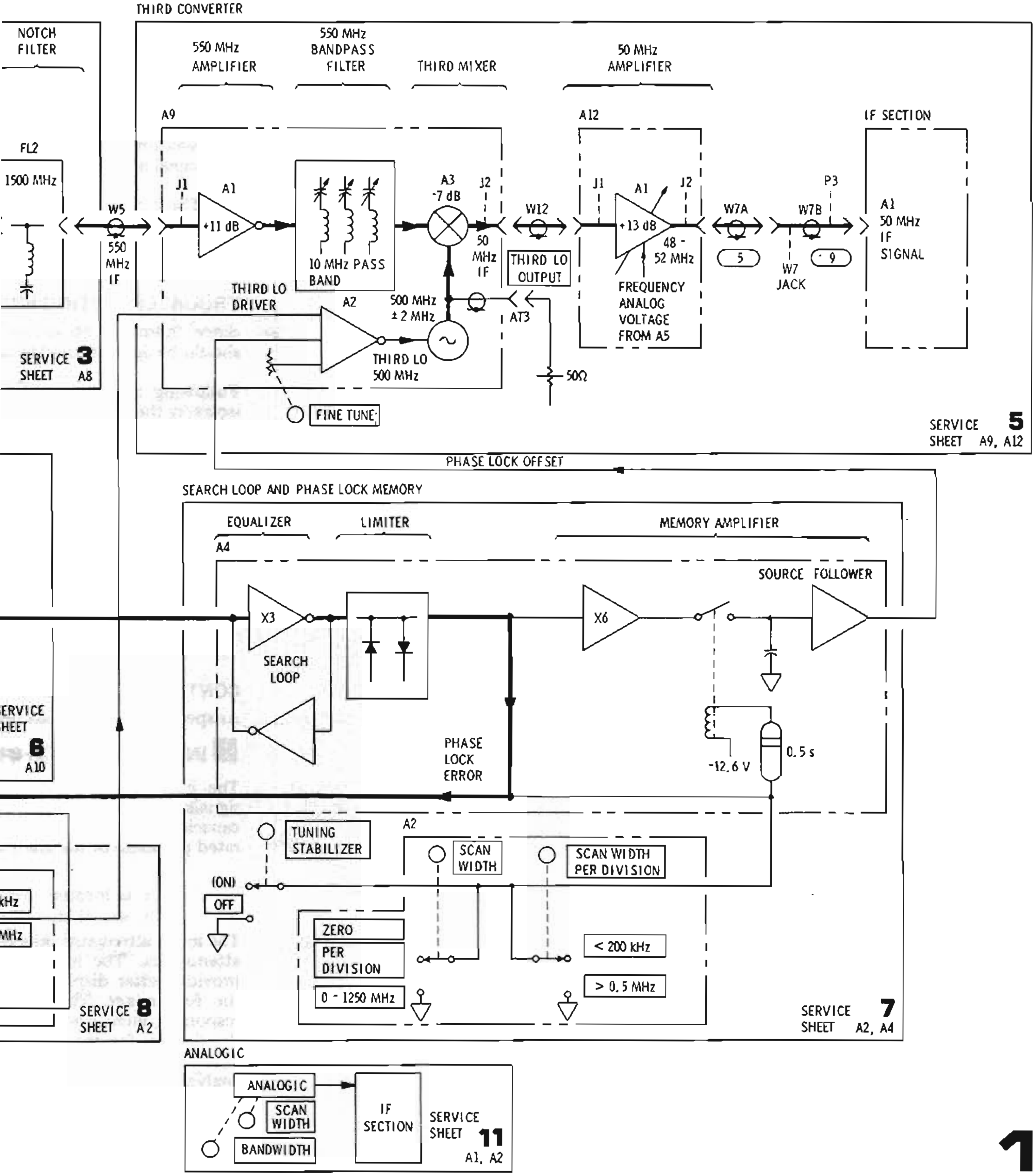


Figure 8-7. Block Diagram

SERVICE SHEET 2

It is assumed that one or more of the following conditions exists:

1. The steps specified in Table 4-1, Front Panel Checks, have been performed; that only the marker and first local oscillator signals appear on the Display Section CRT and that there is no RF input to the first mixer with a RF input signal applied to J1 RF INPUT. (Follow steps 1, 2 and 3.)
2. The index lights do not function properly. (Follow step 4.)
3. Sensitivity as displayed on the CRT in LINEAR mode is incorrect. (Follow step 5.)

TROUBLESHOOTING PROCEDURE

Since there are no active components in the circuits to be tested, the 8554B should be disconnected from the IF and Display Sections.

Following the procedures under individual circuit descriptions should aid in isolating the defective component or circuit.

All RF tests are conducted with a 400 MHz, —10 dBm signal from the HP 608F connected to the analyzer RF INPUT.

EQUIPMENT REQUIRED

Vector Voltmeter	HP 8405A
Volt-ohm-ammeter	HP 412A
Service Kit	HP 11592A
50 ohm Dummy Load	HP 11593A
Signal Generator	HP 608F
Jack-to-jack Adapter	HP 1250-0827
BNC Tee	UG 274 B/U

CONTROL SETTINGS

As specified in individual tests.

1 INPUT CAPACITOR C1 AND ATTENUATOR ASSEMBLY A3

The input coupling capacitor C1 protects the diodes in the first mixer when signals are applied which contain dc components. The breakdown voltage of the capacitor is in excess of 50 volts. The response of C1 is essentially flat over the rated passband of the analyzer.

NOTE

C1 is located inside of RF INPUT jack J1. To gain access to C1, see J1 disassembly procedure below.

The input attenuator provides 0 to 50 dB of attenuation using five fixed, pad type attenuators. The input attenuator is used to attenuate large input signals to provide better display resolution and minimize distortion products generated in the first mixer. The input attenuator may also be used to identify spurious responses; increasing the input attenuation by 10 dB causes a 10 dB reduction on the display for the input signal, but a much greater reduction in any spurious signals. The flat frequency response and attenuator accuracy contribute to the analyzer's absolute amplitude calibration.

NOTE

Do NOT attempt to disassemble the A3A1 Attenuator. It is NOT field repairable.

TEST PROCEDURE 1

Before removing the analyzer from the Display Section verify failure by using a different signal source.

Disconnect the attenuator output W2 and connect it to the HP 8405A using the HP 1250-0827 jack-to-jack adapter, the HP 11592-60001 cable, the UG 274 B/U BNC Tee and the HP 11593A dummy load. With the HP 608F output (400 MHz, −10 dBm) connected to the analyzer RF INPUT, rotate the INPUT ATTENUATION control through its range. With the INPUT ATTENUATION control set at 0 through 50 dB, the HP 8405A should indicate −10 through −60 dBm respectively. If meter readings are not as specified the input capacitor or attenuator assembly are defective. Reconnect W2.

2 1500 MHz LOW PASS FILTER FL1

The 1500 MHz low pass filter FL1, an encapsulated thin-film microcircuit, is relatively flat throughout the passband of the analyzer. The cutoff frequency is 1500 MHz; the filter is down 3 dB at 1500 MHz and provides more than 70 dB rejection to frequencies between 2.05 and 12 GHz.

TEST PROCEDURE 2

Connect the HP 8405A to the output of the low pass filter FL1 with the accessories used in step 1 . With the HP 608F connected as in step 1 and the INPUT ATTENUATION control set to 0 dB the HP 8405A should indicate approximately −10.5 dBm. If the correct reading is not obtained the filter is defective.

3 3 dB ATTENUATOR AT1

The 3 dB attenuator provides impedance matching between the low pass filter and the first mixer.

TEST PROCEDURE 3

Connect the HP 8405A to the output of the 3 dB attenuator with the accessories listed in step 1 . With the HP 608F connected as in step 1 and the INPUT ATTENUATION control set to 0 dB the HP 8405A should indicate approximately −13.5 dBm. If the correct reading is not obtained the 3 dB attenuator is defective.

4 INDEX LIGHT SELECTOR SWITCH A3S1-1F

Index light selection switch S1-F1 on the INPUT ATTENUATION control, selects the index lamps associated with the LOG REF LEVEL/LINEAR SENSITIVITY control in the analyzer IF Section. In LOG mode, the selected index lamp is opposite the scale factor on the LOG REF LEVEL control that corresponds to full-scale deflection on the display. In LINEAR mode, the selected index lamp is opposite the LINEAR SENSITIVITY volts per division scale factor. The lamps provide a moveable index point, positioned by the INPUT ATTENUATION control, thus the analyzer's amplitude calibration is maintained for any INPUT ATTENUATION control setting.

TEST PROCEDURE 4

Connect one lead of the HP 412A to the −12.6 volt source. Rotate the INPUT ATTENUATION control and check for a reading of approximately 91 ohms at connector pins of P3 as follows: 0 dB – pin 33, 10 dB – pin 34, 20 dB – pin 35, 30 dB – pin 9, 40 dB – pin 10, 50 dB – pin 11. If the 91 ohm reading is not obtained at any setting, A3R1 may be defective. If the reading is obtained at some, but not all positions, switch A3S1 or wiring is probably defective.

SERVICE SHEET 2 (cont'd)

5 LINEAR AMPLIFIER COMPENSATION SELECTOR A3S1-1R

S1-1R is a part of an amplifier compensation programming circuit for 10 dB steps of INPUT ATTENUATION control when the analyzer is operated in the LINEAR mode. Refer to the IF Section Operating and Service Manual for a detailed circuit description of the log amplifier.

TEST PROCEDURE 5

Connect one lead of the HP 412A to the −12.6 volt source. Connect the other lead to P3 pin 8. Meter should indicate continuity on the even-numbered positions of the INPUT ATTENUATION control. Move connection from P3 pin 8 to P3 pin 7. Meter should indicate continuity on the odd-numbered positions of the INPUT ATTENUATION control. If readings are correct, trouble should be in the IF Section. If indications are incorrect, check S1-1R and 8554B wiring.

RF INPUT JACK J1 DISASSEMBLY

1. Disconnect semi-rigid coaxial cable W1 (J1MP11) from the A3 Assembly. Remove J1 by removing nut behind front panel. Remove connector body (J1MP1).

2. Slide the shell, J1MP10, back onto cable J1MP11 (do not bend the cable more than necessary).

3. If necessary, unsolder inner-conductor J1MP4 from blocking capacitor board J1MP7. Remove J1MP2, MP3, and MP4 and disassemble.

4. If necessary, unsolder C1 (J1MP8) from J1MP7. Correct orientation for J1MP8 and MP7 is shown in Figure 8-8.

5. If necessary, unsolder W1 (J1MP11) from J1MP7 and remove.

6. If necessary, unsolder J1MP7 from J1MP6 by removing solder from two holes in bottom of J1MP6.

7. Reassemble J1 by reversing the procedures in steps 1 through 6.

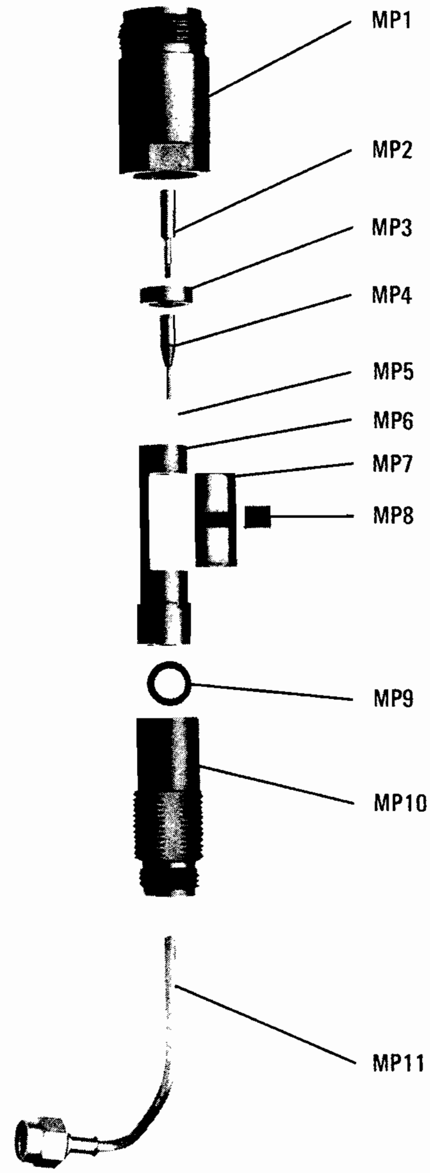
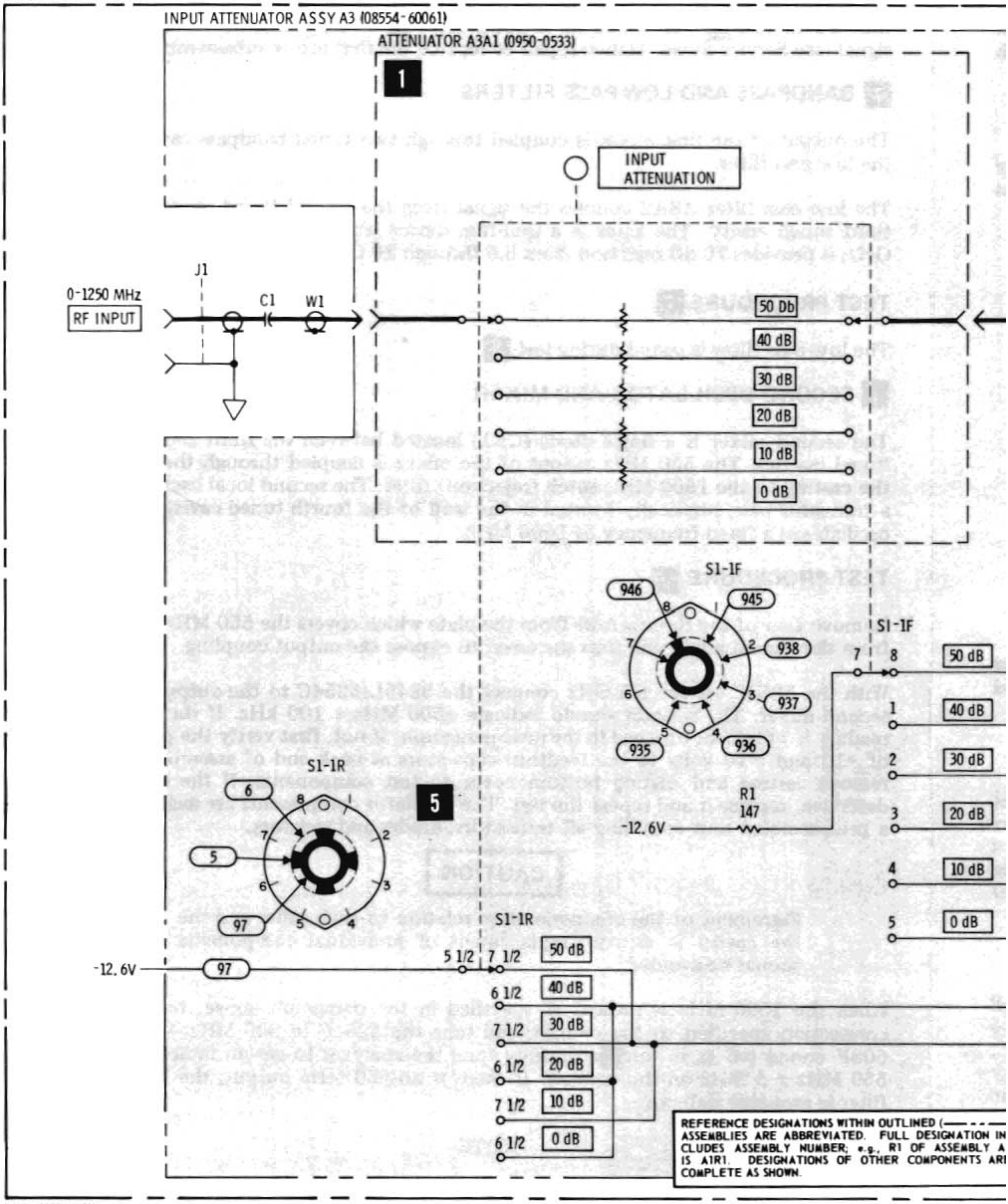
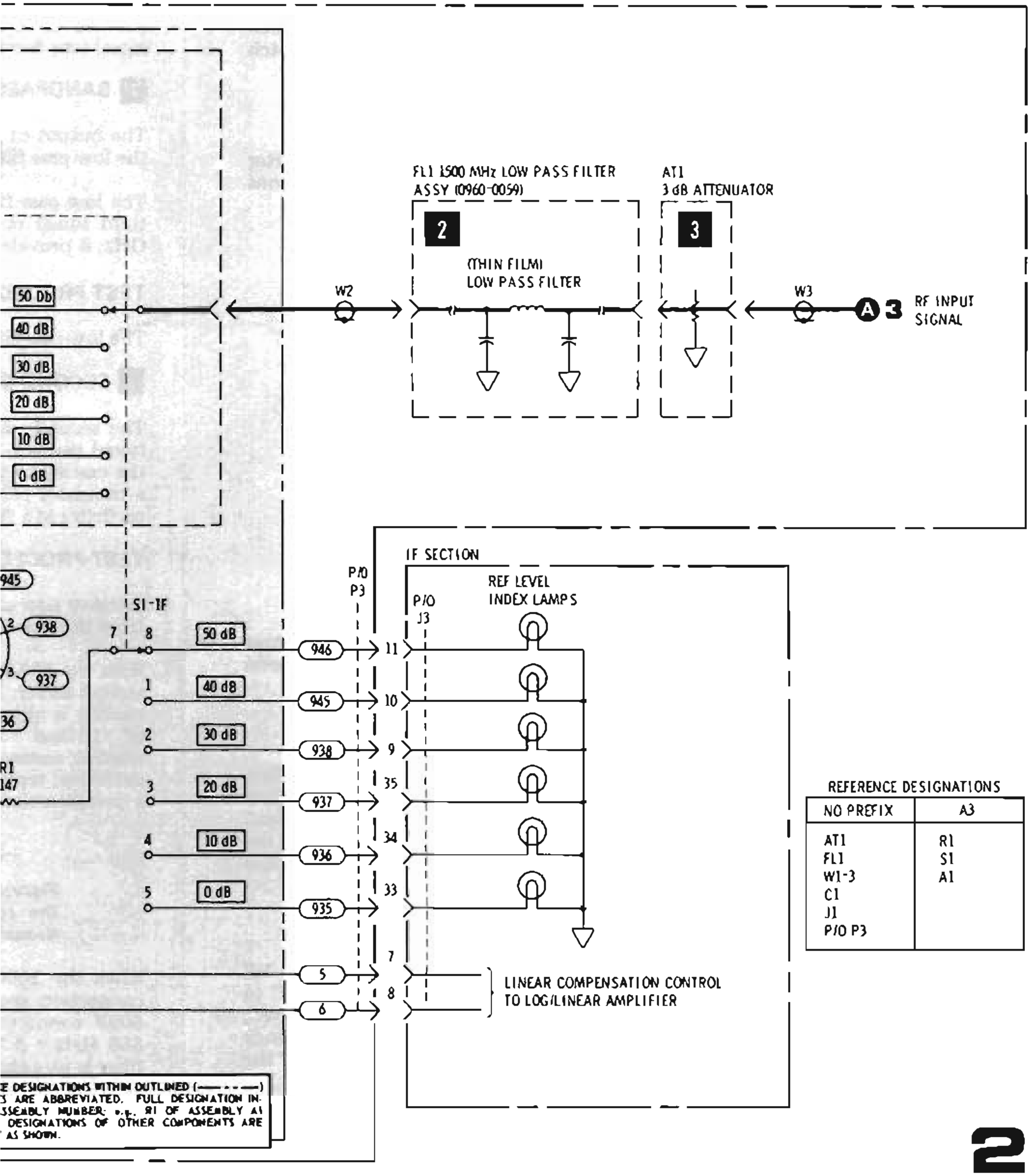


Figure 8-8. RF INPUT Jack J1, Exploded View

P/O 8554B RF SECTION



SERIAL PREFIX: 1245A



REFERENCE DESIGNATIONS

NO PREFIX	A3
AT1 FL1 W1-3 C1 J1 P/O P3	R1 S1 A1

Figure 8-9. Input Circuits: A3 Schematic Diagram

SERVICE SHEET 3

It is assumed that the input circuit including the attenuators and filter have been proved to be operational and that there is no 550 MHz IF output from the notch filter.

TROUBLESHOOTING PROCEDURE

When the source of trouble is suspected to be in the first and second converter assembly A8, follow the test procedures listed after individual circuit descriptions until the malfunction is corrected.

EQUIPMENT REQUIRED

Frequency Counter	HP 5245L/5254C
Digital Voltmeter	HP 3439A/3443A
Volt-ohm-ammeter	HP 412A
Service Kit	HP 11592A
Dummy Load	HP 11593A
VHF Signal Generator	HP 608F
Jack-to-jack Adapter	HP 1250-0827
BNC Tee	UG 274 B/U
Miniature to BNC Adapter	HP 1250-0832

CONTROL SETTINGS

As specified in individual tests.

FIRST AND SECOND CONVERTER ASSEMBLY (General)

The first and second converter assembly consists of a casting containing four cavities, the first and second mixers, a thin-film low pass filter and the second local oscillator.

1 FIRST CONVERTER SUBASSEMBLY

The first converter sub-assembly is part of a replaceable cover plate on the first and second converter assembly. The sub-assembly consists of input connectors (from the first local oscillator and the input RF circuit), a matched diode pair and a stripline circuit. The first converter mixes the first local oscillator signal and the input RF to produce an up-converted IF frequency of 2050 MHz. Conversion loss in the first mixer is typically 10 dB.

TEST PROCEDURE 1

Disconnect the first local oscillator output from the first mixer. Use the HP 1250-0827, the HP 1250-0832 the UG 274 B/U, the HP 11593A and a BNC to BNC cable to connect the first local oscillator output to the HP 5245L/5254C. The counter should indicate approximately 2050 MHz above the frequency indicated on the slide-rule frequency dial (check at 200, 600 and 900 MHz). If the correct reading is not obtained, see Service Sheet 4.

If the first local oscillator signal is present, reconnect the mixer input and apply a 400 MHz, 0 dBm signal from the HP 608F to the analyzer RF INPUT with INPUT ATTENUATION set at 0 dB. Remove one of the small screws next to the first cavity tuning slug (CAUTION - do NOT remove both screws) and couple the 5245L/5254C to the first cavity with a stub probe made of #22 AWG insulated wire. With the analyzer in ZERO scan mode, tune the analyzer and the 5254C for a reading on the 5245L meter at the first IF frequency of 2050 MHz. The 5245L/5254C should indicate 2050 MHz ± 5 MHz. If the correct signal is present proceed to test 3 . If the signal is not present first verify presence of the YIG signal (see Service Sheet 4),then repair or replace the first mixer subassembly.

2 BANDPASS AND LOW PASS FILTERS

The output of the first mixer is coupled through two tuned bandpass cavities to the low pass filter.

The low pass filter A8A2 couples the signal from the second tuned cavity to the third tuned cavity. The filter is a thin-film device with a cutoff frequency of 5 GHz; it provides 70 dB rejection from 5.0 through 20 GHz.

TEST PROCEDURE 2

The low-pass filter is tested during test 3

3 SECOND OSCILLATOR AND MIXER

The second mixer is a single diode (CR1) located between the third and fourth tuned cavities. The 550 MHz output of the mixer is coupled through the top of the casting to the 1500 MHz notch (rejection) filter. The second local oscillator is a transistor pair, physically located in the wall of the fourth tuned cavity, which oscillates at a fixed frequency of 1500 MHz.

TEST PROCEDURE 3

Remove two of the three screws from the plate which covers the 550 MHz output from the second mixer and turn the cover to expose the output coupling.

With the 5254C set for 1.5 GHz connect the 5245L/5254C to the output of the second mixer. The counter should indicate 1500 MHz ± 100 kHz. If the correct reading is obtained, proceed to the next paragraph. If not, first verify the presence of +10 and −10 volts to the feedthru capacitors at back end of assembly, then remove casting and casting bottom cover to test components. If the diode is defective, replace it and repeat the test. The oscillator components are available as a preassembled unit including all transistors, diodes and resistors.

CAUTION

> Placement of the components in relation to each other and the the cavity is critical; replacement of individual components should be avoided.

When the 1500 MHz is present as specified in the paragraph above, retain the connection specified to the counter and tune the 5254C to 500 MHz. With the 608F connected as in test 1, carefully tune the analyzer to get an indication of 550 MHz ± 3 MHz on the counter. If there is no 550 MHz output, the low pass filter is probably defective.

NOTE

> After repairing any part of the first and second converter assembly, the calibration procedures specified in paragraphs 5-27 and 5-29 should be performed.

4 1500 MHz NOTCH FILTER

The 1500 MHz notch filter is a coaxial tank rejection filter which prevents the second local oscillator output from being processed in following analyzer circuits.

TEST PROCEDURE 4

Disconnect the 550 MHz input from the third mixer and IF amplifier and connect it to the HP 8405A using the HP 1250-0827, the HP 11592-60003, the HP 1250-0832, the UG 274 B/U and the HP 11593A. With the HP 608F (400 MHz —10 dBm) connected to the analyzer RF INPUT carefully tune the analyzer for a maximum reading on the HP 8405A. Typical level is —28.5 dBm. If the correct reading is not observed, the notch filter or the coax cable to the third mixer and IF amplifier is probably defective. If the correct reading is obtained, the circuits shown on Service Sheet 3 are functioning properly.

NOTE

If the notch filter is replaced, it should be aligned in accordance with paragraph 5-30.

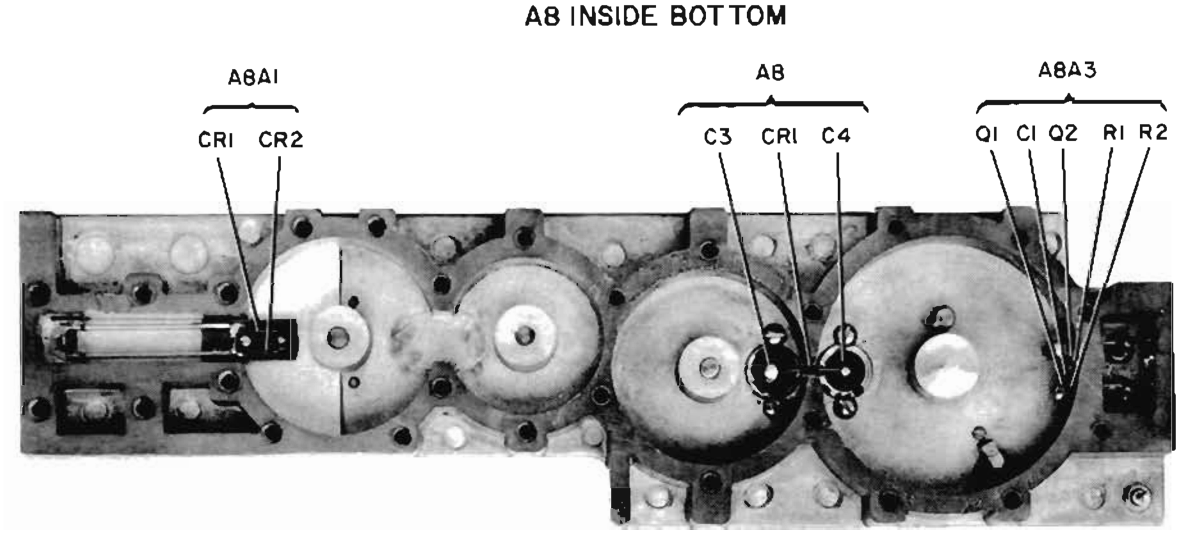


Figure 8-10. First and Second Converter Assembly A8, Component Locations, and 1500 MHz Notch Filter

A5

See Figure 8-35 for A5 component locations.

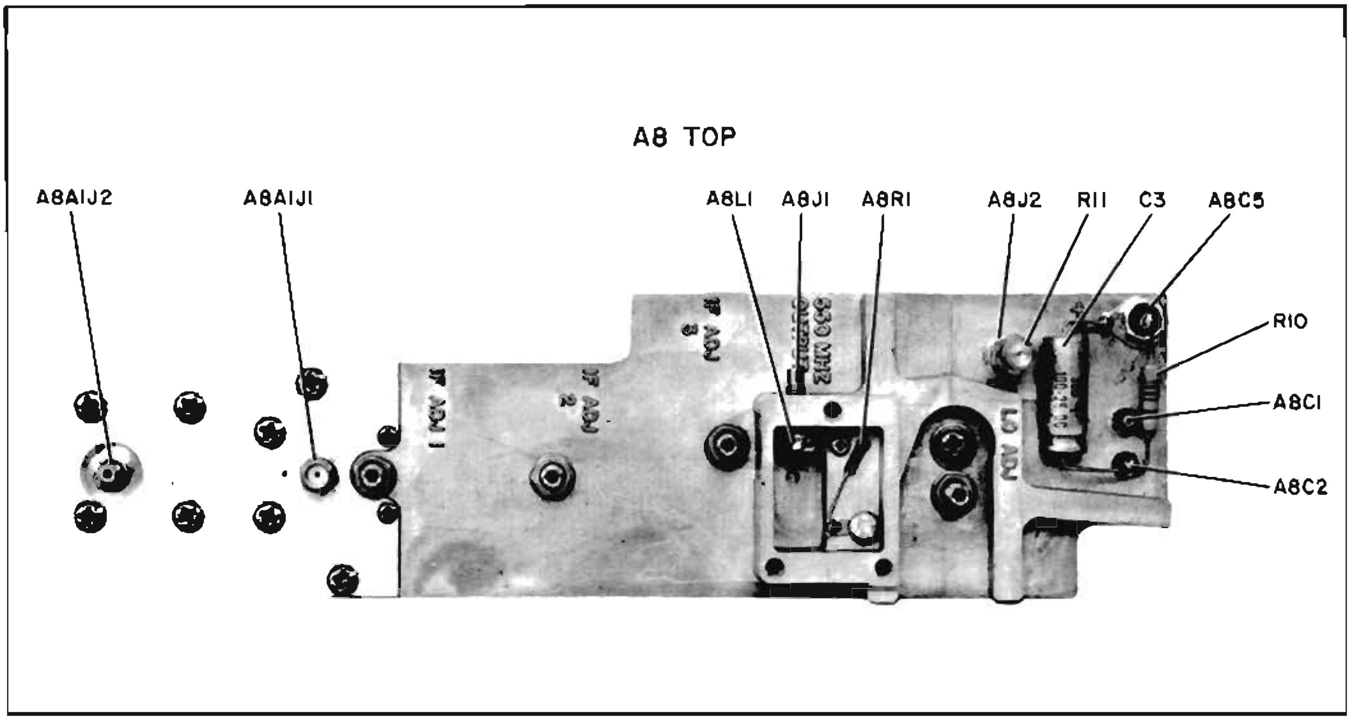


Figure 8-11. First and Second Converter Assembly A8, Top View

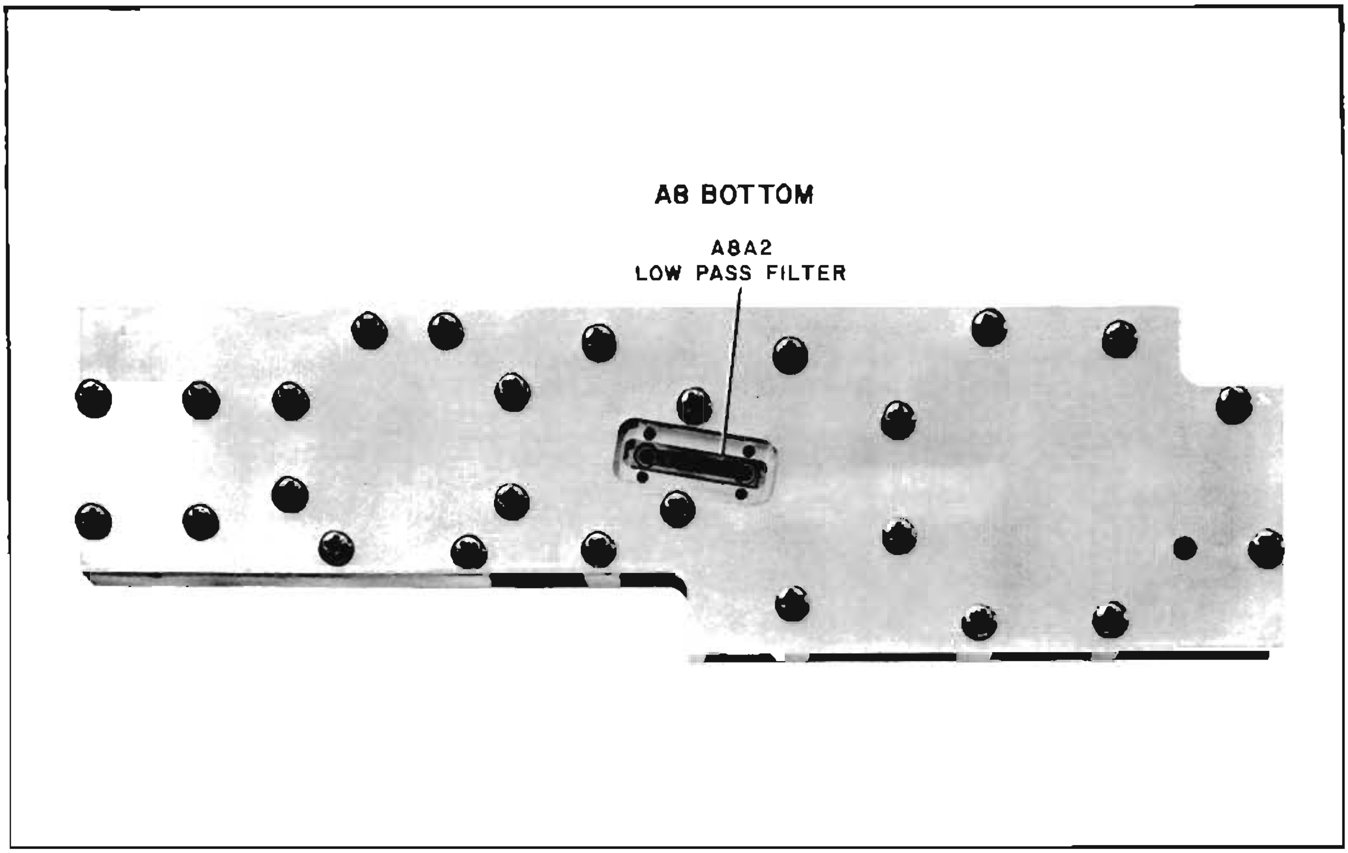
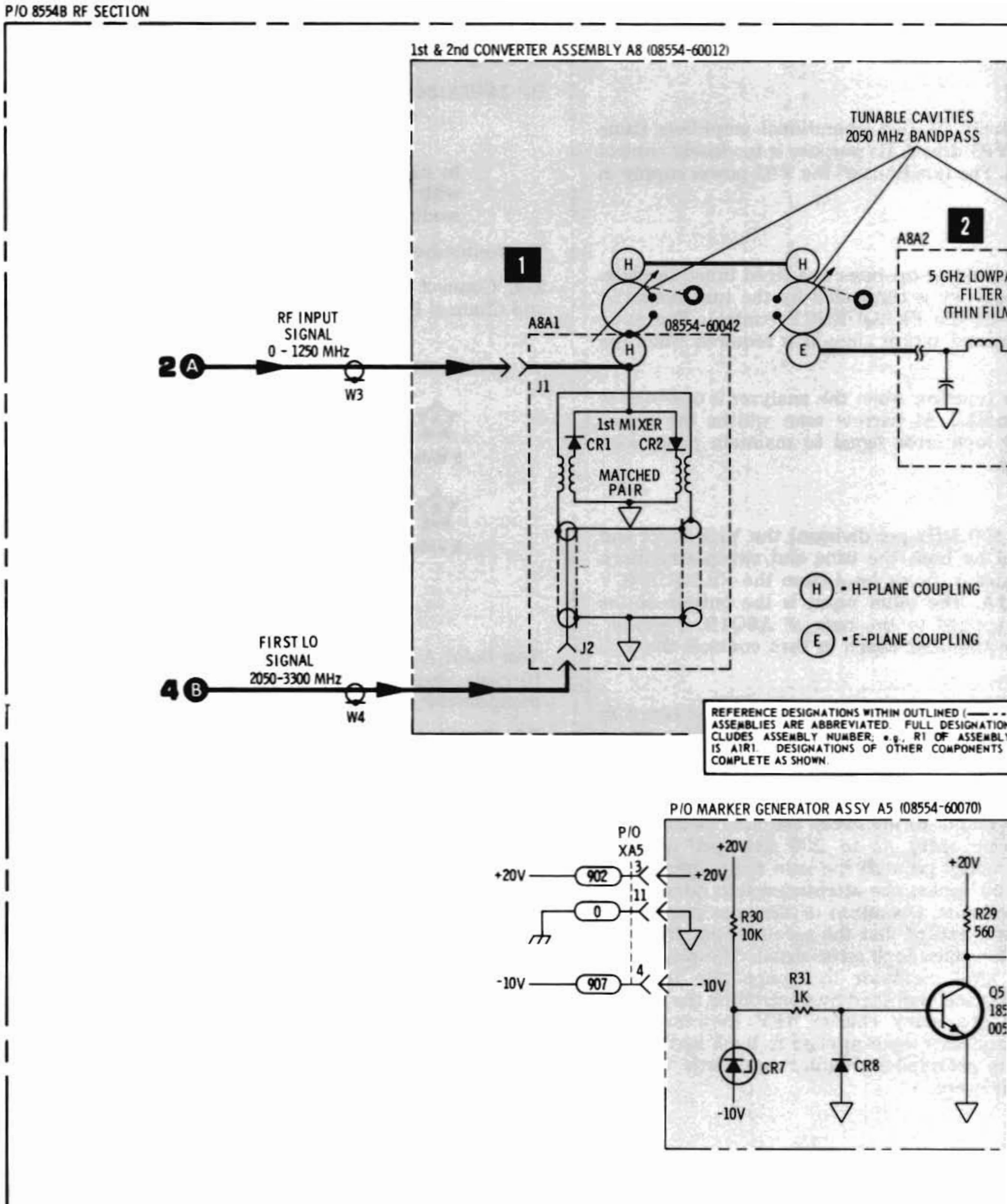
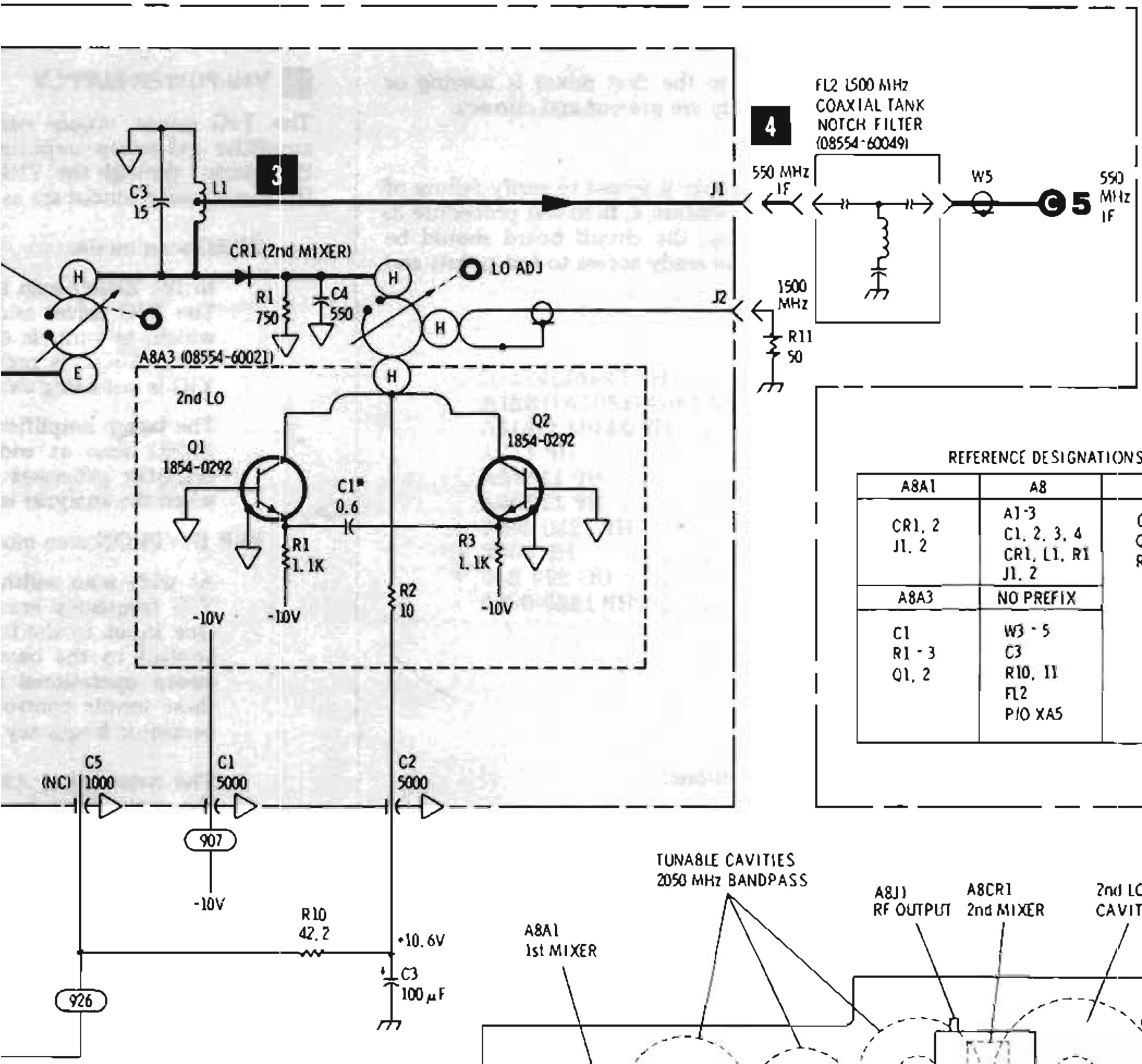


Figure 8-12. First and Second Converter Assembly A8, Bottom View (A8A2 Cover Removed)

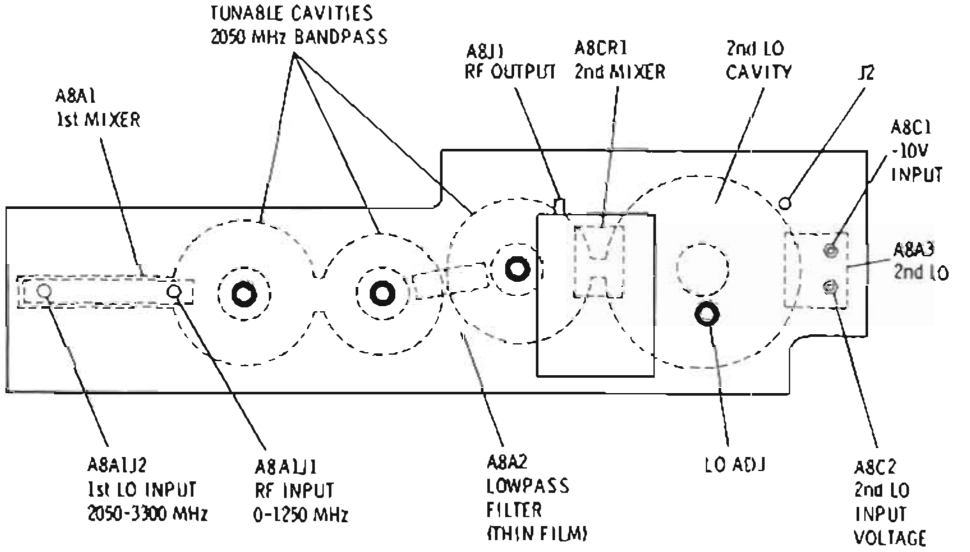


SERIAL PREFIX: 1265A



REFERENCE DESIGNATIONS

A8A1	A8	A5
CR1, 2 J1, 2	A1-3 C1, 2, 3, 4 CR1, L1, R1 J1, 2	CR7, 8 Q5 R29 - 31
A8A3	NO PREFIX	
C1 R1 - 3 Q1, 2	W3 - 5 C3 R10, 11 FL2 P/O XA5	



3
A8

Figure 8-13. First and Second Converter: A8 Schematic Diagram

SERVICE SHEET 4

It is assumed that the first local oscillator (YIG) input to the first mixer is missing or incorrect, and that input dc voltages to the YIG power supply are present and correct.

TROUBLESHOOTING PROCEDURE

Before performing the test procedure for the YIG power supply it is best to verify failure of the YIG oscillator or circulator by first performing test procedure 4, then test procedure 3. When trouble has been isolated to the YIG power supply, the circuit board should be removed and reinstalled using the extender board to provide ready access to test points and components.

EQUIPMENT REQUIRED

Frequency Counter	HP 5245L/5254C
Oscilloscope	HP 180A/1801A/1821A
Digital Voltmeter	HP 3440A/3443A
Volt-ohm-ammeter	HP 412A
Service Kit	HP 11592A
50 ohm Dummy Load	HP 11593A
Jack-to-jack Adapter	HP 1250-0827
VHF Signal Generator	HP 608F
BNC Tee	UG 274 B/U
Miniature to BNC Adapter	HP 1250-0832

CONTROL SETTINGS

As specified in individual tests.

1 SWITCHING FUNCTIONS

The scan width switch assembly performs the following functions:

ZERO scan mode.

A2S2-2F couples the dc level from the FREQUENCY control to the tune amplifier.

A2S2-1F provides a ground return for the noise filter A6C7.

A2S1-5R provides no required function.

PER DIVISION scan mode.

A2S2-2F couples the dc level from the FREQUENCY control to the tune amplifier.

A2S2-1F provides a ground return to A2S1-5R.

A2S1-5R provides a ground return for the noise filter (A6C7) when the analyzer is operated in narrow scan modes (2 kHz to 200 kHz).

0-1250 MHz scan mode.

A2S2-2F connects the dc level from the FREQUENCY control to the marker generator and also couples a fixed dc level from the marker generator to the input of the tune amplifier. The dc level from the marker generator centers the sweep at 625 MHz.

A2S2-1F opens the ground return path for the noise filter C7.

A2S1-5R has no function when the analyzer is operated in the 0-1250 MHz mode.

TEST PROCEDURE 1

Since there are no active components in the switching circuits they may be easily checked using an ohmmeter to make continuity tests with no power applied to the analyzer.

2 YIG POWER SUPPLY

The YIG power supply consists basically of two operational amplifiers (tune amplifier and sweep amplifier) and a YIG driver. Its purpose is to closely control the current through the YIG tune coil. The functions of the YIG power supply in the various scan modes are as follows:

ZERO scan mode.

In the ZERO scan mode the analyzer operates as a fixed tuned receiver. The YIG driver and YIG frequency is controlled by the tune amplifier which, in turn, is controlled by the FREQUENCY control. The noise filter, A6C7, is provided a ground return since it is required when the YIG is not being swept.

The sweep amplifier does not function when the analyzer is operated in ZERO scan at wide scan widths. At narrow scan widths the sweep amplifier processes the phase lock error signal to maintain phase lock when the analyzer is stabilized.

PER DIVISION scan mode.

At wide scan widths (0.5 to 100 MHz per division) the YIG driver and YIG frequency are controlled by both the tune and sweep amplifiers. One input to the tune amplifier is the dc level from the FREQUENCY control to the base of A6Q1A. The other input is the output of the sweep operational amplifier applied to the base of A6Q1B. Together, these inputs control the tune amplifier which in turn controls the YIG oscillator frequency.

The noise filter, A6C7, is not required when the YIG is being swept so the ground return path is removed at wide scan widths. The sweep amplifier, A6U1, processes the attenuated scan ramp to control the width of the YIG sweep about the center frequency selected by the FREQUENCY control. There is no phase lock error signal present during wide scan modes so the second input to the sweep amplifier performs no function . During narrow scan width (2 to 200 kHz per division) operating the scan width attenuator grounds the scan ramp input to the sweep operational amplifier and applies the attenuated scan ramp to the third local oscillator control circuits. Operation of the tune amplifier is the same as in wide scan widths except that the second input from the sweep amplifier consists of the phase lock error signal. The phase lock error signal shifts the first local oscillator to compensate for drift detected by the sampler. This is accomplished by controlling the current in the YIG tune coil. High frequency changes (FM deviations) are compensated for by a secondary error signal applied to the YIG FM coil. The noise filter, A6C7, is again provided a ground return path since the YIG oscillator frequency is not swept.

0-1250 MHz scan mode.

In the 0-1250 MHz scan mode the tune amplifier is controlled by a dc level from a preset voltage divider on the marker generator board which causes the scan to be centered at 625 MHz and the output of the sweep amplifier which processes the full scan ramp (the scan width attenuator is bypassed). Since the noise filter is not required when the YIG oscillator is swept, the ground return for A6C7 is removed in this mode.

TEST PROCEDURE 2

To troubleshoot the tune operational amplifier and the YIG driver place the analyzer in the ZERO scan mode at a wide (0.5 to 100 MHz) scan width. Use the

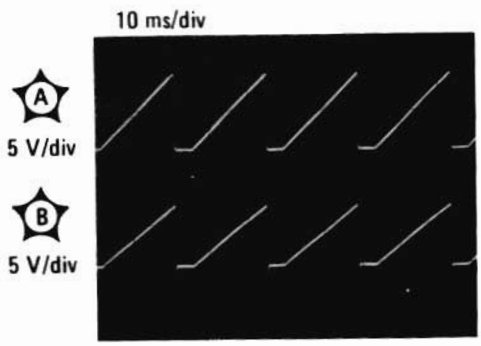
HP 3440A/3443A to check for dc levels shown on the schematic.

NOTE

> In each case where two voltages are listed, the top reading is with the FREQUENCY control set to 0 MHz and the lower reading is at 1250 MHz.

To troubleshoot the sweep amplifier follow steps a, b and c below.

2-a. Connect the 1801/1801A/1821A Channel A input to XA6-10 (Test Point A) and Channel B input to Test Point B and observe the waveform.



CONTROL SETTINGS:

SCAN TIME PER DIVISION:
2 MILLISECONDS
SCAN WIDTH:
0-1250 MHz

Test Point A BAD: Check scan generator in IF Section and scan width attenuator (Service Sheet 8). Test Point A GOOD and B BAD: Check U1 and associated components. Both waveforms GOOD: Proceed to step 2-b.

2-b. Oscilloscope Channel A remains connected as in 2-a above. Connect oscilloscope Channel B to XA6-15 and observe waveforms.

Test Point C GOOD: Proceed to step 2-c. Test Point C BAD: Check signal path from U1 and YIG coil. (YIG coil should measure about 12 ohms from A7 pin 6 to A7 pin 5).

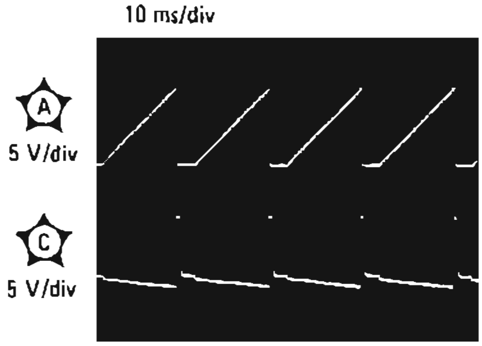
2-c. Disconnect the circulator from the sampler to defeat phase lock. Connect oscilloscope as in step 2-a and observe waveforms.

Test Point B BAD: Check for same signal at XA6-13 with the oscilloscope Channel B probe. If waveform is good at XA6-13, check U1 and associated components. If the waveform is bad at XA6-13 check the phase lock circuitry, Service Sheets 6 and 7. If waveforms shown in 2-a, 2-b and 2-c are correct, assembly is functioning properly.

3 YIG OSCILLATOR

The first local oscillator is a transistor oscillator tuned by a Yttrium-Iron-Garnet (YIG) spherical resonator and followed by a two-stage amplifier. The YIG resonator tunes the oscillator from 2050 to 3300 MHz under the control of a magnetic field from a built-in electromagnet. The two stage amplifier buffers the oscillator circuit from the load impedance and increases the output power. The oscillator-amplifier, including the magnetic circuit, is hermetically sealed to ensure long stable life. The tuning coil (see simplified schematic below) tunes the resonator through all, or portions of, its tuning range when the analyzer is operated in the 0-1250 MHz mode or in wide scan widths of the PER DIVISION mode. The FM coil is used to sweep the YIG resonator ± 600 kHz about the center frequency selected by the FREQUENCY control when the stabilized mode is initiated, until a lock point is found.

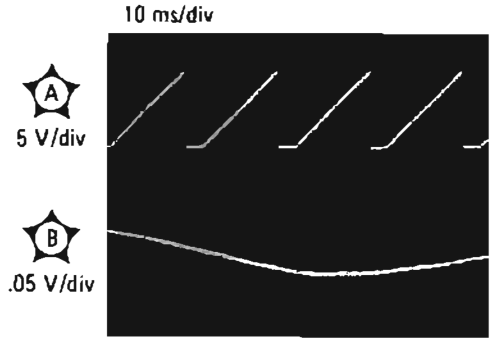
SERVICE SHEET 4 (cont'd)



2-b.

CONTROL SETTINGS:

Same as 2-a.



2-c.

CONTROL SETTINGS:

SCAN TIME PER DIVISION: 2 MILLISECONDS
SCAN WIDTH: 0-1250 MHz

TEST PROCEDURE 3

Connect the RF output of the YIG oscillator-amplifier to the 5245L/5254C. When the input voltages are as shown on the schematic the RF output should be 2050 MHz above the frequency read on the slide-rule frequency dial.

If the frequency shown on the counter is correct, the tune function of the YIG is operating properly. (If the FM coil is suspected of being defective, refer to Service Sheet 7). If there is no RF output or the frequency is different than that specified, the YIG must be replaced; it is not a field repairable assembly.

4 CIRCULATOR

The circulator is a three-port device which accepts the output of the YIG oscillator-amplifier and distributes it to the first converter where it is used for mixing. The reflected power from the first mixer is then coupled by the circulator to the 2 to 3.3 GHz sampler where it is compared to a reference signal to produce the phase lock control signal.

TEST PROCEDURE 4

In order to test the circulator the YIG oscillator-amplifier must be functioning properly. To check the circulator disconnect the output ports one at a time and connect them to the 5245L/5254C. Reading at both ports should be 2050 MHz above the frequency indicated on the slide-rule frequency dial. If correct readings are not obtained, check the coax cable from the YIG oscillator-amplifier and if found good, replace the circulator.

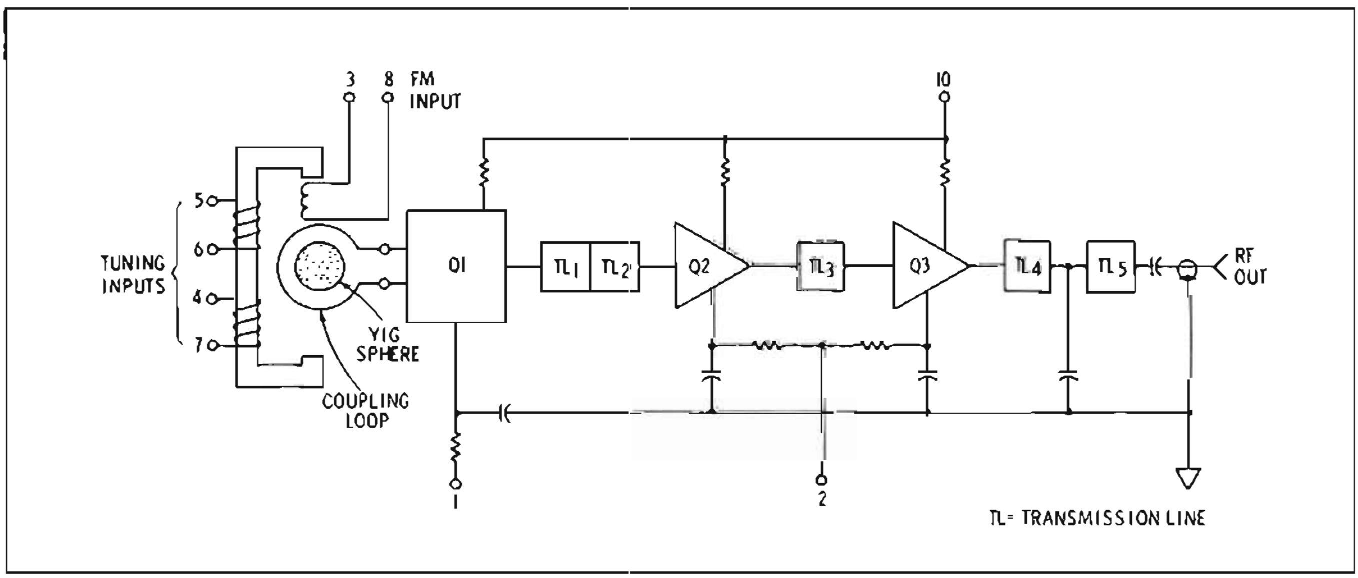


Figure 8-14. Simplified Circuit Diagram of YIG Oscillator

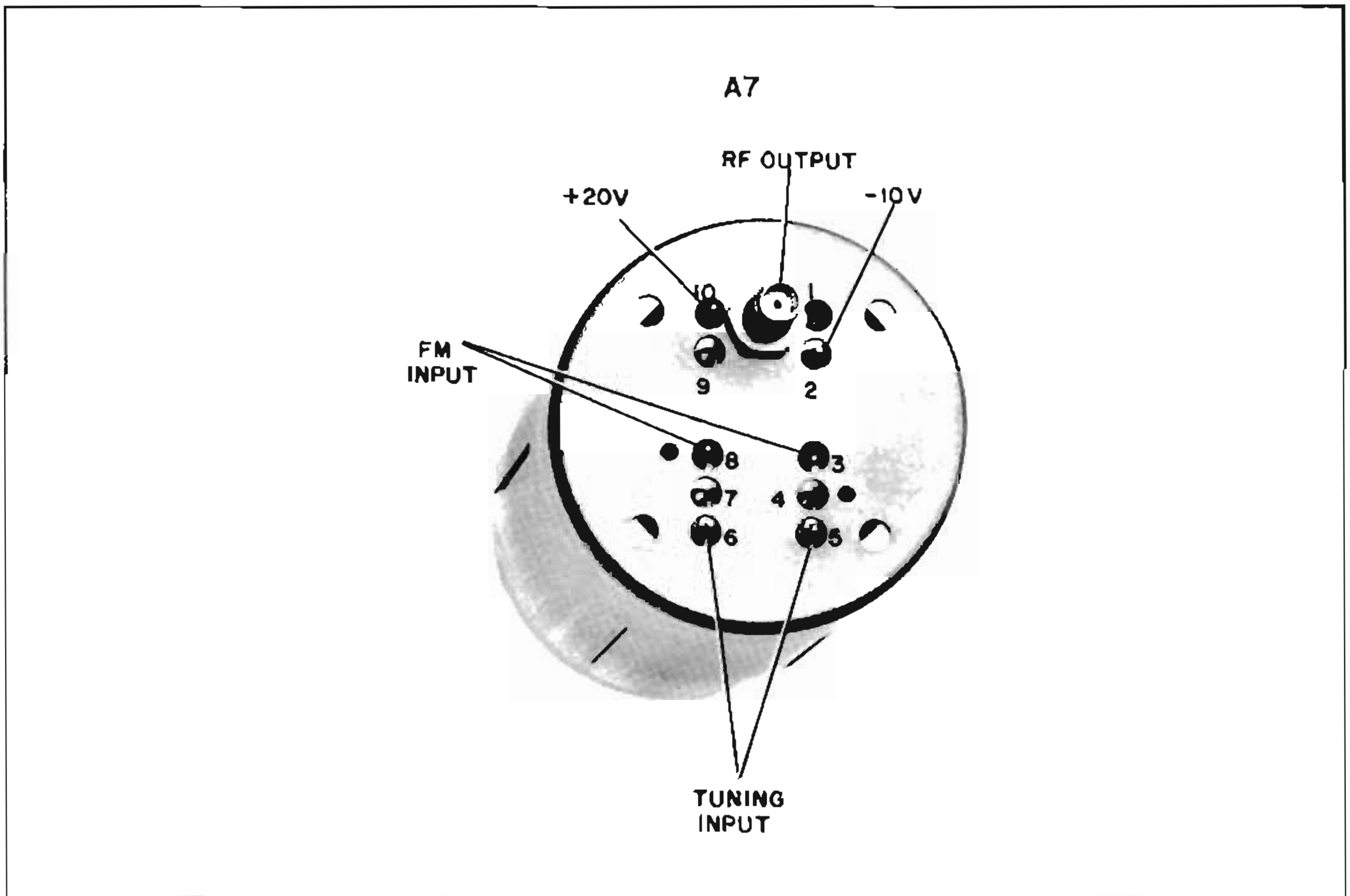


Figure 8-15. YIG Terminal Locations (AT1 Coupled to RF Output Not Shown)

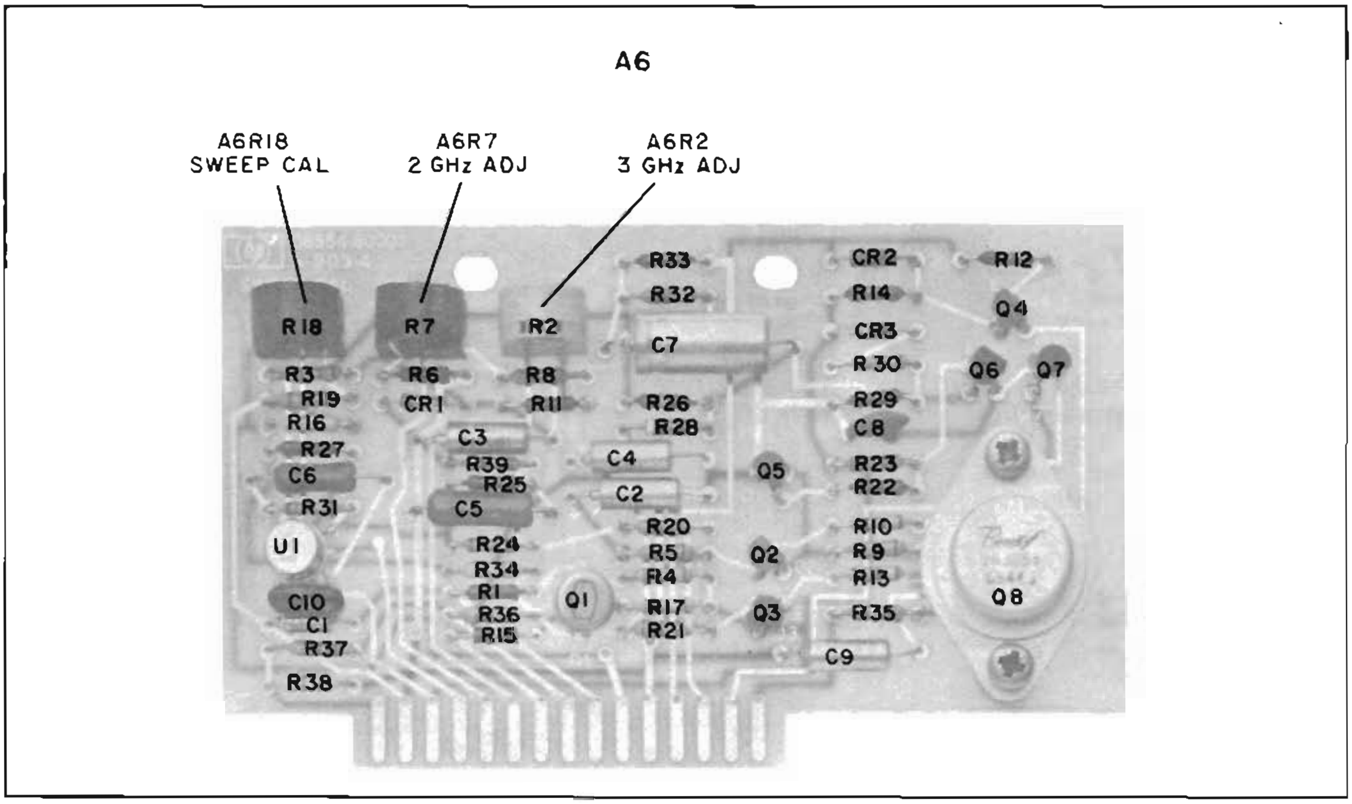
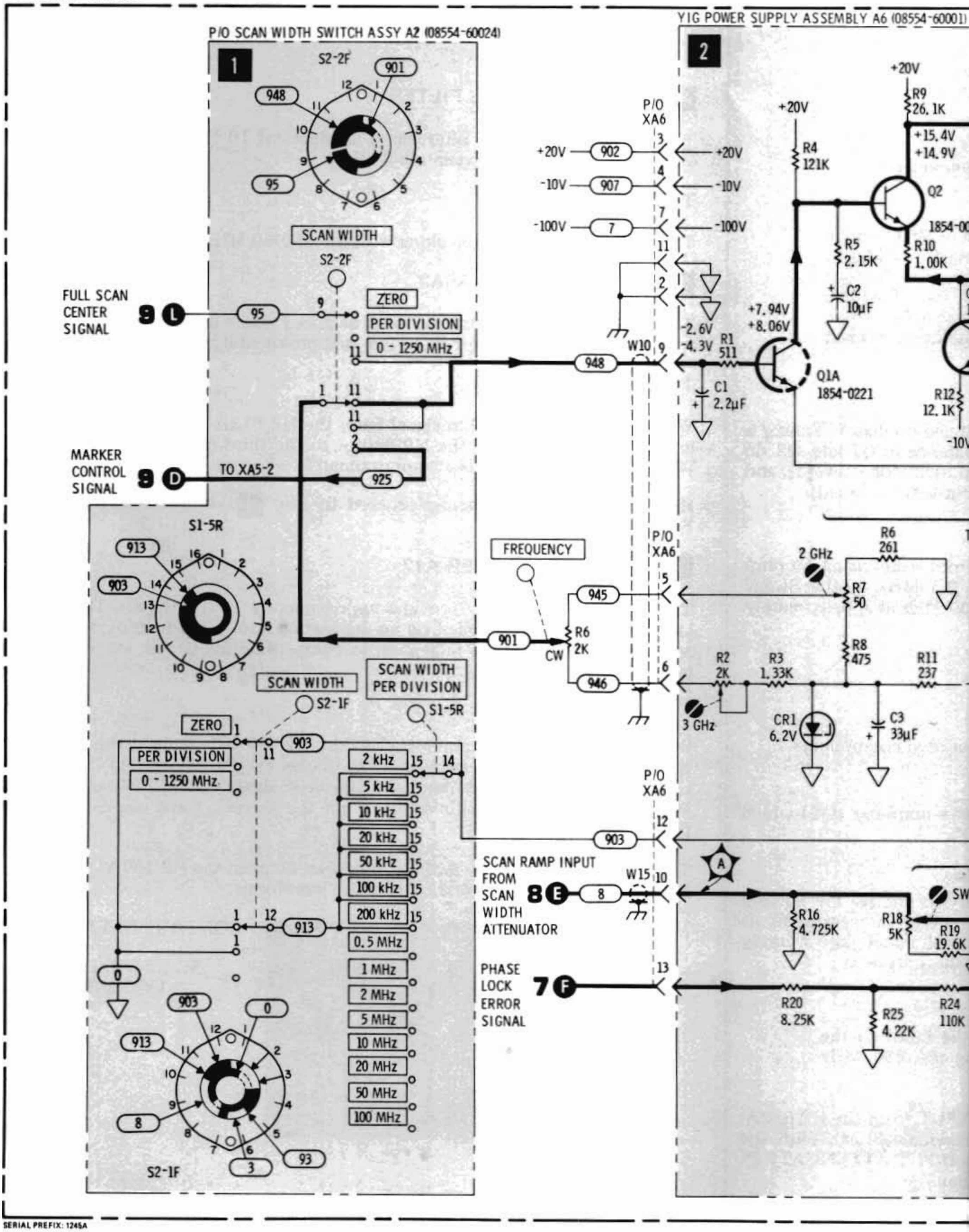
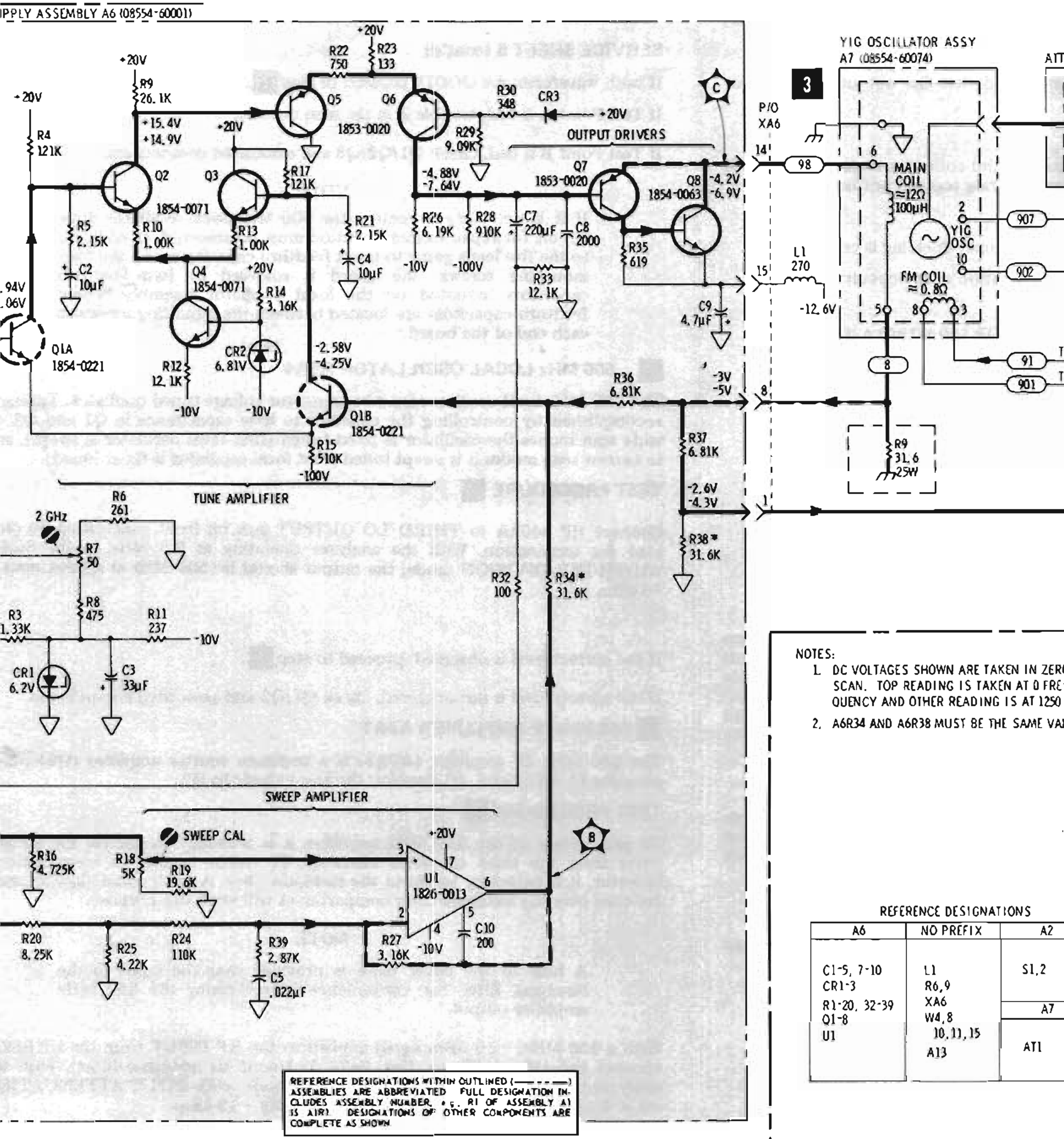


Figure 8-16. YIG Power Supply Assembly A6, Component Locations


P/O SCAN WIDTH SWITCH ASSY A2 (08554-60024)
YIG POWER SUPPLY ASSEMBLY A6 (08554-60001)
1
2
S2-2F
SCAN WIDTH
FULL SCAN CENTER SIGNAL
9 L
ZERO
PER DIVISION
0 - 1250 MHz
MARKER CONTROL SIGNAL
9 D
TO XA5-2
S1-5R
FREQUENCY
SCAN WIDTH
S2-1F
SCAN WIDTH PER DIVISION
S1-5R
2 kHz
5 kHz
10 kHz
20 kHz
50 kHz
100 kHz
200 kHz
0.5 MHz
1 MHz
2 MHz
5 MHz
10 MHz
20 MHz
50 MHz
100 MHz
S2-1F
P/O XA6
+20V
-10V
-100V
W10
W15
SCAN RAMP INPUT FROM SCAN WIDTH ATTENUATOR
8 E
PHASE LOCK ERROR SIGNAL
7 F
R4 121K
R5 2.15K
C2 10µF
R9 26.1K
+15.4V
+14.9V
Q2
R10 1.00K
+7.94V
+8.06V
-2.6V
-4.3V
R1 511
C1 2.2µF
Q1A 1854-0221
R12 12.1K
R6 261
2 GHz
R7 50
R8 475
R6 2K
CW
R2 2K
R3 1.33K
3 GHz
CR1 6.2V
C3 33µF
R11 237
R16 4.725K
R18 5K
R19 19.6K
R20 8.25K
R25 4.22K
R24 110K

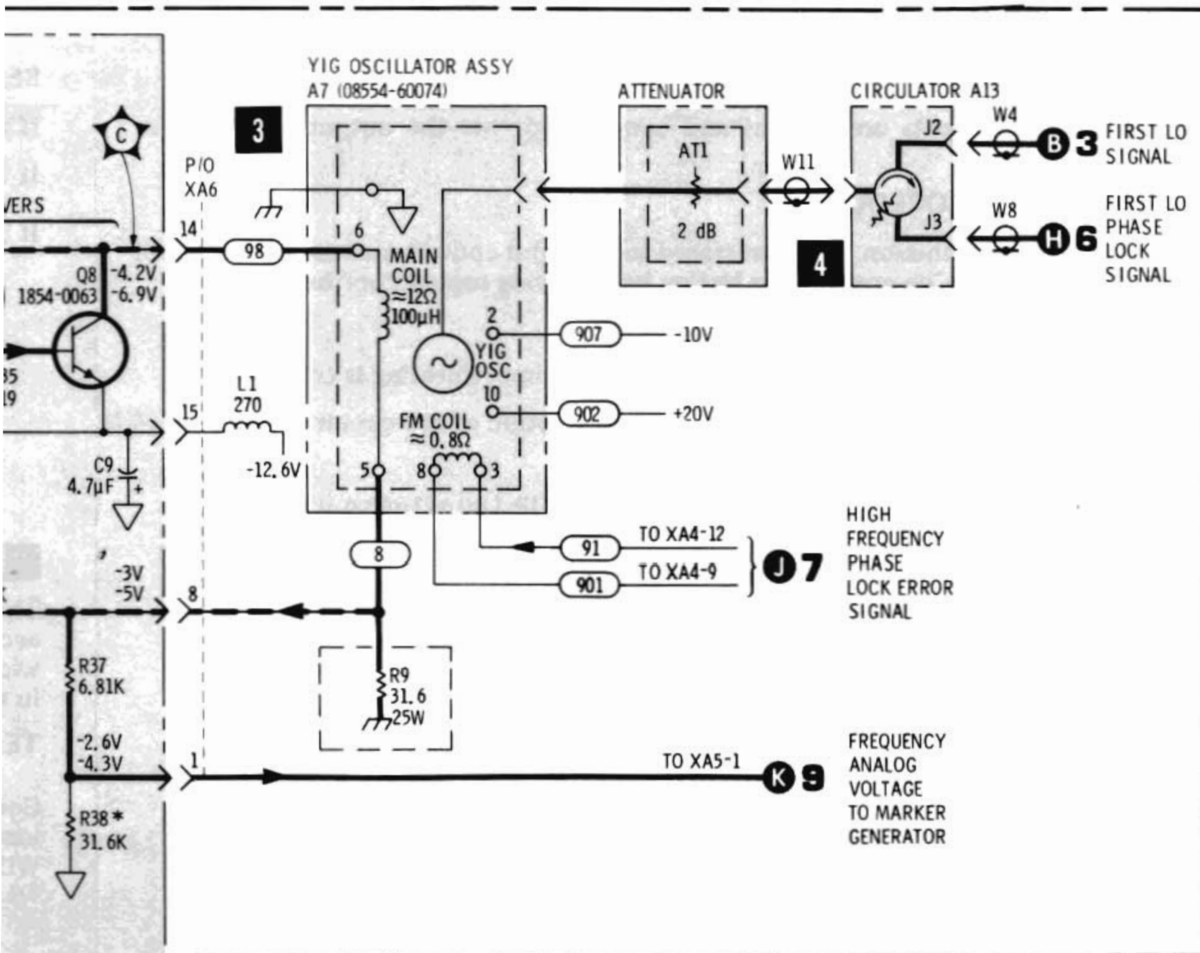


NOTES:

1. DC VOLTAGES SHOWN ARE TAKEN IN ZERO SCAN. TOP READING IS TAKEN AT 0 FREQUENCY AND OTHER READING IS AT 1250
2. A6R34 AND A6R38 MUST BE THE SAME VA

REFERENCE DESIGNATIONS

A6	NO PREFIX	A2
C1-5, 7-10 CR1-3 R1-20, 32-39 Q1-8 U1	L1 R6,9 XA6 W4,8 10,11,15 A13	S1,2
		A7
		AT1



NOTES:

1. DC VOLTAGES SHOWN ARE TAKEN IN ZERO SCAN. TOP READING IS TAKEN AT 0 FREQUENCY AND OTHER READING IS AT 1250 MHz.
2. A6R34 AND A6R38 MUST BE THE SAME VALUE.

REFERENCE DESIGNATIONS

A6	NO PREFIX	A2
C1-5, 7-10 CR1-3 R1-20, 32-39 Q1-8 U1	L1 R6,9 XA6 W4,8 10,11,15 A13	S1,2 **A7** AT1

4
A2,A6
A7,A13

Figure 8-17. First LO and Control Circuits: A2, A6, A7 and A13 Schematic Diagram

SERVICE SHEET 5

It is assumed that all inputs are present and correct and that the output is missing or incorrect.

TROUBLESHOOTING PROCEDURE

When the cause of a malfunction has been traced to the third converter assembly, three of the four circuit boards may be revealed for testing by removing top and bottom covers.

CAUTION

Only one cover should be removed at any given time; shielding is critical.

Test procedures for each circuit follow the technical description of the circuit.

EQUIPMENT REQUIRED

Oscilloscope	HP 180A/1801A/1821A
Signal Generator	HP 612A
Vector Voltmeter	HP 8405A
Service Kit	HP 11592A

CONTROL SETTINGS

Unless otherwise specified in individual tests.

SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	200 kHz
BANDWIDTH	30 kHz
SCAN TIME PER DIVISION	5 MILLISECONDS
TUNING STABILIZER	On (up)

THIRD CONVERTER ASSEMBLY A9 (General)

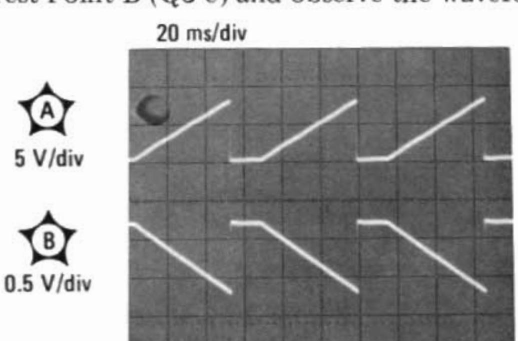
Third converter assembly consists of four small printed circuits and a 550 MHz bandpass filter. All are in the same casting but are individually shielded from each other. Inputs consist of the 550 MHz IF signal from the second converter, an attenuated sweep ramp (in narrow scan stabilized modes), a phase lock offset level (in narrow scan stabilized modes) and a dc level from the FINE TUNE control. Outputs are the 50 MHz IF signal and the third local oscillator signal. Since both sides of the circuit boards are not readily accessible, they will be described and tested in order of "easiest test".

1 500 MHz LOCAL OSCILLATOR DRIVE A9A2

In wide scan modes the only input to the 500 MHz local oscillator drive circuit is the dc level from the FINE TUNE control. In narrow scan stabilized modes the 500 MHz local oscillator drive amplifier combines and inverts the attenuated scan ramp, the phase lock offset and the FINE TUNE dc level.

TEST PROCEDURE 1

Connect the HP 180A/1801A/1821A Channel A probe to Test Point A (C4) and the Channel B probe to Test Point B (Q3-c) and observe the waveforms.



If both waveforms are GOOD, proceed to step **2**.

If Test Point A is bad, trouble is in the scan circuits.

If Test Point B is bad, check Q1/Q2/Q3 and associated components.

NOTE

> If it is necessary to remove the 500 MHz local oscillator drive circuit for repair extreme caution must be observed. In addition to the five leads going to input feedthru capacitors, and the four mounting screws, the board is soldered to two feedthru capacitors mounted on the local oscillator assembly. These feedthru capacitors are located between the mounting screws at each end of the board.

2 500 MHz LOCAL OSCILLATOR A9A4

The 500 MHz local oscillator is a two-transistor voltage tuned oscillator. Tuning is accomplished by controlling the collector to base capacitance in Q1 and Q2. In wide scan modes the oscillator is fixed tuned (first local oscillator is swept), and in narrow scan modes it is swept tuned (first local oscillator is fixed tuned).

TEST PROCEDURE 2

Connect HP 8405A to THIRD LO OUTPUT jack on front panel using 50 ohm load for termination. With the analyzer operating at 0.5 MHz in the SCAN WIDTH PER DIVISION mode, the output should be 500 MHz at approximately +6 dBm.

If the correct level is observed, proceed to step **3**.

If the correct level is not observed, check Q1/Q2 and associated components.

3 550 MHz IF AMPLIFIER A9A1

The 550 MHz IF amplifier (A9A1) is a common emitter amplifier (Q2) which provides 11 dB of gain. Q1 controls the bias current to Q2.

TEST PROCEDURE 3

To gain access to the 550 MHz amplifier it is necessary to remove the bottom cover from the third converter assembly. To ensure validity of measurements however, it is necessary to shield the bandpass filter. A small metal plate securely fastened over the bandpass filter compartment will serve this purpose.

NOTE

> A hole in the cover plate is provided over the input to the bandpass filter for convenience in measuring the 550 MHz amplifier output.

With a 450 MHz, —10 dBm signal applied to the RF INPUT from the HP 612A, connect the HP 8405A to Test Point D (input to bandpass filter). With the analyzer tuned to maximum in ZERO scan mode, with INPUT ATTENUATION set to 0 dB, the reading should be approximately —19 dBm.

If correct reading is obtained proceed to step **4**. If not, check Q1/Q2 and associated components.

4 550 MHz BANDPASS FILTER

The 550 MHz bandpass filter has a bandpass of 10 MHz centered at 550 MHz. Loss in the filter is approximately 3 dB.

TEST PROCEDURE 4

The bandpass filter is tested along with the 550/50 MHz mixer.

5 550/50 MHz MIXER A9A3

The 550/50 MHz mixer is a doubled balanced mixer using a matched diode quad for the mixing bridge. Conversion loss is approximately 6 dB.

TEST PROCEDURE 5

With a 550 MHz, —10 dBm signal from the HP 612A applied to the 550 MHz IF amplfier input, connect the HP 8405A to the third converter assembly output. The HP 8405A should indicate approximately —7 dBm.

If correct reading is obtained proceed to step 6. If not, check the Bandpass Filter and the Mixer.

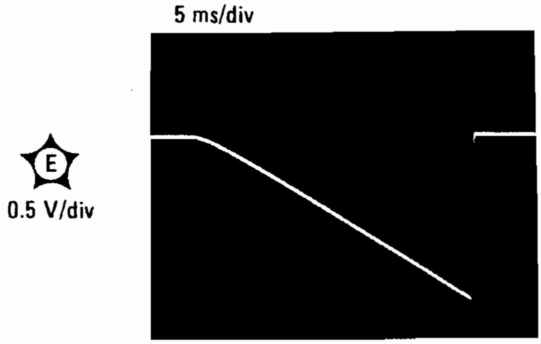
6 50 MHz IF AMPLIFIER A12

The 50 MHz IF amplifier provides approximately 13 dB of gain. The gain of the amplifier is partly controlled by an attenuated scan ramp to provide higher gain, as the input frequency is increased, to compensate for circuit and cable losses at higher frequency.

TEST PROCEDURE 6

With the CAL OUTPUT connected to the RF INPUT, connect the HP 8405A to the 50 MHz output (green coax near frequency potentiometer) through a Tee connector and observe the reading. With the analyzer set in ZERO scan mode (0.5 MHz/DIV) tune for maximum signal on the meter. Meter should indicate approximately —21 dBm.

To verify gain programming of the amplifier, connect the HP 180A/1801A/1821A to Test Point E (A12C1) and observe the waveform.



CONTROL SETTINGS:

SCAN WIDTH:
0-1250 MHz

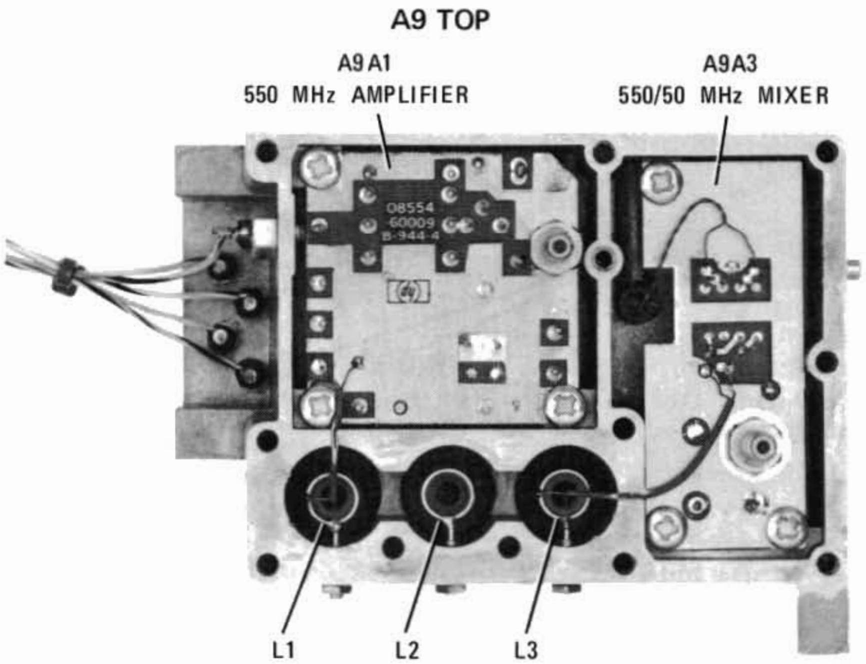


Figure 8-18. Third Converter Assembly A9, Top View Component Locations (A9A1 and A9A3)

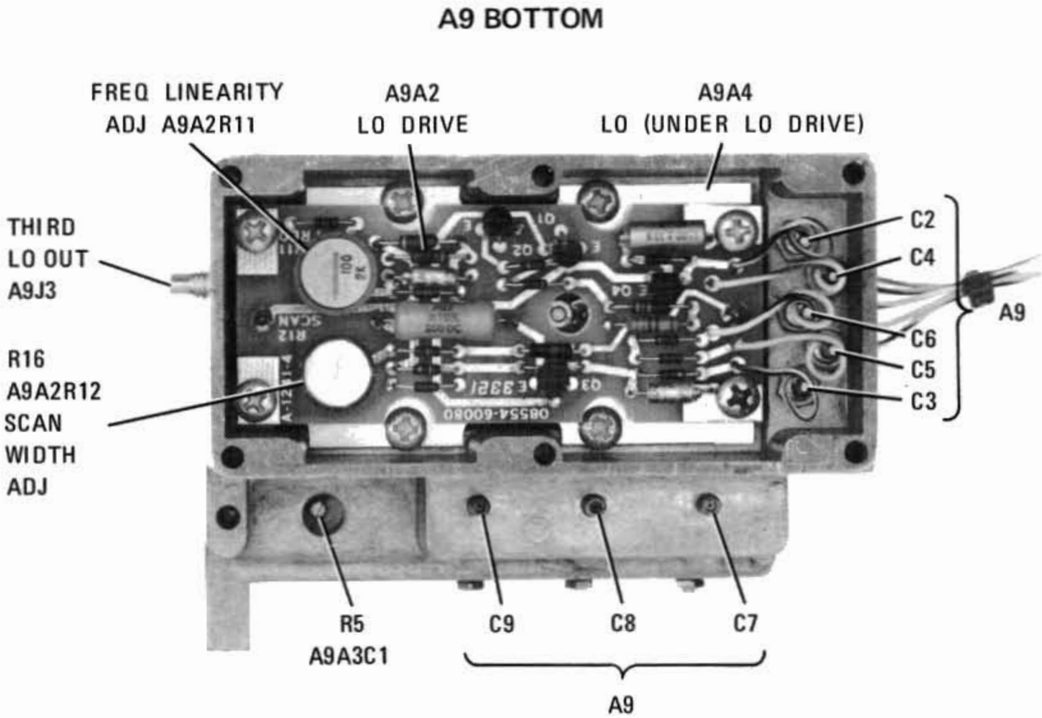


Figure 8-19. Third Converter Assembly A9, Bottom View Component Locations (A9A2)

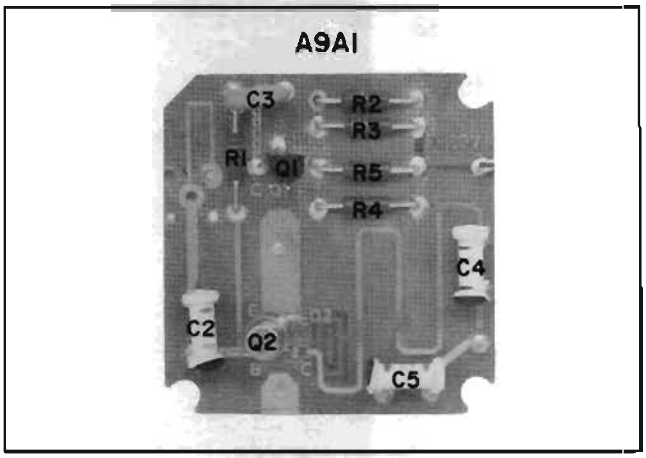


Figure 8-20. 550 MHz Amplifier A9A1, Component Locations

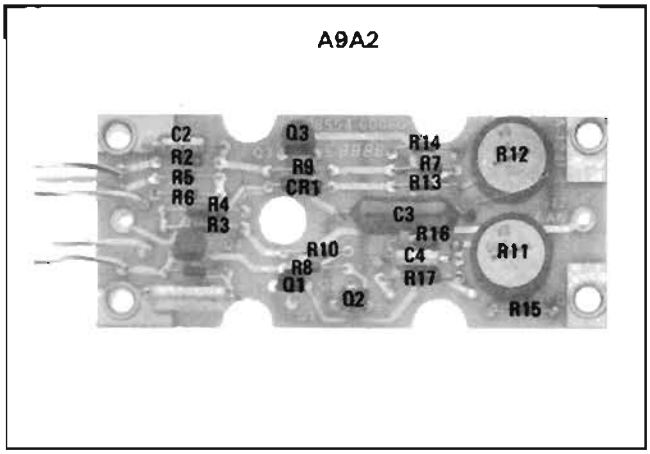


Figure 8-21. 500 MHz LO Driver A9A2, Component Locations

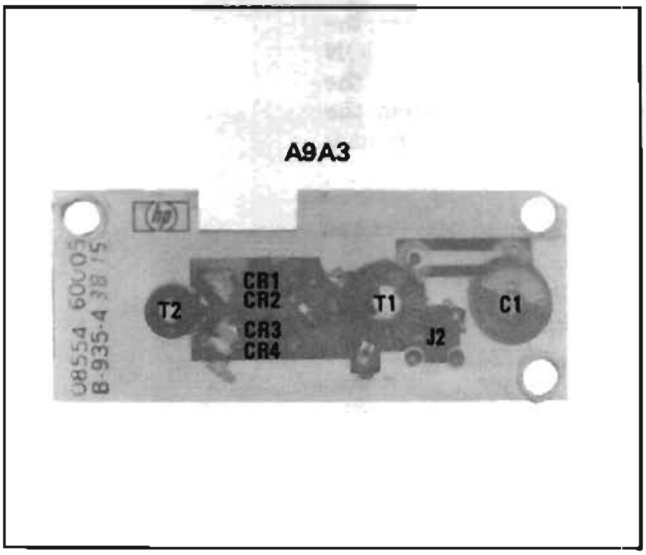


Figure 8-22. 550/50 MHz Mixer A9A3, Component Locations

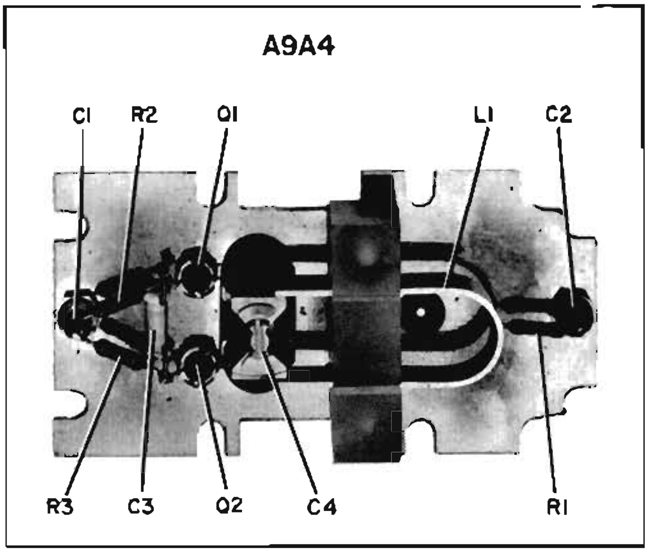


Figure 8-23. 500 MHz LO A9A4, Component Locations

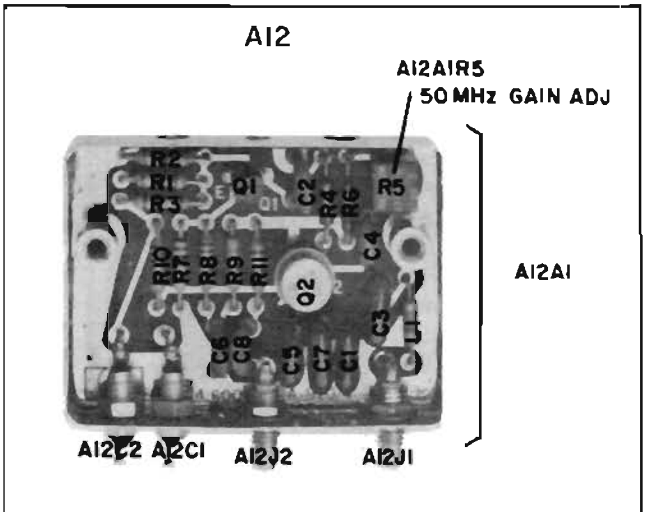


Figure 8-24. 50 MHz Amplifier A12, Component Locations

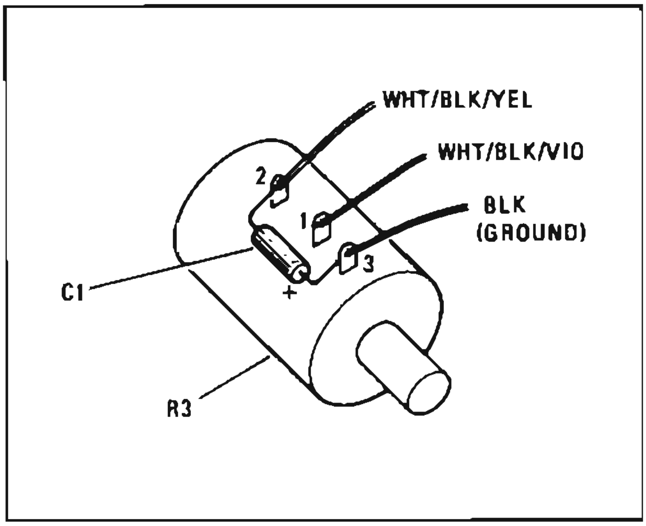
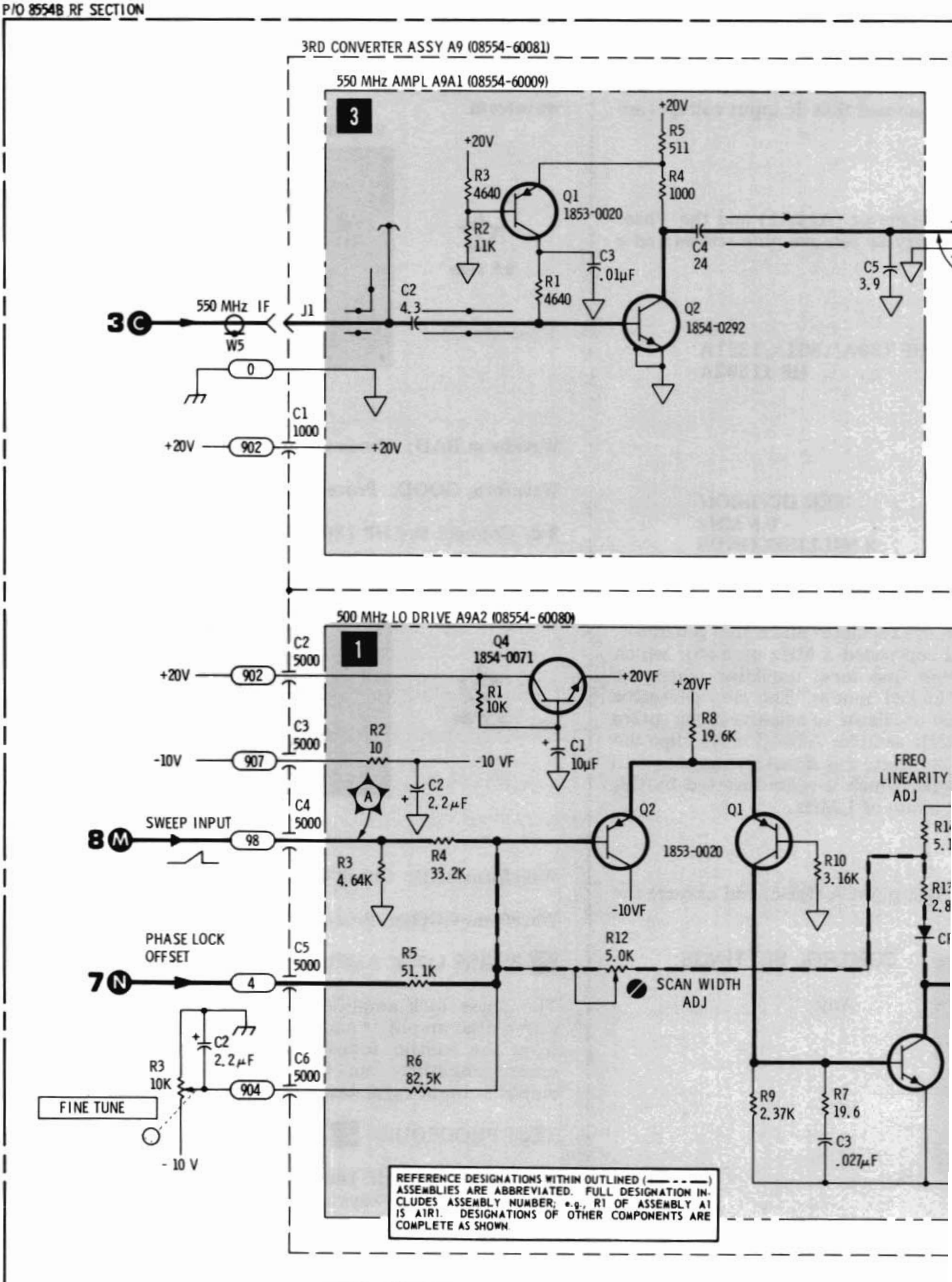
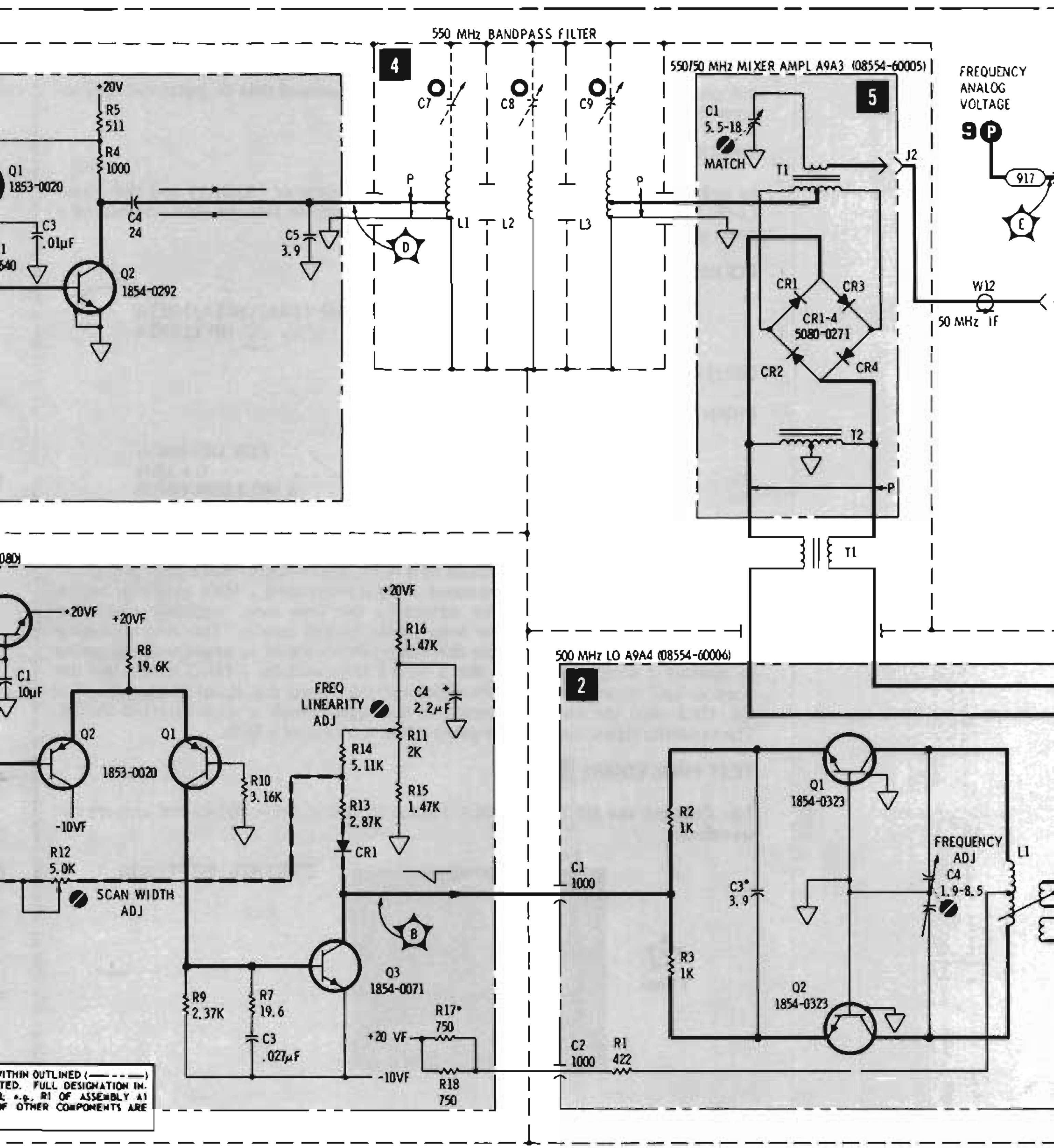


Figure 8-25. R3 Wiring Connections

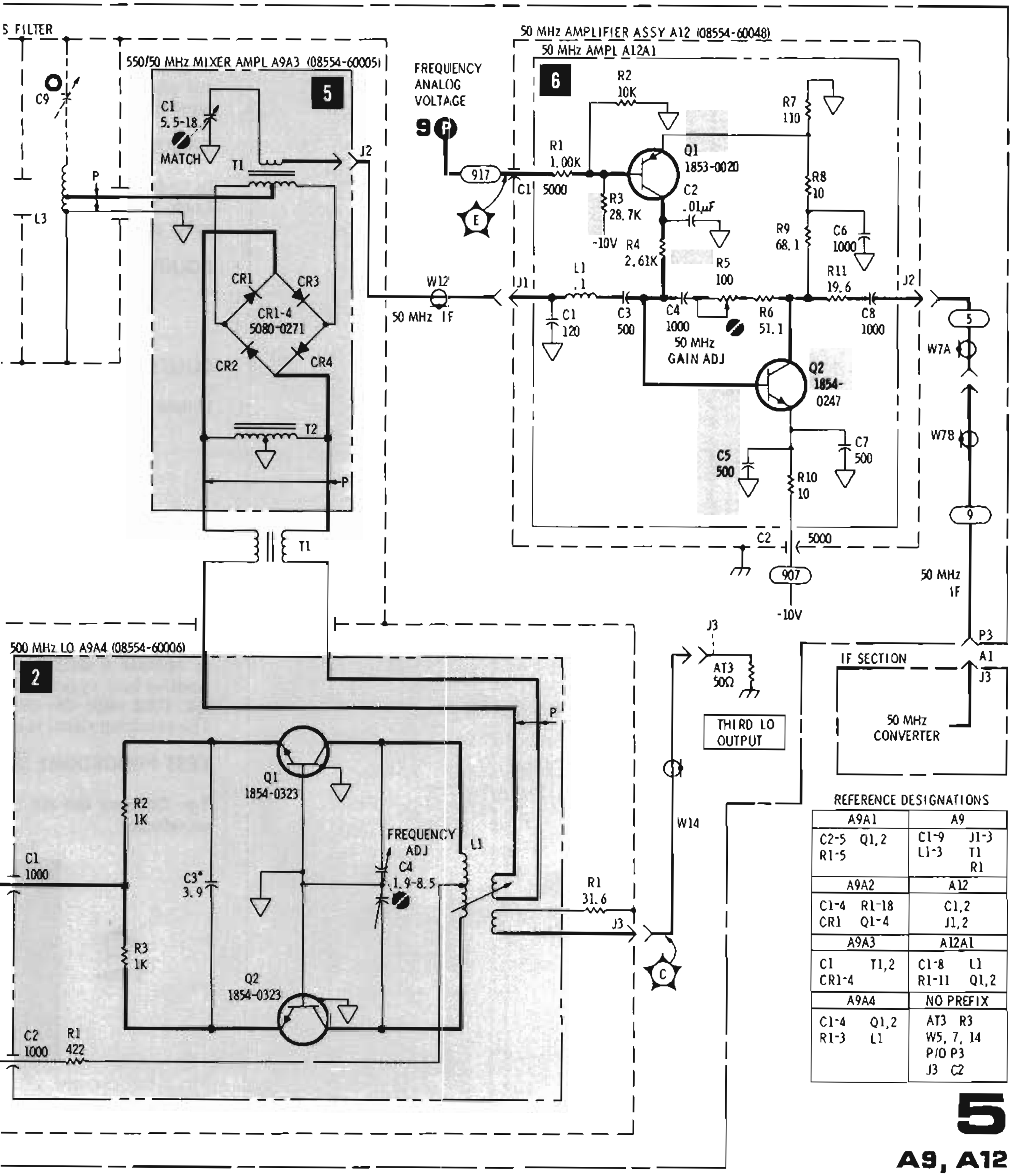


REFERENCE DESIGNATIONS WITHIN OUTLINED (— - - —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

SERIAL PREFIX: 1245A



550 MHz BANDPASS FILTER
550/50 MHz MIXER AMPL A9A3 (08554-60005)
FREQUENCY ANALOG VOLTAGE
917
50 MHz IF
W12
J2
C1 5.5-18.5
MATCH
T1
CR1
CR2
CR3
CR4
CR1-4 5080-0271
T2
C7
C8
C9
L1
L2
L3
C5 3.9
C4 24
C3 .01µF
R5 511
R4 1000
+20V
Q1 1853-0020
Q2 1854-0292
+20VF
R8 19.6K
C1 10µF
Q2
Q1
1853-0020
-10VF
R12 5.0K
SCAN WIDTH ADJ
R10 3.16K
FREQ LINEARITY ADJ
R16 1.47K
C4 2.2µF
R11 2K
R14 5.11K
R13 2.87K
R15 1.47K
CR1
Q3 1854-0071
R9 2.37K
R7 19.6
C3 .027µF
R17* 750
R18 750
+20 VF
-10VF
500 MHz LO A9A4 (08554-60006)
C1 1000
C2 1000
R1 422
R2 1K
R3 1K
C3* 3.9
Q1 1854-0323
Q2 1854-0323
FREQUENCY ADJ
C4 1.9-8.5
L1
WITHIN OUTLINED (—— - - —)
TED. FULL DESIGNATION IN-
: e.g. R1 OF ASSEMBLY A1
F OTHER COMPONENTS ARE



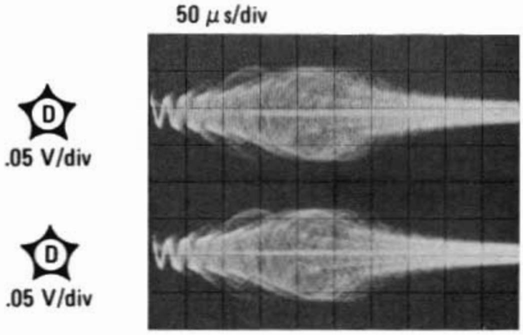
REFERENCE DESIGNATIONS

A9A1	A9
C2-5 Q1,2 R1-5	C1-9 J1-3 L1-3 T1 R1
A9A2	**A12**
C1-4 R1-18 CR1 Q1-4	C1,2 J1,2
A9A3	**A12A1**
C1 T1,2 CR1-4	C1-8 L1 R1-11 Q1,2
A9A4	**NO PREFIX**
C1-4 Q1,2 R1-3 L1	AT3 R3 W5, 7, 14 P/O P3 J3 C2

5

A9, A12

Figure 8-26. Third Converter: A9 and A12 Schematic Diagram



CONTROL SETTINGS:

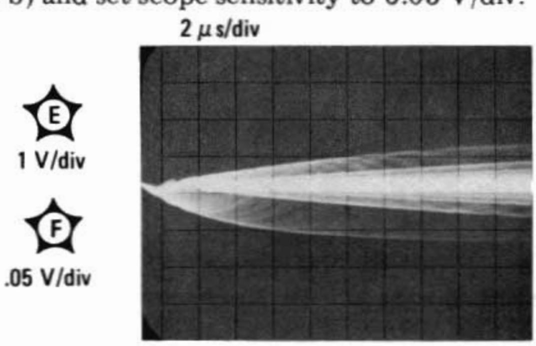
Same as basic.

If either or both of the waveforms are not present, the sampler is probably defective.

If waveforms are good, first disconnect the sampler input from the circulator; the waveforms should disappear. Next place the SCAN WIDTH PER DIVISION switch in the 200 kHz position; the waveforms should again disappear. If the waveform disappears when the circulator input is removed but not when the SCAN WIDTH PER DIVISION switch is set to 200 kHz, the phase lock circuit is defective. Proceed to 2-b.

2-b. Connect the HP 180A/1801A/1821A to Test Point E (Q4-e) and observe the waveform.

If the correct waveform is not present move the oscilloscope probe to Test Point F (Q2-b) and set scope sensitivity to 0.05 V/div.



CONTROL SETTINGS:

Same as basic

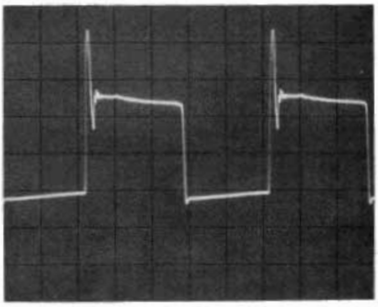
The waveform should be the same as shown above. If the waveform is correct at Test Point F but not at Test Point E, check Q2, Q3, Q4 and associated components. If the waveform is not present at Test Points E or F, trouble is probably in the sampler balance circuit, Q1, or associated components.

When the correct waveform appears at Test Point E momentarily remove the input to the sampler from the circulator; the waveform should disappear. Next momentarily place the SCAN WIDTH PER DIVISION switch in the 200 kHz position; the waveform should again disappear. If the waveform disappears when the circulator is disconnected but does not when the SCAN WIDTH PER DIVISION switch is set to 200 kHz, trouble is probably in the phase lock circuits shown on Service Sheet 7.

1-b. Connect the HP 180A/1801A/1821A to Test Point B (Q4-b) and observe the waveform.

0.2 μs/div

(B)
0.5 V/div



CONTROL SETTINGS:

Any

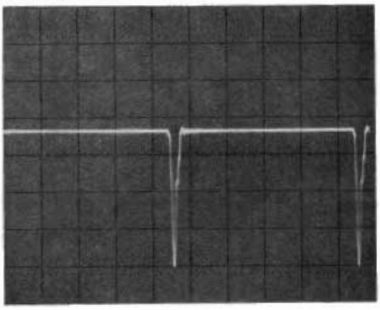
Waveform BAD: Check Q3 and associated components.

Waveform GOOD: Proceed to 1-c.

1-c. Connect the HP 180A/1801A/1821A to Test Point C and observe waveform.

0.2 μs/div

(C)
5 V/div



CONTROL SETTINGS:

Any

Waveform BAD: Check Q4 and associated components.

Waveform GOOD: Proceed to step 2.

2 PHASE LOCK AMPLIFIER ASSEMBLY A10A2

The phase lock amplifier assembly consists of a balancing circuit, a two stage differential amplifier and an emitter follower output stage. Feedback is employed from the emitter follower output stage to the input differential amplifier to ensure amplifier gain stability. Positive feedback from C5 compensates for amplifier input capacitance to increase gain bandwidth.

TEST PROCEDURE 2

2-a. Connect the HP 180A/1801A/1821A Channel A and B probes to Test Points D and observe the waveforms.

SERVICE SHEET 6

It is assumed that the analyzer is working properly in wide scan modes but will not phase lock in narrow scan modes. It is also assumed that dc input voltages are present and correct.

TROUBLESHOOTING PROCEDURE

In order to gain access to the Sampler Pulse Generator (A10A1) and the Phase Lock Amplifier (A10A2) assemblies it is necessary to remove nine screws and a cover plate under the RF Section.

EQUIPMENT REQUIRED

Oscilloscope	HP 180A/1801A/1821A
Service Kit	HP 11592A

CONTROL SETTINGS

Unless otherwise specified in individual tests.

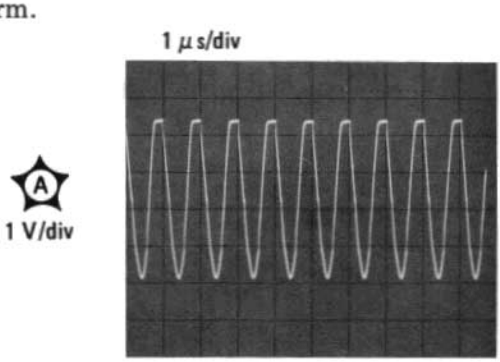
SCAN WIDTH	PER DIVISION
SCAN WIDTH PER DIVISION	0.5 MHz
SCAN TIME PER DIVISION	2 MILLISECONDS

1 SAMPLER PULSE GENERATOR ASSEMBLY A10A1

The sampler pulse generator consists of a reference oscillator and a step generator. The reference oscillator is a standard crystal controlled 1 MHz oscillator which provides the reference base for stabilizing the first local oscillator when the analyzer is operated in narrow scan phase locked modes. The step generator converts the 1 MHz output from the reference oscillator to negative-going spikes to operate a sampling gate in the 2 to 3.3 GHz sampler A10A3. CR1 clips the positive half cycles of the 1 MHz signal and Q3 inverts this signal and applies it to Q4. CR2 clips the negative portion of the signal which is again inverted by Q4. The resulting signal is a negative-going spike at a rate of 1 MHz.

TEST PROCEDURE 1

1-a. Connect the HP 180A/1801A/1821A to Test point A (Q1-c) and observe the waveform.



CONTROL SETTINGS:

Any

Waveform BAD: Check Q1, Q2, Y1 and associated components.

Waveform GOOD: Proceed to 1-b. Note that some clipping has occurred on the positive half of the sine wave. If it has not, CR1 is probably defective.

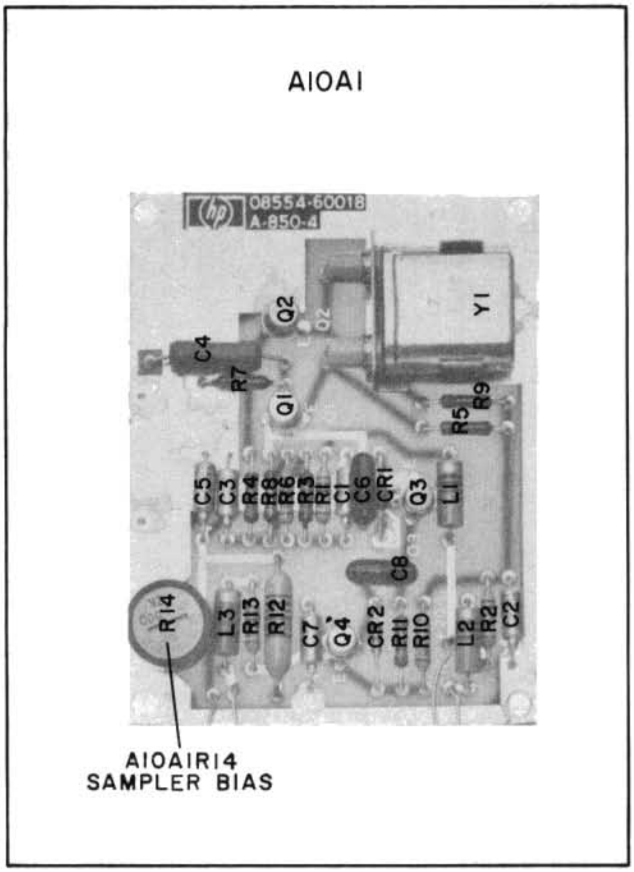


Figure 8-27 Sampler Pulse Generator A10A1, Component Locations

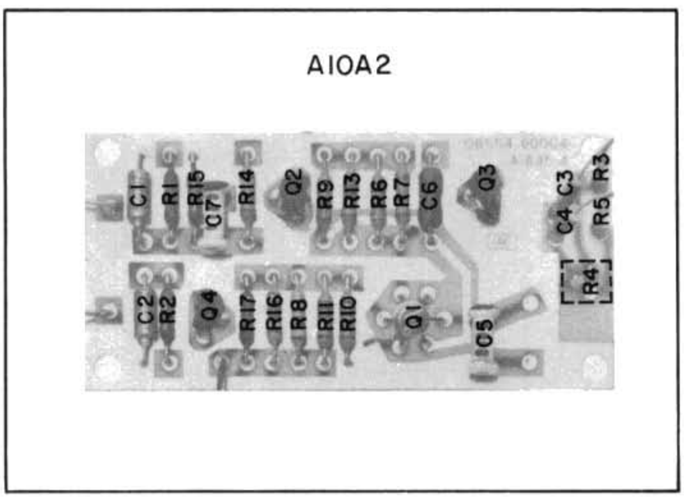


Figure 8-28. Phase Lock Amplifier Assembly A10A2, Component Locations

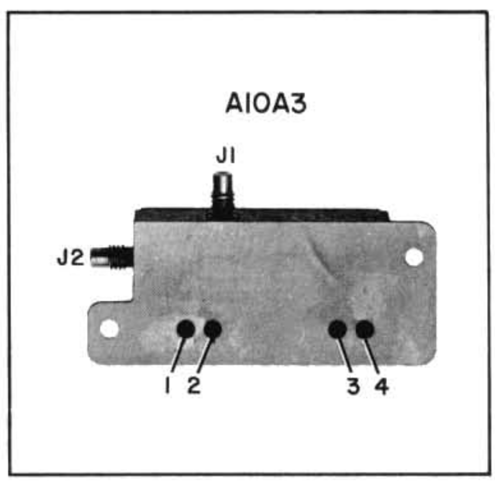
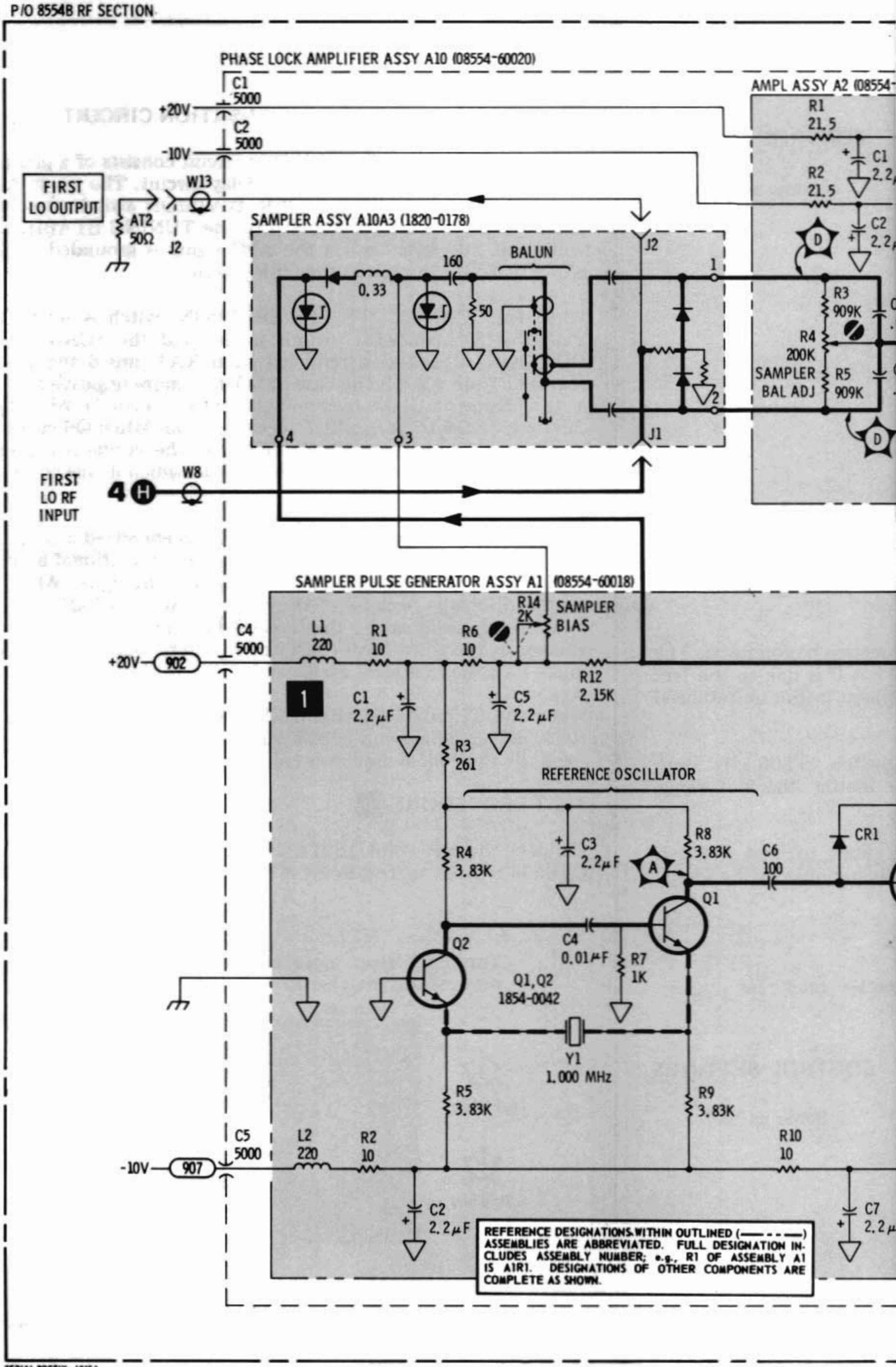
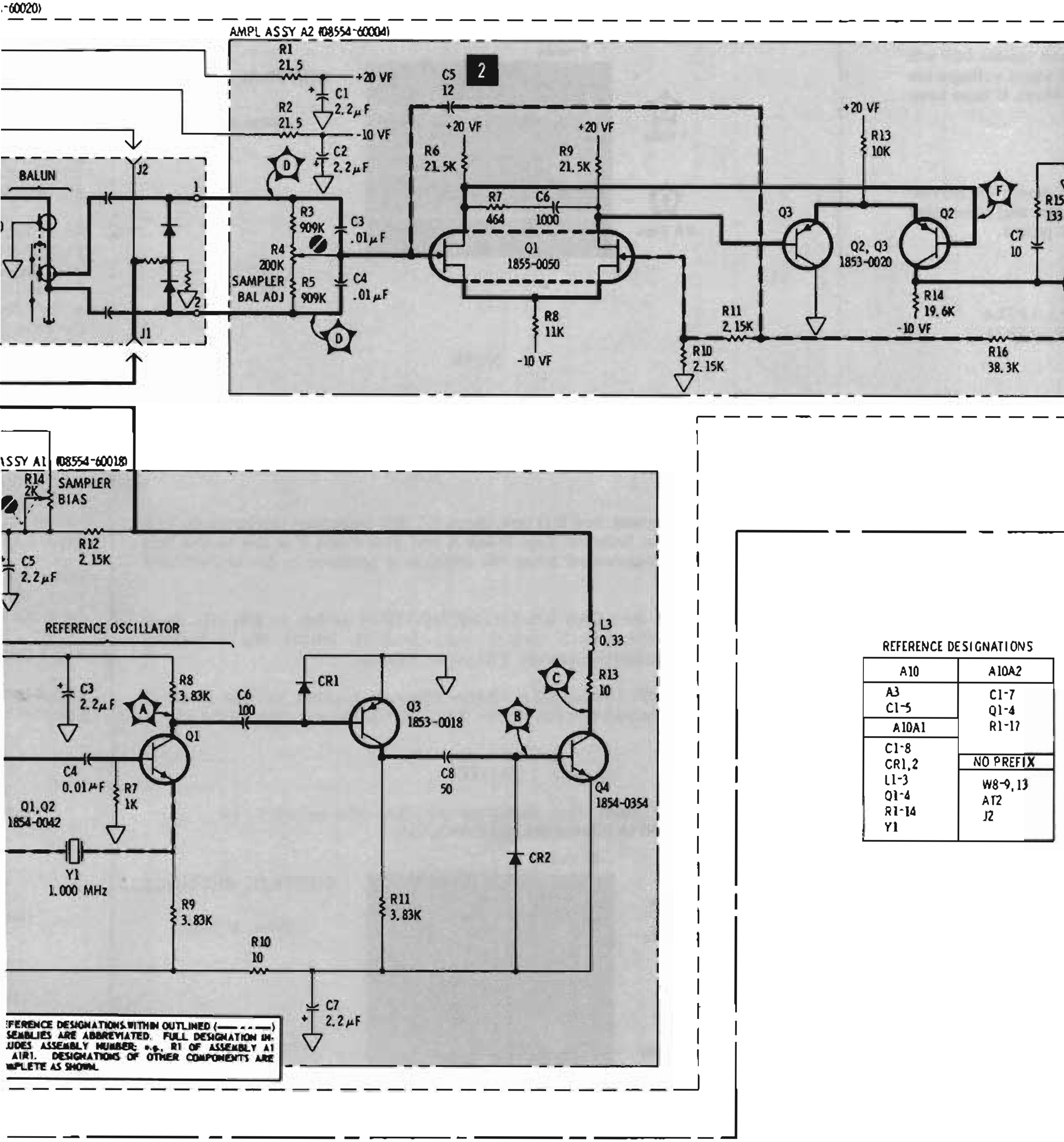


Figure 8-29. Sampler Assembly A10A3, Connector Identification

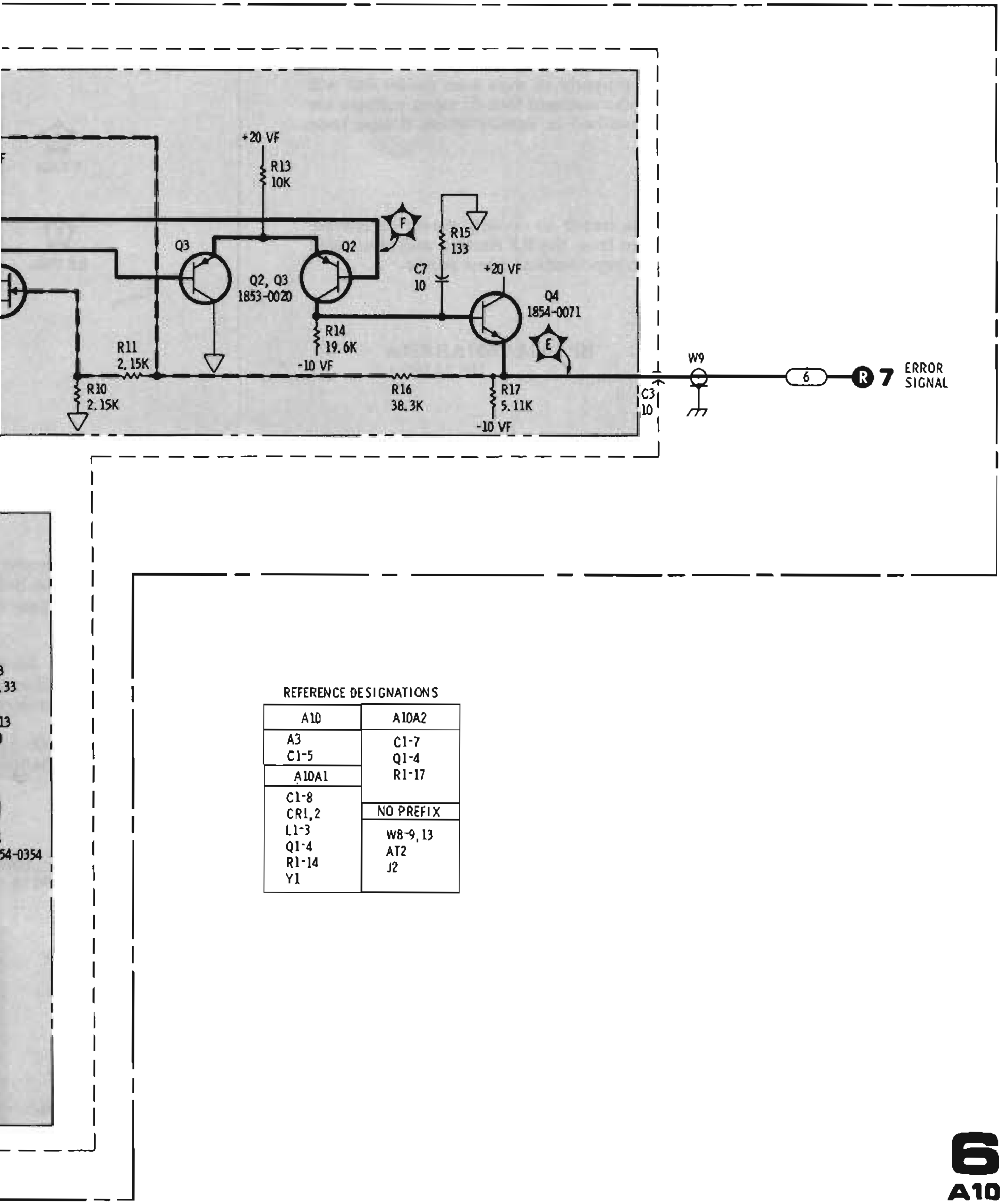

P/O 8554B RF SECTION
PHASE LOCK AMPLIFIER ASSY A10 (08554-60020)
C1 5000
+20V
C2 5000
-10V
FIRST LO OUTPUT
W13
AT2 50Ω
J2
AMPL ASSY A2 (08554-
R1 21.5
C1 2.2
R2 21.5
C2 2.2
SAMPLER ASSY A10A3 (1820-0178)
0.33
160
BALUN
50
R3 909K
R4 200K
SAMPLER BAL ADJ
R5 909K
J1
FIRST LO RF INPUT
W8
SAMPLER PULSE GENERATOR ASSY A1 (08554-60018)
R14 2K
SAMPLER BIAS
C4 5000
L1 220
R1 10
R6 10
+20V
902
C1 2.2μF
C5 2.2μF
R12 2.15K
R3 261
REFERENCE OSCILLATOR
R4 3.83K
C3 2.2μF
R8 3.83K
C6 100
CR1
Q1
Q2
C4 0.01μF
R7 1K
Q1, Q2 1854-0042
Y1 1.000 MHz
R5 3.83K
R9 3.83K
C5 5000
L2 220
R2 10
R10 10
-10V
907
C2 2.2μF
C7 2.2μ
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

A10	A10A2
A3 C1-5	C1-7 Q1-4 R1-17
A10A1	
C1-8 CR1,2 L1-3 Q1-4 R1-14 Y1	NO PREFIX W8-9, 13 AT2 J2

EFERENCE DESIGNATIONS WITHIN OUTLINED (— - - —) SEMBLIES ARE ABBREVIATED. FULL DESIGNATION IN- UDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE MPLETE AS SHOWN.



REFERENCE DESIGNATIONS

A10	A10A2
A3 C1-5	C1-7 Q1-4 R1-17
A10A1	NO PREFIX
C1-8 CR1,2 L1-3 Q1-4 R1-14 Y1	W8-9, 13 AT2 J2

6
A10

Figure 8-30. Phase Lock Reference and Sampler: A10 Schematic Diagram

SERVICE SHEET 7

It is assumed that the analyzer is working properly in wide scan modes but will not phase lock in narrow scan modes. It is also assumed that dc input voltages are present and correct and that the tests prescribed in Service Sheet 6 have been conducted with satisfactory results.

TROUBLESHOOTING PROCEDURE

When the cause of a malfunction has been traced to circuits shown on Service Sheet 7 the A4 assembly should be removed from the RF Section and reinstalled on the extender board to provide access to components and test points.

EQUIPMENT REQUIRED

Oscilloscope . . . . HP 180A/1801A/1821A
Service Kit . . . . HP 11592A

CONTROL SETTINGS

Unless otherwise specified in individual tests.

SCAN WIDTH . . . . PER DIVISION
SCAN WIDTH PER DIVISION . . . . 0.5 MHz
BANDWIDTH . . . . 30 kHz
SCAN TIME PER DIVISION . . . . 2 MILLISECONDS

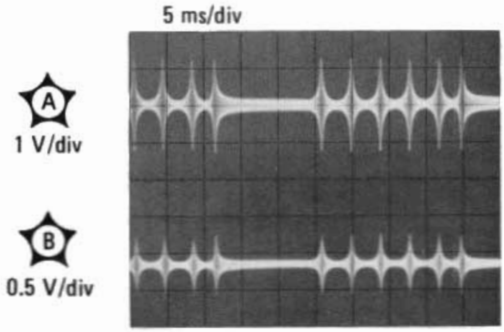
1 EQUALIZER-LIMITER-SEARCH LOOP

The equalizer-limiter-search loop provides the search and control function required to phase lock the first local oscillator when the analyzer is operated in the stabilized mode at narrow scan widths (2 to 200 kHz per division). When the analyzer is switched to a stabilized mode the search loop oscillates at a frequency of approximately 5 Hz. The search signal, approximately 0.6 Vp-p, is applied to the YIG power supply to sweep the first local oscillator ± 600 kHz. Since the lock points are 1 MHz apart (± 500 kHz), this ensures that the first local oscillator will be swept through a phase lock point. When a phase lock point is reached the output from the sampler, through the phase lock amplifier, ends the search function and the search oscillator ceases to oscillate.

After phase lock is accomplished any phase shift in the first local oscillator frequency, as compared to the reference signal, is "shaped" by the equalizer and applied to the YIG power supply and the FM coil in the YIG oscillator assembly. The YIG power supply compensates for low frequency shift and the FM coil compensates for high frequency shifts.

TEST PROCEDURE 1

1-a. Connect the HP 180A/1801A/1821A Channel A input to Test Point A (XA4-14) and the Channel B input to Test Point B (U1-10) and observe the waveforms.



CONTROL SETTINGS:

Same as basic.

NOTE

It may be necessary to vary the FREQUENCY control to obtain the correct waveform.

If neither waveform is present, trouble is probably in the phase lock amplifier. See Service Sheet 6.

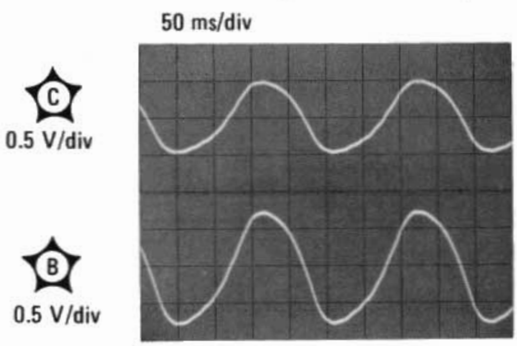
If waveform A is present and B is not, check U1 and associated components. The apparent loss in gain between Test Point A and Test Point B is due to the fact that Test Point 1 is grounded when the analyzer is operated in the unstabilized mode.

Momentarily switch the SCAN WIDTH PER DIVISION switch to 200 kHz. Both waveforms should disappear. If they do not, check the limiter, the lock range adjust setting and connections to the YIG power supply.

1-b. Connect the HP 180A/1801A/1821A Channel A input to Test Point C (XA4-13) and the Channel B input to Test Point B (U1-10) and observe the search signal.

NOTE

The signal from the circulator to the sampler must be disconnected to disable the phase lock loop.



CONTROL SETTINGS

Same as basic.

If both waveforms are missing check the search loop components. If signal at Test Point C is missing check the lock range adjust.

2 AUTOMATIC PHASE COMPENSATION CIRCUIT

The automatic phase compensation circuit consists of a phase lock memory offset amplifier and a phase lock offset delay circuit. The input APC signal is grounded through the SCAN WIDTH PER DIVISION switch at settings of 0.5 MHz or greater regardless of the position of the TUNING STABILIZER switch. For scan widths of 200 kHz or less the APC signal is grounded only when the TUNING STABILIZER switch is in the OFF position.

When the SCAN WIDTH PER DIVISION switch is set to 200 kHz or less, the TUNING STABILIZER switch is on, and the SCAN WIDTH is set to PER DIVISION, a ground is removed from XA4 pins 5 and 12. When the ground is removed from XA4-5 the base of Q5 goes more negative and Q5 is cut off as soon as the charge on C10 is overcome (about 0.5 second). When Q5 is cut off it causes the base of Q6 to go positive to cut off Q6. When Q6 cuts off the relay contacts of Q1 open and the dc level present at the contacts remains stored on C11 to maintain conduction of Q1 at the level at which it was conducting when the relay contacts opened.

During the 0.5 second time that relay Q1 is energized after initiation of the phase lock cycle, the APC signal is processed by operational amplifier Q2/Q3/Q4 and applied to C11 which charges to the level of the signal. When relay K1 opens, C11 cannot discharge because of the high impedance of Q1. The output of Q1 is held at a level determined by the level of the charge on C11 and is applied as an offset voltage to the third local oscillator to compensate for frequency shift required to phase lock the first local oscillator.

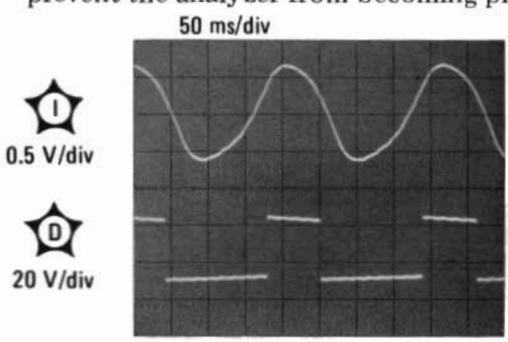
When the TUNING STABILIZER is OFF the system is no longer phase locked. Relay K1 energizes and allows C11 to discharge. This removes the offset voltage from the third local oscillator control circuits.

TEST PROCEDURE 2

Connect the HP 180A/1801A/1821A Channel A input to Test Point 1 and the Channel B input to Test Point D (Q4-c) and observe the waveforms.

NOTE

> The circulator must be disconnected from the sampler to prevent the analyzer from becoming phase locked.



CONTROL SETTINGS:

SCAN WIDTH PER DIVISION: 200 kHz

If waveform at Test Point D is missing check Q2/Q3/Q4 and associated components.

Phase Lock Reference and Sampler: A10

◀ SERVICE SHEET 6

SERVICE SHEET 7 (cont'd)

If correct waveforms are present and the analyzer still will not phase lock when the circulator is reconnected, check Q1 and the third local oscillator control circuits (Service Sheet 5).

NOTE

If any of the circuits shown on this Service Sheet are repaired, the procedures specified in paragraphs 5-32 through 5-35 should be performed.

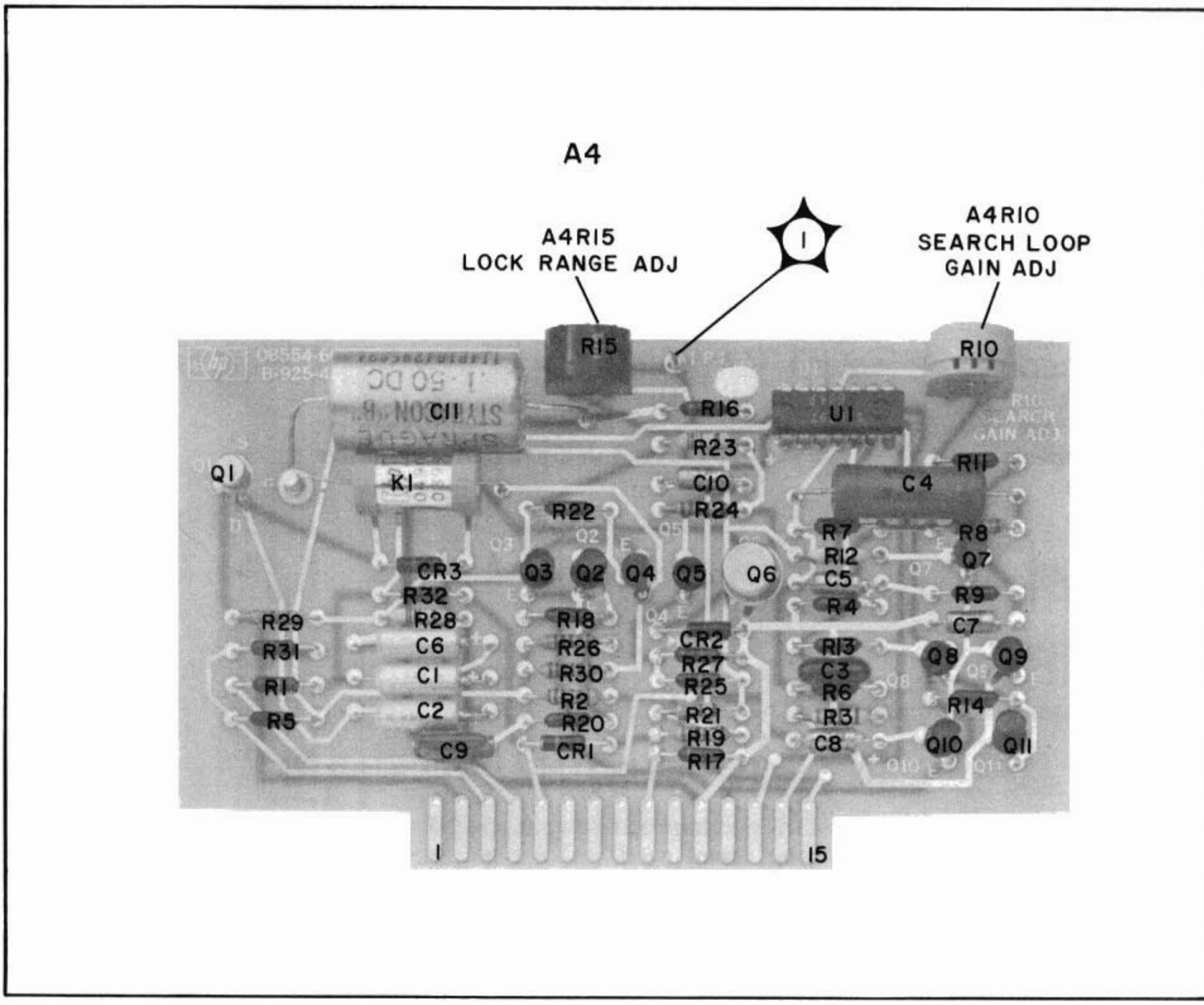
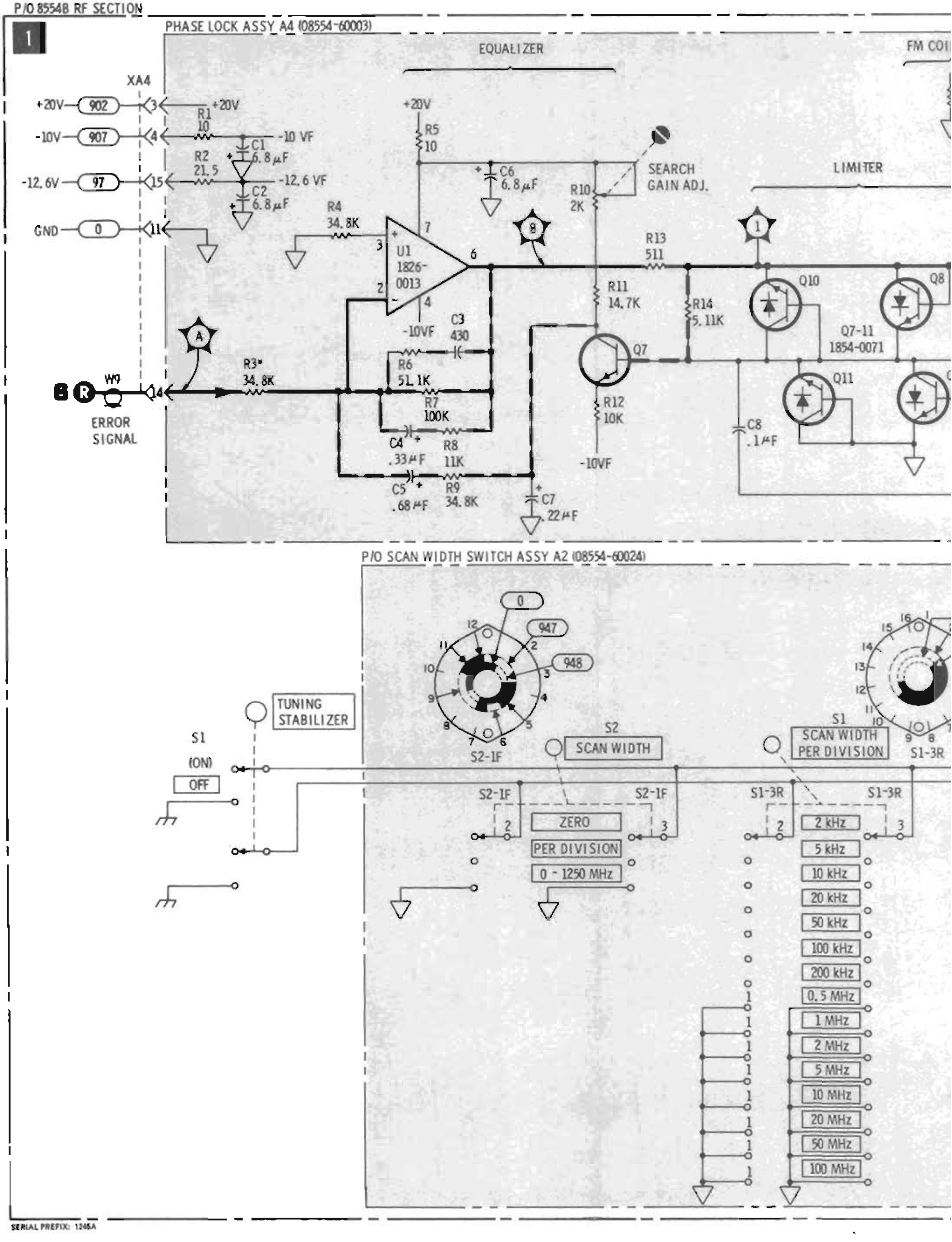
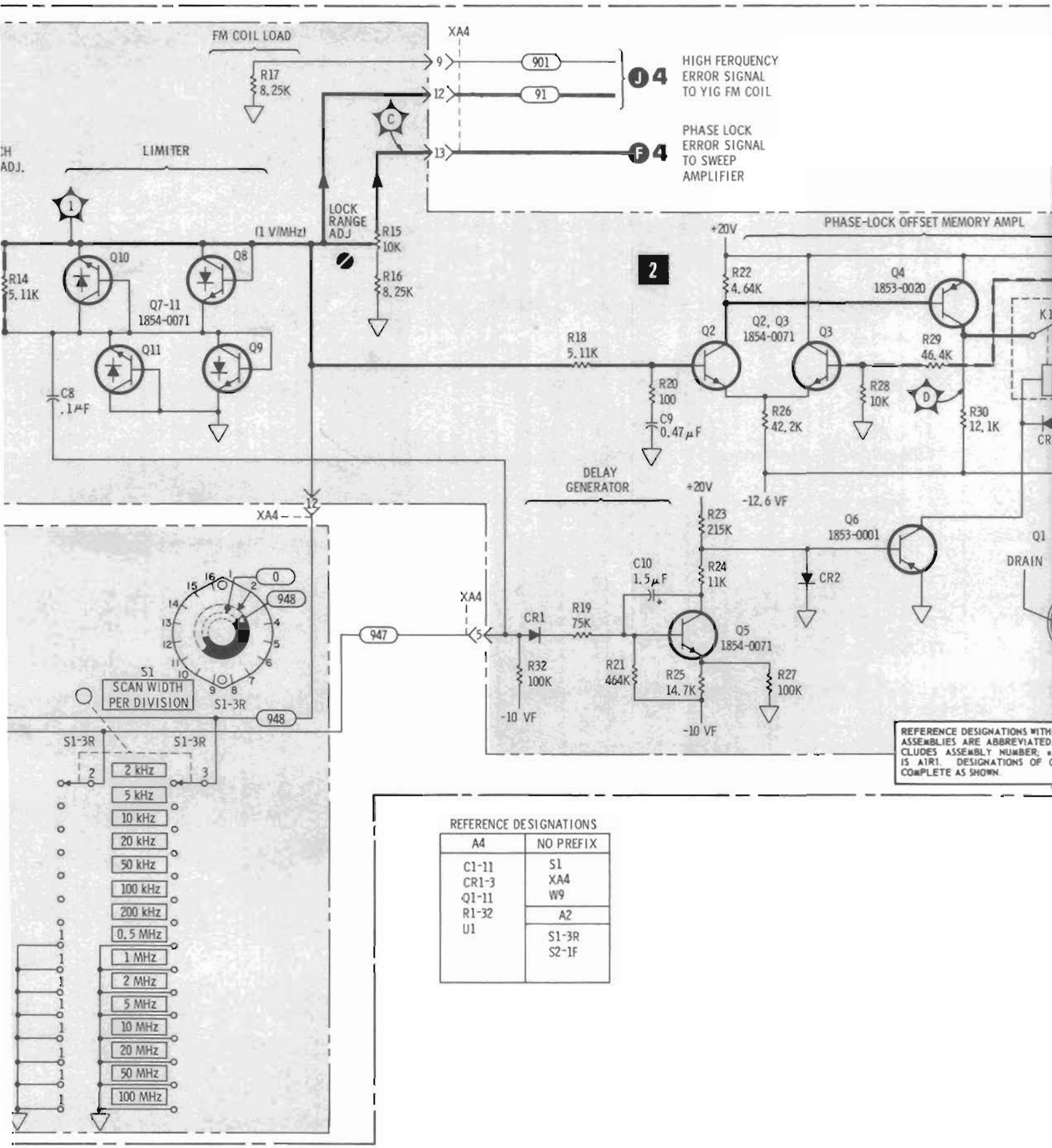


Figure 8-31. Search Loop and Phase Lock Memory Amplifier A4, Component Locations

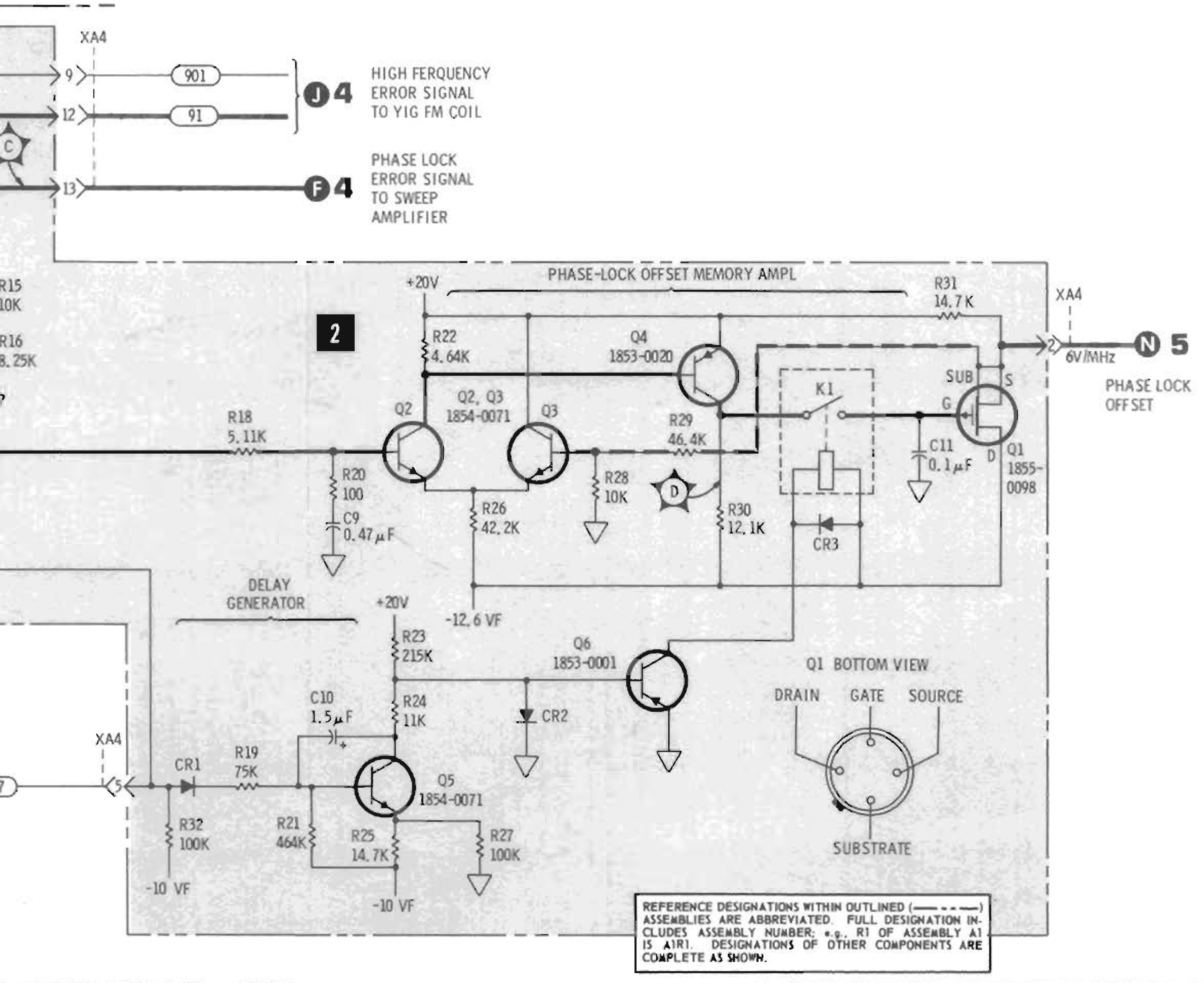

1
PHASE LOCK ASSY A4 (08554-60003)
EQUALIZER
FM COI
XA4
+20V
902
-10V
907
-12.6V
97
GND
0
+20V
R1
10
-10 VF
C1
6.8μF
R2
21.5
-12.6 VF
C2
6.8μF
R4
34.8K
+20V
R5
10
C6
6.8μF
SEARCH
GAIN ADJ.
R10
2K
LIMITER
U1
1826-
0013
-10VF
C3
430
R13
511
R11
14.7K
R14
5.11K
Q10
Q8
Q7-11
1854-0071
Q7
Q11
R3*
34.8K
R6
51.1K
R7
100K
C4
.33μF
R8
11K
C5
.68μF
R9
34.8K
C7
22μF
R12
10K
-10VF
C8
.1μF
W9
ERROR
SIGNAL
P/O SCAN WIDTH SWITCH ASSY A2 (08554-60024)
0
947
948
S2-1F
TUNING
STABILIZER
S1
(ON)
OFF
S2
SCAN WIDTH
S1
SCAN WIDTH
PER DIVISION
S1-3R
S2-1F
S2-1F
S1-3R
S1-3R
ZERO
PER DIVISION
0 - 1250 MHz
2 kHz
5 kHz
10 kHz
20 kHz
50 kHz
100 kHz
200 kHz
0.5 MHz
1 MHz
2 MHz
5 MHz
10 MHz
20 MHz
50 MHz
100 MHz



REFERENCE DESIGNATIONS

A4	NO PREFIX
C1-11 CR1-3 Q1-11 R1-32 U1	S1 XA4 W9
	A2
	S1-3R S2-1F

Figure 8-32. S



REFERENCE DESIGNATIONS

A4	NO PREFIX
C1-11 CR1-3 Q1-11 R1-32 U1	S1 XA4 W9
	A2
	S1-3R S2-1F

7

A2,A4

Figure 8-32. Search Loop and Phase Lock Memory: A2 and A4 Schematic Diagram

SERVICE SHEET 8

It is assumed that trouble has been isolated to that portion of Scan Width Attenuator Assembly A2 shown on Service Sheet 8.

TROUBLESHOOTING PROCEDURE

Since there are no active components in the circuit to be repaired, the 8554B should be disconnected from the IF Section and the Display Section and an ohmmeter used for point-to-point measurements.

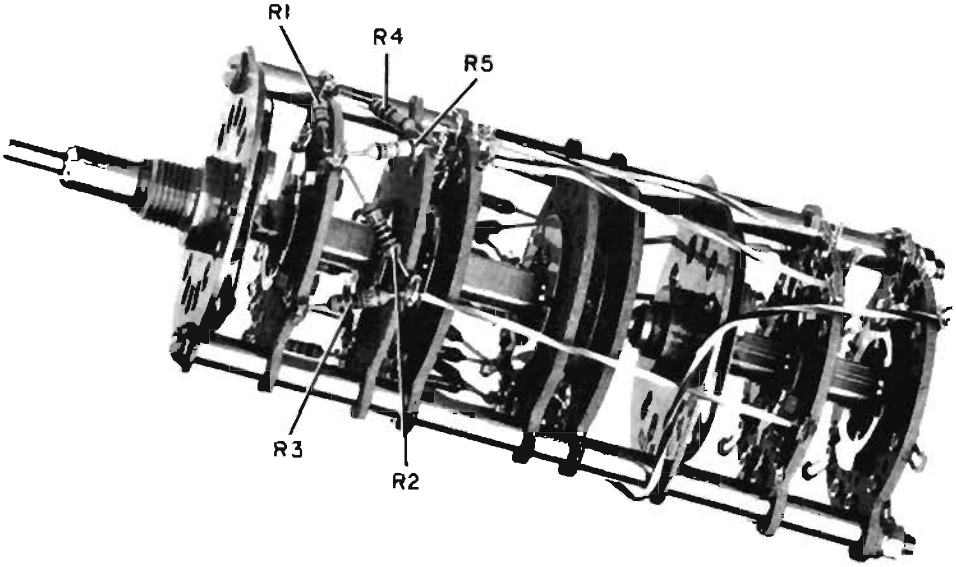
EQUIPMENT REQUIRED

Volt-Ohm-Ammeter . . . . HP 412A

TEST PROCEDURE

Since there are no active components in the circuit, a point-to-point resistance check with the HP 412A should quickly isolate defective components.

A2



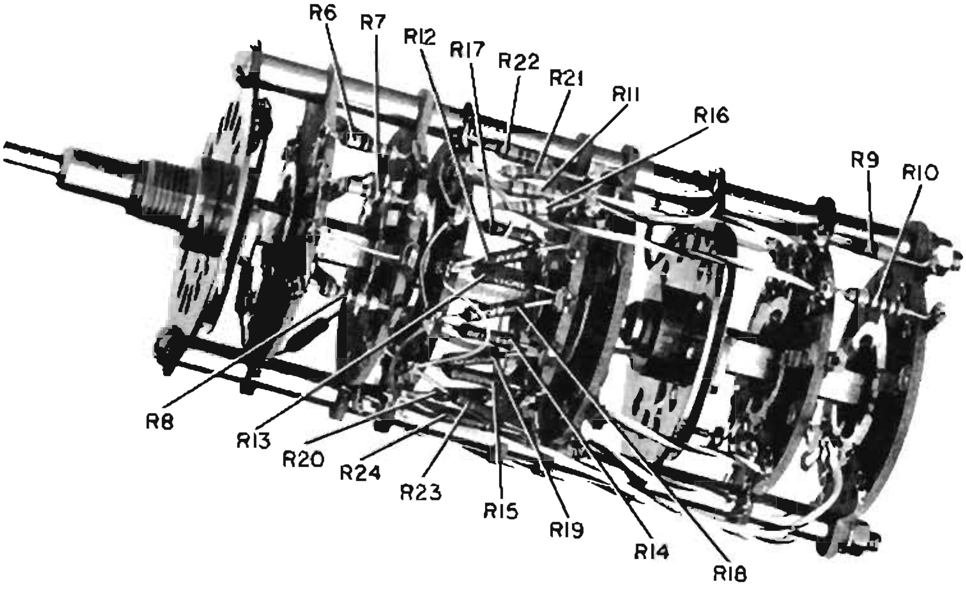
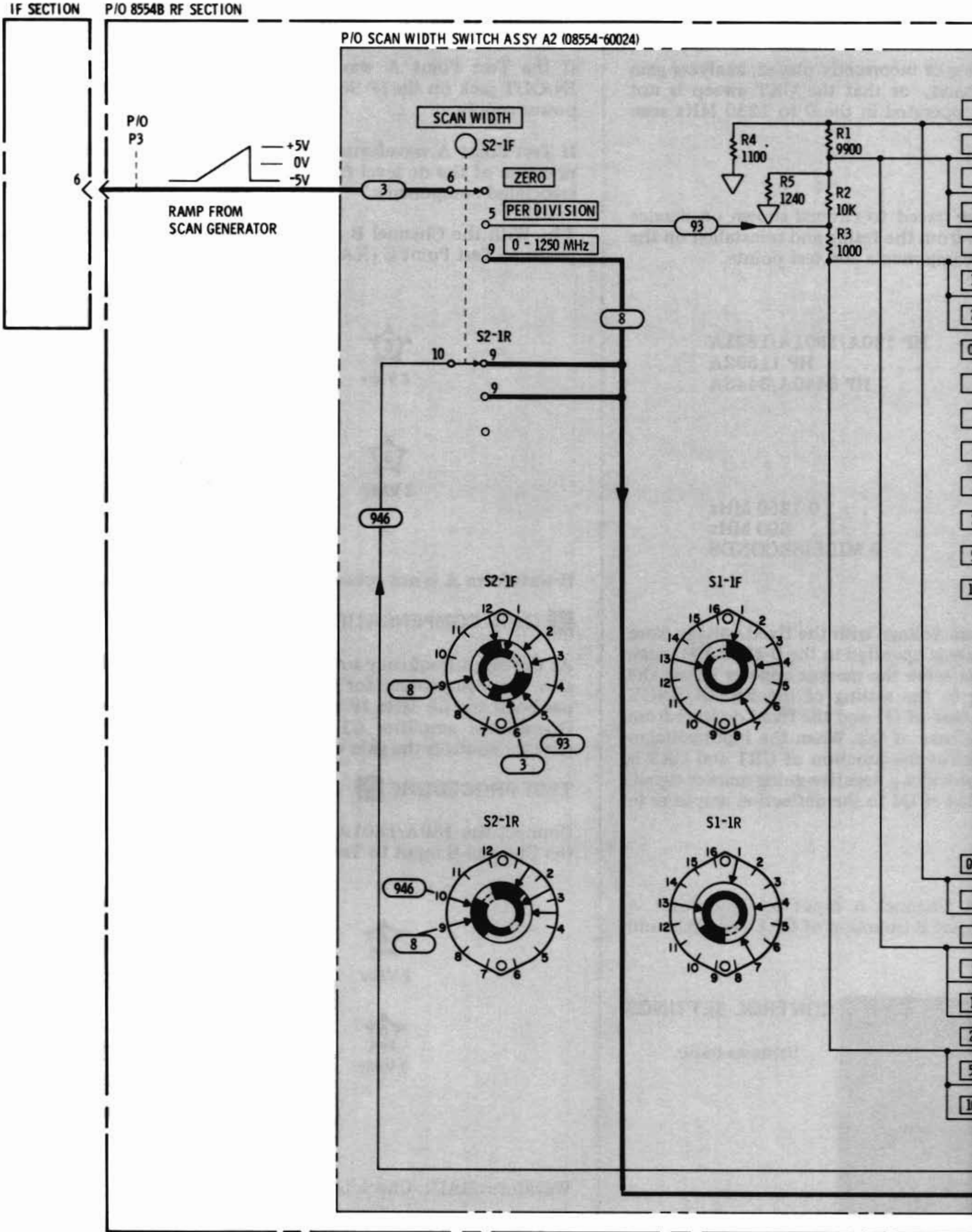
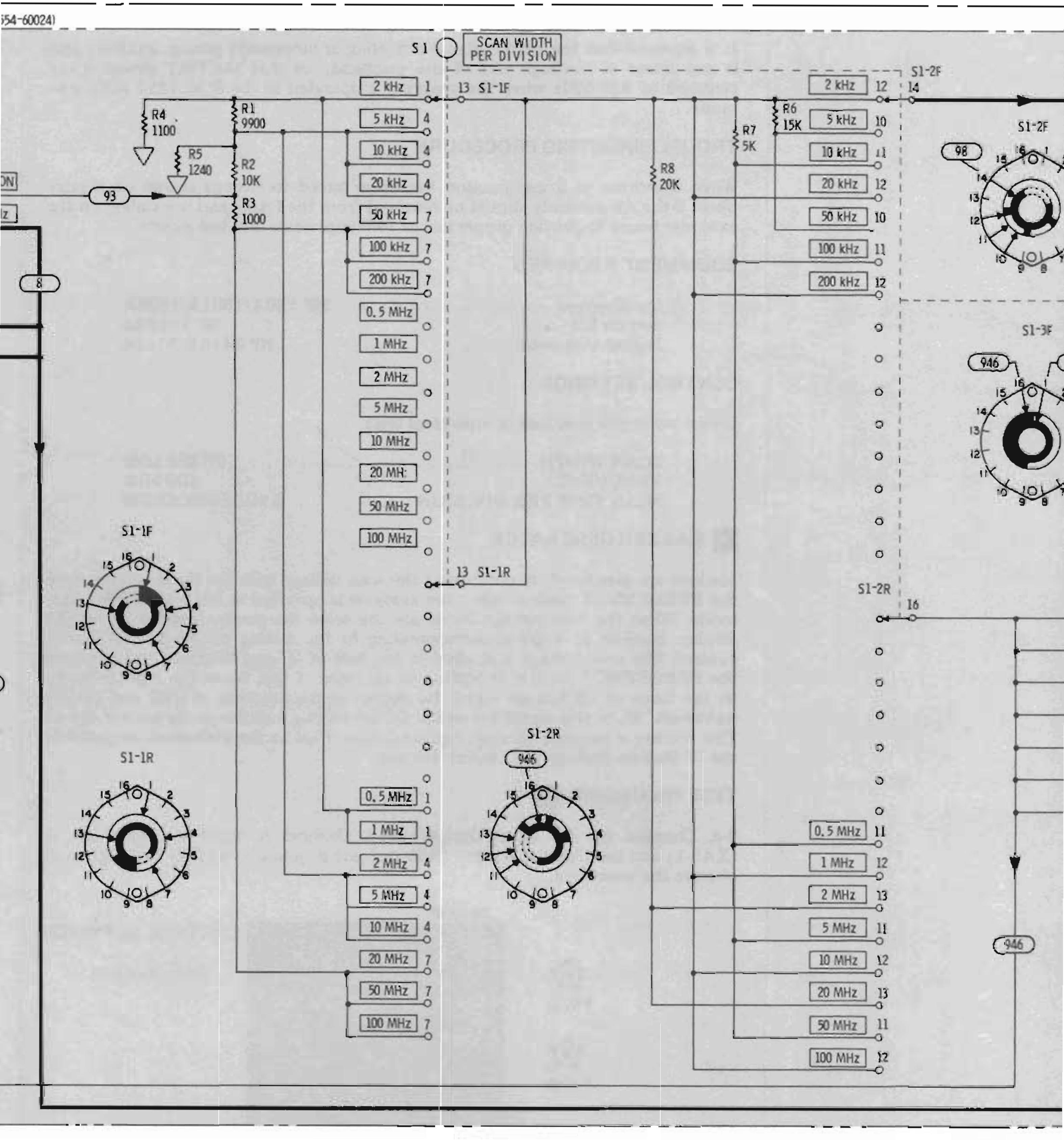


Figure 8-33. Scan Width Switch Assembly A2, Component Locations



SERIAL PREFIX: 1245A



54-60024)
S1
SCAN WIDTH PER DIVISION
S1-1F
S1-1R
S1-2F
S1-2R
S1-3F
R1 9900
R2 10K
R3 1000
R4 1100
R5 1240
R6 15K
R7 5K
R8 20K
93
8
98
946
2 kHz
5 kHz
10 kHz
20 kHz
50 kHz
100 kHz
200 kHz
0.5 MHz
1 MHz
2 MHz
5 MHz
10 MHz
20 MHz
50 MHz
100 MHz

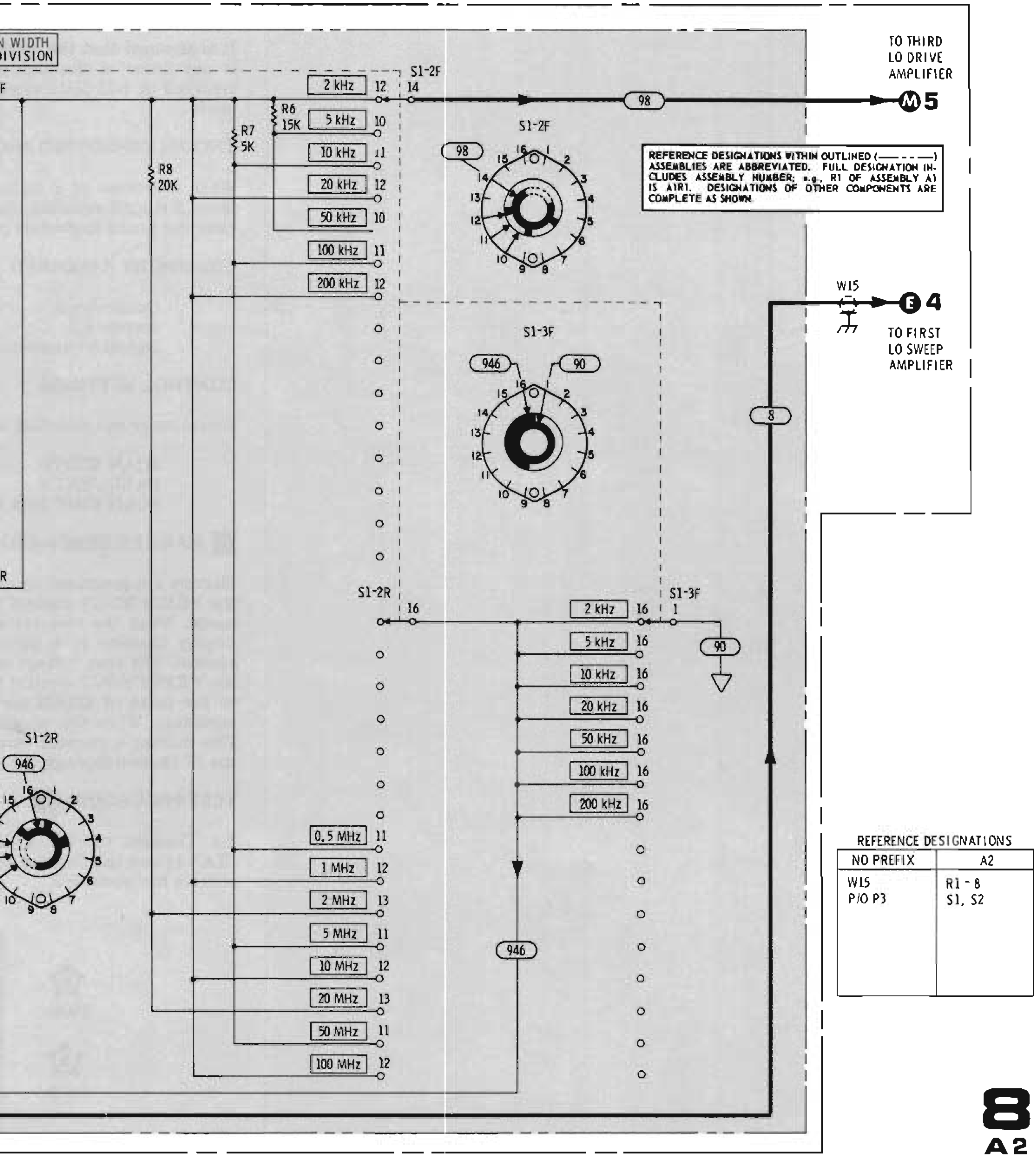


Figure 8-34. Scan Width Attenuator: A2 Schematic Diagram

SERVICE SHEET 9

It is assumed that the marker signal is missing or incorrectly placed, analyzer gain is not linear at the high end of the passband, or that the CRT sweep is not centered at 625 MHz when the analyzer is operated in the 0 to 1250 MHz scan mode.

TROUBLESHOOTING PROCEDURE

When the cause of a malfunction has been traced to circuits shown on Service Sheet 9 the A5 assembly should be removed from the frame and reinstalled on the extender board to provide proper access to components and test points.

EQUIPMENT REQUIRED

Oscilloscope	HP 180A/1801A/1821A
Service Kit	HP 11592A
Digital Voltmeter	HP 3440A/3443A

CONTROL SETTINGS

Unless otherwise specified in individual tests.

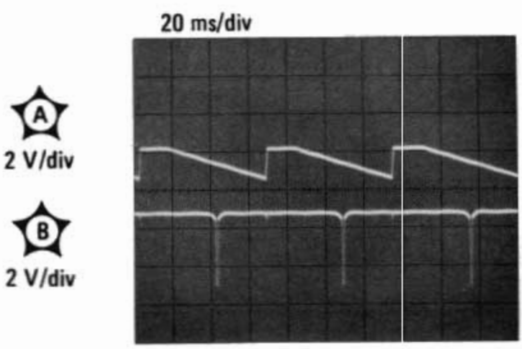
SCAN WIDTH	0-1250 MHz
FREQUENCY	600 MHz
SCAN TIME PER DIVISION	5 MILLISECONDS

1 MARKER GENERATOR

Markers are generated by comparing the scan voltage with the fixed voltage from the FREQUENCY control when the analyzer is operated in the 0-1250 MHz scan mode. When the two voltage levels are the same the marker appears below the display baseline at a point corresponding to the setting of the FREQUENCY control. The scan voltage is applied to the base of Q1 and the fixed dc level from the FREQUENCY control is applied to the base of Q2. When the input voltages to the bases of Q1/Q2 are equal the output at the junction of CR1 and CR3 is minimum. When this condition exists Q3 provides a negative-going marker signal. This marker is coupled through emitter-follower Q4 to the deflection amplifier in the IF Section through the Display Section.

TEST PROCEDURE 1

1-a. Connect the HP 180A/1801A/1821A Channel A input to Test Point A (XA5-1) and the Channel B input to Test Point B (junction of CR1 and CR3) and observe the waveform.



CONTROL SETTINGS:

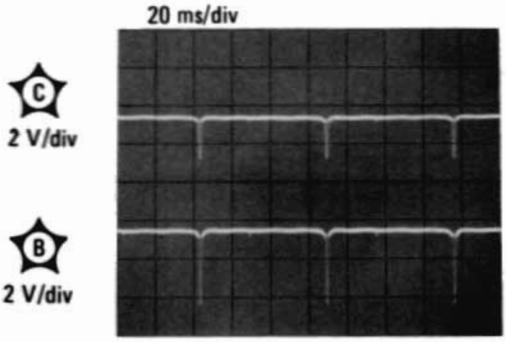
Same as basic.

SERVICE SHEET 9 (cont'd)

If the Test Point A waveform is missing, first check for scan ramp at SCAN IN/OUT jack on the IF Section, then check sweep and tune amplifiers in the YIG power supply.

If Test Point A waveform is correct the the Test Point B waveform is not, verify presence of the dc level from the FREQUENCY control, then check Q1/Q2 and associated components.

1-b. With the Channel B probe connected as in 1-a above, connect the Channel A probe to Test Point C (XA5-14) and observe the waveform.



CONTROL SETTINGS:

Same as basic.

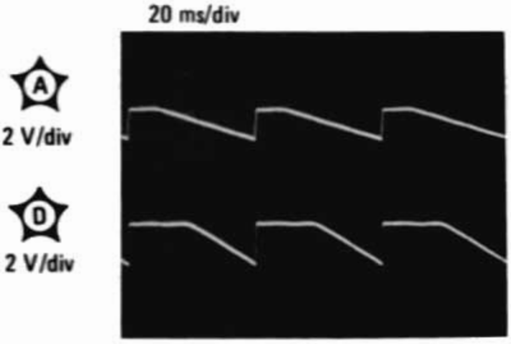
If waveform A is not present check Q3/Q4 and associated components.

2 GAIN COMPENSATION CIRCUIT

As the input frequency to the analyzer increases cabling and circuit losses increase also. To compensate for these losses and to make the analyzer flat across the passband the 50 MHz IF amplifier A12, gain is programmed by the sweep ramp. Operational amplifier U1 isolates the IF amplifier from the tuning ramp and directly controls the gain of the 50 MHz IF amplifier A12.

TEST PROCEDURE 2

Connect the 180A/1801A/1821A Channel A input to Test Point A (XA5-1) and the Channel B input to Test Point D (XA5-8) and observe the waveform.



CONTROL SETTINGS:

Same as basic

Waveform BAD: Check U1 and associated components.

Waveform GOOD: Proceed to step 3.

Scan Width Attenuator: A2

◀ SERVICE SHEET 8

SERVICE SHEET 9 (cont'd)

3 0-1250 MHz SCAN CENTER ADJUST

The scan center adjust circuit is a voltage divider which is used to center the scan ramp at 625 MHz when the analyzer is operated in the 0-1250 MHz scan mode.

TEST PROCEDURE 3

Connect the HP 3440A/3443A between ground and Test Point E (XA5-9). Note the initial reading, rotate R22 through its range, and return to initial setting. Voltage range should be about −2.6 to −3.6 volts.

4 47 MHz LOCAL OSCILLATOR DRIVE

R19 and R20 comprise a voltage divider which provides a dc level to maintain the frequency of the fourth local oscillator in the IF Section at a fixed frequency of 47 MHz. The output dc level at XA5-6 should be + 5.2 volts ± 0.15 volt.

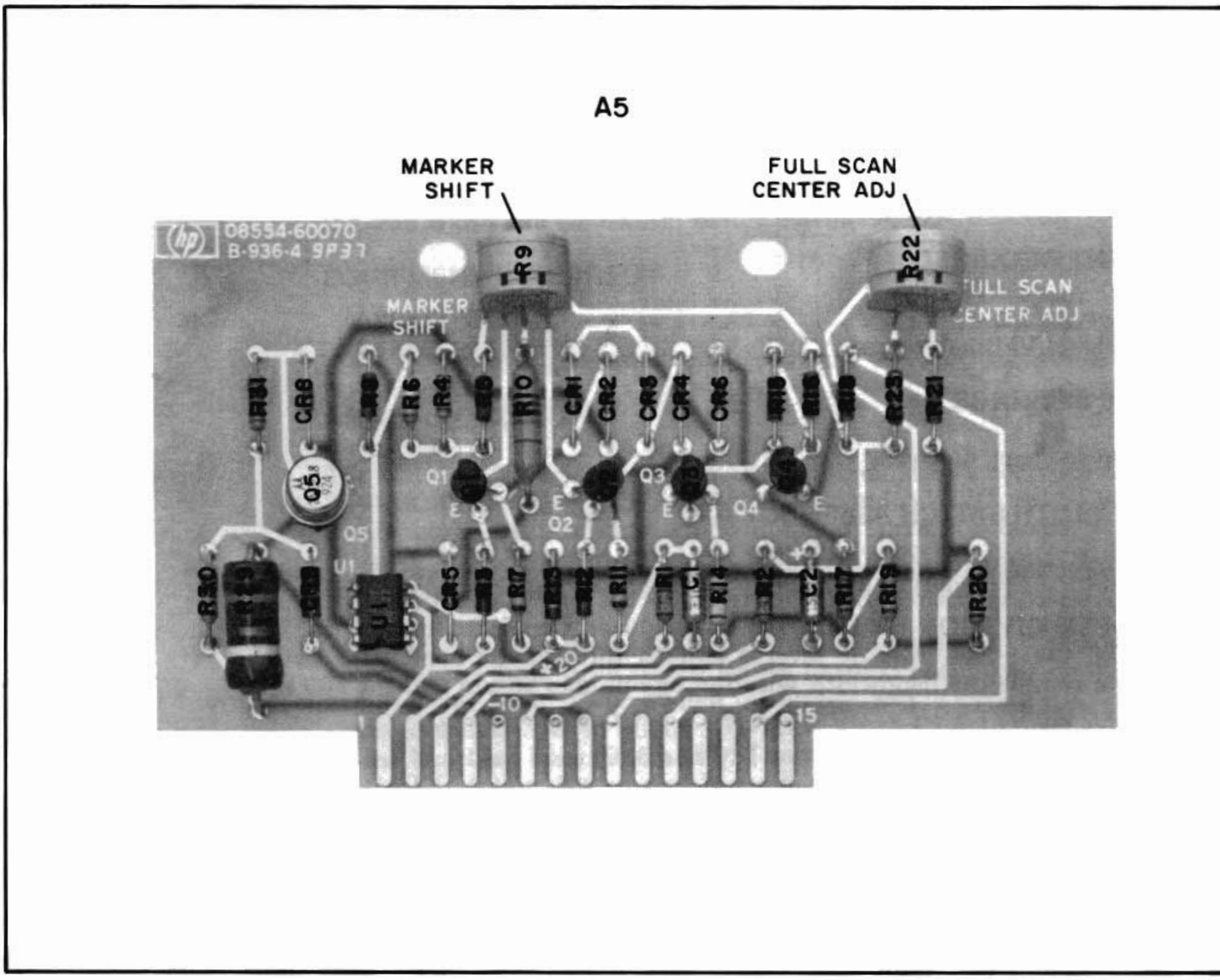
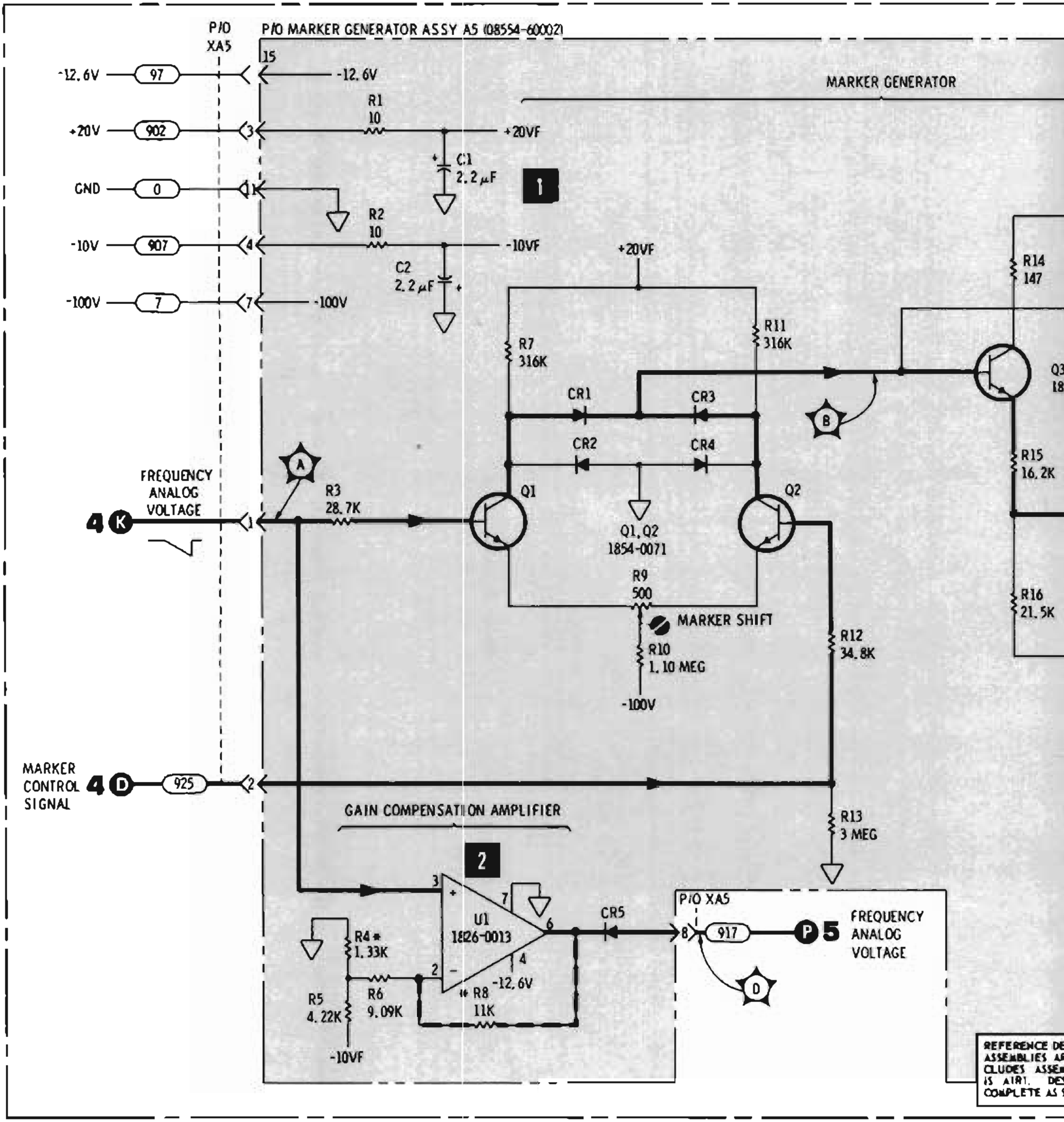


Figure 8-35. Marker Generator Assembly A5, Component Locations



P/O XA5
P/O MARKER GENERATOR ASSY A5 (08554-60002)
MARKER GENERATOR
-12.6V
97
+20V
902
GND
0
-10V
907
-100V
7
R1 10
+20VF
C1 2.2 µF
R2 10
-10VF
C2 2.2 µF
R14 147
R7 316K
R11 316K
CR1
CR3
CR2
CR4
Q1
Q2
Q1, Q2 1854-0071
R3 28.7K
FREQUENCY ANALOG VOLTAGE
4 K
R9 500
MARKER SHIFT
R10 1.10 MEG
R12 34.8K
R15 16.2K
R16 21.5K
MARKER CONTROL SIGNAL
4 D
925
GAIN COMPENSATION AMPLIFIER
R13 3 MEG
U1 1826-0013
R4* 1.33K
R5 4.22K
R6 9.09K
*R8 11K
-12.6V
CR5
P/O XA5
917
P 5
FREQUENCY ANALOG VOLTAGE

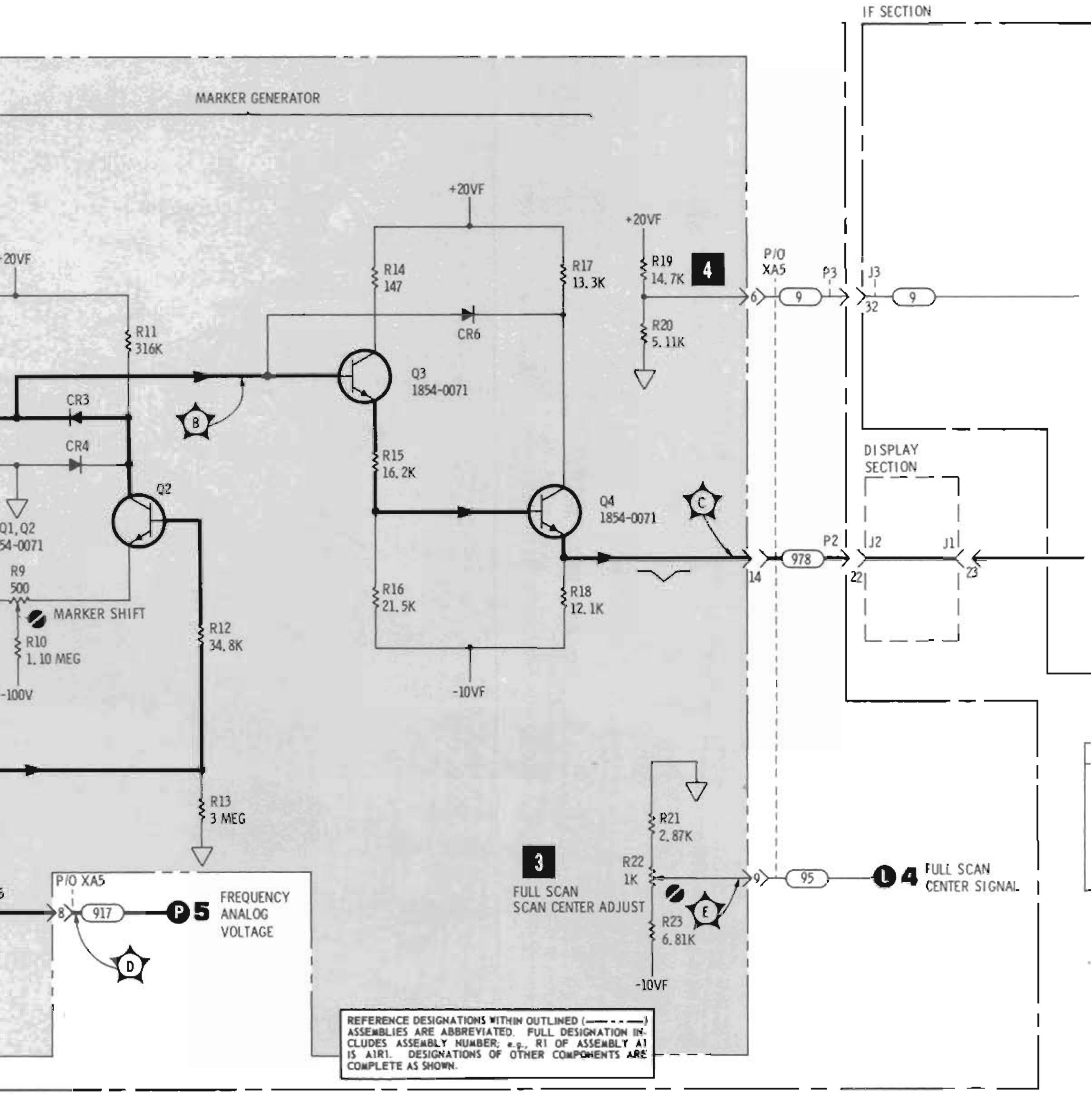
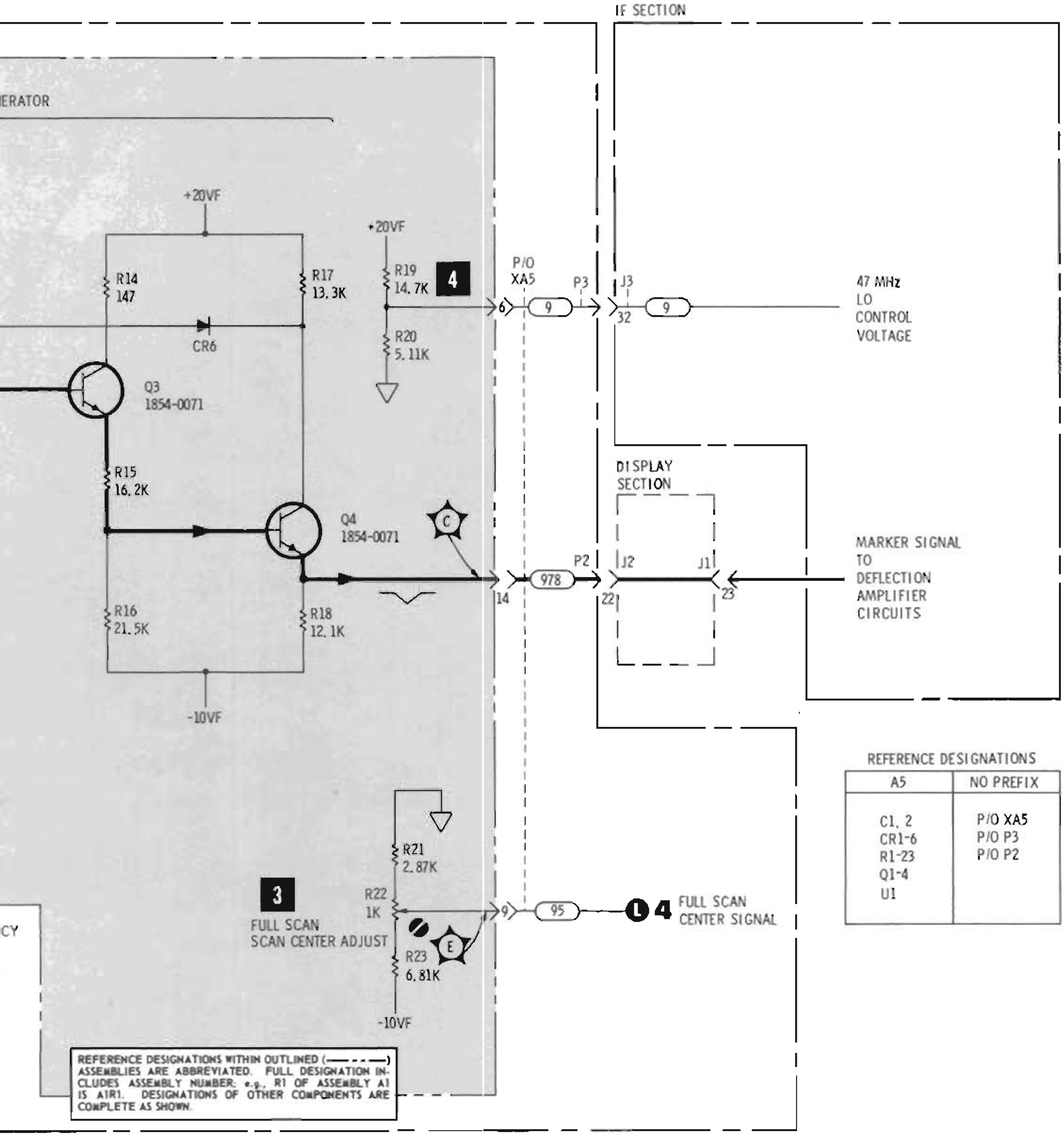

IF SECTION
MARKER GENERATOR
+20VF
+20VF
+20VF
R19
14.7K
4
P/O
XA5
P3
J3
32
9
9
R14
147
R17
13.3K
CR6
R11
316K
R20
5.11K
Q3
1854-0071
CR3
B
CR4
R15
16.2K
DISPLAY
SECTION
Q2
Q4
1854-0071
C
Q1, Q2
54-0071
P2
J2
J1
978
14
22
23
R9
500
R16
21.5K
R18
12.1K
MARKER SHIFT
R10
1.10 MEG
R12
34.8K
-100V
-10VF
R13
3 MEG
R21
2.87K
R22
1K
3
P/O XA5
FREQUENCY
ANALOG
VOLTAGE
917
P 5
FULL SCAN
SCAN CENTER ADJUST
95
L 4
FULL SCAN
CENTER SIGNAL
R23
6.81K
E
D
-10VF
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 8



9
A5

Figure 8-36. Marker Generator: A5 Schematic Diagram

SERVICE SHEET 10

Normally, malfunctions which occur in the switching circuits will be detected and corrected while troubleshooting the IF Section bandwidth circuits.

TROUBLESHOOTING PROCEDURE

Since these switches function for voltage switching only, all components and wiring can be checked by monitoring voltage levels at the input connectors to the IF Section Bandwidth Circuits.

EQUIPMENT REQUIRED

Service Kit . . . . HP 11592A
Digital Voltmeter . . . . HP 3440A/3443A

CONTROL SETTINGS

As required to check dc levels.

1 SCAN WIDTH SWITCH ASSEMBLY A2

The switch section shown provides −12.6 volts to the bandwidth switch assembly for use in selecting desired bandwidths when the analyzer is operated in the ZERO or PER DIVISION modes. When the analyzer is operated in the 0 to 1250 MHz mode, the −12.6 volt dc level is applied through the bandwidth switch assembly to disable the bandwidth selection circuits and ensure that the 300 kHz bandwidth is used.

TEST PROCEDURE 1

See step 2 .

2 BANDWIDTH SWITCH ASSEMBLY A1

This portion of the bandwidth switch assembly provides positive or negative voltages to various IF Section Components to add, bypass, or remove bandwidth shaping elements in the signal path.

TEST PROCEDURE 2

Use the HP 3440A/3443A Digital Voltmeter to verify switching voltages.

If all voltages are correct the portions of the SCAN WIDTH and BANDWIDTH switches shown are functioning properly.

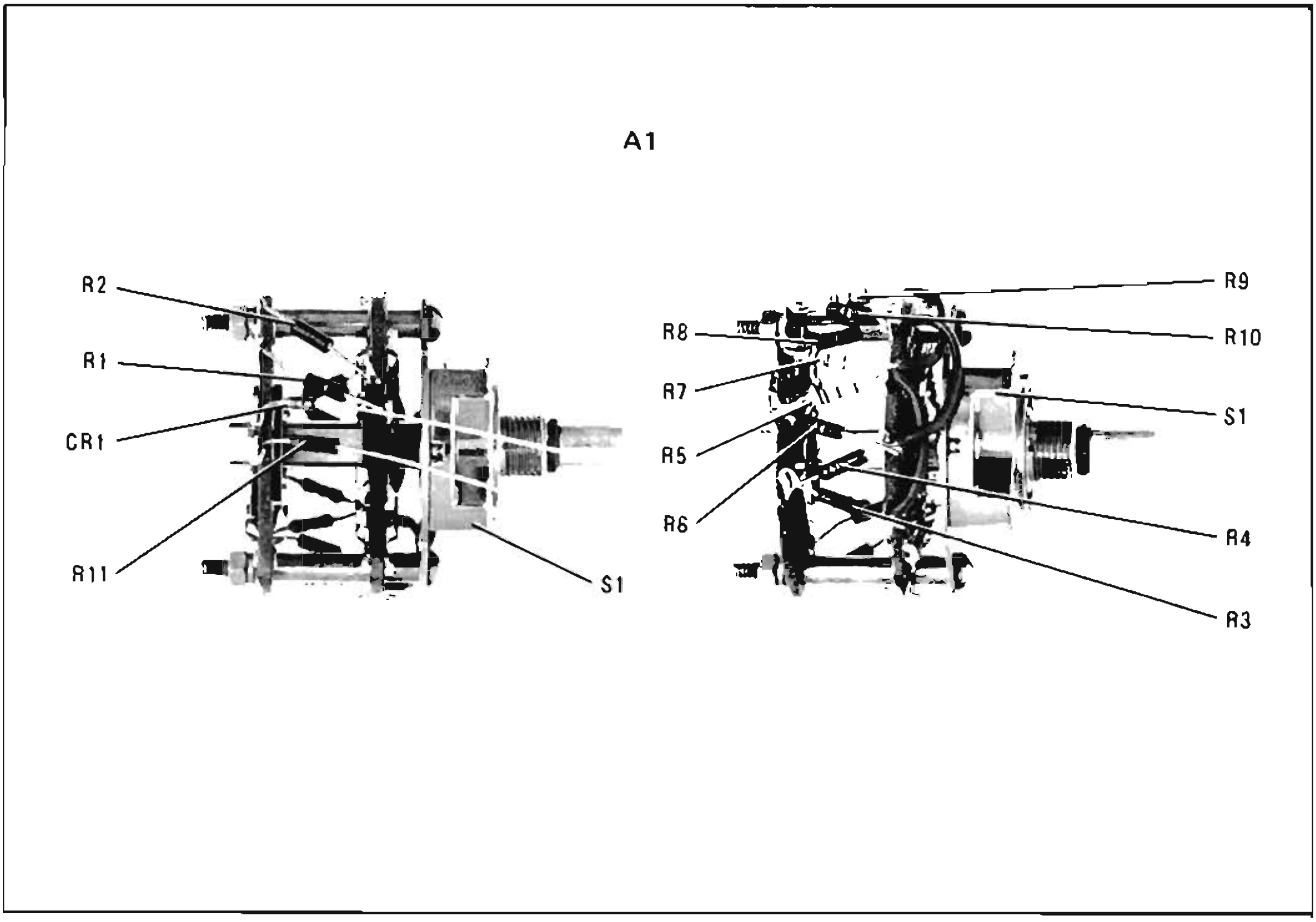
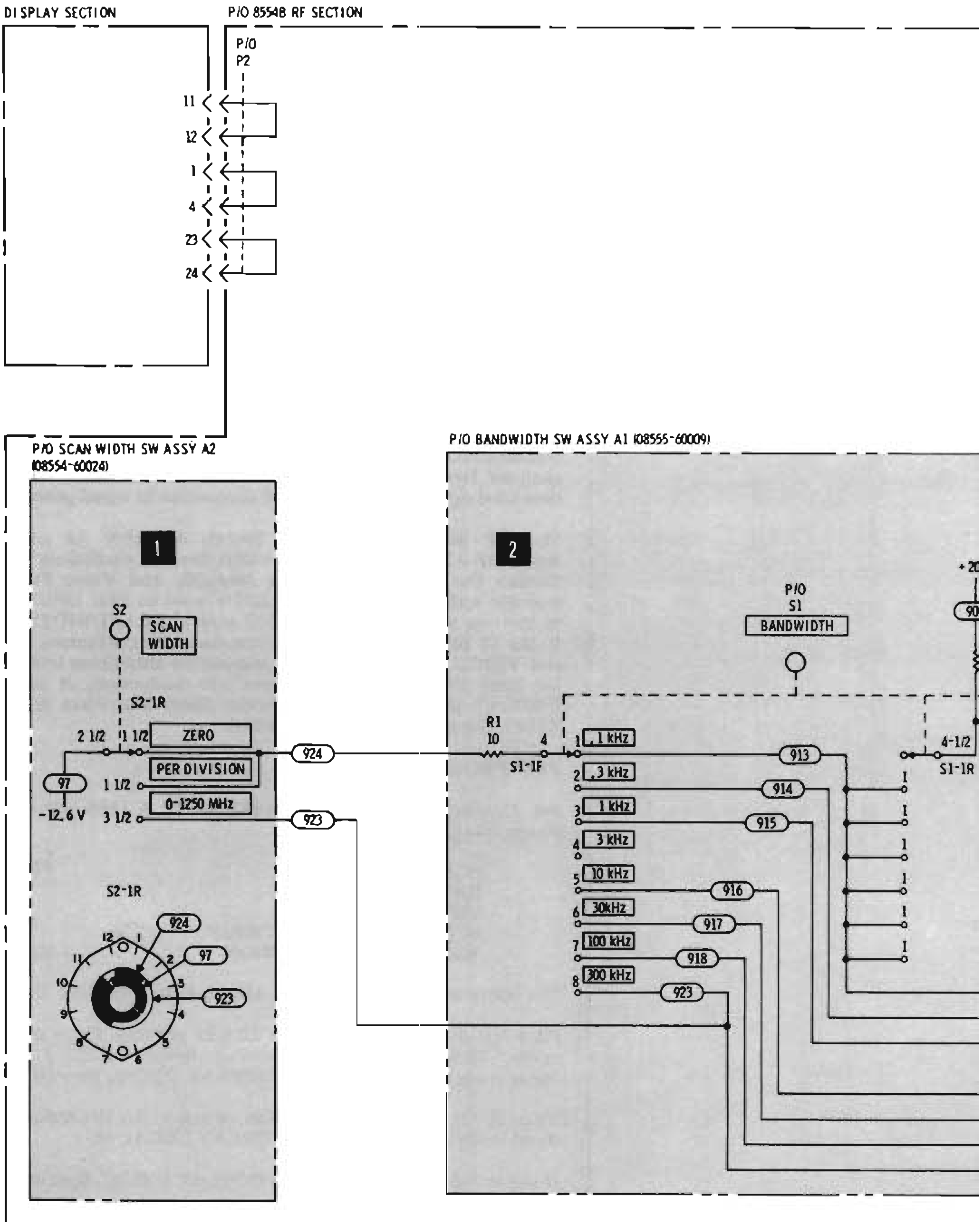
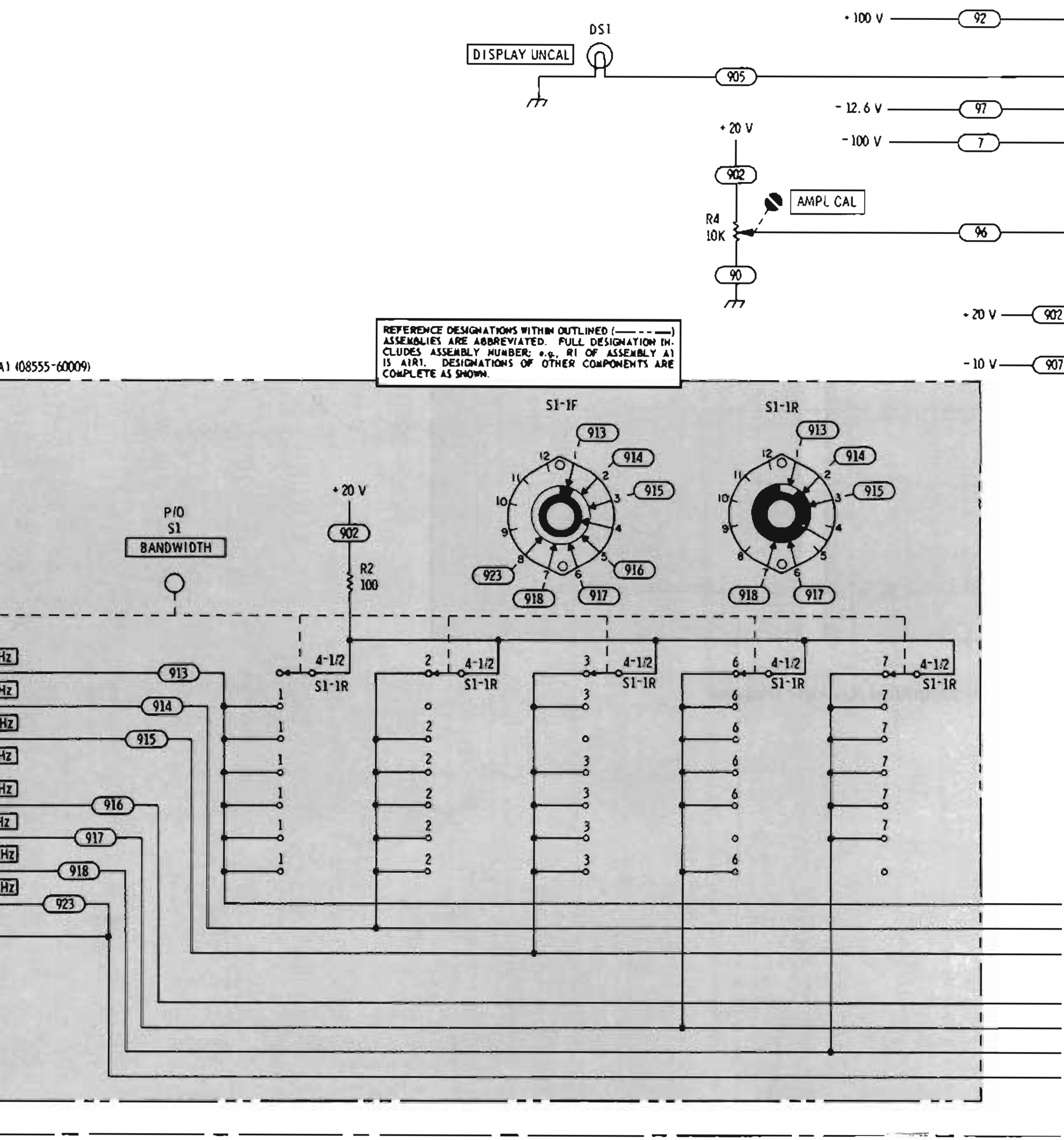


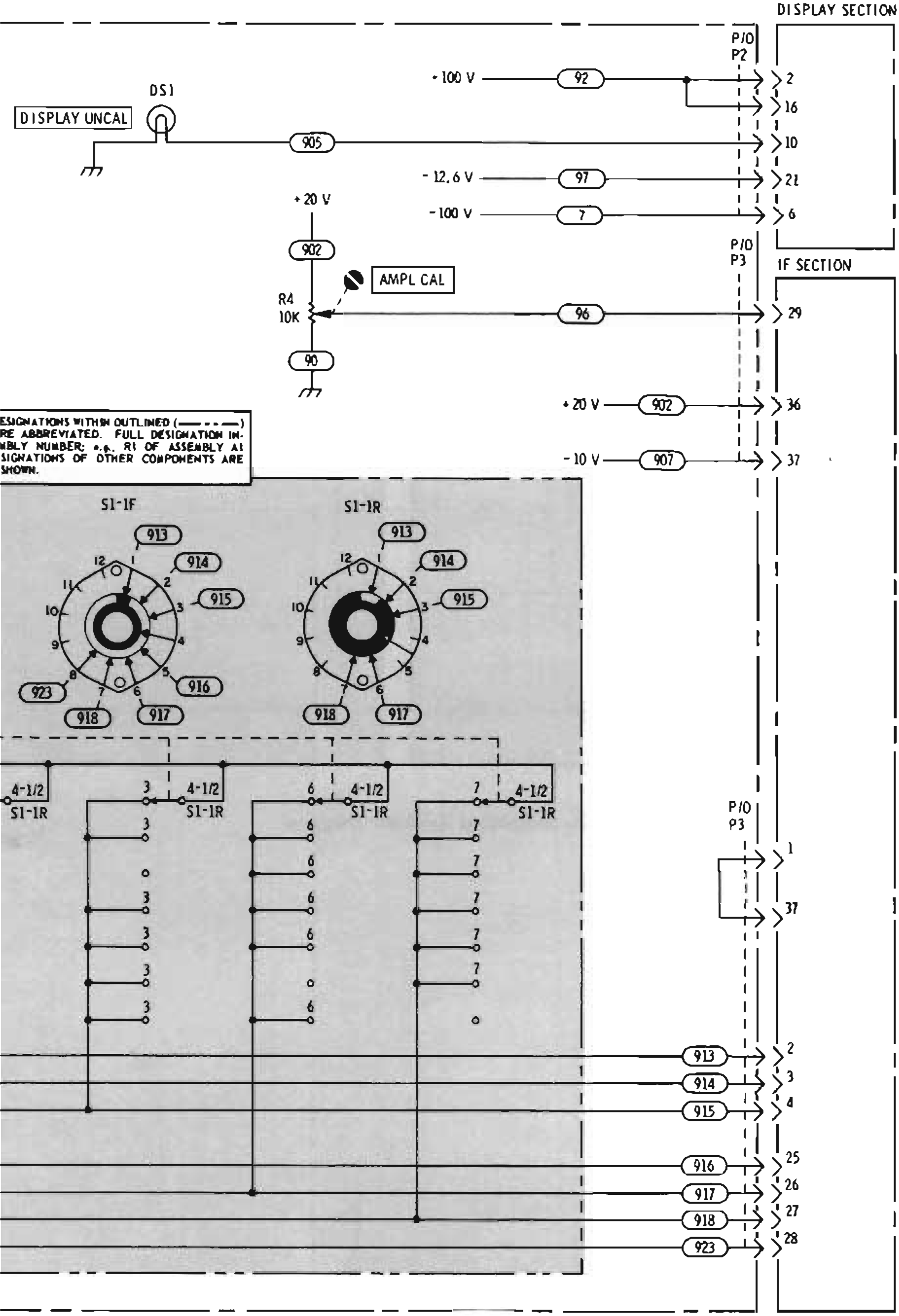
Figure 8-37. Bandwidth Switch Assembly A1, Component Locations



DISPLAY SECTION
P/O 8554B RF SECTION
P/O
P2
11
12
1
4
23
24
P/O SCAN WIDTH SW ASSY A2
(08554-60024)
P/O BANDWIDTH SW ASSY A1 (08555-60009)
1
2
S2
SCAN
WIDTH
S2-1R
2 1/2
1 1/2
ZERO
PER DIVISION
0-1250 MHz
97
-12.6 V
3 1/2
924
923
S2-1R
P/O
S1
BANDWIDTH
R1
10
S1-1F
4-1/2
S1-1R
.1 kHz
.3 kHz
1 kHz
3 kHz
10 kHz
30kHz
100 kHz
300 kHz
913
914
915
916
917
918



DS1
DISPLAY UNCAL
+100 V
92
905
- 12.6 V
97
+20 V
- 100 V
7
902
AMPL CAL
R4
10K
96
90
+20 V
902
- 10 V
907
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.
A1 (08555-60009)
S1-1F
S1-1R
913
914
915
916
917
918
923
P/O
S1
BANDWIDTH
+20 V
R2
100
4-1/2
S1-1R



REFERENCE DESIGNATIONS

A1	A2
S1-1F S1-2R R1-2	S2-1R
	NO PREFIX
	DS1 P/O P2, P3 R4

10

A1, A2

Figure 8-38. IF Section Control Circuits: A1 and A2 Schematic Diagram

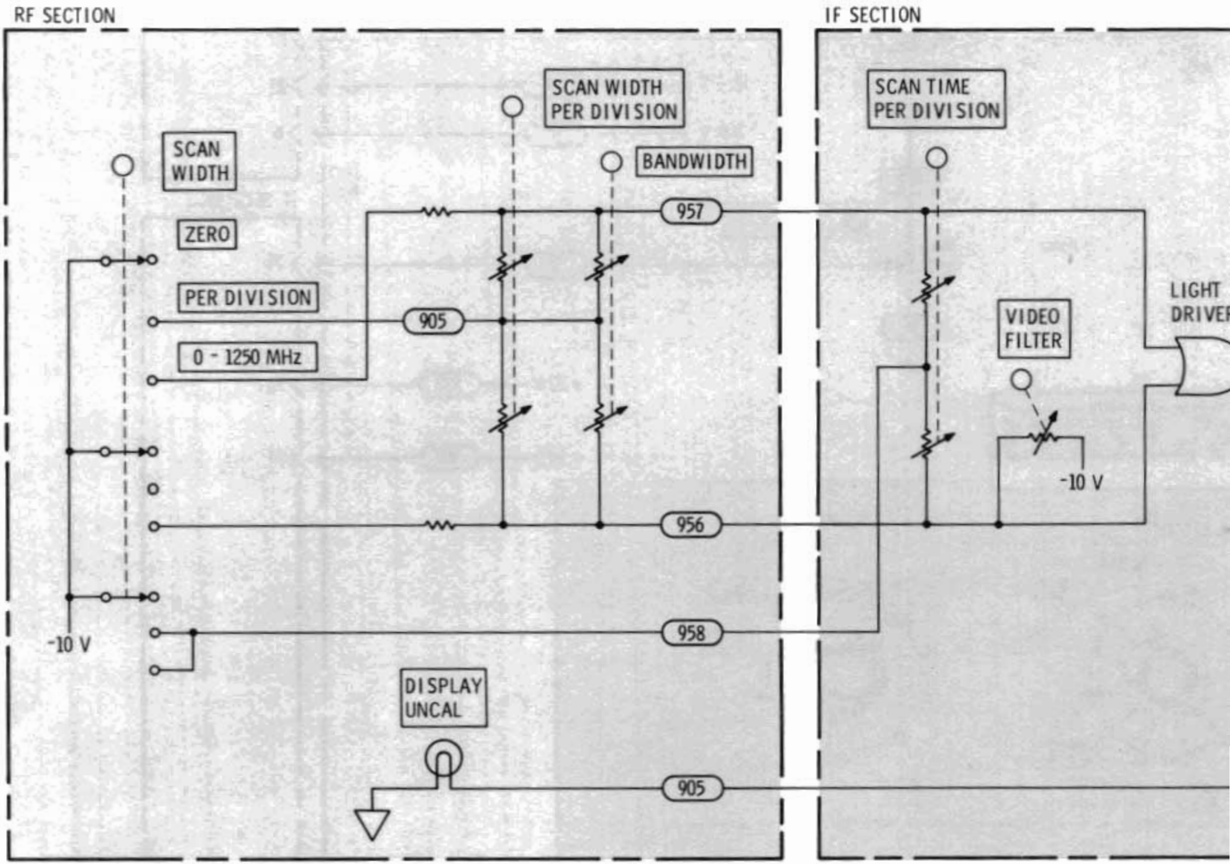
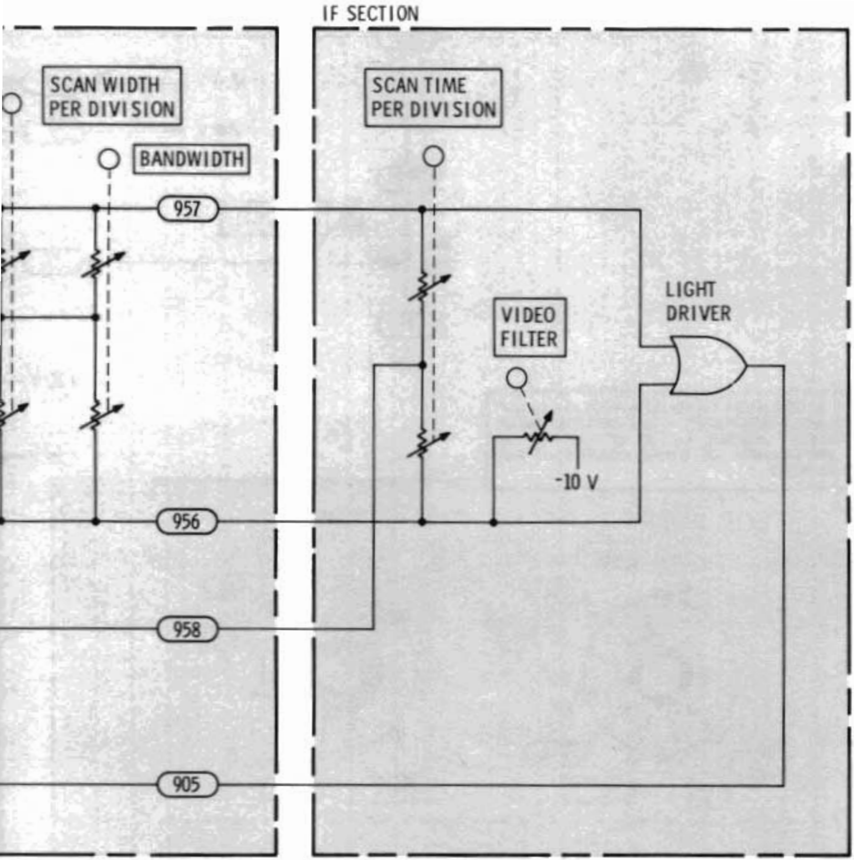


Figure 8-39. Simplified Analogic Diagram



8-39. Simplified Analogic Diagram

SERVICE SHEET 11

It is assumed that the DISPLAY UNCAL lamp is operating erratically or not at all.

TROUBLESHOOTING PROCEDURE

When a malfunction has been isolated to the analogic circuits, the RF and IF Sections should be extended on the extender cable assembly to provide access to the scan width and bandwidth switch assemblies.

EQUIPMENT REQUIRED

Service Kit	HP 11592A
Digital Voltmeter	HP 3440A/3443A

ANALOGIC CIRCUITS

The DISPLAY UNCAL lamp DS1 illuminates when SCAN WIDTH PER DIVISION, BANDWIDTH, SCAN TIME and VIDEO FILTER are set at any combination of positions which does not permit accurate calibration of the analyzer (see Figure 8-39). The DISPLAY UNCAL lamp is illuminated by a simulated signal and has no actual connection to signal processing circuits.

The RF Section Scan Width Switch Assembly A2 and Bandwidth Switch Assembly A1 both have switch wafers devoted exclusively to analogic. (In the IF Section the Scan Time Switch Assembly and Video Filter Switch also have analogic wafers). When SCAN WIDTH is set to PER DIVISION, current is added to the two buss lines (956 and 957 wires) by BANDWIDTH and PER DIVISION. In the IF Section this current is summed with the current added by SCAN TIME and VIDEO FILTER. When the current on either buss line is high enough to bias the light driver in the IF Section into conduction, it turns on and lights the DISPLAY UNCAL lamp (see Service Sheet 10). When SCAN WIDTH is set to ZERO, the analogic circuit is disabled.

TEST PROCEDURE

1-a. Connect the HP 3440A/3443A to TP A (956 wire) and set the analyzer controls as follows:

SCAN WIDTH	PER DIVISION
BANDWIDTH	10 kHz
VIDEO FILTER	OFF
SCAN WIDTH PER DIVISION	20 kHz
SCAN TIME PER DIVISION	1 MILLISECOND

The voltmeter should read about +580 mVdc - DISPLAY UNCAL lamp off.

Place VIDEO FILTER switch in 10 kHz position. Meter should read about −600 mVdc - DISPLAY UNCAL remains on. Return VIDEO FILTER switch to OFF. Meter reads about +580 mVdc - DISPLAY UNCAL lamp off.

Place SCAN TIME PER DIVISION switch in 0.5 MILLISECOND position. Meter should read about −2.4 volts - DISPLAY UNCAL on.

If meter readings are correct but DISPLAY UNCAL does not illuminate, check IF Section analogic circuits.

If voltage are incorrect check switches, resistors, wiring, etc.

IF Section Control Circuits: A1 and A2

◀ SERVICE SHEET 10

SERVICE SHEET 11 (cont'd)

1-b. Connect the HP 3440A/3443A to TP B (957 wire) and set the analyzer controls as initially set in test 1-a. Meter should read about +165 mVdc.

Place VIDEO FILTER switch in the 10 kHz position. Meter should read about + 50 mVdc - DISPLAY UNCAL on.

Place VIDEO FILTER switch in the 100 Hz position. Meter should read about —40 mVdc - DISPLAY UNCAL on. Return VIDEO FILTER switch to OFF. Meter reads about +165 mVdc - DISPLAY UNCAL off.

Place SCAN TIME PER DIVISION switch to 0.5 MILLISECONDS. Meter should read about —1.4 volts - DISPLAY UNCAL on. Return SCAN TIME PER DIVISION switch to 1 MILLISECOND. DISPLAY UNCAL off - meter reads about +165 mVdc.

Place BANDWIDTH switch to 3 kHz position. Meter reads approximately —58 mVdc - DISPLAY UNCAL on. Return BANDWIDTH switch to 10 kHz position. DISPLAY UNCAL off - meter reads about + 165 mVdc.

If readings are correct but DISPLAY UNCAL does not illuminate check IF Section analogic circuits.

If readings are incorrect check switches, resistors, wiring, etc.

NOTE

A further aid to troubleshooting is Table 5-3. Using the table in conjunction with the schematic should aid in localizing cause of malfunction to specific components.

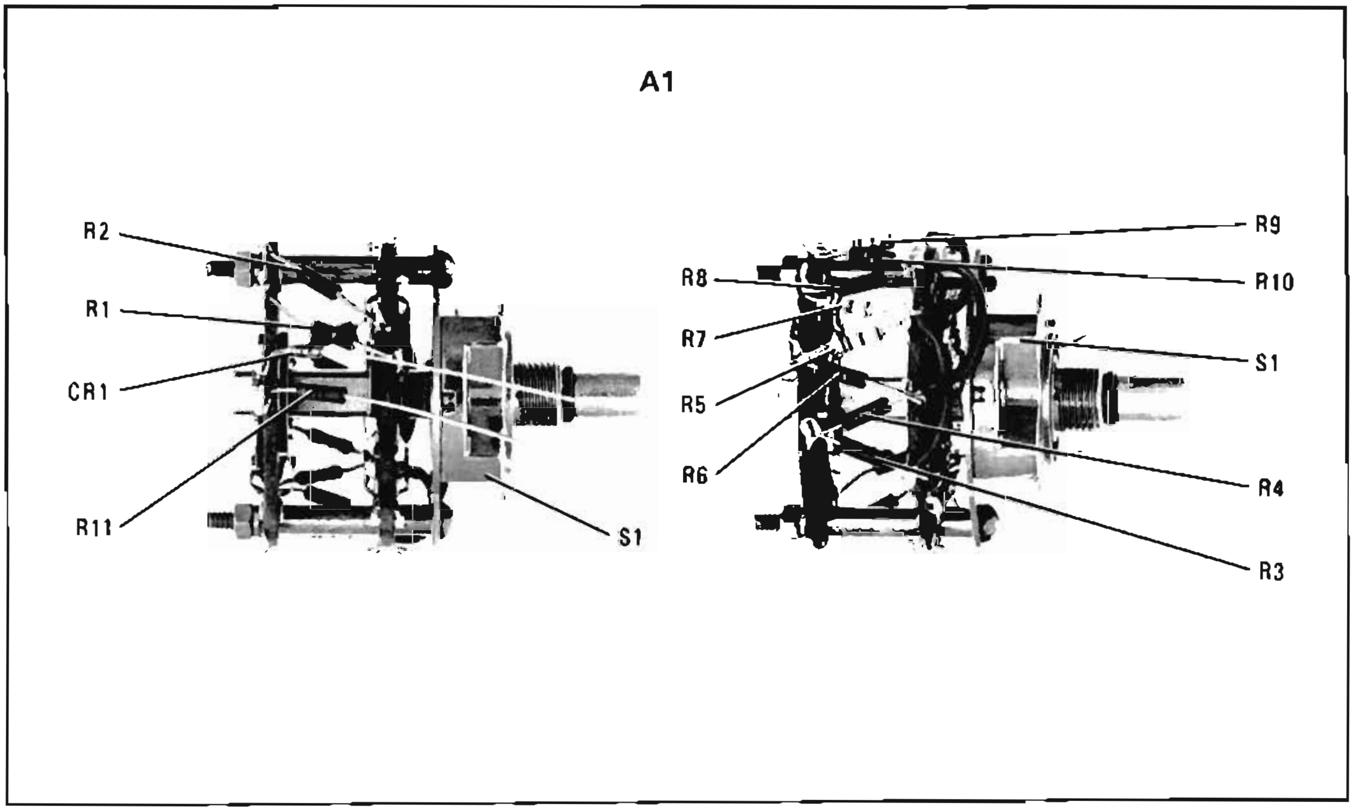


Figure 8-40. Bandwidth Switch Assembly A1, Component Locations

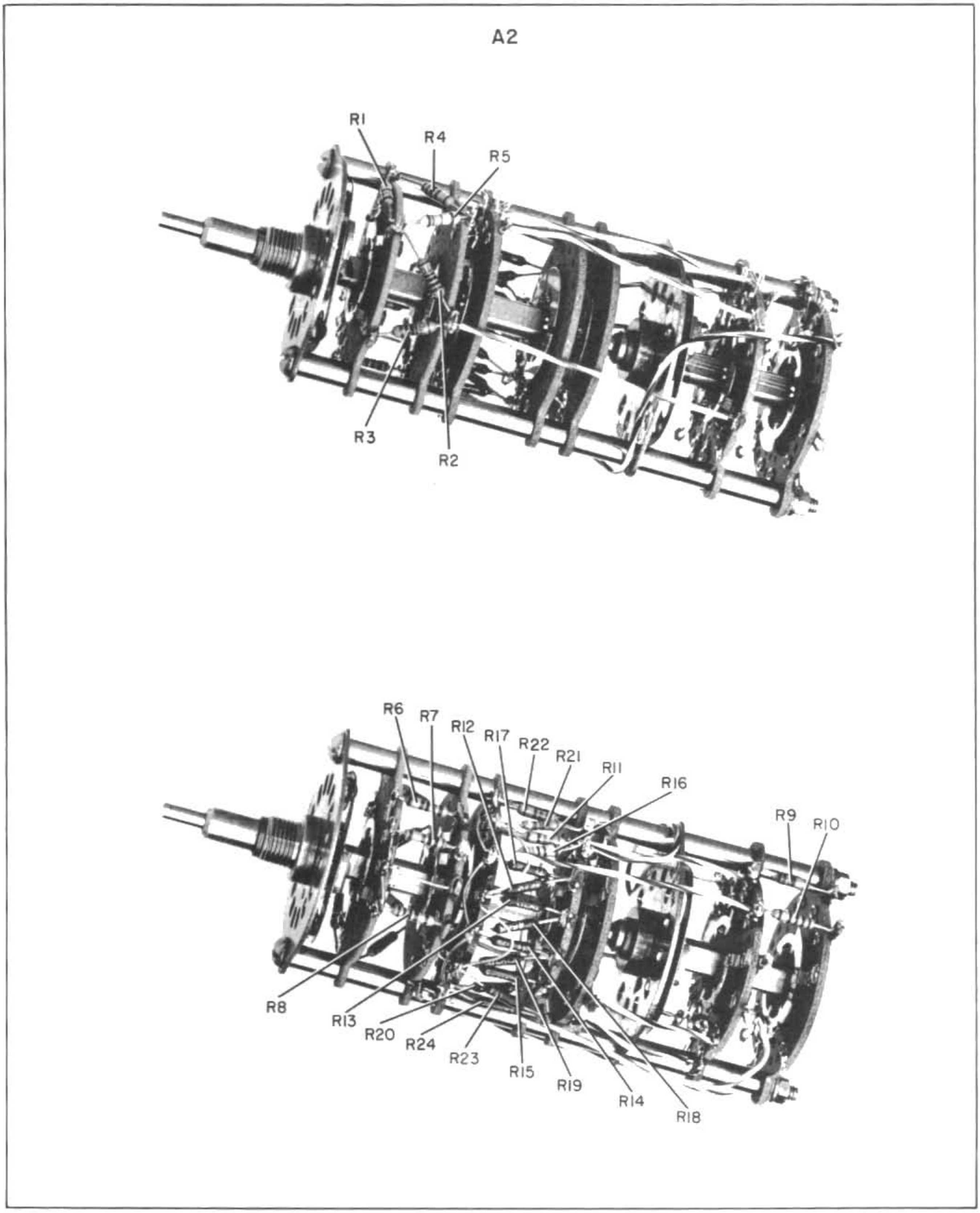
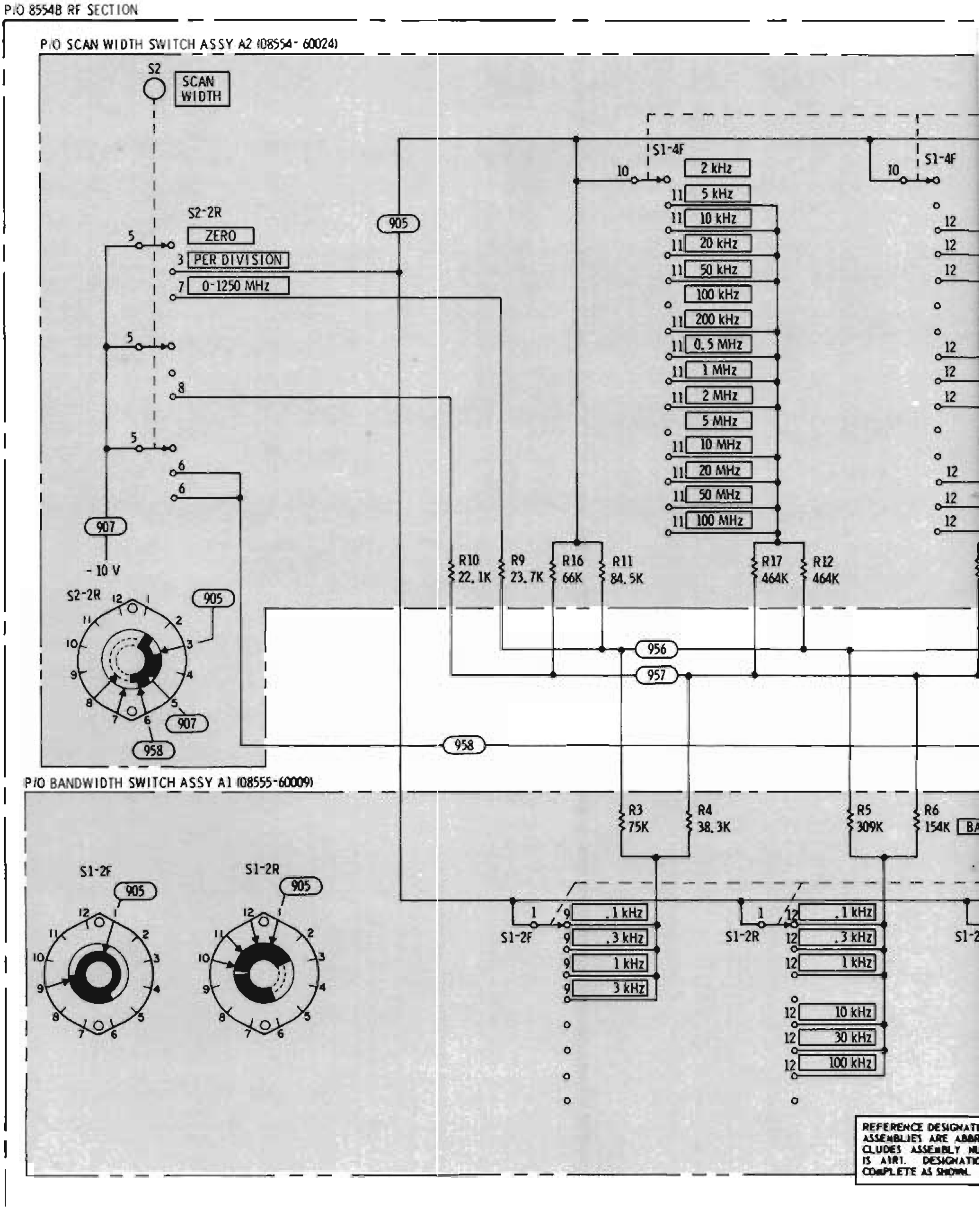
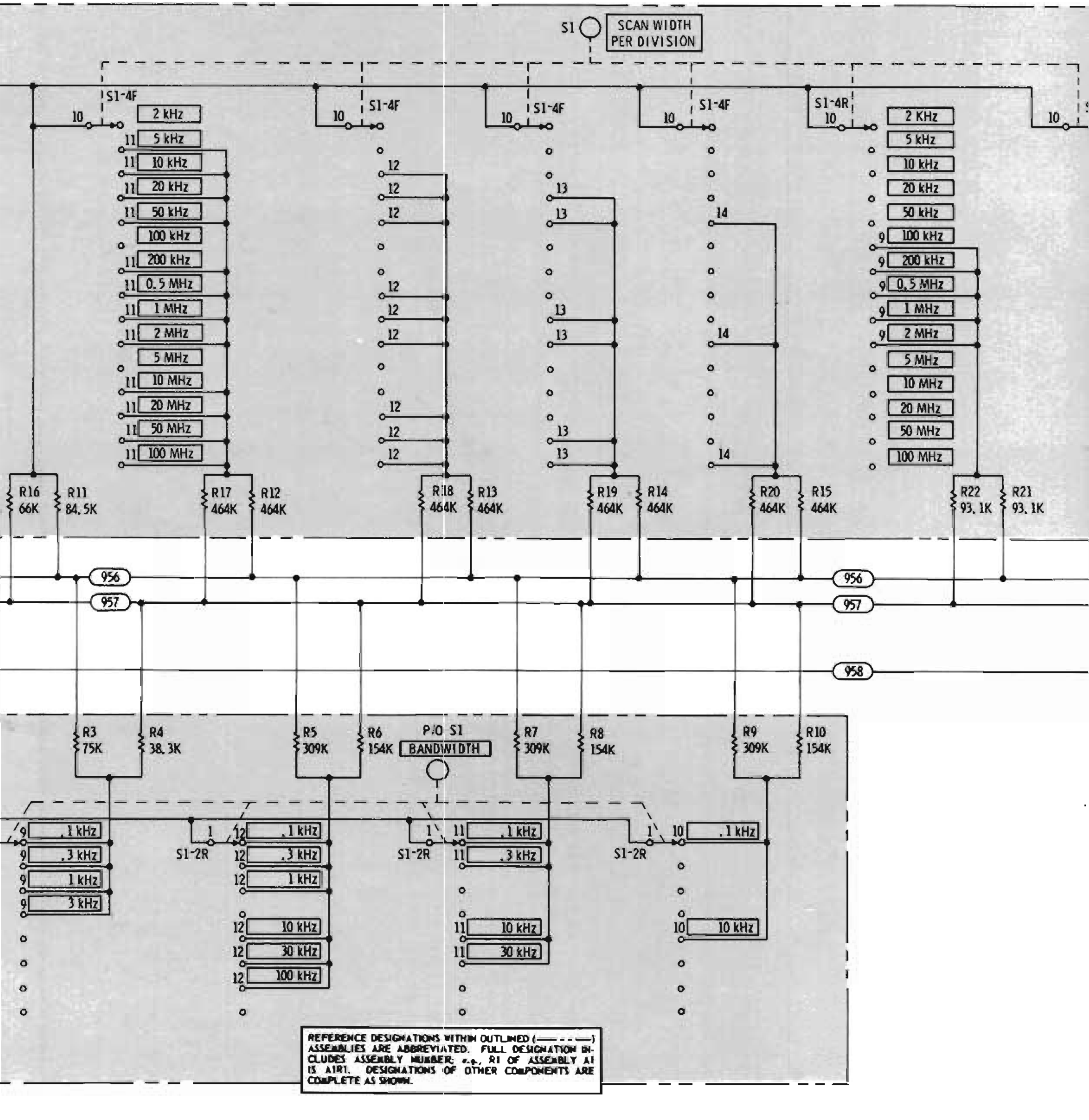


Figure 8-41. Scan Width Switch Assembly A2, Component Locations


P/O 8554B RF SECTION
P/O SCAN WIDTH SWITCH ASSY A2 (08554-60024)
S2
SCAN WIDTH
S2-2R
ZERO
PER DIVISION
0-1250 MHz
S1-4F
2 kHz
5 kHz
10 kHz
20 kHz
50 kHz
100 kHz
200 kHz
0.5 MHz
1 MHz
2 MHz
5 MHz
10 MHz
20 MHz
50 MHz
100 MHz
905
907
- 10 V
958
956
957
R10 22.1K
R9 23.7K
R16 66K
R11 84.5K
R17 464K
R12 464K
P/O BANDWIDTH SWITCH ASSY A1 (08555-60009)
R3 75K
R4 38.3K
R5 309K
R6 154K
S1-2F
S1-2R
.1 kHz
.3 kHz
1 kHz
3 kHz
10 kHz
30 kHz
100 kHz
REFERENCE DESIGNATI
ASSEMBLIES ARE ABBR
CLUDES ASSEMBLY NU
IS A1R1. DESIGNATIO
COMPLETE AS SHOWN.



REFERENCE DESIGNATIONS WITHIN OUTLINED (— — — —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

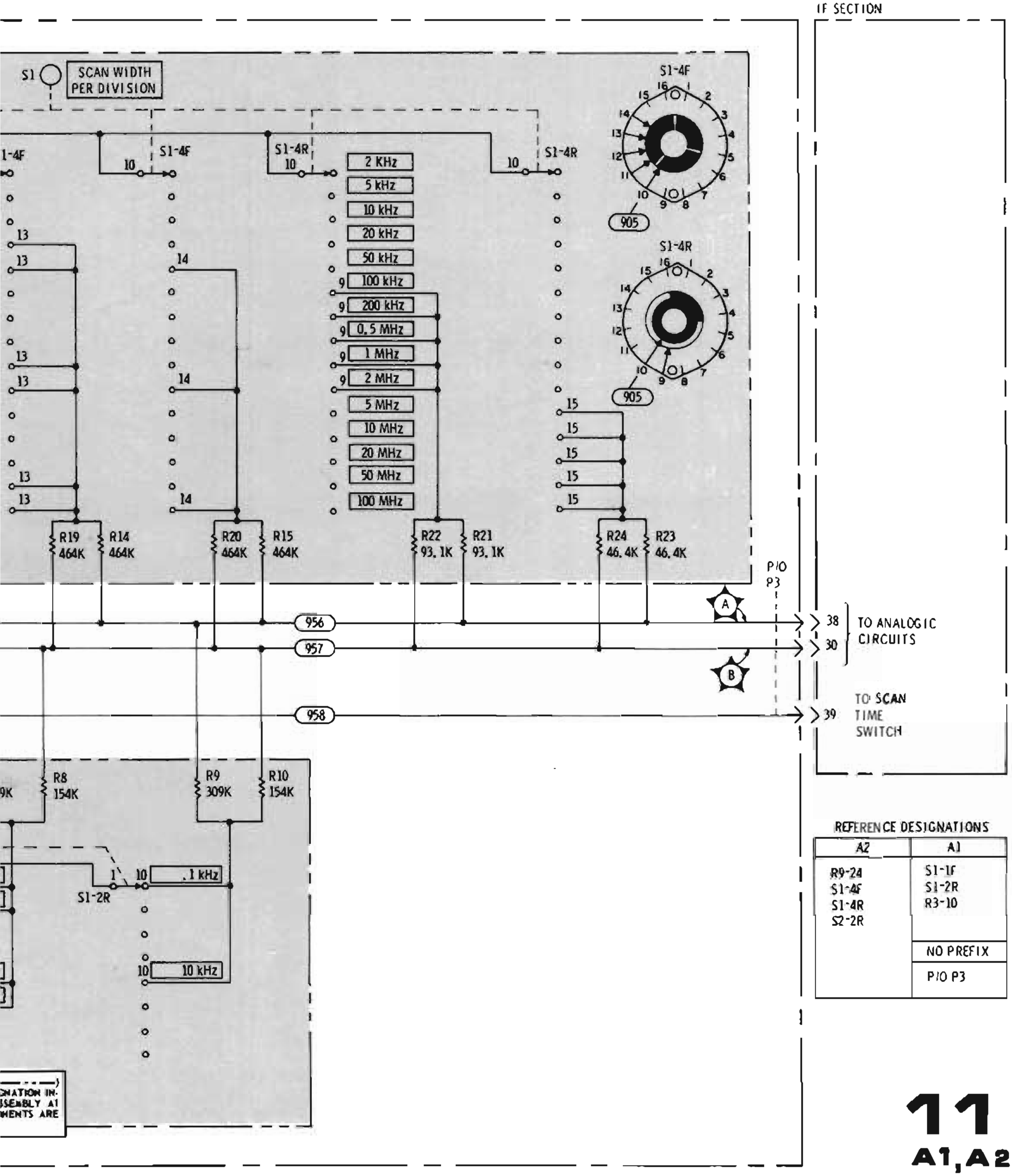


Figure 8-42. Analogic Circuits: A1 and A2 Schematic Diagram

HEWLETT PACKARD

HEWLETT-PACKARD SALES AND SERVICE OFFICES

To obtain servicing information or to order replacement parts, contact the nearest Hewlett-Packard Sales and Service Office listed in the HP Catalog, or contact the nearest regional office listed below:

IN THE UNITED STATES

CALIFORNIA
3939 Lankershim Boulevard
North Hollywood 91604

GEORGIA
P.O. Box 105005
2000 South Park Place
Atlanta 30339

ILLINOIS
5201 Tollview Drive
Rolling Meadows 60008

NEW JERSEY
W. 120 Century Road
Paramus 07652

IN CANADA

Hewlett-Packard (Canada) Ltd.
17500 South Service Road
Trans-Canada Highway
Kirkland, Quebec H9J 2M5

IN FRANCE

Hewlett-Packard France
F-91947 Les Ulis Cedex
Orsay

IN GERMAN FEDERAL REPUBLIC

Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Berner Strasse 117
Postfach 560 140
D-6000 Frankfurt 56

IN GREAT BRITAIN

Hewlett-Packard Ltd.
King Street Lane
Winnersh, Wokingham
Berkshire RG11 5AR

IN OTHER EUROPEAN COUNTRIES

SWITZERLAND
Hewlett-Packard (Schweiz) AG
29 Chemin Chateau Bloc
CH-1219 LeLignon-Geneva

IN ALL OTHER LOCATIONS

Hewlett-Packard Inter-Americas
3200 Hillview Avenue
Palo Alto, California 94304

HEWLETT PACKARD

HP Part No. 08554-90035

PRINTED IN U.S.A.