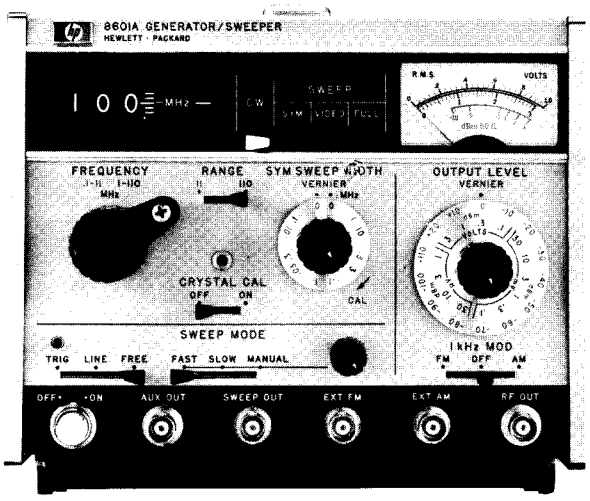
OPERATING AND SERVICE MANUAL

GENERATOR SWEEPER

8601A



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CERTIFICATION

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

WARRANTY AND ASSISTANCE

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

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

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

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GENERATOR/SWEEPER
8601A

Serial Prefix 969-

This manual applies directly to HP Model 8601A Generator / Sweepers having serial prefix number 969-.

Serial Prefixes Not Listed

For serial prefixes above 969-, a "Manual Changes" sheet is included with this manual. For serial prefixes below 969-, see Section VII, Manual Changes.

Options

For available options, see Section I of this manual.

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SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This manual contains installation, operation and service information for the HP Model 8601A, shown in Figure 1-1. Complete specifications for the Model 8601A Generator/Sweeper are given in Table 1-1.

1-3. INSTRUMENTS COVERED BY MANUAL

1-4. Each Model 8601A is identified by a two-section serial number on the rear of the instrument. The first section is separated from the second section by a dash or a letter. The first section of numbers is a serial prefix number used to document changes and the second set of numbers is an identification number unique to each instrument.

1-5. All instruments with the same serial prefix are the same. The groups of instruments to which this manual applies directly are identified on the title page. For instruments with lower serial prefix numbers than those listed, make manual changes listed in Section VII. For instruments with higher serial prefix numbers, a Manual Changes sheet is included, describing the required changes. If a change sheet is missing, the information can be supplied by any Hewlett-Packard sales and service office (see list at the rear of this manual).

1-6. DESCRIPTION

1-7. The Model 8601A Generator/Sweeper is a rf signal source with both CW and wide band swept frequency capabilities in the 0.1 to 110 MHz range. In the CW mode, residual fm is less than 50 Hz rms from 0.1 to 11 MHz, and less than 500 Hz rms from 1.0 to 110 MHz (including line-related components). Harmonic outputs are 35 dB below the carrier; spurious and non-harmonic outputs are 40 dB below the carrier. Swept-frequency measurements of all or any part of the 0.1 to 11 MHz or 1.0 to 110 MHz bands are possible by selection of FULL, VIDEO, or SYMMETRICAL sweep modes. Internal and external frequency modulation is also possible for narrow-band sweep operations or remote tuning.

1-8. The FULL sweep covers the whole 0.1 to 11 MHz or 1.0 to 110 MHz band. The VIDEO sweep is from the bottom of the selected range up to the frequency selected by front panel frequency control. The SYMMETRICAL sweep operation sweeps above and below the CW frequency selected by front panel frequency control. The symmetrical sweep width is calibrated from 0.01 to 1.0 MHz for the 0.1 to 11 MHz band, and from 0.1 to 10 MHz for the 1.0 to 110 MHz band. A sweep width vernier adjusts the sweep width from the calibrated position to zero.

1-9. The calibrated rf output is variable from +20 to −110 dBm (2.23V to 1 μVrms) into 50 ohms by use of the OUTPUT LEVEL and VERNIER controls. Other outputs include a 0.1 to 11 MHz auxiliary output on both bands to permit use of a low-frequency counter for frequency monitoring; a 0 to +7V sweep output for horizontal drive of oscilloscopes and X-Y recoders; and an uncalibrated rf output for phase-lock operations.

1-10. OPTIONS AVAILABLE

1-11. Options 001 and 002 modify the 8601A to provide variable internal am and fm. FM deviation is variable from 0 to 110 kHz for Option 001. FM deviation is variable from 0 to 30 kHz for Option 002. Amplitude modulation is variable from zero to 30% with either option. When the front panel MOD pushbutton is depressed, the RF output meter indicates modulation level.

NOTE

Front panel meter is usable as am or fm monitor with externally applied modulation.

1-12. Option 003 reduces the external fm sensitivity to 100 kHz/volt ±5%, high range, and 10 kHz/volt ±5%, low range.

1-13. Option 004 adds a rear panel auxiliary output in parallel with the standard front panel auxiliary output.

1-14. Option 005 modifies the 8601A to provide a 400 Hz internal modulation frequency rate.

1-15. Option 006 modifies the 8601A to provide 22.5 kHz peak internal fm deviation, high range, and 2.25 kHz peak deviation, low range.

1-16. Option 007 enables the 8601A to be used as a tracking generator by substituting an external

signal for the 8601A vto (Internal Voltage Tuned Oscillator) signal. This capability allows the 8601A to be used with the HP Model 8553 110 MHz Spectrum Analyzer to provide displays of log amplitude versus frequency with 70 dB display range for sweep widths from 500 kHz to 100 MHz. To obtain this operation, the first lo (local oscillator) output of the Spectrum Analyzer is taken directly to an 8601A rear panel input by removing the shorting cable that is used for normal 8601A operation.

1-17. Options 008, 009, and 010 change the output meter, attenuator assembly, RF output cable, and connector to provide the 8601A with a 75 ohm output impedance. The dBm scale on the meter is moved to indicate dBm into 75 ohms. For Option 008, the output connector is a standard BNC connector. For option 009, the output connector is a TNC connector. For Option 010, the output connector is the Western Electric type.

1-18. Option 011 provides variable fm with peak deviation of 0 to 30 kHz and 0 to 10 kHz. A dual-scale front panel meter monitors peak deviation.

1-19. RECOMMENDED TEST EQUIPMENT

1-20. Equipment required to maintain the Model 8601A is listed in Table 1-2. Other equipment may be substituted if it meets or exceeds the critical specifications listed in the table.

Table 1-1. Specifications (1 of 2)

FREQUENCY CHARACTERISTICS

Coverage: Low range, 0.1 — 11 MHz; high range, 1 — 110 MHz.

Accuracy (in CW, stop frequency of VIDEO sweep, and center frequency of SYMMETRICAL sweep):
Low range, ±1% of frequency ±10 kHz.
High range, ±1% of frequency ±100 kHz.

Settability: Vernier settability, ±0.01%; range, ±0.1%; coarse settability using frequency control is 5 kHz, low range; 50 kHz, high range.

Linearity: ±0.5% of sweep width.

Stability in CW:
100 ppm +1 kHz/10 min. high range after one hour warm up.
100 ppm +100 Hz/10 min. low range after one hour warm up.
300 ppm +3 kHz/°C, high range.
300 ppm +300 Hz/°C, low range.
10 ppm/V line voltage change.

Harmonics and Spurious Signals (CW above 250 kHz, output levels below +10 dBm): Harmonics at least 35 dB below carrier (33 dB below carrier for options 008, 009 and 010). Spurious signals at least 40 dB below carrier.

Residual FM: Noise in a 10 kHz bandwidth including line related components. (Dominant component of RESIDUAL FM is noise.)

CW: <50 Hz rms, low range: <500 Hz rms, high range.

SYM 0, Sweep: Less than 100 Hz rms, low range; <1 kHz rms, high range.

Incidental FM with 30% AM:
CW: negligible.
SYM 0, Sweep: <100 Hz peak, low range; <1 kHz peak, high range.

Residual AM: AM noise modulation index (rms, 10 kHz bandwidth) is <—50 dB. (Typically —60 dB at 25°C.)

Incidental AM: Incidental AM modulation index is <—55 dB with 75 kHz deviation.

OUTPUT CHARACTERISTICS

Level: +20 to —110 dBm (+18 to —110 dBm for Options 008, 009 and 010). 10 dB steps and 13 dB vernier provide continuous settings over entire range. Meter monitors output in dBm and rms volts into 50 Ω (75Ω for Options 008, 009 and 010).

Accuracy: ±1 dB accuracy for any output level from +13 dBm to —100 dBm.

Flatness: ±0.25 dB over full range, ±0.1 dB over any 10 MHz portion.

Impedance: 50Ω, SWR <1.2 on 0 dBm step and below.

RF Leakage: Low leakage permits receiver sensitivity measurements down to 1 microvolt.

SWEEP CHARACTERISTICS

Full: Approximately 0.1 — 11 MHz and 1 — 110 MHz independent of dial setting.

Video: Sweep extends from low end of range to frequency dial setting. Start frequency accuracy is ±1% of stop frequency, ±10 kHz, low range; ±100 kHz high range.

Symmetrical: Center frequency may be tuned to any point on either range.

Sweep Width: 0 — 1 MHz low range; 0 — 10 MHz high range. There are five calibrated sweep width positions as well as an uncalibrated vernier to provide continuous adjustment.

Table 1-1. Specifications (2 of 2)

Sweep Width Accuracy: ±2% of sweep width and ±1 kHz on low range; ±2% of sweep width and ±10 kHz on high range.

Sweep Speeds: Fast, typically 3 to 60 sweeps per second, variable. Slow, typically 3 to 60 seconds per sweep, variable. Manual, continuous tuning over preset limits.

Trigger Modes: Manual trigger with reset, line-synchronized, or free running.

AMPLITUDE MODULATION

Internal AM:
30% ±5% at 1 kHz, less than 3% distortion. Typically <1% distortion for output readings on upper half of meter scale.

Note

For Option 005, rate is 400 Hz.

External AM: Zero to 50%, up to 400 Hz. Zero to 30%, up to 1 kHz. Applied through external AM input on front panel. Sensitivity typically 2V peak/10% modulation index at 400 Hz (10 — 50% AM).

FREQUENCY MODULATION

Internal FM: Low range: 7.5 kHz ±5% peak deviation, 1 kHz rate; high range: 75 kHz ±5% peak deviation, 1 kHz rate; less than 3% distortion. Typically <1%.

Note

For Option 005, internal rate is changed to 400 Hz.

External FM: Sensitivity: 0.5 MHz per volt ±5%, low range; 5 MHz per volt ±5%, high range; negative polarity.

Deviations to the band edges are possible for rates to 100 Hz; voltage to frequency linearity is ±0.5%, allowing remote frequency programming. FM rates to 10 kHz are obtainable with less linearity and accuracy.

CRYSTAL CALIBRATOR

Internal 5 MHz crystal allows single frequency calibration to ±0.01% at any multiple of 5 MHz.

AUXILIARY OUTPUTS

Front Panel: Sweep Output: approximately 0 to +7 volts. Auxiliary Output: always 0.1 — 11 MHz for low frequency counter monitoring.

Rear Panel: Sweep inhibit; stops sweep when grounded. Uncalibrated RF output: —5 dBm minimum, unmodulated. VTO output: 200.1 — 310 MHz, output level —25 dBm minimum. Blanking: —4 volt pulse concurrent with RF blanking.

GENERAL

Power: 115 or 230V, ±10%, 50 — 400 Hz, ±10%; approximately 50 watts.

Weight: Net, 21 lbs (9,5 kg).

Dimensions: 7-25/32 in. wide, 6-3/32 in. high, 16-3/8 in. deep (190 x 155 x 416 mm).

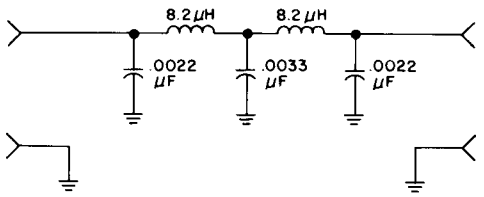
Table 1-2. Recommended Test Equipment (1 of 3)

Instrument Type	Measurement Requirements	Suggested Model	Use (Note 1)
Counter/Marker Generator	Frequency Range: 0.1 — 12 MHz Accuracy: 0.1% of frequency Input Impedance: 500K ohms	HP 8600A	P, A, T
Digital Voltmeter	Voltage Range: 0 — 75 VDC to +25 V Accuracy: ±0.16% of voltage Input Impedance: >100K ohms	HP 3439A/3443A	P, A
RF Detector	Frequency Range: 0.1 — 110 MHz Frequency Response: <±0.1 dB over any 10 MHz range Output Polarity: Negative Input Impedance: 50 ohms (note 2)	HP 8471A (note 2)	P, A, T

Table 1-2. Recommended Test Equipment (2 of 3)

Instrument Type	Measurement Requirements	Suggested Model	Use (Note 1)
Frequency Meter and FM Discriminator	Input Frequency Range: 10 MHz Bandwidth: 3 Hz to 2 MHz Discriminator Output: Linearity: ±0.5% Residual FM Noise: All components 43.3 dB below full scale output level Output Range: Adjustable from 100 kHz/volt to 10 MHz volt Output Filtering: (see Note 4)	HP 5210A and 2 MHz low-pass filter (Note 3)	P, A
Oscilloscope	Bandwidth: DC to 20 MHz Vertical Sensitivity: 5 mV/div to 1 volt/div Input Impedance: 100K ohms External and internal horizontal sweep capability	HP 180A/1803A/1820A	P, A, T
110 MHz Spectrum Analyzer	Frequency Range: 1 kHz — 110 MHz Input Measurement Range: −50 to +10 dBm in 50 ohms Amplitude Calibration: 1. 10 dB/div 2. Accuracy: ±1 dB	HP 140T/8552/8553	P, A,T
400 MHz Spectrum Analyzer	Frequency Range: 10 MHz — 400 MHz Input Measurement Range: −50 to +20 dBm Amplitude Calibration: 1. 10 dB/div 2. Accuracy: ±1 dB	HP 140T/8552/8555	P, A, T
1 kHz Amplifier	Frequency Range: 1 kHz Amplification: >10 dB in 50 ohms	HP 461A or 466A	P
DC Power Supply	DC Range: 0.05 to +10.9 VDC Output Impedance: <0.5 ohms	HP 6215A	P, A
Signal Generator	Frequency Range: 0.2 to 110 MHz Output Level: −10 dBm into 50 ohms Residual FM: 1. <50 Hz up to 110 MHz 2. <20 Hz up to 11 MHz	HP 606A and 608C	P
Audio Oscillator	Frequency Range: 100 Hz to 10 kHz Output Level: 10 volts into 600 ohms	HP 200CD	P, A
50 Ohm Termination (Note 5)	Frequency Range: 0.1 to 110 MHz Impedance: 50 ohms ±5% Connector: BNC plug	HP Part No. 1250-0207	P, A
RMS Voltmeter	Frequency Range: DC to 80 kHz Input Range: 7 mV to 1 Vrms Input Impedance: >100K ohms	HP 3400A	P, A
50 Ohm Termination (Note 5)	Frequency Range: 0.1 to 110 MHz Impedance: 50 ohms ±5% Connector: SMC Coaxial Plug	HP Part No. 1250-0839	A, T

Table 1-2. Recommended Test Equipment (3 of 3)

Instrument Type	Measurement Requirements	Suggested Model	Use (Note 1)
Minimum Loss Pad	Frequency Range: 0.1 to 110 MHz 75 ohm to 50 Ohm Transition Connector: BNC plug/BNC jack	Texscan Corporation, Model ZM-57 (Note 6)	P, A
Adapters 1. BNC Tee	1. BNC plug and two BNC jacks Impedance: 50 ohms	HP Part No. 1250-0781	P
2. Subminiature-to-BNC	2. BNC jack to SMC plug Impedance: 50 ohms	HP Part No. 1250-0832	A
Balanced Mixer	Frequency Range: 6 to 60 MHz Inputs: −10 dBm to +10 dBm	HP 10514A or 10534A	P, A
2 MHz low pass filter	 Cutoff Frequency: 2 MHz Insertion Loss: Above 2 MHz: >6 dB Above 10 MHz: >40 dB	Suggested Part Types: 8.2 µH ±10% (HP Part No. 9140-0105) 0.0033 µF ±10% (HP Part No. 0160-0155) 0.0022 µF ±10% (HP Part No. 0160-0154)	

Notes

1. P = Performance tests; A = Adjustment procedures; T = Troubleshooting.
2. For 8601A Options 008, 009 and 010: the HP-8471A, Option 005, is required.
3. 2 MHz low pass filter construction is shown at end of table.
4. 10 kHz and 100 kHz filtering of output signal is required for some tests. The HP Model 10531A Filter Kit is recommended.
5. For 8601A Options 008. 009 and 010: a 75 ohm termination is required. This termination could be a 50-to-75 ohm matching transformer used with a standard 50 ohm termination. (A typical matching transformer is the North Hills Electronics Company's Model 11061.)
6. Texscan Corporation, 2446 North Shadeland Avenue, Indianapolis, Indiana, 46219.

SECTION II
INSTALLATION

2-1. INITIAL INSPECTION

2-2. Mechanical Check

2-3. If external damage to the shipping carton is evident, ask the carrier's agent to be present when the instrument is unpacked. Inspect the instrument for mechanical damage. Also, check the cushioning material for signs of severe stress.

2-4. Electrical Check

2-5. The electrical performance of the Model 8601A should be verified as soon as possible upon receipt. Performance tests suitable for incoming inspection are given in Section IV, Performance Tests. Equipment required for performance tests is listed in Table 1-2.

2-6. Claims for Damage

2-7. Before shipment this instrument was inspected and found free of electrical and mechanical defects. If the Model 8601A is mechanically damaged in transit, notify the carrier and the nearest Hewlett-Packard sales and service office immediately. Retain the shipping carton and packing material for the carrier's inspection. The Hewlett-Packard sales and service office will arrange for replacement or repair of your instrument without waiting for claim settlements against the carrier.

2-8. PREPARATION FOR USE

2-9. Power Requirements

2-10. The HP Model 8601A Generator/Sweeper requires a power source of 115 or 230 volts ac ±10%, 50 to 400 Hz, single phase, which can supply at least 50 watts.

2-11. 115/230 Volt Operation

CAUTION

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

2-12. A rear panel two-position slide switch permits operation from either a 115 or 230 volt power source. The number visible on the switch indicates the line voltage for which the instrument is connected. To prepare the Model 8601A for operation, position the 115/230 volt slide switch so that the number visible corresponds to the available line voltage, and install a line fuse of correct rating.

2-13. Three-Conductor Power Cable

2-14. To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends the instrument panels and cabinets be grounded. Accordingly, the Model 8601A is equipped with a three-conductor cable which, when plugged into an appropriate receptacle, grounds the instrument panel and cabinet. The offset pin of the three-prong connector is the ground pin. The Model 8601A employs power connector, switches, and safety requirements as recommended by the International Electrotechnical Commission (IEC). To preserve the protection feature when operating the Generator/Sweeper from a two-contact outlet, use a three-prong to two-prong adapter (HP Part No. 1251-0048) and connect the green pigtail on the adapter to ground.

2-15. Operating Environment

2-16. The temperature of surrounding air must not exceed 55°C (131°F). Clearances for ventilation should be at least three to four inches at the rear of the cabinet and two to three inches at the sides. The clearances provided by the plastic feet in bench stacking are adequate for the top and bottom cabinet surfaces.

2-17. Bench Operation

2-18. The Model 8601A cabinet has plastic feet and a foldaway tilt stand for convenience in bench operation. The tilt stand permits inclining the instrument for ease in reading the meter. The plastic feet are shaped to provide clearance for air circulation and to make HP half-width modular instruments such as the Generator/Sweeper self-aligning when stacked.

2-19. REPACKAGING FOR SHIPMENT

2-20. Original Packing Materials

2-21. Containers and packing materials identical to those used by the factory are available through

your nearest Hewlett-Packard sales and service office (see list at the rear of this manual). If the Model 8601A is being returned for servicing and repair, attach a tag indicating type of service, return address, and full instrument serial number. Also mark the box FRAGILE to assure careful handling. In any correspondence regarding your instrument, refer to the instrument by its full HP model number and full serial number.

2-22. Other Packing Materials

2-23. The following general instructions should be followed for repackaging with commercially available materials:

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

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

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

4. Seal the shipping container securely.

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

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This operating section explains the function of the controls and indicators of the Model 8601A Generator/Sweeper. It also describes typical operating modes and operator maintenance such as fuse and indicator lamp replacement.

3-3. PANEL FEATURES

3-4. Front and rear panel features are described in Figures 3-1 and 3-2. Description numbers match the numbers on the illustration.

3-5. OPERATOR'S CHECK

3-6. The operator's check (Figure 3-3) is supplied to allow the operator to make a quick check of the main instrument functions prior to use. If the correct indications are not obtained, perform the performance tests in Section IV to determine if the instrument is working correctly.

3-7. OPERATING INSTRUCTIONS

3-8. Figure 3-4 describes general operating procedures and the crystal calibration procedure is described in Figure 3-5. Procedure steps are numbered to correspond to related controls in the photographs.

3-9. General Operating Information

3-10. The FULL sweep covers the full 0.1 to 11 MHz or 1.0 to 110 MHz range. The VIDEO sweep is from the bottom of the band up to the frequency indicated by the front panel tuning controls. The SYMMETRICAL sweep operation sweeps upward, centered on the CW frequency indicated by the front panel tuning controls. The symmetrical sweep width is calibrated and can be varied from 1.0 to 0 MHz on range 11 and from 10 to 0 MHz on range 110. The zero sweep width position disables the sweep and is reserved for fm operation.

3-11. Sweep speed is varied with the FAST/SLOW/MANUAL switch. The control adjacent to this switch serves as a sweep speed vernier in the FAST and SLOW positions and as a manual sweep control in the MANUAL position. Sweep speed adjustment range is from approximately 3 to 60 sweeps/second in the FAST position and from approximately 3 to 60 seconds/sweep in the SLOW position.

3-12. Sweep triggering is selected with the TRIG/LINE/FREE switch. In the TRIG position, the sweep is started by depressing the trigger button. Retrace occurs automatically or sweep may be terminated manually by depressing the trigger button a second time. In the LINE position, the sweep repetition rate is synchronized with the line frequency. In the FREE position, the sweep repetition rate is free running.

3-13. The OUTPUT LEVEL and VERNIER controls provide continuous adjustment of the rf output level from +20 to −110 dBm. The output level is calibrated when the VERNIER is adjusted for a 0 dBm reading on the meter.

3-14. FM and Symmetrical Operation

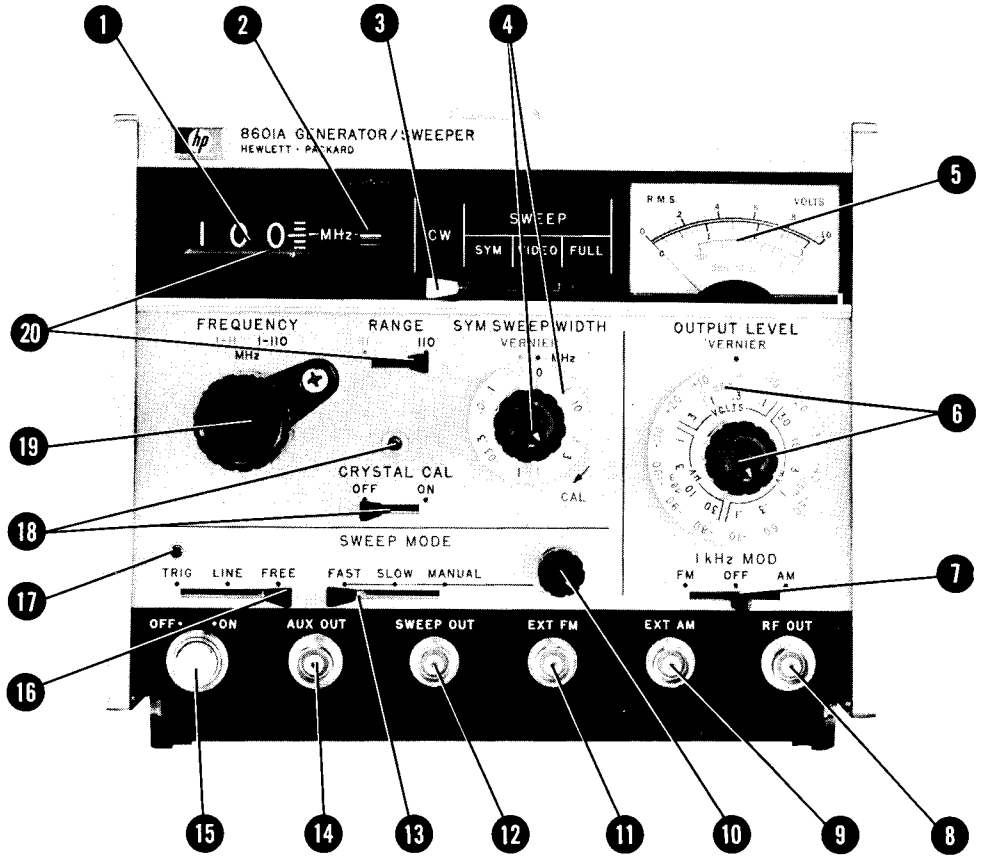
3-15. Internal fm may be used in CW or any sweep mode. Internal fm is 7.5 kHz ±5% peak deviation on range 11, and 75 kHz ±5% on range 110. The internal fm rate is 1 kHz. External fm operation is available on any SWEEP mode, but not useable in CW mode. The deviation and rate limits of external fm operation are shown in Figure 3-8.

3-16. During fm and symmetrical sweep operations, special care should be taken to operate within the specified 8601A frequency limits. If operation is set for frequencies below 0.1 MHz on range 11 or 1.0 MHz on range 110, a search circuit activates and prevents the output frequency from going below the lower limit of the band. Search operation is indicated by jitter on an oscilloscope display of the detected rf output when the 8601A is required to operate below the lower limit of the band.

3-17. Amplitude Modulation Operation

3-18. Internal or external am can be used in CW or any sweep mode. Internal modulation is 30%

FRONT PANEL FEATURES



1. Digital Frequency Readout. Indicates CW frequency, SYM sweep center frequency, or VIDEO sweep upper frequency limit, depending on position of CW/SWEEP switch. Numerals to left side of decimal point light indicate frequency in MHz.

2. FREQUENCY VERNIER. Fine tunes RF output frequency. Adjustment range is approximately ±0.1% of frequency. Upward rotation increases frequency.

3. CW/SWEEP. Selects FULL, VIDEO, SYMMETRICAL sweeps or CW operation. FULL sweeps full range; 0.1 to 11 MHz (range 11). 1.0 to 110 MHz (range 110). VIDEO sweeps from bottom of the band to frequency indicated on digital frequency readout. SYM sweeps symmetrically about the center frequency indicated on the digital frequency readout. CW generates a fixed frequency that is selected by the digital frequency readout.

4. SYM SWEEP WIDTH/VERNIER. Selects sweep width about center frequency. Blue numbers correspond to range 11; black numbers correspond to range 110. The SWEEP WIDTH VERNIER adjusts the sweep width from the calibrated position to zero width.

5. Meter. Indicates RF output level in dBm or volts rms into 50 ohms.

6. OUTPUT LEVEL/VERNIER. Adjusts RF output level. Output is calibrated when OUTPUT LEVEL VERNIER is adjusted for 0 dBm meter reading. Blue numbers correspond to black meter scale (volts rms). Clockwise rotation increases output level.

Figure 3-1. Front Panel Controls, Connectors and Indicators (1 of 2)

FRONT PANEL FEATURES

7. 1 kHz MOD. Turns on either internal frequency or amplitude modulation of RF output. In AM position output is amplitude modulated at 30%, 1 kHz rate. In FM position output is frequency modulated at 7.5 kHz deviation, 1 kHz rate (75 kHz peak deviation on high range).

8. RF OUT. Calibrated RF output (into 50 ohms).

9. EXT AM. Input for external amplitude modulating signals (see Figure 3-9).

10. Manual/Sweep Speed Control. Manual sweep control in MANUAL mode; sweep speed vernier in FAST and SLOW modes. Clockwise rotation sweeps upward across band (in MANUAL) or increases sweep speed (in SLOW and FAST).

11. EXT FM. Input for modulation signals at rates up to 10 kHz (see Figure 3-8). Modulation (deviation) sensitivity is 5 MHz/volt in range 110; 0.5 MHz/volt in range 11.

12. SWEEP OUT. Output ramp voltage concurrent with RF sweep. Output is approximately 0 to +7V in all sweep modes.

13. FAST/SLOW/MANUAL. Selects sweep speed or manual operation.

14. AUX OUT. Auxiliary output used for frequency monitoring. Output level is approximatley 0.5V p-p into 200 ohms. Output frequency is 0.1 to 11 MHz on both ranges. (Range 110 output is divided by ten.) Provides about a —5 volt DC level for decimal point movement when using HP Model 8600A for frequency measurement.

15. ON/OFF. Depressing turns instrument on or off; lamp lights when instrument is on.

16. TRIG/LINE/FREE. Selects sweep trigger. In TRIG position, sweep is started by depressing trigger button. Retrace occurs automatically, or sweep can be terminated manually by depressing trigger button a second time. In LINE position, sweep repetition rate is synchronized with line frequency. In FREE position, sweep is derived from internal sweep generator and system is free running.

17. Trigger Pushbutton. Initiates single sweep each time it is pressed momentarily when TRIG/LINE/FREE switch is in TRIG position (SYM, VIDEO or FULL SWEEP modes).

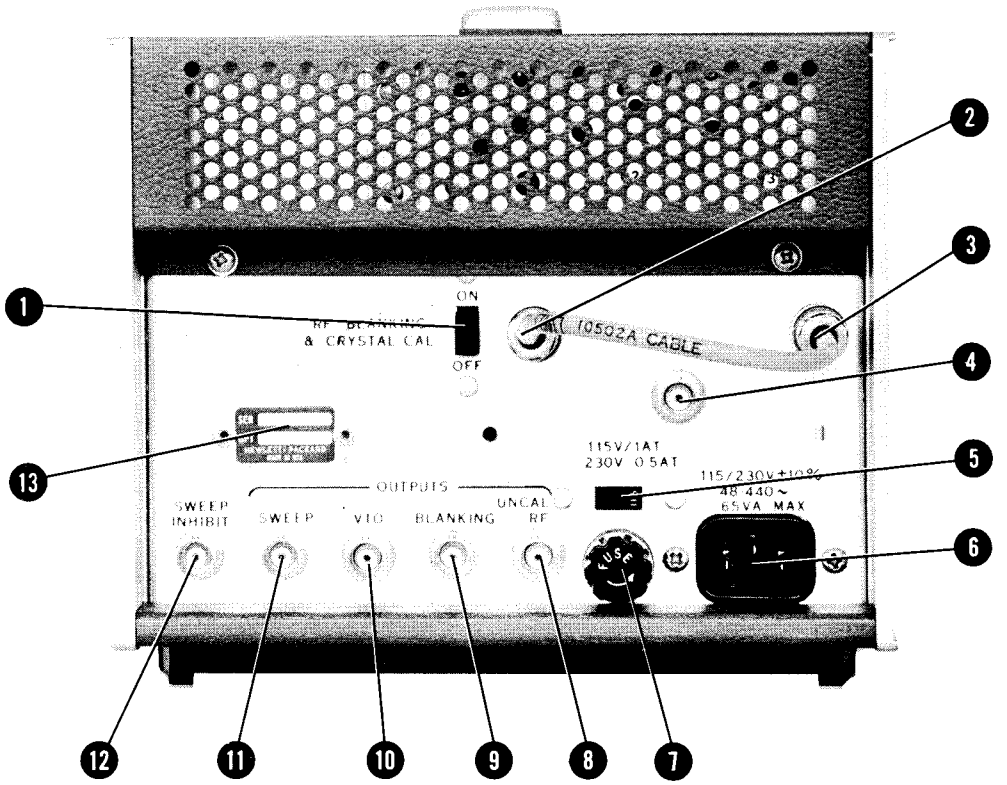
18. Crystal Cal. Activates 5 MHz calibrator circuit. Output beat-signals at 5 MHz intervals are used to calibrate single or very slow swept frequency readout (refer to Figure 3-5).

19. FREQUENCY. Selects CW frequency, SYMMETRICAL sweep center frequency, or VIDEO sweep upper frequency limit, depending on position of CW/SWEEP switch. Clockwise rotation increases frequency.

20. RANGE. Selects desired frequency range. Decimal point indicator light is automatically placed for correct frequency readout (MHz).

Figure 3-1. Front Panel Controls, Connectors and Indicators (2 of 2)

REAR PANEL FEATURES



1. RF BLANKING/CRYSTAL CAL. Enables and disables RF blanking and crystal calibrator circuit.

2. VTO Output (Option 007 only). 200.1 to 211 MHz in Range 11, 201 to 310 MHz in Range 110. Minimum amplitude is −15 dBm. For normal operating modes connect this VTO output to the LO INPUT (item 3). When using 8601A as a tracking generator leave VTO output unconnected.

3. LO INPUT (Option 007 only). For normal operating modes, connect VTO output (item 2) to LO INPUT. When using 8601A as a tracking generator connect output of external oscillator to LO INPUT.

4. AUX OUT (Option 004 only). Auxiliary output used for frequency monitoring. Output level is approximately 0.5V p-p into 200 ohms. Output frequency is 0.1 to 11 MHz on both ranges. (Range 110 output is divided by ten.)

5. Line Voltage Switch. Slide switch selects proper primary circuit for 115 or 230 Vac operation. Exposed number indicates primary voltage to be used.

CAUTION

Before plugging in power cable, check that line voltage switch is set for correct ac line voltage.

6. Power cable connector.

7. LINE FUSE. Primary circuit overcurrent protection. For 115 Vac operation, use 1

Figure 3-2. Rear Panel Controls and Connectors (1 of 2)

REAR PANEL FEATURES

amp, slow-blow fuse. For 230 Vac operation, use 0.5 amp, slow-blow fuse.

8 UNCAL RF. RF output concurrent with front panel RF OUT but is not calibrated or blanked during sweep retrace.

9 BLANKING. Output is a rectangular pulse of approximately −4V that occurs during retrace portion of sweep.

10 VTO OUTPUT. 200.1 to 211 MHz in range 11; 201 to 310 MHz in range 110. Minimum amplitude is −15 dBm.

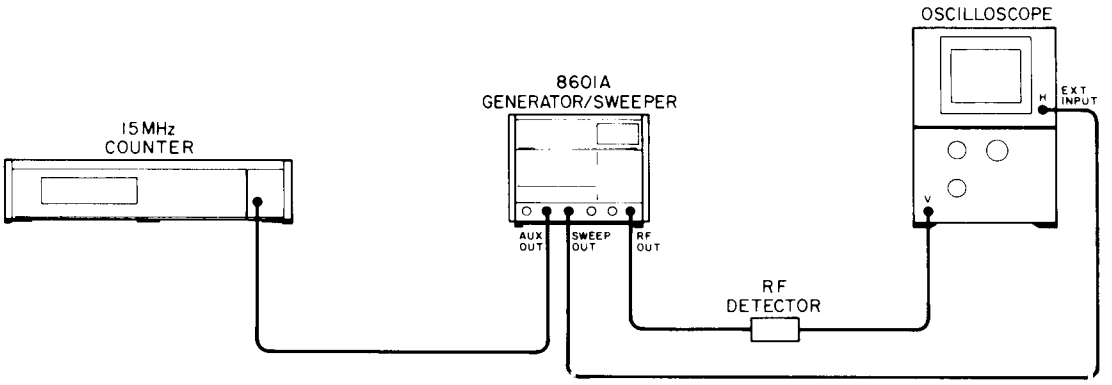
11 SWEEP. Sweep voltage output concurrent with RF sweep. Output is approximately 0 to +7V in all sweep modes.

12 SWEEP INHIBIT. A sweep inhibit pulse (momentary ground), adjustable for any frequency point across the swept range, is applied to momentarily stop the 8601A sweep. This pause enables the HP Model 8600A Digital Marker to measure the frequency at that particular point in the sweep.

13 Identification Plate. Serial number that identifies individual instrument. First three or four digits identify the serial prefix. If instrument includes a standard modification (called an Option) then the option number is given on the identification plate just below the serial number.

Figure 3-2. Rear Panel Controls and Connectors (2 of 2)

OPERATOR'S CHECK



Procedure:

1. Connect equipment as shown in Test setup.

2. Set 8601A controls as follows:

RANGE	11
FREQUENCY	11 MHz
CW/SWEEP	FULL
SYM SWEEP WIDTH	0
SYM SWEEP WIDTH VERNIER	CAL
CRYSTAL CAL	OFF
TRIG/LINE/FREE	FREE
FAST/SLOW/MANUAL	MANUAL
MANUAL	Fully Clockwise
OUTPUT LEVEL	0 dBm
OUTPUT LEVEL VERNIER	Fully Counterclockwise
1 kHz MOD	OFF
BLANKING/CRYSTAL CAL (rear panel)	OFF

3. Depress ON/OFF pushbutton to turn on instrument, pushbutton lamp should light. Allow 15 minutes of warmup time.

RF Power Check

4. Adjust OUTPUT LEVEL VERNIER (red knob) clockwise for a 0 dBm indication on 8601A meter: meter indication verifies RF output.

Full Sweep and Frequency Range Checks

5. Note counter reading. Counter should indicate approximately 11 MHz. Adjust MANUAL sweep control fully counterclockwise. Counter should indicate approximately 0.1 MHz.

6. Set RANGE switch to range 110. Counter should indicate approximately 0.1 MHz. Adjust MANUAL sweep control fully clockwise. Counter should indicate approximately 11.0 MHz: this verifies proper operation of frequency control circuitry in FULL SWEEP mode.

Auto Sweep, Blanking, and Leveling Checks

7. Set FAST/SLOW/MANUAL switch to FAST. Set oscilloscope to external sweep and a vertical sensitivity of 0.1 V/div. Establish a zero volt base line near the top edge of the CRT face. Swept trace verifies proper operation of sweep generator circuitry.

8. Set rear panel BLANKING/CRYSTAL CAL switch to ON position. The oscilloscope should display two different signal levels (sweep and blanking traces). This verifies proper operation of blanking circuitry.

9. Oscilloscope display should be as shown in Figure 5-1. Leveled output verifies proper operation of rf detection and ALC circuitry.

Crystal CAL Check

10. Set CRYSTAL CAL switch to ON position and RANGE switch to 11. Observe the oscilloscope display. The rf output sweep trace should be blanked momentarily at 5 MHz intervals (two places). Momentarily blanked output verifies operation of 5 MHz marker generator.

11. Return CRYSTAL CAL switch to OFF position.

Figure 3-3. Operator's Check (1 of 2)

OPERATOR'S CHECK

Video Sweep Check

12. Set CW/SWEEP control to VIDEO and adjust FREQUENCY control for 5 MHz.

13. Set FAST/SLOW/MANUAL switch to MANUAL and adjust MANUAL control fully clockwise.

14. Counter should indicate approximately 5 MHz (upper frequency limit of VIDEO SWEEP).

15. Adjust MANUAL control fully counterclockwise. Counter should indicate approximately 0.1 MHz (lower frequency limit of VIDEO SWEEP). Frequency outputs verify proper operation of frequency control circuitry in VIDEO SWEEP mode.

SYM Sweep Check

16. Set CW/SWEEP switch to SYM. Adjust FREQUENCY control for a counter indication of 5.0 ±0.1 MHz.

17. Set SYM SWEEP WIDTH control to 1 MHz (blue numbers).

18. Adjust MANUAL control from fully counterclockwise position to fully clockwise position. Counter should indicate a total frequency change of approximately 1 MHz. This verifies proper operation of frequency control circuitry in SYM SWEEP mode.

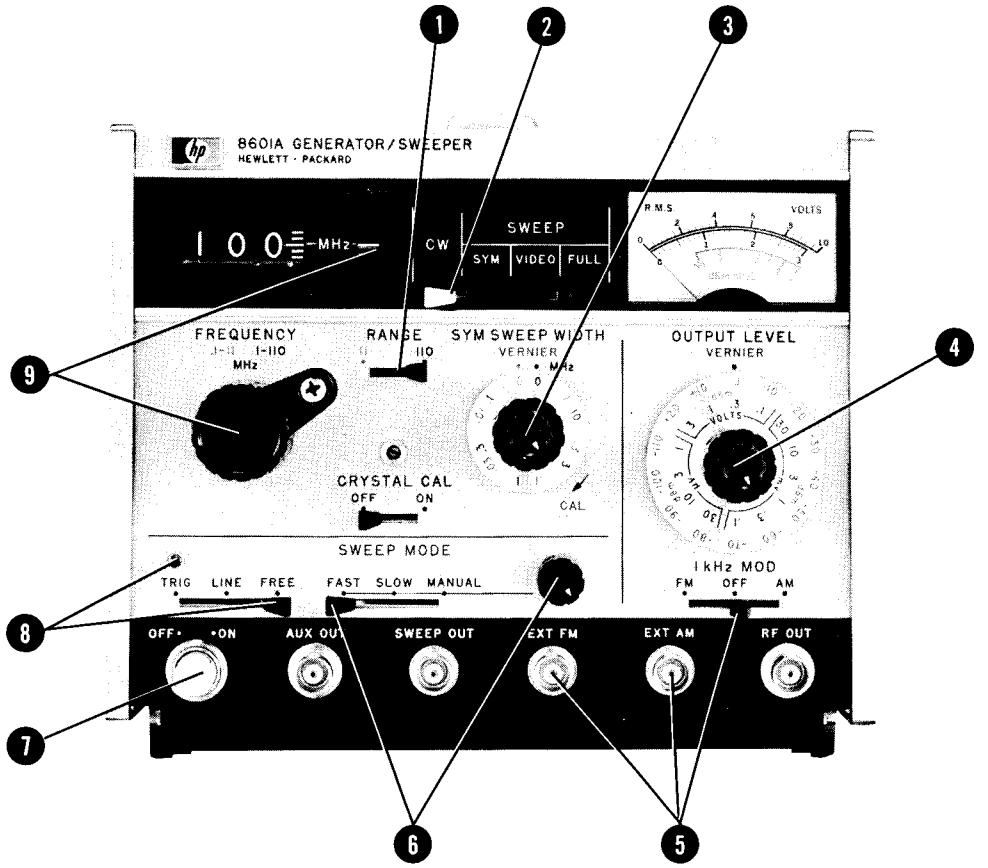
Modulation Check

19. Set 1 kHz MOD switch to AM position and set oscilloscope for an internal sweep of 1 ms/div. Oscilloscope display should appear as a 1 kHz sine wave. This verifies proper operation of internal 1 kHz oscillator circuitry.

This completes the operator's check. Detailed performance testing procedures are given in Section IV.

Figure 3-3. Operator's Check (2 of 2)

FRONT PANEL OPERATION



1. Select the frequency range desired:

   Range 11: 0.1 to 11 MHz
   Range 110: 1.0 to 110 MHz

2. Select mode of operation desired:

   FULL: Sweeps full band 0.1 to 110 MHz on range 11; 1.0 to 110 MHz on range 110.

   VIDEO: Sweeps from bottom of band (0.1 or 1.0 MHz) up to frequency indicated on digital frequency readout.

   SYM: Sweeps upward, centered on CW frequency indicated on digital frequency readout.

   CW: RF output frequency is indicated on digital frequency readout.

3. If using the SYM sweep operation, select the desired sweep width. Sweep width is calibrated when VERNIER is in CAL position. VERNIER can be used to vary sweep width from calibrated width to zero. Blue numbers on dial correspond to range 11, black numbers correspond to range 110.

4. Adjust for the desired output level. Calibrate output by adjusting for 0 dBm reading with OUTPUT LEVEL VERNIER.

5. Apply frequency or amplitude modulation as desired.

Figure 3-4. Front Panel Operation (1 of 2)

FRONT PANEL OPERATION

NOTE

Internal modulation is obtained with 1 kHz MOD switch to AM or FM. External modulation is obtained with MOD switch to OFF and external signal applied to EXT AM or EXT FM jack.

Internal am, fm or external am may be applied in CW or any sweep mode. External am limits are shown in Figure 3-9.

External fm may be applied in any sweep mode, but not CW mode. External fm limits are shown in Figure 3-8.

6 Select the desired sweep speed or manual operation. In FAST and SLOW position, the manual control serves as a sweep speed vernier. Clockwise rotation increases sweep speed.

FAST: 3 to 60 sweeps/second
SLOW: 3 to 60 seconds/sweep

7 Depress ON/OFF button. Allow two hour warmup.

8 Select the desired sweep trigger:

TRIG: Sweep is started by depressing trigger button. Retrace occurs automatically or sweep may be terminated manually be depressing trigger button a second time.

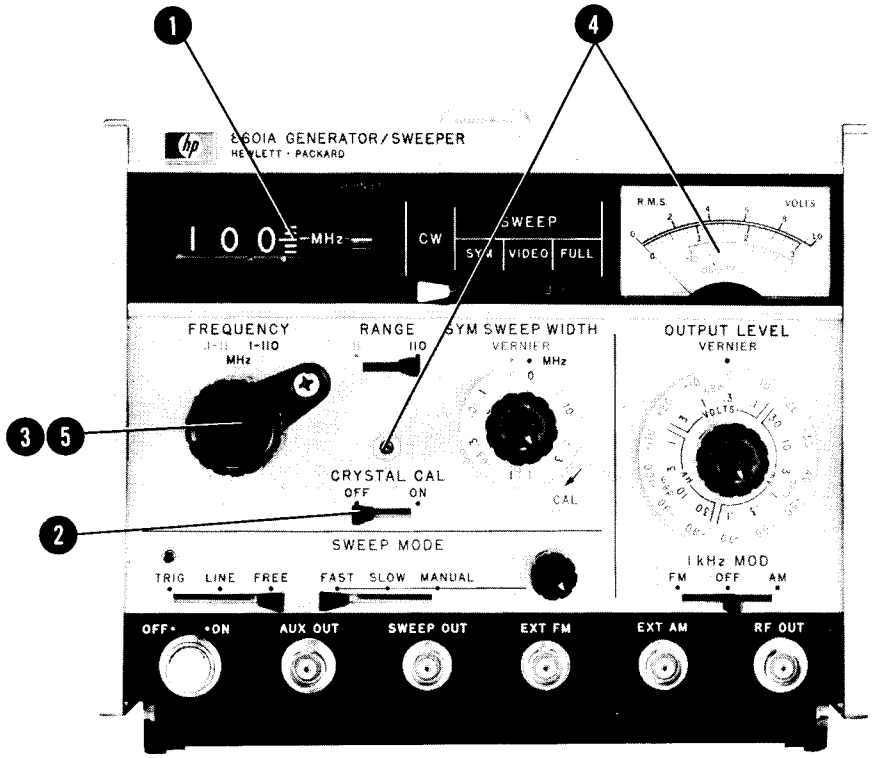
LINE: Sweep is synchronized with line frequency.

FREE: Sweep free runs.

9 Tune to the desired frequency on the digital frequency readout. The VERNIER can be used to fine-tune the frequency approximately ±0.1% of frequency

Figure 3-4. Front Panel Operation (2 of 2)

CRYSTAL CALIBRATION



1. Be sure that the FREQUENCY VERNIER is centered on the white mark, and rear panel BLANKING/CRYSTAL CAL switch is ON.

NOTE

Set CW/SWEEP control to CW.

2. Switch CRYSTAL CAL to ON.

3. Tune the FREQUENCY control to the 5 MHz multiple nearest the desired frequency.

4. Slowly tune CRYSTAL CAL adjust to obtain peak meter indication.

NOTE

When properly tuned, the peak response will be centered between two nulls.

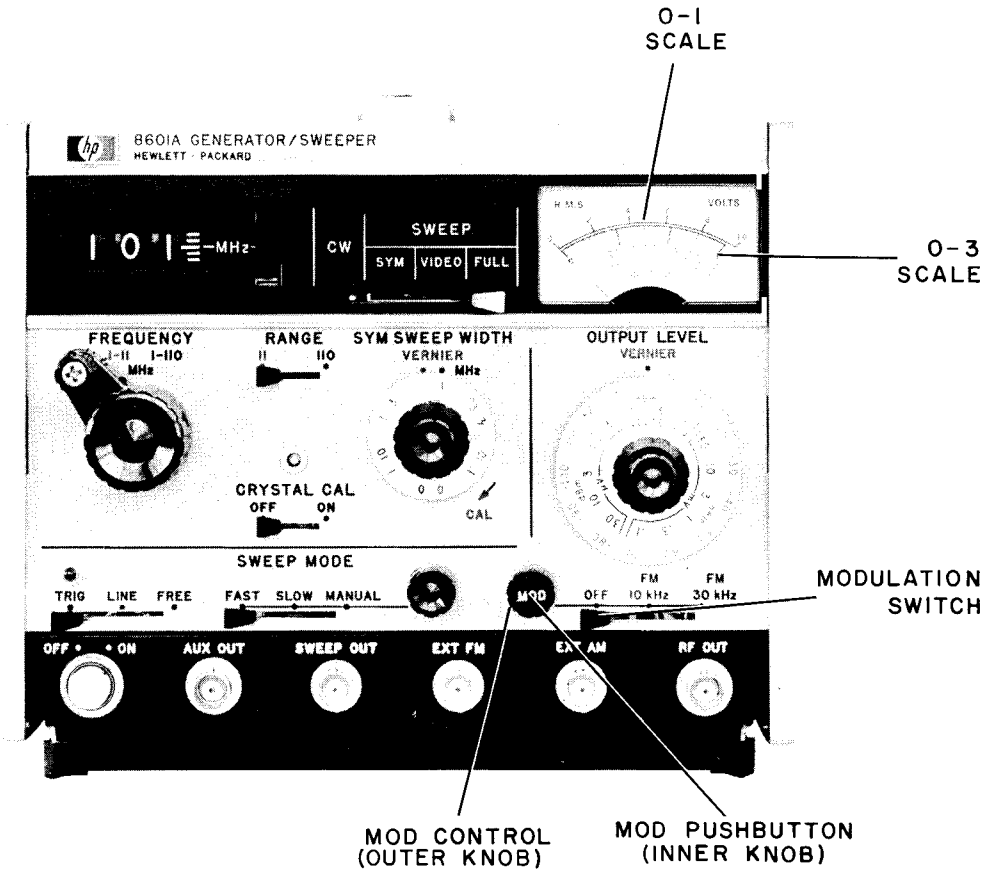
5. Switch CRYSTAL CAL to OFF. The digital frequency readout is calibrated to ±0.01%.

NOTE

The crystal calibrator signal can be used as a series of marker signals for very slow sweep rates.

Figure 3-5. Crystal Calibration

8601A METER AS AN AM INDICATOR



1. Connect 8601A controls as follows:

OUTPUT LEVEL//VERNIER	0 dBm on 8601A meter
CW/SWEEP	CW
RANGE	110
FREQUENCY	10 MHz (or greater)
MOD Control	Fully counterclockwise
Modulation Switch	AM (Options 001, 002)*
	OFF or EXT AM (Option 011)*

*AM readings should be made on the 0 — 3 scale of the 8601A meter. This scale has been calibrated for AM readings of 0 to 30%.

2. To Use 8601A Meter as an External AM Indicator

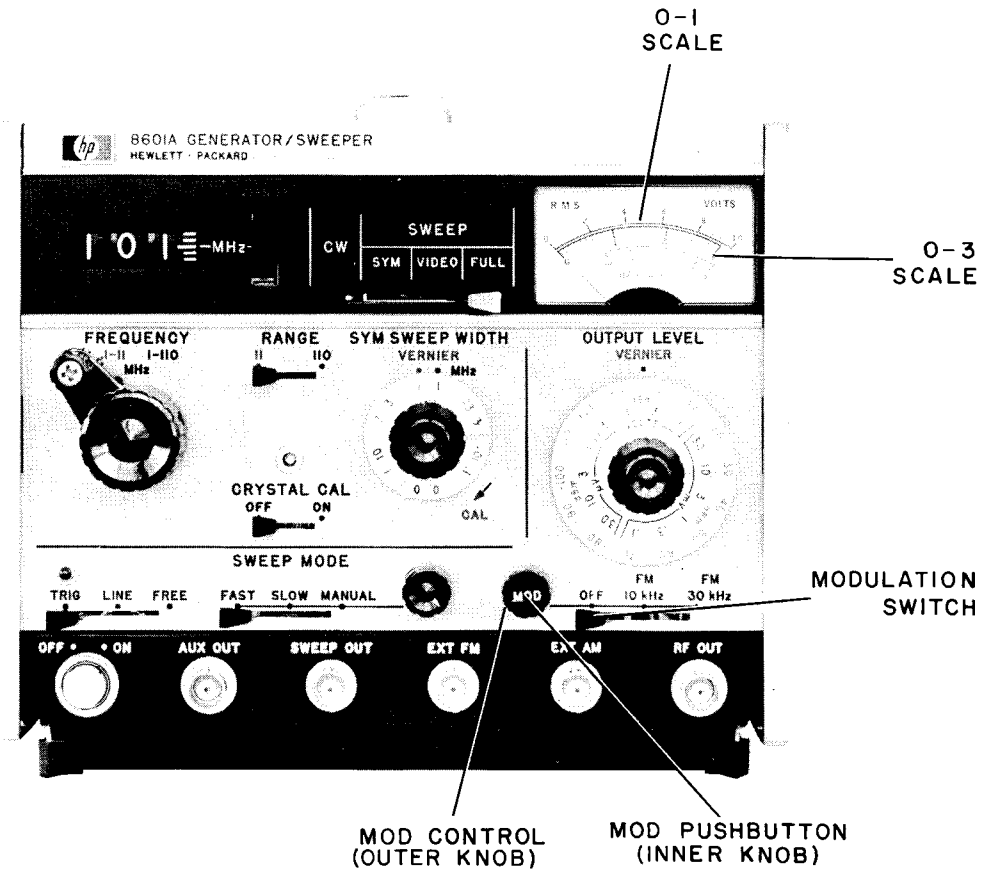
Depress the MOD pushbutton and apply an external AM signal to the front panel EXT AM jack. The amount of external am applied can be read directly on the 0 — 3 (0 — 30%) scale of the 8601A meter.

3. To Use 8601A Meter as an Internal AM Indicator

Set Modulation switch to the AM position. (Option 011 does not have internal AM.) Depress the MOD pushbutton and adjust MOD control (outer knob) clockwise for the desired amount of internal AM on the 0 — 3 (0 — 30%) scale of the 8601A Meter.

Figure 3-6. Using 8601A as AM Indicator (Options 001, 002, 011)

8601A METER AS AN FM INDICATOR



1. Connect 8601A controls as follows:

OUTPUT LEVEL/VERNIER	0 dBm on 8601A meter
SYM SWEEP WIDTH	0
CW/SWEEP	SYM
RANGE	110
FREQUENCY	10 MHz (or higher)
TRIG/LINE/FREE	FREE
FAST/SLOW/MANUAL	FAST
Mod Control (outer knob)	Fully counterclockwise
Modulation Switch	FM (Options 001, 002)*
	FM 10 kHz or FM 30 kHz (Option 011)*

2. Using 8601A Meter as an External FM Indicator

Depress the MOD pushbutton, apply an external AC signal to the front panel EXT FM jack. The amount of external FM applied can be read directly on the appropriate 8601A meter.

3. Using 8601A Meter as an Internal FM Indicator

Set Modulation switch to the desired FM position. Depress MOD pushbutton and adjust MOD control (outer knob) clockwise for the desired amount of internal FM, as indicated on the appropriate 8601A Meter.*

*FM readings should be made on the following 8601A Meter scales.

(Option 001) the 0 — 1 scale has been calibrated for FM readings of 0 to 100 kHz.

(Option 002) the 0 — 3 scale has been calibrated for FM readings of 0 to 30 kHz.

(Option 011) the modulation switch selects either the 0 — 1 or 0 — 3 scales; the FM 10 kHz position selects the 0 — 1 scale, which is calibrated for FM readings of 0 to 10 kHz; the FM 30 kHz position selects the 0 — 3 scale, which is calibrated for FM readings of 0 to 30 kHz.

Figure 3-7. Using 8601A Meter as an FM Indicator (Options 001, 002, 011)

±5% at a 1 kHz rate. The external am is adjustable from about 10% at 5 kHz rate, to 50% at 400 Hz rate, to 80% at 10 Hz (see Figure 3-9 for maximum limits).

3-19. For AM operation, the rf output level should be adjusted before applying modulation. The meter monitors the output of a peak detector and, therefore, reads a greater apparent rf level when amplitude modulation is applied.

3-20. OPERATOR'S MAINTENANCE

3-21. Fuses

3-22. Fuse F1, located on the rear panel, is installed in the primary circuit of power transformer T1, to protect the instrument. For 115 Vac operation, F1 should be a standard 1 amp, slow-blow fuse, for 230 Vac operation, F1 should be a standard 0.5 amp, slow-blow fuse. Refer to parts list in Section VI for fuse part number.

3-23. Fuses A8F1 and A8F2 are located on rectifier board A8. A8F1 is a standard 2 amp, slow-blow fuse, that protects the +20V and —6.3V power supplies. A8F2 is a standard 0.125 amp, slow-blow fuse, that protects the —75V power supply. Refer to parts list in Section VI for fuse part number.

3-24. Lamp Replacement

3-25. The front panel indicator lamp located in the ON/OFF switch is replaceable from the front. Pull the white pushbutton straight out, and replace the lamp (HP Part Number 2140-0244). Align the pushbutton guide (small protrusion) with the notch in the ON/OFF switch-receptacle and reinsert pushbutton.

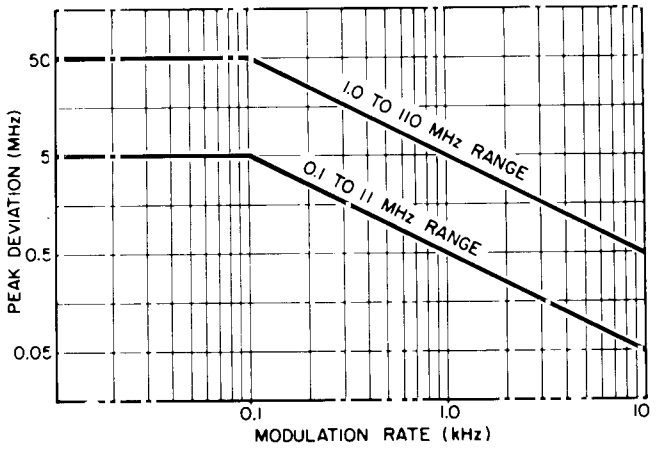


Figure 3-8. Maximum Peak Deviation versus Modulation Rate

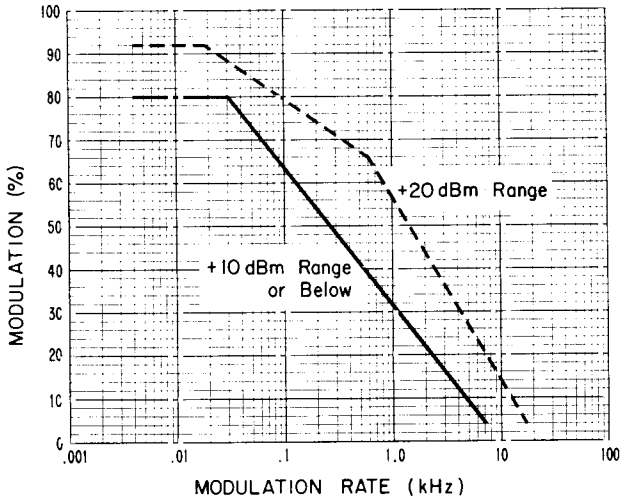


Figure 3-9. Maximum Percent Modulation versus Modulation Rate

SECTION IV
PERFORMANCE TESTS

4-1. INTRODUCTION

4-2. The procedures in this section test the instrument's electrical performance (standard instrument and instrument Options 001 — 011) using the specifications of Table 1-1 as the performance standards. All tests can be performed without access to the interior of the instrument. A simpler operational test is included in Section III under Operator's Checks.

4-3. EQUIPMENT REQUIRED

4-4. Equipment required for the performance tests is listed in Table 1-2, Recommended Test Equipment. Any equipment that satisfies the measurement requirements given in the table may be substituted for the recommended models.

4-5. TEST RECORD

4-6. Results of the performance tests may be tabulated on the Test Record at the end of the procedures. The Test Record lists all of the tested specifications and their acceptable limits. Test results recorded at incoming inspection can be used for comparison in periodic maintenance and troubleshooting and after repairs or adjustments.

PERFORMANCE TESTS

4-7. Initial Setup. Before proceeding with performance tests, allow the Model 8601A at least a one hour warmup.

4-8. Frequency Coverage/Accuracy

Specification:

Coverage: Low range, 0.1 — 11 MHz; high range, 1 — 110 MHz.

Accuracy (in CW, stop frequency of VIDEO sweep, and center frequency of SYMMETRICAL sweep):

Low Range, ±1% of frequency ±10 kHz

High Range, ±1% of frequency ±100 kHz.

Description:

The frequency coverage (range) and accuracy is tested using a counter to measure the model 8601A AUX OUT frequency. The AUX OUT frequency is equal to the actual RF output frequency in low range of the 8601A and is equal to the actual RF output frequency divided by ten (through a precision-internal divider) in the high range of the 8601A.

Equipment:

Counter/Marker Generator . . . . . HP 8600A

Procedure:

1. Connect counter to 8601A AUX OUT connector.

2. Make the following 8601A settings:

FREQUENCY	0.1 MHz	CRYSTAL CAL	OFF
RANGE	11	SWEEP MODE	FAST
FREQUENCY VERNIER	Centered	TRIG/LINE/FREE	FREE
CW/SWEEP	CW	OUTPUT LEVEL	0 dBm
SYM SWEEP WIDTH	0	OUTPUT LEVEL VERNIER	0 dBm on output meter
SYM SWEEP WIDTH VERNIER	CAL	1 kHz MOD	OFF (or EXT)

3. Counter should indicate 0.1 MHz ±11 kHz.

4. Adjust 8601A FREQUENCY control to 5 MHz.

5. Counter should indicate 5 MHz ±60 kHz.

6. Adjust FREQUENCY control to 11 MHz.

7. Counter should indicate 11 MHz ±120 kHz.

8. Set 8601A RANGE switch to 110.

9. Adjust FREQUENCY control to 1 MHz.

10. Counter reading should be 0.1 MHz ±11 kHz.

PERFORMANCE TESTS

4-8. Frequency Coverage/Accuracy (Cont)

NOTE

When using a HP Model 8600A counter, the decimal point is automatically shifted one place when 8601A is used on high 110 RANGE. Therefore, for step 10 a HP Model 8600A counter reading should be 1 MHz ±110 kHz.

11. Adjust FREQUENCY control to 50 MHz: the counter reading should be 5 MHz ±60 kHz.

12. Adjust FREQUENCY control to 110 MHz: the counter reading should be 11 MHz ±120 kHz.

4-9. Sweep Characteristics

Specifications:

Full Sweep: Approximately 0.1 — 11 MHz and 1 — 110 MHz independent of dial setting.

Video Sweep: Sweep extends from low end of range to frequency dial setting. Start frequency accuracy is ±1% of stop frequency, ±100 kHz, high range; ±1% of stop frequency, ±10 kHz low range.

Symmetrical Sweep: Center frequency may be tuned to any point on either range:

Sweep Width: 0 — 1 MHz low range; 0 — 10 MHz high range. There are five calibrated sweep width positions as well as an uncalibrated vernier to provide continuous adjustment.

Sweep Width Accuracy: ±2% of sweep width ±1 kHz on low range; ±2% of sweep width ±10 kHz on high range.

Description:

The sweep characteristics of the 8601A are tested by actually measuring RF frequency points during swept operation with a special electronic counter (the HP Model 8600A). If this special counter is not available, an alternate test of 8601A sweep characteristics can be made with the 8601A in MANUAL SWEEP mode and using a standard electronic counter.

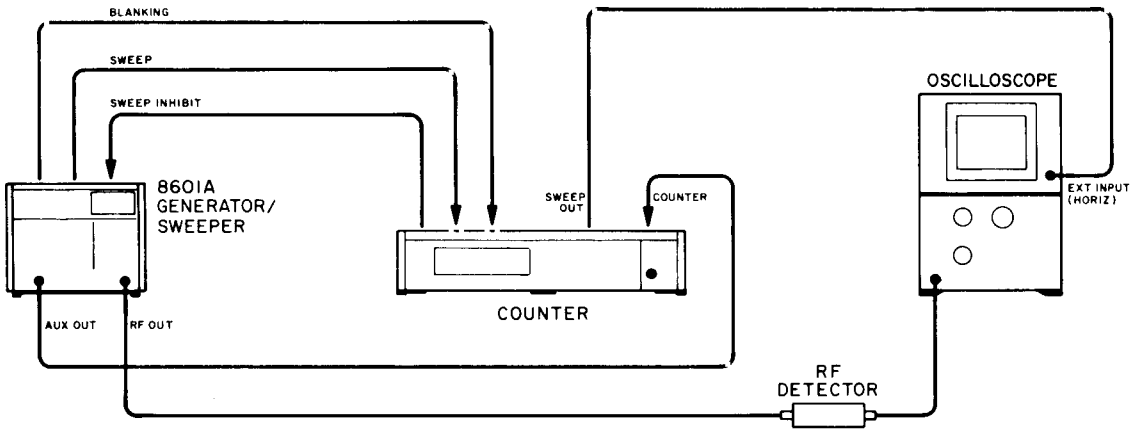


Figure 4-1. Sweep Characteristics Test Setup

PERFORMANCE TESTS

4-9. Sweep Characteristics (Cont)

Equipment:

RF Detector	HP 8471A
Oscilloscope	HP 180A/1803A/1820A
Counter/Marker Generator	HP 8600A

Procedure:

1. Connect equipment as shown in Figure 4-1.

2. Make the following initial settings:

8601A

RANGE	110	OUTPUT LEVEL	0 dBm
CW/SWEEP	FULL	SYM SWEEP WIDTH	0
SWEEP MODE	FAST/FREE	SYM SWEEP WIDTH VERNIER	CAL
MANUAL SWEEP CONTROL	Fully clockwise	CRYSTAL CAL	OFF
		MOD	OFF (or EXT)

3. Set Counter/Marker Generator for SCOPE/SWEEP mode and Oscilloscope DC coupled-external horizontal input sensitivity for full screen (horizontal line) CRT display.

4. Select a marker to be counted by pushing the pushbutton in the center of the desired marker knob.

NOTE

The marker selected provides a brighter marker dot than the other dots.

5. Position selected marker to highest swept frequency point on display. The counter indication should be 110 to 120 MHz.

6. Push a different pushbutton and position newly selected marker to lowest swept frequency point on display. The counter indication should be 0.98 to 3 MHz.

7. Set 8601A range to 11 and reposition selected markers, if necessary measure highest and lowest swept frequencies. Highest frequency should be 11 to 12 MHz. Lowest frequency should be 0.1 to 0.3 MHz.

8. Set 8601A CW/SWEEP control to VIDEO and FREQUENCY control to 10 MHz.

9. Repeat steps 5 and 6 above. The lowest frequency should be 0.1 ±0.11 MHz. The highest frequency should be 10 ±0.11 MHz.

10. Set 8601A to range 110 and FREQUENCY control to 100 MHz.

11. Repeat steps 5 and 6 above. The lowest frequency should be 1 ±1.1 MHz. The highest frequency should be 100 ±1.1 MHz.

12. Set 8601A CW/SWEEP control to SYM, SYM SWEEP WIDTH control to 10 MHz, SYM SWEEP WIDTH VERNIER to CAL, and SWEEP MODE to FAST/FREE.

PERFORMANCE TESTS

4-9. Sweep Characteristics (Cont)

13. Position a selected marker to center of oscilloscope swept display line.

14. Adjust 8601A FREQUENCY control for counter indication of 100 MHz.

15. Position a selected marker to highest frequency point on display. Counter indication should be 105 ±0.2 MHz.

16. Position a selected marker to lowest frequency point on display. Counter indication should be 95 ±0.2 MHz.

17. Adjust 8601A SYM SWEEP WIDTH control to 3 MHz.

18. Repeat steps 15 and 16. Highest frequency should be 101.5 ±0.06 MHz and lowest frequency should be 98.5 ±0.06 MHz.

19. Adjust 8601A SYM SWEEP WIDTH control to 1 MHz.

20. The highest frequency should be 100.5 ±0.02 MHz and lowest frequency should be 99.5 ±0.02 MHz.

21. Adjust SYM SWEEP WIDTH to each remaining position and measure sweep width accuracy as above. Accuracy of each swept frequency end point must be ±2% of sweep width ±10 kHz.

22. Adjust 8601A range to 11 and SYM SWEEP WIDTH to 1 MHz (blue number on dial).

23. Position a selected marker to center of oscilloscope swept display line. Adjust 8601A FREQUENCY control for counter indication of 10 MHz.

24. Highest swept frequency should be 10.5 ±0.02 MHz. Lowest frequency should be 9.5 ±0.02 MHz.

25. Adjust SYM SWEEP WIDTH control to each position and measure the sweep width accuracy. The accuracy of each swept frequency end point should be ±2% of symmetrical sweep width ±1 kHz.

4-10. Linearity

Specification:
Linearity: ±0.5% of full sweep.

Description:
Linearity (RF output frequency versus sweep output voltage) can be checked two ways. Measuring RF frequency points during swept operation with an oscilloscope and a special electronic counter (HP Model 8600A) or calibrating an X-Y recorder and plotting the 5 MHz markers of the internal 8601A Crystal Calibrator. Both measurement techniques are described in the following procedure.

NOTE

The accuracy of the special counter technique is dependent on the oscilloscope accuracy.

PERFORMANCE TESTS

4-10. Linearity (Cont)

Procedure:

Special Counter Technique

1. Use equipment setup of Figure 4-1.

2. Make the following initial settings:

CW/SWEEP	FULL	OUTPUT LEVEL	0 dBm
SWEEP MODE	FAST/FREE	CRYSTAL CAL	OFF
MANUAL SWEEP		MOD	OFF (or EXT)
CONTROL	Full clockwise	RANGE	110

3. Set Counter/Marker Generator for SCOPE/SWEEP and oscilloscope DC coupled-external horizontal input sensitivity for full screen (horizontal line) display.

4. Select a marker to be counted by pushing the pushbutton in the center of the desired marker knob.

5. Position selected marker to highest swept frequency point on display and record counter reading.

6. Position selected marker to lowest swept frequency point on display and record counter reading.

7. Position selected marker to center of swept display. The counter reading should equal a frequency half way between the highest and lowest swept frequency points.

8. Position selected marker to a point on the swept display that is half way between the lowest and center points. Counter reading should equal a frequency one-quarter way between the highest frequency and lowest frequency.

9. Position selected marker to a point on the swept display half-way between the center and highest points. Counter reading should equal a frequency three-quarters of the way between the highest frequency and lowest frequency.

10. Repeat above procedure at all frequency points of interest.

X-Y Recorder Technique

11. Connect equipment as shown in Figure 4-2.

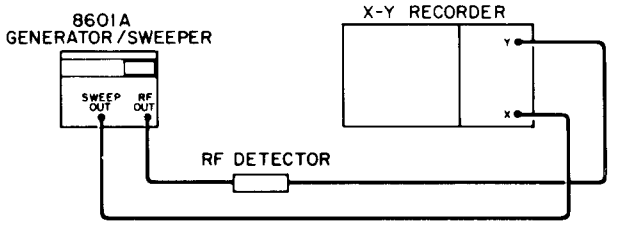


Figure 4-2. Alternate Linearity Test Setup

PERFORMANCE TESTS

4-10. Linearity (Cont)

12. Set 8601A controls as follows:

CW/SWEEP	VIDEO	SWEEP MODE	TRIG/SLOW
RANGE	110	CRYSTAL CAL	ON
FREQUENCY	110 MHz	OUTPUT LEVEL	0 dBm

13. Adjust recorder X-axis sensitivity for 21 cm horizontal display. With this calibration, 1 mm equals 0.5% of sweep width.

14. Depress TRIG button to obtain sweep.

15. Markers are visible every 5 MHz and occur every cm ±1 mm (1 mm = 0.5% linearity).

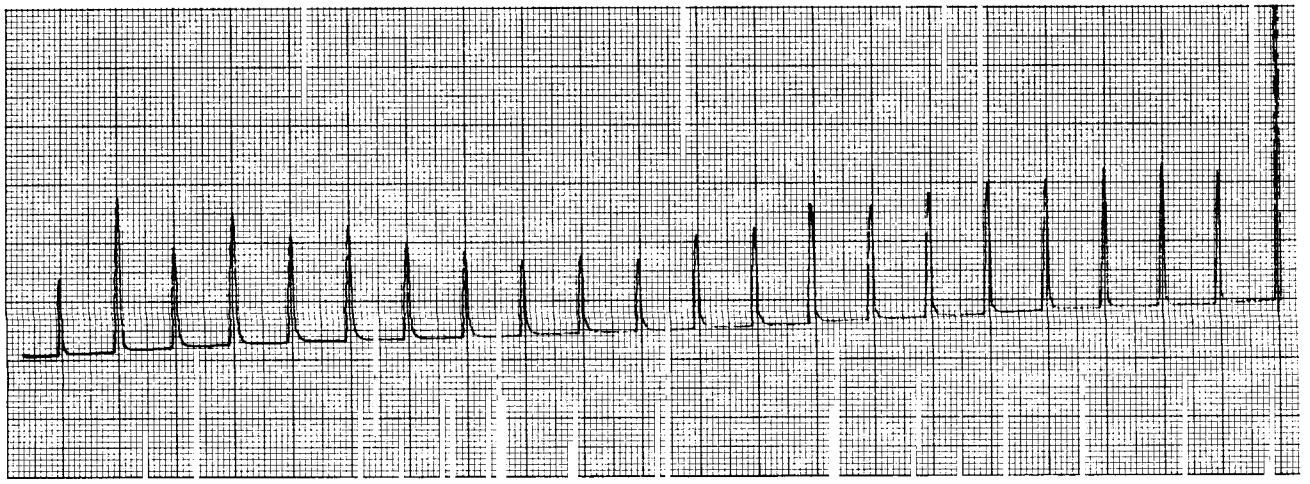


Figure 4-3. Recorder Trace of Linearity

4-11. Amplitude Modulation

Specification:

Standard Instrument and Options 003, 004 and 006 — 010

Internal AM: 30% ±5% at 1 kHz, less than 3% distortion. Typically <1% distortion for output readings on upper half of meter scale.

External AM: Zero to 50%, up to 400 Hz. Zero to 30%, up to 1 kHz. Applied through external AM input on front panel. Sensitivity typically 2V peak/10% modulation index at 400 Hz (10 — 50% AM).

Option 001 and 002 Instruments

Same as standard instrument, except:

1. Output level meter usable as 0 — 30% AM monitor for internal or external AM with ±3% accuracy for 22 to 30% AM levels (50 Hz to 1 kHz rates).
2. Internal AM adjustable 0 — 30%.

PERFORMANCE TESTS

4-11. Amplitude Modulation (Cont)

Option 005 Instrument
Same as standard instrument, except Internal AM rate is 400 Hz.

Option 011 Instrument
Same as Option 001 instrument except that internal AM is removed from instrument.

Description:
The amplitude modulation rate and level is measured using an oscilloscope.

Equipment:
Oscilloscope . . . . HP 180A/1803A/1820A Audio Oscillator . . . . . HP 200CD

Procedure:
1. Connect oscilloscope to 8601A RF OUT with 50 ohm termination connected in parallel with RF input at oscilloscope input.

NOTE

For Option 008, 009 and 010 instruments (75 ohm output impedance) use a 75 ohm to 50 ohm minimum loss pad. Refer to Table 1-2.

2. Make following 8601A settings:

CW/SWEEP	CW	FREQUENCY	10 MHz
OUTPUT LEVEL	+10 dBm	MOD	OFF (or EXT AM)
RANGE	11		

3. Adjust oscilloscope vertical sensitivity for a 5 cm display (oscilloscope horizontal sweep time should be about 0.5 millisecond/div).

4. Connect audio oscillator (1000 Hz) to 8601A EXT AM connector.

5. Adjust audio oscillator amplitude output level for 30% amplitude modulation level as indicated on oscilloscope display (1.5 cm peak-to-trough modulation signal as shown in Figure 4-4).

NOTE

By varying audio oscillator amplitude output level, the modulation signal should be adjustable from 1.5 cm (peak-to-trough) amplitude to approximately zero amplitude.

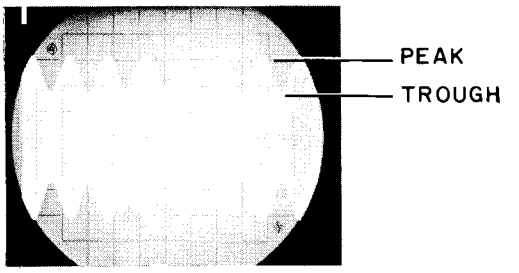


Figure 4-4. Typical Amplitude Modulated Carrier Waveform

AM Monitor TEST (For Option 001, 002 and 011 instruments only)
6. For Option 001 or Option 002 instruments, turn front panel MOD vernier control full counterclockwise and set AM/FM/OFF switch to AM. For Option 011 instruments, 10 kHz/30 kHz/OFF switch should be set to OFF.

NOTE

For some Option 011 instruments, the OFF position was labeled EXT AM.

PERFORMANCE TESTS

4-11. Amplitude Modulation (Cont)

7. If necessary, re-adjust audio oscillator for 30% amplitude modulation as in step 5.

8. Push front panel MOD pushbutton. The 8601A OUTPUT LEVEL METER, with MOD button depressed should indicate 30 ±3 divisions on the 0 — 3 volt scale.

Internal AM Test

NOTE

The Option 011 instrument does not have internal AM.

9. Remove 8601A EXT AM input signal.

10. Set OFF/AM/FM switch to AM. For Option 001 and 002 instruments, push MOD button and adjust MOD vernier control for 30% output level meter reading on 0 — 3V scale.

11. Internal amplitude modulation level as indicated on oscilloscope should be 1.5 ±0.25 cm (30 ±5%).

4-12. External FM

Specifications:

Standard Instrument (and Options 004 — 010)

External FM: Sensitivity; 5 MHz per volt ±5%, high range; 0.5 MHz per volt ±5% low range; negative polarity.

Deviations to the band edges are possible for rates from DC to 100 Hz; voltages to frequency linearity are ±0.5%, allowing remote frequency programming.

Option 001 Instrument

Same as standard instrument except:

Meter is usable as FM peak deviation monitor for FM deviations of 0 — 100 kHz at RF frequencies above 10 MHz. Meter accuracy is ±5 kHz for 50 Hz to 10 kHz FM rates; ±10 kHz for 10 to 20 kHz FM rates.

Option 002 Instrument

Same as standard instrument, except:

Meter is usable, as FM peak deviation monitor for FM deviations of 0 — 30 kHz at RF frequencies above 10 MHz. Meter accuracy is ±1.5 kHz for 50 Hz to 10 kHz rates; ±3 kHz for 10 to 20 kHz rates.

Option 003 Instrument

Same as standard instrument except:

For narrow frequency control up to 300 kHz (30 kHz on low range): External FM sensitivity is reduced to 100 kHz/volt high range; 10 kHz/volt, low range.

PERFORMANCE TESTS

4-12. External FM (Cont)

Option 011 Instrument

Same as standard instrument, except:

1. Meter is usable as FM peak deviation monitor for deviation rates of 0 — 30 kHz and 0 — 10 kHz at frequencies above 10 MHz.
2. Meter accuracy for 0 — 30 kHz deviation same as Option 002.
3. Meter accuracy for 0 — 10 kHz deviation, ±0.6 kHz for 50 Hz to 10 kHz rates; ±1.0 kHz for 10 kHz to 20 kHz rates.

Description:

The frequency modulated carrier signal from the 8601A is down converted to 1.0 MHz using a signal generator and a frequency mixer. This down-converted frequency retains all frequency modulation characteristics of the original signal. It (1 MHz frequency modulated signal) is demodulated, using a calibrated discriminator, and a rms voltmeter is used to measure the magnitude of the modulation signal.

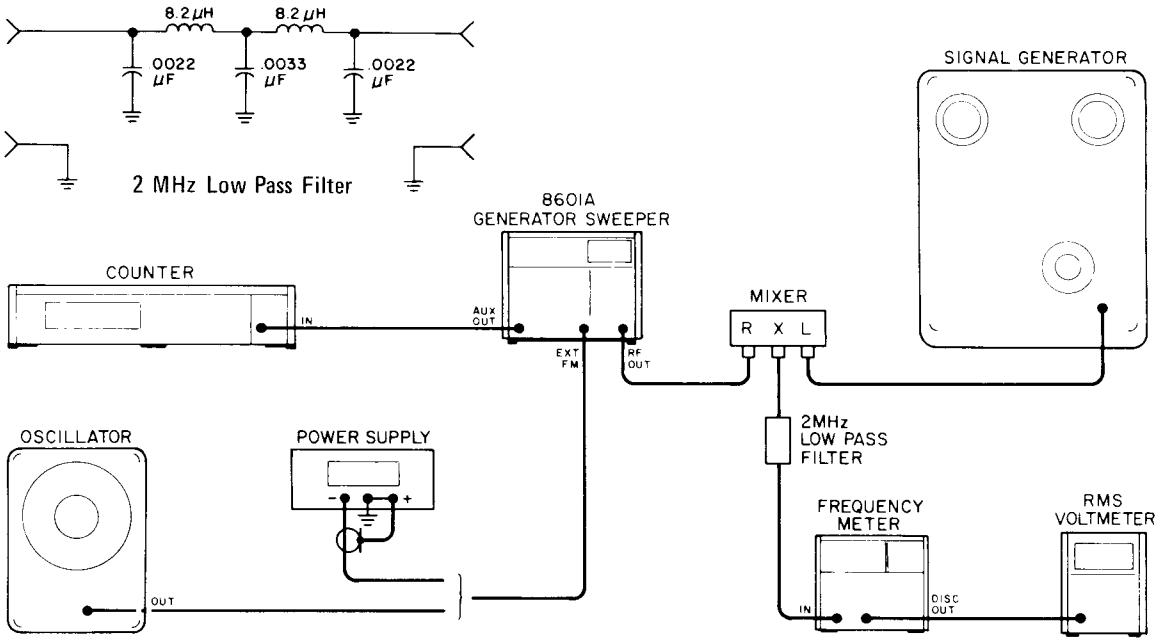


Figure 4-5. External FM Test Setup

Equipment:

Counter/Marker Generator	HP 8600A	Signal Generator	HP 606A and HP 608C
DC Power Supply	HP 6215A		
Audio Oscillator	HP 200CD	2 MHz Low Pass Filter	(See Table 1-2)
RMS Voltmeter	HP 3400A	Digital Voltmeter	HP 3439A/ 3443A
Frequency Meter	HP 5210A		
Balanced Mixer	HP 10514A or HP 10534A		

PERFORMANCE TESTS

4-12. External FM (Cont)

Procedure (Standard and all Option Instruments)

1. Connect dc power supply and counter to 8601A as shown in Figure 4-5.

NOTE

For Options 008, 009 or 010 instruments 75 ohm output impedance, use a 75 ohm to 50 ohm minimum loss pad. (Refer to Table 1-2).

2. Set 8601A controls as follows:

SWEEP MODE	FAST	CW/SWEEP	SYM
RANGE	110	SYM SWEEP WIDTH	0
FREQUENCY	60 MHz	OUTPUT LEVEL	+10 dBm
		MOD	OFF*

*For some Option 011 instruments, the OFF position was labeled EXT AM.

3. Increase power supply output in −1 volt steps.

NOTE

For Option 003 instruments, only up to 3 volts.

4. Counter indicates 8601A frequency, increases approximately 5 MHz for every 1 volt increase across the band (100 kHz per volt for Option 003 instruments).

5. Set power supply to 0 volt and 8601A RANGE to 11.

6. Increase power supply in −1 volt steps.

7. Counter indicates 8601A frequency, increases approximately 0.5 MHz for every 1 volt increase across the band (10 kHz per volt for Option 003 instruments).

8. Remove power supply and connect audio oscillator to EXT FM jack.

9. Frequency Meter Calibration. Before connecting the frequency meter in the test setup, calibrate it as follows:

a. Install shorting board in Model 5210A.

b. Set sensitivity (volts RMS) to CAL (100 kHz) and range to 100 kHz. The meter should display a full scale indication; if not, adjust screwdriver CAL (100 kHz) as necessary.

c. Adjust rear panel DISC GAIN CONTROL for −1 volt DC at DISC OUT jack of 5210A (as measured on voltmeter).

d. Reset SENSITIVITY (volts RMS) to 0.1 Vrms.

e. Remove internal shorting board and install 10 kHz low pass filter (HP Part No. 10531-6001) in 5210A. The Butterworth configuration is preferred because it provides maximum amplitude response flatness.

NOTE

If internal 10 kHz low pass filter is not available, internal shorting board should be installed in 5210A and 10 kHz low pass filter connected to DISC OUT jack of 5210A.

PERFORMANCE TESTS

4-12. External FM (Cont)

10. Connect equipment as shown in Figure 4-5. Set 8601A RANGE to 110, FREQUENCY to 60 MHz and adjust Signal Generator for 61.0 MHz at a level of about −10 dBm.

11. Set 5210A frequency meter RANGE to 1 MHz, the DISC OUT is now calibrated for 1 MHz/volt (peak). Adjust signal generator frequency for 1 MHz (full scale) frequency meter reading.

12. Set audio oscillator to 1 kHz and adjust output level for 70.7 mV rms voltmeter reading (this indicates a 100 kHz, 8601A frequency peak deviation).

13. Set 8601A FREQUENCY to 10 MHz and repeat steps 11 and 12.

Procedure (Option 001, 002 and 011 Instruments Only)

14. For Option 001 instrument: Set MOD control fully counterclockwise and OFF/AM/FM switch to FM.

15. Push MOD button, the output level meter should indicate 100 ±5 kHz on 0 — 1 volt scale.

16. For Option 002 and 011 instruments: Set MOD control fully counterclockwise and switch to FM (Option 002) or FM 30 kHz (Option 011). Adjust audio oscillator output level for 21.21 mVrms voltmeter reading (this indicates 30 kHz peak frequency deviation).

17. Push MOD pushbutton, the output level meter should read 30 ±1.5 kHz on the 0 — 3 volt scale.

18. For Option 011 instruments: With MOD control fully counterclockwise, adjust audio oscillator output level for 7.07 mVrms (indicating 10 kHz peak frequency deviation).

19. Set switch to FM 10 kHz. Push MOD pushbutton, the output level meter should read 10 ±0.6 kHz on the 0 — 1 volt scale.

4-13. Internal FM

Specifications:

Standard and Option 003, 004, 007 — 010 Instruments:

1 kHz rate; 75 kHz ±5% deviation, high range.
1 kHz rate; 7.5 kHz ±5% deviation, low range.

Option 001 Instruments

1 kHz rate; 0 — 100 kHz peak deviation, high range; 0 — 10 kHz peak deviation, low range.
For RF frequencies >10 MHz an internal deviation monitor provides ±5 kHz readout accuracy for deviations of 70 to 100 kHz.

Option 002 Instruments

1 kHz rate; 0 — 30 kHz peak deviation, high range; 0 — 3 kHz peak deviation, low range.
For RF frequencies >10 MHz an internal deviation monitor provides ±1.5 kHz readout accuracy for deviations of 21 to 30 kHz.

Option 005 Instruments

Same as standard instrument, except internal AM rate is 400 Hz.

PERFORMANCE TESTS

4-13. Internal FM (Cont)

Option 006 Instruments

Same as standard instrument, except internal FM deviation is 22.5 kHz ±5% on high range and 2.25 kHz ±5% on low range.

Option 011 Instruments

Same as Option 002 instrument, additionally: a 0 — 10 kHz deviation, high range is provided with internal deviation monitor, usable above 10 MHz, accuracy of ±0.6 kHz for deviations of 7 to 10 kHz.

NOTE

Internal FM operation is not guaranteed on low range.

Description:

The frequency modulated carrier signal from the 8601A is down converted to 1 MHz (or 100 kHz) using a signal generator and a balanced mixer. This down converter signal retains all frequency modulation characteristics of the original signal. It (1 MHz or 100 kHz signal) is demodulated, using a calibrated discriminator, and an rms voltmeter is used to measure the magnitude of the modulation signal.

Procedure (all instruments):

1. Setup equipment as shown in Figure 4-5. Audio Oscillator, DC Power Supply and Counter/ Marker Generator are not needed.

2. Set 8601A controls as follows:

SWEEP MOD	FAST	SYM SWEEP WIDTH	0
RANGE	110 MHz	OUTPUT LEVEL	+10 dBm
FREQUENCY	60 MHz	MOD	FM (or FM 30 kHz)
CW/SWEEP	SYM		

3. Frequency Meter Calibration:

a. Install shorting board in 5210A.

b. Set sensitivity (volts RMS) to CAL (100 kHz) and range to 100 kHz. The meter should display a full scale indication; if not, adjust screwdriver CAL (100 kHz) as necessary.

c. Adjust rear panel DISC GAIN CONTROL for —1 volt DC at DISC OUT jack of 5210A.

d. Reset sensitivity (volts rms) to 0.1 Vrms.

e. Remove internal shorting board and install 100 kHz low pass filter (HP 10531-6002) in 5210A (the Butterworth configuration is recommended).

4. Set 5210A frequency meter RANGE to 1 MHz.

5. Adjust signal generator frequency for 1 MHz (full scale) frequency meter reading.

6. RMS voltmeter indication should be:

a. For Standard and Options 003, 004, 005, 007, 008, 009 and 010 instrument: 53 mVrms ±5%.

b. For Option 006 instrument: 15.9 mVrms ±5%.

PERFORMANCE TESTS

4-13. Internal FM (Cont)

c. For Option 011 instruments: Voltmeter indication should be adjustable to 70.7 mVrms using MOD control.

NOTE

With MOD button pushed the 8601A OUTPUT LEVEL meter should indicate 100 ±5 kHz on the 0 — 1 volt scale (1 = 100 kHz).

d. For Option 002 and 011 instruments: The voltmeter indication should be adjustable to 21.2 mVrms using MOD control.

NOTE

With MOD button pushed the 8601A OUTPUT LEVEL meter should indicate 30 ±1.5 kHz on the 0 — 3 volt scale (3 = 30 kHz).

e. For Option 011 instruments: Adjust FM 30 kHz switch to FM 10 kHz. Voltmeter indication should be adjustable to 7.07 mVrms and MOD button push should cause 10 ±0.6 kHz indication on OUTPUT LEVEL meter on 0 — 1 volt scale (1 = 10 kHz).

7. Set 8601A RANGE to 11 (low range).

8. Remove 100 kHz low pass filter from 5210A frequency meter and install 10 kHz low pass filter.

9. Set 5210A frequency meter RANGE to 100 kHz.

10. Adjust signal generator frequency for 100 kHz (full scale frequency meter reading).

11. RMS voltmeter indication should be:

a. For Standard and Options 003, 004, 005, 007, 008, 009 and 010 instruments: 53 mVrms ±5%.

b. For Option 006 instruments: 15.9 mVrms ±5%.

c. For Option 001 instruments: Voltmeter indication should be adjustable to 70.7 mVrms using MOD control.

NOTE

MOD button is not usable on 8601A (0.1 — 11 MHz) low range.

d. For Option 002 and 011 instruments: The voltmeter indication should be adjustable, to 21.2 mVrms using MOD control.

NOTE

MOD button is not usable on 8601A (0.1 — 11 MHz) low range.

PERFORMANCE TESTS

4-14. Residual and Incidental FM

Specifications:

Residual FM (noise in 10 kHz bandwidth including line related components):

CW: <50 Hz rms, low range; <500 Hz rms, high range.

SYM, 0 Sweep: <100 Hz rms, low range; <1000 Hz rms, high range.

Incidental FM (with 30% AM):

SYM, 0 Sweep: <100 Hz peak, low range; <1000 Hz peak, high range.

Description:

Residual FM: The CW signal from the 8601A is down converted to 100 kHz using a signal generator and a frequency mixer. The down-converted frequency retains all frequency stability characteristics of the original CW signal. It (100 kHz signal) is discriminated and used to generate an AC signal proportional to its frequency instability (residual FM) and measured on an rms voltmeter.

Incidental FM: The amplitude modulated CW signal from the 8601A is down converted to 100 kHz and used to generate an AC signal proportional to frequency instability and measured.

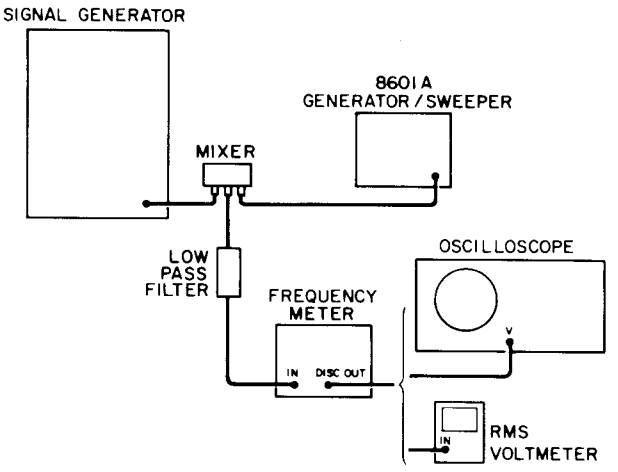


Figure 4-6. Residual and Incidental FM Test Setup

Equipment:

Signal Generator	HP 606A/608A	RMS Voltmeter	HP 3400A
Balanced Mixer	HP 10514A	Oscilloscope	HP 180A/1803A/1820A
	or HP 10534A	2 MHz Low Pass	
Frequency Meter	HP 5210A	Filter	(See Table 1-2)

Procedure:

1. Connect equipment as shown in Figure 4-6.

2. Set 8601A controls:

FREQUENCY	110 MHz	CRYSTAL CAL	OFF
RANGE	110	MODULATION	OFF (or EXT)
CW/SWEEP	CW	OUTPUT LEVEL	+10 dBm

PERFORMANCE TESTS

4-14. Residual and Incidental FM (Cont)

Frequency Meter Calibration

3. Install internal shorting board into model 5210A.

4. Set sensitivity (volts RMS) to CAL (100 kHz) and range to 100 kHz. The meter should display a full scale indication, if not, adjust screwdriver CAL (100 kHz) as necessary.

5. Adjust rear panel DISC GAIN CONTROL for −1 volt dc at DISC OUT jack of 5210A.

6. Reset SENSITIVITY (volts RMS) to 0.1 Vrms.

7. Set range to 100 kHz. The DISC OUT is now calibrated for 100 kHz/volt or 100 Hz per millivolt.

Residual FM Test

8. Remove internal shorting board and install the 10 kHz low pass filter (HP 10531-6001) in 5210A. The Butterworth configuration is preferred because it provides maximum amplitude response flatness.

9. Adjust signal generator frequency for about −10 dBm output and 100 kHz difference frequency reading on frequency meter (5210A).

10. Connect rms voltmeter to frequency meter (5210A) DISC OUT. The voltage indication should be less than 5 mVrms (500 Hz).

11. Repeat steps 9 and 10 at any other frequencies of interest in high range (1 − 110 MHz).

12. Set 8601A range to 11 and repeat step 9 at all frequencies of interest in low range (0.1 − 11 MHz). RMS voltmeter indication should be less than 0.5 mVrms (50 Hz).

13. Set 8601A CW/SWEEP to SYM and SYM SWEEP WIDTH to 0.

14. Repeat step 9 at all frequency points of interest in low range (0.1 − 11 MHz). RMS voltmeter indication should be 1 mVrms or less (100 Hz).

15. Set 8601A range to 110. Repeat step 9 at all frequency points of interest. RMS voltmeter indication should be 10 mVrms or less (1 kHz).

Incidental FM Test

16. Replace rms voltmeter with oscilloscope. Line synchronize and ac couple oscilloscope.

17. Set 8601A RANGE to 110, CW/SWEEP to SYM and SYM SWEEP WIDTH to 0.

18. Adjust signal generator frequency for 100 kHz difference frequency reading on frequency meter (5210A).

19. Set 8601A 1 kHz MOD to AM.

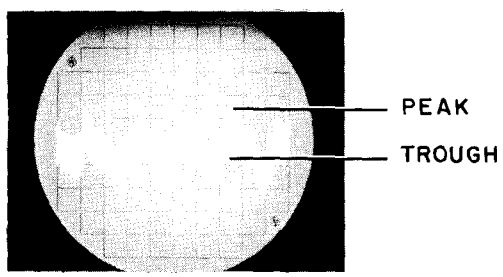


Figure 4-7. Typical Incidental FM Waveform

PERFORMANCE TESTS

4-14. Residual and Incidental FM (Cont)

20. Oscilloscope indication should be less than 10 mV peak-to-trough (1 kHz) as shown in Figure 4-7.

21. Repeat steps 18 through 20 at all frequencies of interest.

22. Set 8601A RANGE to 11.

23. Repeat steps 18 and 19 at all frequency points of interest. Oscilloscope indication should be less than 1 mV peak-to-trough (100 Hz).

4-15. Residual AM

Specification:
Residual AM: AM noise modulation index (rms, 10 kHz bandwidth) is <—50 dB.

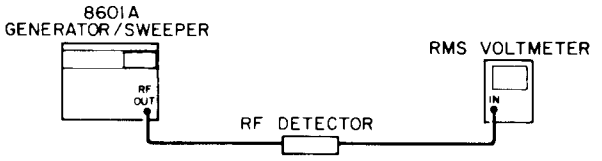


Figure 4-8. Residual AM Test Setup

Equipment:
RF Detector . . . . . HP 8471A* RMS Voltmeter . . . . . HP 3400A

*For Options 008, 009 and 010 instruments, use HP 8471A — Option 005.

Procedure:
1. Connect equipment as shown in Figure 4-8.

2. Set 8601A controls as follows:

RANGE	11	CW/SWEEP	CW
FREQUENCY	6 MHz	OUTPUT LEVEL	+15 dBm

3. Set 8601A 1 kHz MOD to AM.

4. Carefully adjust 8601A OUTPUT LEVEL VERNIER to set rms voltmeter at convenient reference point. Record as R1 in dB.

5. Set 8601A 1 kHz MOD to OFF.

6. Down-range the voltmeter to obtain on scale reading. Record as R2 in dB.

PERFORMANCE TESTS

4-15. Residual AM (Cont)

7. Compute Residual AM: (R2 — R1) dB + (10 dB).

8. Residual AM (step 7 answer) is >50 dB below R1 reading.

4-16. Incidental AM

Specification:
Incidental AM: Modulation index is less than —55 dB with 75 kHz deviation.

Description:
With the carrier signal approximately 30% AM modulated, the actual percent of modulation is measured. This measured modulation signal is then used to establish a reference with respect to the carrier. Since the reference (modulation signal) is not equal to the carrier, a correction factor is determined and added to the measured incidental AM signal (incidental AM is amplitude modulation caused by frequency modulation of carrier signal).

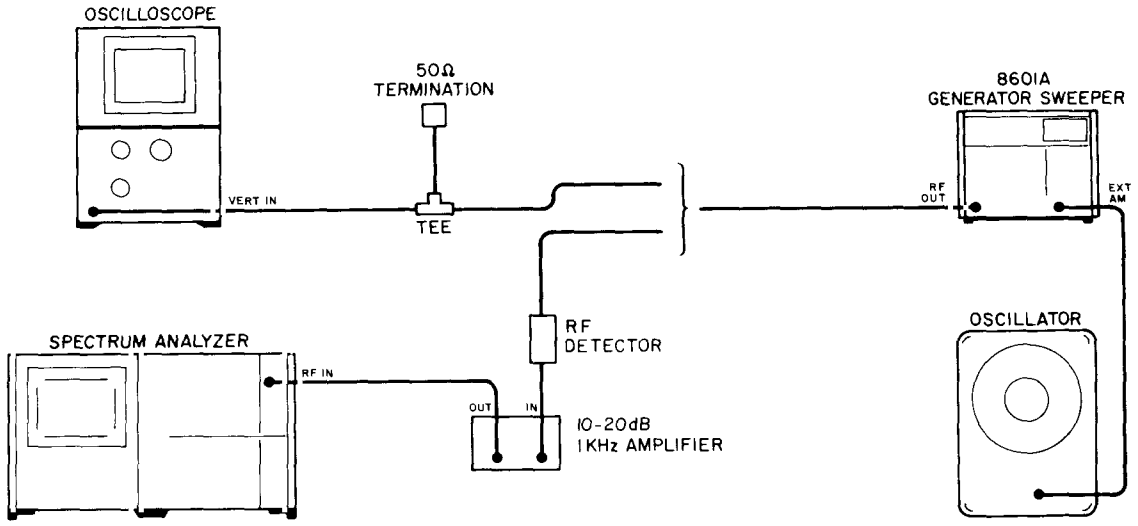


Figure 4-9. Incidental AM Test Setup

Equipment:

RF Detector	HP 8471A (Note 1)	400 MHz Spectrum Analyzer	HP 140T/8552/8553
1 kHz Amplifier	HP 461A or HP 466A	50 Ohm Termination	HP 1250-0207
Oscilloscope	HP 180A/1803A/1820A	Audio Oscillator	HP 200CD (Note 2)

NOTE

1. For Options 008, 009 and 010 instruments, use HP 8471A (Option 005).
2. The Audio Oscillator is only needed for instruments Options 005 and 011.

PERFORMANCE TESTS

4-16. Incidental AM (Cont)

Procedure:

Determining Level of AM Reference Relative to Carrier

1. Connect equipment to oscilloscope as shown in Figure 4-9. Set oscilloscope for internal sweep.

NOTE

1 kHz Audio Oscillator is only needed for 8601A instruments without internal 1 kHz AM (instrument Options 005 and 011).

2. Set 8601A controls:

FREQUENCY	10 MHz	CRYSTAL CAL	OFF
RANGE	110	1 kHz MOD	OFF
CW/SWEEP	CW	OUTPUT LEVEL	0 dBm

NOTE

For instruments without an OFF setting, set 1 kHz MOD switch to AM.

3. Using BNC tee, connect 8601A RF OUT and 50 ohm termination to oscilloscope vertical input.

4. Adjust oscilloscope vertical senstivity for 5 cm waveform display.

5. Adjust 8601A for 1 kHz AM modulation as follows:

a. For all instruments, except instrument Options 001, 002, 005 and 011, set 1 kHz MOD to AM.

b. For instrument Options 001 and 002, set MOD switch to AM. With MOD button pushed, adjust MOD control for a three reading on the 0 — 3 volt scale of 8601A OUTPUT LEVEL meter.

c. For instrument Options 005 and 011, set MOD switch to OFF (or EXT AM). Connect 1 kHz audio oscillator to EXT AM input and adjust amplitude of audio oscillator for a 1.5 cm peak-to-trough signal on the oscilloscope.

6. Observe the oscilloscope display. The amplitude modulation signal (peak-to-trough amplitude) should be about 1.5 cm (approximately 30% modulation). Determine the correction factor by calculating actual percentage of modulation and referring to the graph in Figure 4-10. To calculate actual percentage divide the peak-to-trough amplitude of the modulated signal by the peak-to-peak amplitude of the unmodulated signal (5 cm) and multiply by 100.

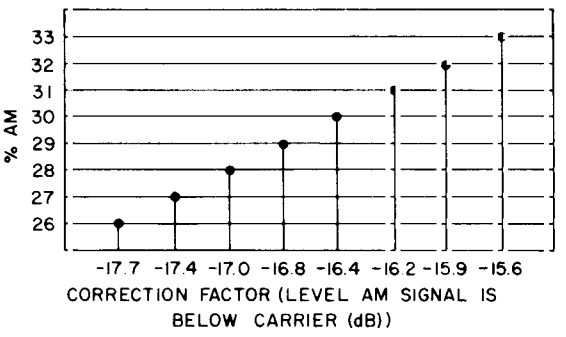


Figure 4-10. Correction Factor Chart

Incidental AM Test

7. Disconnect 8601A RF OUT from oscilloscope and connect to 110 MHz spectrum analyzer as shown.

NOTE

1 kHz amplifier gain should be about 20 dB.

PERFORMANCE TESTS

4-16. Incidental AM (Cont)

8. Set spectrum analyzer controls:

SCAN TIME	0.2 sec.	BANDWIDTH	0.1 kHz
LOG/LINEAR	LOG	CENTER FREQUENCY	0 MHz
INPUT ATTENUATION	20 dB	SCAN WIDTH	1.0 kHz/Div

9. Adjust spectrum analyzer frequency control to center 1 kHz 8601A modulation signal on spectrum analyzer (see Figure 4-11).

NOTE

As shown in Figure 4-11, there are three signals present. Adjust actual 1 kHz signal to center of analyzer display as shown.

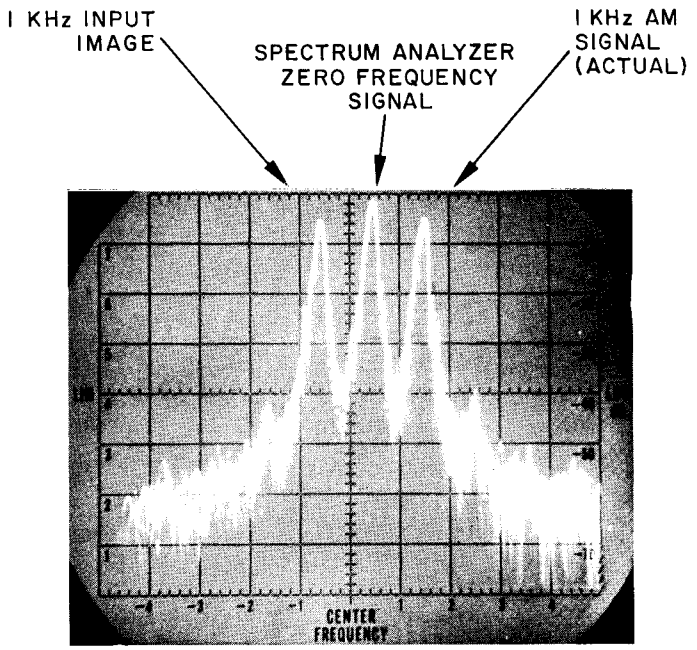


Figure 4-11. Spectrum Analyzer Display

10. Set spectrum analyzer scan width to 0.2 kHz.

11. Adjust spectrum analyzer amplitude controls to display reference signal at top graticule line of spectrum analyzer.

12. Set 8601A 1 kHz MOD control to FM (for instruments being externally modulated, remove modulation signal from EXT AM input and connect to EXT FM input).

PERFORMANCE TESTS

4-16. Incidental AM (Cont)

13. Determine Incidental AM. Incidental AM is equal to the decrease in amplitude of the 1 kHz signal + the correction factor. (Typically the 1 kHz signal level is so small that the actual spectrum analyzer display is only noise.) The correction factor is the difference in amplitude between the smaller 30% amplitude modulation signal level and the unmodulated carrier signal level.

NOTE

Example, if the calculated percent of modulation is 30% (step 6) the correction factor will be 16.4 dB (Figure 4-10). Since the minimum level of Incidental AM must be 55 dB below the carrier, the 1 kHz amplitude should decrease by at least 38.6 dB (minimum specification level − correction factor).

4-17. Output Level

Specification:
Level: +20 to −110 dBm into 50 ohms.
Accuracy: ±1 dB for any level from +13 to −110 dBm.

NOTE

For instrument Options 008, 009 and 010, the output level is +18 to −110 dBm into 75 ohms.

Description:
Output level is measured using a spectrum analyzer or RF voltmeter with absolute voltage calibration.

NOTE

Using spectrum analyzer is only approximate check (±0.5 dB).

Procedure Using 110 MHz Spectrum Analyzer:
1. Set 8601A controls as follows:

RANGE	110 MHz	OUTPUT LEVEL VERNIER	Fully counterclockwise
FREQUENCY	10 MHz	CRYSTAL CAL	OFF
CW/SWEEP	CW	1 kHz MOD	OFF
OUTPUT LEVEL	+20 dBm		

2. Connect 20 dB attenuator between 8601A RF OUTPUT and the input of the spectrum analyzer.

NOTE

For Option 008, 009 and 010 instruments (75 ohm output impedance), use a 75 ohm to 50 ohm minimum loss pad. Refer to Table 1-2.

3. Adjust 8601A OUTPUT LEVEL controls for a spectrum analyzer indication of 0 dBm (for 50 ohm output instruments) or a spectrum analyzer indication of −7.7 dBm (for 75 ohm output instruments).

PERFORMANCE TESTS

4-17. Output Level (Cont)

NOTE

The −7.7 dBm level corresponds to +18 dBm attenuated by 25.7 dB in the RF signal path (20 dB attenuator and 5.7 dB attenuation of minimum loss pad).

4. The 8601A output level meter indication should be:
   a. 0 dBm ±1.5 dB for all 50 ohm output 8601A instruments.
   b. −2 dBm ±1.5 dB for all 75 ohm output 8601A instruments.

NOTE

Do *Not* change the setting of the OUTPUT LEVEL vernier control.

5. Reduce the 8601A RF output in 10 dB steps with the coarse OUTPUT LEVEL control. The 8601A meter indication should stay within the tolerances specified in step 4.

4-18. Harmonics and Spurious Signals

Specifications:

All instruments except Options 008, 009 and 010 (CW above 250 kHz, output level below +10 dBm): Harmonics at least 35 dB below carrier. Spurious signals at least 40 dB below carrier.

Instrument Options 008, 009 and 010 (CW above 250 kHz, output level below +10 dBm): Harmonics at least 33 dB below carrier. Spurious signals at least 40 dB below carrier.

Description:

The level of harmonic and spurious signals relative to the carrier signal is measured using a spectrum analyzer with absolute calibration.

Procedure:

1. Connect 8601A RF OUT to input of 400 MHz spectrum analyzer with a 10 dB fixed attenuator connected betweel 8601A and spectrum analyzer.

NOTE

For Option 008, 009 and 010 instruments (75 ohm output impedance), use a 75 ohm input to 50-ohm output minimum loss pad. Refer to Table 1-2.

2. Set 8601A controls as follows:

RANGE	110	CW/SWEEP	CW
FREQUENCY	1 MHz	OUTPUT LEVEL	+10 dBm

3. Slowly tune the 8601A FREQUENCY from 1 to 110 MHz while observing the spectrum analyzer display for any questionable harmonics or spurious signals.

NOTE

If the input to the spectrum analyzer is overloaded, the spectrum analyzer may originate some mixing harmonics that can appear on the display. If a signal is in question, increase the spectrum analyzer attenuation by 10 dB, note the changes in signal amplitude, then return the attenuator to its original position. If the signal in question originates in the spectrum analyzer, the level will either change by greater or less than 10 dB or it may not change at all.

Table 4-1. Performance Test Record (1 of 3)

Hewlett-Packard Model 8601A
Generator Sweeper
Serial Number _____

Test Performed by: _____

Date: _____

	Upper Limit	Measured Value	Lower Limit
4-8. Frequency Coverage/Accuracy			
Range 11			
3. FREQUENCY control to 0.1 MHz	0.111 MHz	_____	0.089 MHz
5. FREQUENCY control to 5 MHz	5.060 MHz	_____	4.940 MHz
7. FREQUENCY control to 11 MHz	11.120 MHz	_____	10.880 MHz
Range 110			
10. FREQUENCY control to 1 MHz	0.111 MHz	_____	0.089 MHz
11. FREQUENCY control to 50 MHz	5.060 MHz	_____	4.940 MHz
12. FREQUENCY control to 110 MHz	11.120 MHz	_____	10.880 MHz
4-9. Sweep Characteristics			
Full Sweep (Range 110)			
5. High end frequency	120 MHz	_____	110 MHz
6. Low end frequency	3.0 MHz	_____	0.98 MHz
Full Sweep (Range 11)			
7. a. High end frequency	12 MHz	_____	11 MHz
b. Low end frequency	0.3 MHz	_____	0.1 MHz
Video Sweep (Range 11)			
9. a. Low end frequency	0.21 MHz	_____	0.0 MHz
b. High end frequency	10.11 MHz	_____	9.89 MHz
Video Sweep (Range 110)			
11. a. Low end frequency	2.1 MHz	_____	0.0 MHz
b. High end frequency	101.1 MHz	_____	98.9 MHz
Sym Sweep (Range 110)			
10 MHz Sweep Width			
15. High frequency end	105.21 MHz	_____	104.79 MHz
16. Low frequency end	95.21 MHz	_____	94.79 MHz
3 MHz Sweep Width			
18. a. High frequency end	101.57 MHz	_____	101.43 MHz
b. Low frequency end	98.57 MHz	_____	98.43 MHz

Table 4-1. Performance Test Record (2 of 3)

	Upper Limit	Measured Value	Lower Limit
4-9. Sweep Characteristics (cont)			
1 MHz Sweep Width			
20. a. High frequency end	100.52 MHz	_____	100.48 MHz
b. Low frequency end	99.52 MHz	_____	99.48 MHz
0.3 MHz Sweep Width			
21. a. High frequency end	100.166 MHz	_____	100.134 MHz
b. Low frequency end	99.866 MHz	_____	99.834 MHz
0.1 MHz Sweep Width			
21. c. High frequency end	100.062 MHz	_____	100.038 MHz
d. Low frequency end	99.912 MHz	_____	99.888 MHz
SYM Sweep (Range 11)			
1 MHz Sweep Width			
24. a. High end frequency	10.52 MHz	_____	10.48 MHz
b. Low end frequency	9.52 MHz	_____	9.48 MHz
0.3 MHz Sweep Width			
25. a. High end frequency	10.157 MHz	_____	10.143 MHz
b. Low end frequency	9.857 MHz	_____	9.834 MHz
0.1 MHz Sweep Width			
25. c. High end frequency	10.053 MHz	_____	10.047 MHz
d. Low end frequency	9.953 MHz	_____	9.947 MHz
0.03 MHz Sweep Width			
25. e. High end frequency	10.032 MHz	_____	10.028 MHz
f. Low end frequency	9.987 MHz	_____	9.983 MHz
0.01 MHz Sweep Width			
25. g. High end frequency	10.006 MHz	_____	10.004 MHz
h. Low end frequency	9.996 MHz	_____	9.994 MHz
4-10. Linearity			
15. Refer to initial recorder trace of 5 MHz markers.			
4-11. Amplitude Modulation			
8. AM Monitor	33%	_____	27%
10. Internal AM	35%	_____	25%

Table 4-1. Performance Test Record (3 of 3)

	Upper Limit	Measured Value	Lower Limit
4-12. External FM			
4. External FM (Range 110)		_____	5 MHz/V
7. External FM (Range 11)		_____	0.5 MHz/V
12. a. Deviation (Range 110)		_____	70.7 mVrms
b. Deviation (Range 11)		_____	70.7 mVrms
4-13. Internal FM			
6. Internal FM (Range 110)	55.65 mVrms	_____	50.35 mVrms
11. Internal FM (Range 11)	55.65 mVrms	_____	50.35 mVrms
4-14. Residual and Incidental FM			
CW Mode			
10. Residual FM (Range 110)	5 mVrms	_____	
12. Residual FM (Range 11)	0.5 mVrms	_____	
SYM Mode (0 Sweep)			
14. Residual FM (Range 11)	1.0 mVrms	_____	
15. Residual FM (Range 110)	10 mVrms	_____	
20. Incidental FM (Range 110)	10 mV	_____	
23. Incidental FM (Range 11)	1 mV	_____	
4-15. Residual AM			
7. Residual AM		_____	−50 dB
4-16. Incidental AM			
13. Incidental AM		_____	−55 dB
4-17. Output Level			
4. Meter Output Level	+1.5 dB	_____	−1.5 dB
4-18. Harmonics and Spurious Signals			
3. a. Harmonics		_____	−35 dB
b. Spurious Signals		_____	−40 dB

SECTION V
ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section provides instructions for adjusting the standard Model 8601A instruments including Options 001 through 011. These procedures should not be performed as routine maintenance, but should be used only after replacement of a part or component, or when the performance test shows that the specifications of Table 1-1 cannot be met.

NOTE

If an instrument includes an Option or Options, the serial plate (rear panel) will list Option number(s).

5-3. EQUIPMENT REQUIRED

5-4. Recommended test equipment is listed in Table 1-2. If recommended test equipment is not available, other equipment may be substituted if performance meets the measurement requirements listed in the table.

5-5. FACTORY SELECTED COMPONENTS

5-6. Table 5-1 is a list of factory selected components by reference designation, reason for selection, and Service Sheet number on which the component is illustrated. Factory selected components are designated by an asterisk (*) on the schematic diagrams in Section VIII of this manual.

Table 5-1. Factory Selected Components

Selected Component	Reason for Selection	Service Sheet
A3A1R2	Selected to produce an output signal of +2 dBm minimum at A3J1 at 118 MHz.	3
A3A1R3	Selected to produce an output signal of +2 dBm minimum at A3J1 at 118 MHz.	3
A4A1R7	Selected to produce an output signal of −2 dBm ±2 dB at A4J2.	4
A6A1R6	Selected to control open loop gain of ALC loop.	6
A9R122	Selected to bring A9R120 approximately into the center of its range when adjusted for input offset voltage.	11
A14A1C7 (Option 007 only)	Selected to reduce spurious responses ≥40 dB below carrier with OUTPUT LEVEL set at +10 dBm and VERNIER set for −10 dBm reading.	13
A15R9 (Options 001, 002, 011 only)	Selected for correct monitor accuracy with 20 kHz FM deviation.	14
A15R5 (Options 001, 002, 011 only)	Selected for correct monitor accuracy with 20 kHz FM deviation.	14
A15R35 (Options 001, 002, 011 only)	Selected to center AM adjust range (A15R34).	14

Table 5-2. Controls Listed in Adjustment Sequence (1 of 2)

Reference Designation	Title	Function Adjusted
A10R11	+20V ADJ	Sets +20V Regulator
A5A1R13	High Frequency ADJ	Adjusts VTO high frequency for 318 MHz (RF OUT = 118 MHz or greater).
A5A1R11	Low Frequency ADJ	Adjusts VTO low frequency for 201 MHz (RF out = 1 MHz).
A4A1L5	200 MHz Amplitude Peaking ADJ	Adjusts crystal oscillator 200 MHz OUTPUT for peak amplitude.
A4A3A1L3	0 — 110 MHz Amplitude Peaking ADJ	Adjusts low pass filter 0 — 110 MHz OUTPUT for peak amplitude.
A3A2A1L3	0 — 110 MHz Amplitude Peaking ADJ	Adjusts loop amplifier 0 — 110 MHz OUTPUT for peak amplitude.
A1A1C6	Slope ADJ	Adjusts frequency linearity across band.
A1A1R29	Frequency offset ADJ	Adjusts ramp voltage for 0 Vdc at low frequency end.
A9R136	ALC Balance ADJ	Adjusts flatness of blanking retrace.
A9R160	Frequency ADJ	Adjusts frequency of internal modulation oscillator.
A9R138	FM Deviation ADJ	Adjusts amount of FM deviation about center frequency.
A9R162	% MOD ADJ	Adjusts amplitude modulation for 30%.
A9R131	METER ADJ	Adjusts meter for 0 dB reading.
A9R181	−10 ADJ	Adjusts meter for −10 dB reading.
A9R88	B ADJ	Adjusts temperature balance for wide sweep ranges.
A9R95	A ADJ	Adjusts temperature balance for symmetrical sweep.
A9R20	Dwell Time ADJ	Adjusts for equal delay time at start and end of each sweep.
A9R120	SYM Fc MIN	Minimizes frequency shift when switching CW/SWEEP between SYM and CW (low end of frequency band).
A9R117	SYM Fc MAX	Minimizes frequency shift when switching CW/SWEEP between SYM and CW (middle of frequency band).
A9R24	VIDEO SWP STOP ADJ	Minimizes frequency shift when switching CW/SWEEP between CW and VIDEO

Table 5-2. Controls Listed in Adjustment Sequence (2 of 2)

Reference Designation	Title	Function Adjusted
A9R34	VIDEO START ADJ	Adjusts lower end of video frequency band to equal CW frequency.
A9R71	Δ SYM ADJ	Adjusts symmetry of sweep about the center frequency.
A9R75	SYM CAL ADJ	Adjusts sweep width of symmetrical sweep.
A15R22	FM 1 ADJ	Adjusts deviation monitor accuracy for Options 001, 002 and 011 instruments.
A15R15	FM 2 ADJ	Same as A15R22.
A15R34	AM ADJ	Adjusts % AM monitor accuracy for Option 001, 002 and 011 instruments.

ADJUSTMENTS

5-7. Power Supply Adjustment

NOTE

The location of all adjustments is shown in Figures 8-40 thru 8-45 of this manual.

Description:
The +20V power supply is adjusted for correct output voltage.

Equipment:
Digital Voltmeter . . . . . HP 3439A/3443A

Procedure:
1. Connect the digital voltmeter to XA10 pins 7 — 9 (A10TP1).

2. Adjust +20V ADJUST A10R11 for +20.0 ±0.1 volts.

FREQUENCY RANGE ADJUSTMENTS

5-8. Crystal Oscillator Adjustment

Description:
The crystal oscillator output is first adjusted for the correct power level at 200 MHz output. The oscillator mixer is then adjusted for the correct injection voltage to the video amplifier.

Equipment:
400 MHz Spectrum Analyzer . . . . . HP 140T/8552/8555
50 Ohm Termination (subminiature) . . . . . HP 1250-0839
BNC to Subminiature Adapter . . . . . HP 1250-0832

Procedure:
1. Disconnect all cable connections to A4.

2. Remove the six screws holding the board down and remove A4.

3. Place a piece of insulating material across the top of the instrument and set A4 on it. Reconnect the —6.3V and +20V wires and the VTO INPUT cable.

4. Connect the 50 ohm termination to the AM INPUT jack on A4.

5. Connect 400 MHz spectrum analyzer to the 200 MHz OUTPUT jack on A4.

NOTE

Adjustment of A4A1L5 can be critical. When not properly tuned, the 200 MHz signal level is very low.

ADJUSTMENTS

5-8. Crystal Oscillator Adjustment (Cont)

6. Adjust 200 MHz amplitude peaking ADJ A4A1L5 for −2 dBm ±2 dB.

NOTE

It may be necessary to change the value of resistor A4A1R7 to change the 200 MHz signal level (any increase in resistor resistance will decrease signal level).

7. Disconnect 400 MHz spectrum analyzer from the 200 MHz OUTPUT jack and connect it to the 0 − 110 MHz OUTPUT jack on A4. Reconnect the 200 MHz OUTPUT cable. Disconnect the TUNING VOLTAGE cable connection from the A5 VTO assembly.

8. Adjust 0 − 110 MHz amplitude peaking ADJ A4A3A1L3 for maximum output on the spectrum analyzer. (Minimum output level should be at least −30 dBm).

9. Re-install A4 board and restore all A4 and A5 connections.

5-9. VTO Adjustment

Description:
The voltage-tuned oscillator is adjusted to give frequency coverage over the entire range of the instrument.

Equipment:

Counter/Marker Generator	HP 8600A
Subminiature 50 ohm Termination	HP 1250-0839

Procedure:

1. Disconnect TUNING VOLTAGE cable from A5.

2. Set 8601A RANGE to 110 and connect counter to 8601A AUX OUT.

3. Counter indication should be 11.9 ±0.1 MHz (119 ±1 MHz when using HP Model 8600A). If necessary, adjust HIGH FREQ ADJ, A5A1R13.

NOTE

Frequency decreases about 5 MHz if VTO assembly is removed from module box.

4. Attach 50 ohm termination to the TUNING VOLTAGE jack on A5 VTO assembly.

5. Counter indication should be 100 ±10 kHz (1 ±0.1 MHz when using HP Model 8600A). If necessary, adjust LOW FREQ ADJUST A5A1R11.

6. Remove 50 ohm termination from TUNING VOLTAGE jack and restore all A5 connections.

ADJUSTMENTS

PEAK OUTPUT POWER ADJUSTMENT

5-10. Loop Amplifier Adjustment

Description:
The loop amplifier mixer is adjusted for maximum output.

Equipment:

110 MHz Spectrum Analyzer	HP 140T/8552/8553
BNC to Subminiature Adapter	HP 1250-0832

Procedure:

1. Set controls as follows:

8601A

SWEEP MODE	FREE/SLOW	CW/SWEEP	FULL
RANGE	110	FREQUENCY	110 MHz

2. Disconnect all connections to A3.

3. Remove the six screws holding the board down and remove A3.

4. Place a piece of insulating material across the top, set A3 on it, and reconnect all cables and wires except for the 0 — 110 MHz OUTPUT cable.

NOTE

Disconnect TUNING VOLTAGE cable connection from A5 VTO assembly.

5. Connect 110 MHz spectrum analyzer to the 0 — 110 MHz OUTPUT jack on A3.

6. Adjust amplitude peaking ADJ A3A2A1L3 for maximum power on spectrum analyzer. (Minimum output level should be at least +2 dBm).

7. Re-install A3 board and restore all A3 and A5 cable connections.

FREQUENCY ACCURACY ADJUSTMENTS

5-11. Discriminator and DC Amplifier Adjustments

Description:
The discriminator and dc amplifier are adjusted to produce the correct output frequency for a given dial setting.

Equipment:

Counter/Marker Generator	HP 8600A

Procedure:

1. Set the 8601A front panel controls as follows:

CW/SWEEP	CW	FREQUENCY	110 MHz
RANGE	110	OUTPUT LEVEL	0 dBm

ADJUSTMENTS

5-11. Discriminator and DC Amplifier Adjustments (Cont)

2. Connect counter to the 8601A AUX OUT jack.

3. Adjust SLOPE ADJUST A1A1C6 for 11 MHz counter reading ±0.12 MHz (110 MHz ±1.2 MHz counter reading on 8600A).

4. Set 8601A FREQUENCY control to 1.0 MHz.

5. Adjust FREQUENCY OFFSET ADJUST A1A1R29 for 100 kHz counter reading ±11 kHz (1 MHz ±110 kHz counter reading on 8600A).

6. Set 8601A RANGE switch to 11.

7. Set FREQUENCY control to 11 MHz.

8. Re-adjust A1A1C6 (if necessary) for 11 MHz counter reading ±0.12 MHz.

9. Set FREQUENCY control to 0.1 MHz.

10. Re-adjust A1A1R29 (if necessary) for 100 kHz counter reading ±11 kHz.

11. Repeat steps 3 through 10 until no further adjustment is required.

5-12. ALC Balance Adjustment

Description:
The ALC loop is adjusted for a swept leveled output across the band.

Equipment:

Oscilloscope	HP 180A/1803A/1820A	RF Detector	HP 8471A

Procedure:
1. Connect 8601A RF OUT to oscilloscope vertical input via rf detector and SWEEP OUT to horizontal input. Set oscilloscope for external horizontal sweep and a vertical sensitivity of 0.2 V/div. Establish a 0 volt base-line at the center of the oscilloscope display.

2. Set 8601A controls as follows:

CW/SWEEP	FULL	TRIG/LINE/FREE	FREE
FAST/SLOW/MANUAL	FAST	OUTPUT LEVEL	+10 dBm

3. If necessary, slowly turn OUTPUT LEVEL VERNIER counterclockwise until power output is leveled across the band as shown in Figure 5-1.

ADJUSTMENTS

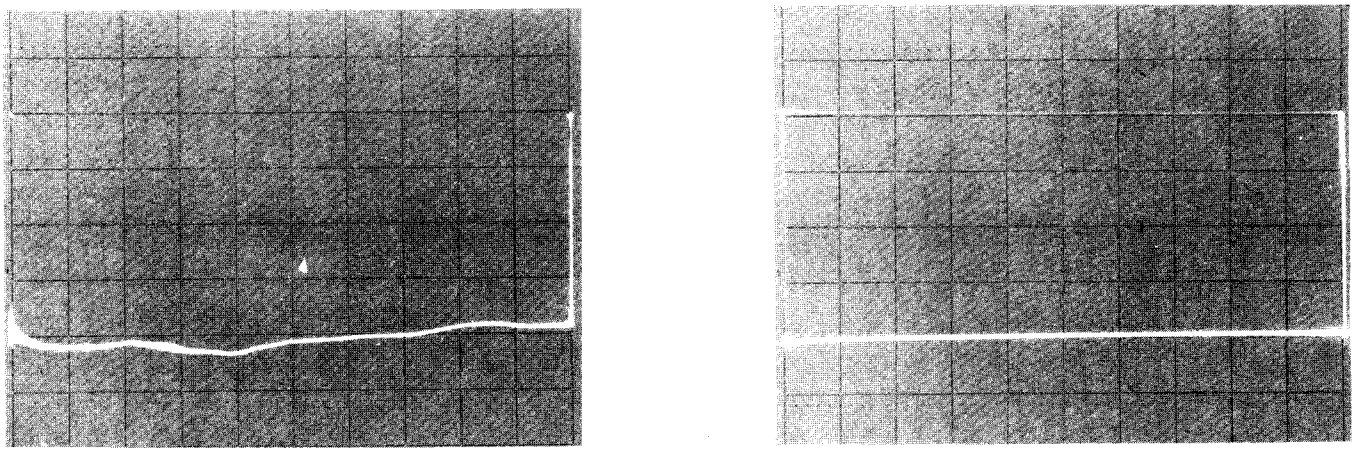


Figure 5-1. Oscilloscope Displays of 8601A RF Output Power

4. Adjust ALC BALANCE ADJUST A9R136 to obtain a flat RF blanking level (top line) across the band as shown in Figure 5-2.

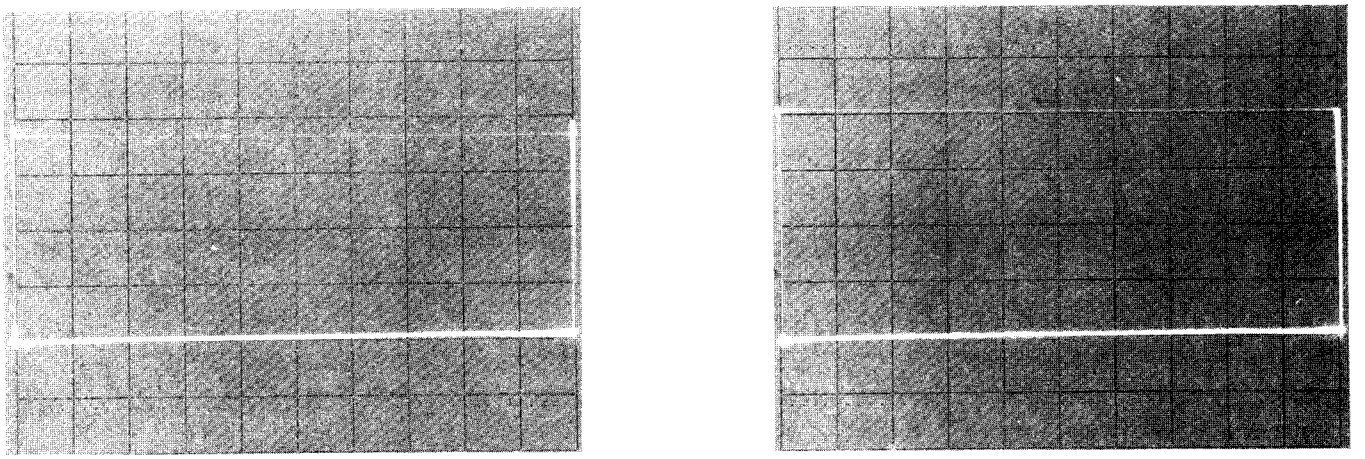


Figure 5-2. Oscilloscope Displays of Correct and Incorrect ALC Balance Adjustment

ADJUSTMENTS

5-13. Modulation Rate Adjustment

Description:
The modulation is adjusted for a 1 kHz rate (400 Hz for Option 005 instruments).

Equipment:
Counter/Marker Generator . . . . . HP 8600A

Procedure:
1. Connect counter to A9TP4.
2. Set 8601A 1 kHz MOD switch to FM.
3. Adjust FREQ ADJ A9R160 for a 1 kHz counter reading (400 Hz for Option 005 instruments).

5-14. FM Adjustment

Description:
The correct FM deviation is adjusted using a calibrated FM discriminator (demodulator) and a monitoring oscilloscope.

Equipment:

Frequency Meter	HP 5210A	50 Ohm Termination	HP 1250-0207*
Oscilloscope	HP 180A/1803A/1820A	BNC Tee Connector	HP 1250-0781

NOTE

*75 ohm termination for instrument options 008, 009 and 010.

Procedure:
1. Connect equipment as shown in Figure 5-3.

NOTE

For instrument Options 008, 009 and 010 use 75 ohm termination.

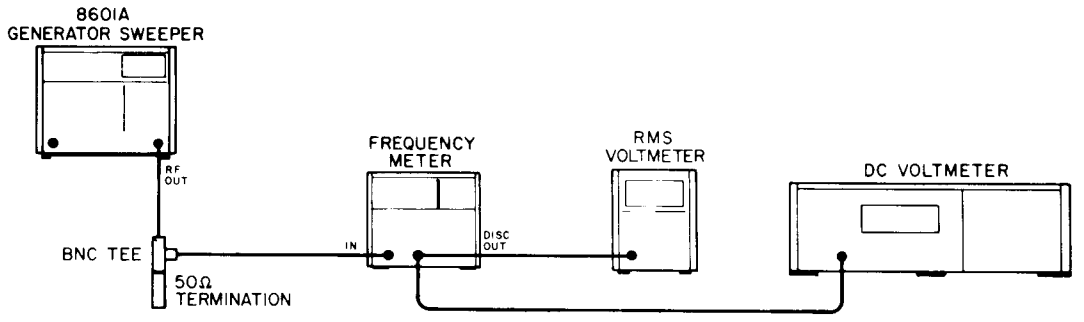


Figure 5-3. Internal FM Adjustment Setup

ADJUSTMENTS

5-14. FM Adjustment (Cont)

2. Calibrate frequency meter as follows:

a. Install the internal shorting board into the Model 5210A frequency meter.

b. Set the SENSITIVITY (VOLTS RMS) switch to the CAL (100 kHz) position and the RANGE switch to the 100 kHz position. The meter should display a full scale indication; if not, adjust the screwdriver CAL (100 kHz) control as necessary.

c. Adjust the rear panel DISC GAIN control for 1 Vdc at the DISC OUT jack.

d. Reset the SENSITIVITY (VOLTS RMS) switch to 0.1 Vrms.

3. Set controls as follows:

8601A

TRIG/LINE/FREE	FREE	CW/SWEEP	SYM
FAST/SLOW/MANUAL	FAST	1 kHz MOD	FM (or FM 30 kHz)
SYM SWEEP WIDTH	0		
RANGE	110	OUTPUT LEVEL	+10 dBm
FREQUENCY	10 MHz		

NOTE

For option 001, 002 and 011 instruments adjust MOD knob full clockwise.

Frequency Meter

SENSITIVITY (VOLTS RMS)	0.1 Vrms	RANGE	10 MHz

Oscilloscope

VERTICAL SENSITIVITY	5 mV/cm	HORIZONTAL TIME/DIVISION	0.5 ms/div

4. Install 100 kHz low pass filter (HP 10531A) in the Model 5210A frequency meter in place of the internal shorting board.

NOTE

If 100 kHz low pass filter (HP 10531A) is not available, a 100 kHz low pass filter may be connected to frequency meter output while internal shorting board remains in 5210A.

5. Adjust 8601A FREQUENCY control for 10 MHz reading (full scale) on the frequency meter.

6. Adjust 8601A FM DEVIATION ADJUST A9R183 for the following rms voltmeter reading:

a. For all instruments (except Option 001, 002, 006 and 011 instruments): 5.3 mVrms.

b. For Option 001 instruments: 7.1 to 7.7 mVrms.

c. For Option 002 and 011 instruments: 2.8 mVrms.

d. For Option 006 instruments: 1.59 mVrms.

ADJUSTMENTS

5-14. FM Adjustment (Cont)

Procedure (Option 001, 002 and 011 Instruments Only):

7. Re-adjust 8601A FREQUENCY control, if necessary, for 10 MHz reading (full scale) on the frequency meter.

NOTE

For 8601A instruments Option 011, set modulation switch to FM 10 kHz.

8. Adjust MOD knob for the following rms voltmeter reading:

   a. For Option 001 instruments: 7.07 mVrms.

   b. For Option 002 instruments: 2.12 mVrms.

   c. For Option 011 instruments: 0.707 mVrms.

9. Depress MOD pushbutton and adjust FM1 ADJ (A15R22) and FM 2 ADJ (A15R15) for an 8601A meter reading of:

   a. For Option 001 and 011 instruments: 1 on 0 — 1 volt scale.

   b. For Option 002 instruments: 3 on 0 — 3 volt scale.

5-15. AM Adjustment

Description:

The amplitude modulation percentage is adjusted using a 20 MHz oscilloscope for measurement.

Equipment:

Oscilloscope	HP 180A/1803A/1820A	50 ohm Termination	HP 1250-0207*
BNC Tee Connector	HP 1250-0781	Audio Oscillator	HP 200CD**

NOTE

*For 8601A Options 008, 009 and 010, use 75 ohm termination.
**The Audio Oscillator is required for 8601A Options 001, 002 and 011 only.

Procedure (For all Instruments except Option 011):

1. Connect 8601A RF OUT to oscilloscope vertical input using BNC Tee connector and termination at oscilloscope input.

2. Set controls as follows:

8601A

CW/SWEEP	CW	TRIG/LINE/FREE	FREE
RANGE	11	OUTPUT LEVEL	+10 dBm
FREQUENCY	5 MHz	MODULATION	OFF (or EXT AM)
FAST/SLOW/MANUAL	FAST		

Oscilloscope

VERTICAL SENSITIVITY	0.5 V/cm	HORIZONTAL TIME/DIVISION	0.5 ms/div

ADJUSTMENTS

5-15. AM Adjustment (Cont)

3. Re-adjust oscilloscope vertical sensitivity to obtain a 5 cm display.

4. Set modulation switch to AM.

5. Adjust % MOD ADJUST A9R162 for a peak-to-trough amplitude variation of 1.5 cm (1.5 cm = 30% modulation).

Procedure (Option 001, 002 and 011 Instruments Only):

6. Repeat steps 1 through 3.

7. Connect 1 kHz audio oscillator to 8601A EXT AM input and adjust oscillator output level for 1.5 cm (30%) peak-to-trough oscilloscope display.

8. With MOD button depressed, adjust AM ADJ A15R34 for 3.0 (30%) reading on 0 — 3 scale of 8601A meter.

5-16. Meter Adjustment

Description:

The meter sensitivity is adjusted so that the reading on the front panel meter corresponds to the actual RF power output.

Equipment:

110 MHz Spectrum Analyzer	HP 140T/8552/8553
75 ohm input to 50 ohm output minimum loss pad (Option 008, 009 and 010 instruments only)	

Procedure:

1. Connect the 110 MHz spectrum analyzer to the 8601A RF OUT jack.

NOTE

For instrument Options 008, 009 and 010, connect 75 to 50 ohm minimum loss pad between 8601A and spectrum analyzer.

2. Set controls as follows:

8601A			
CW/SWEEP	CW	RANGE	110
		FREQUENCY	60 MHz
Spectrum Analyzer			
LOG REF LEVEL			+10 dBm

3. Set 8601A OUTPUT LEVEL to the +10 dBm position and adjust the OUTPUT LEVEL VERNIER for a +10 dBm signal on the spectrum analyzer display.

NOTE

For Option 008, 009 and 010 instruments, spectrum analyzer display should be adjusted for a +10 dBm signal minus attenuation of 75 to 50 ohm minimum loss pad.

5-16. Meter Adjustment (Cont)

4. Adjust METER ADJUST A9R131 for +10 dBm (0 dBm on 8601A meter scale).

5. Adjust 8601A OUTPUT LEVEL VERNIER for a 0 dBm signal on the spectrum analyzer display.

NOTE

For Option 008, 009 and 010 instruments, spectrum analyzer display should be adjusted for a 0 dBm signal minus attenuation of 75 to 50 ohm minimum loss pad.

6. Adjust −10 ADJUST A9R181 for 0 dBm (−10 dBm on 8601A meter scale).

7. Repeat steps 3 through 6 until no further adjustment is required.

5-17. Buffer Adjustment

Description:
The buffers are adjusted for a zero offset of the summing amplifier.

Equipment:
Digital Voltmeter . . . . . HP 3439A/3443A

Procedure:

1. Disconnect cable from A1J2 FREQ CONTROL jack.
2. Set 8601A SWEEP switch to SYM.
3. Ground test points A9TP7 and A9TP10.
4. Connect the dc digital voltmeter to test point A9TP9.
5. Adjust SYM Fc MIN A9R120 for 0 volt reading.
6. Disconnect ground leads from A9TP7 and A9TP10.
7. Ground test points A9TP8 and A9TP12.
8. Connect the dc digital voltmeter to test point A9TP7.
9. Adjust buffer A ADJUST A9R95 for 0 ±1 mV reading.
10. Connect the dc digital voltmeter to test point A9TP10.
11. Adjust buffer B ADJUST A9R88 for 0 ±0.5 mV reading.
12. Remove grounds from A9TP8 and A9TP12.
13. Re-connect frequency control cable to A1J2.

ADJUSTMENTS

5-18. Dwell Time Adjustment

Description:
The dwell time (horizontal length before and after each ramp), is adjusted for a symmetrical sweep output display.

Equipment:

Oscilloscope	HP 180A/1803A/1820A

Procedure:

1. Set controls as follows:

8601A			
CW/SWEEP	FULL	SWEEP MODE	FAST
		TRIG/LINE/FREE	FREE
Oscilloscope		HORIZONTAL	
VERTICAL SENSITIVITY	1 V/cm	TIME/DIVISION	5 ms/div

2. Connect oscilloscope to 8601A front panel SWEEP OUT jack.

3. Adjust DWELL TIME ADJUST A9R20 for a symmetrical dwell time on the oscilloscope display.

5-19. Symmetrical Sweep Center Frequency Adjustment

Description:
The symmetrical sweep controls are adjusted for a minimum frequency shift across the band when switching from CW to SYM.

Equipment:

Counter/Marker Generator	HP 8600A

Procedure:

1. Set 8601A controls as follows:

CM/SWEEP	CW	RANGE	110
SYM SWEEP WIDTH	0	FREQUENCY	1.0 MHz

2. Connect the counter to the front panel AUX OUT jack and note counter reading.

3. Set CW/SWEEP switch to SYM and adjust SYM Fc MIN A9R120 to obtain the same counter reading as in CW (step 2).

4. Set CW/SWEEP switch back to CW.

5. Set FREQUENCY control to 50 MHz and note counter reading.

6. Set CW/SWEEP switch back to SYM and adjust SYM Fc MAX A9R117 to obtain the same counter reading as in CW (step 5).

7. Set CW/SWEEP switch back to CW.

ADJUSTMENTS

5-19. Symmetrical Sweep Center Frequency Adjustment (Cont)

8. Set FREQUENCY control to 110 MHz and record counter reading.

9. Set CW/SWEEP switch to SYM and record counter reading.

10. Compute:

$$\frac{(freq\ in\ CW) - (freq\ in\ SYM)}{(freq\ in\ CW)}$$

11. Repeat steps 3 through 10 until answer is less than 0.5% (550 kHz).

12. Repeat steps 3 through 11 until no further adjustment is required.

5-20. Sweep Width Adjustment

Description:
The symmetrical sweep circuitry is adjusted for a calibrated symmetrical sweep about the center frequency. The video sweep circuitry is adjusted for a minimum frequency shift when switching from VIDEO to CW mode.

Equipment:

Counter/Marker Generator	HP 8600A

Procedure:

1. Set 8601A controls as follows:

CW SWEEP	SYM	RANGE	11
SYM SWEEP WIDTH	0	SWEEP MODE	MANUAL

2. Connect the counter to the front panel AUX OUT jack.

3. Tune 8601A FREQUENCY control for 5 MHz counter reading.

4. Set SYM SWEEP WIDTH to 1 MHz position (blue numbers).

5. Note frequency change on counter while rotating MANUAL control from fully clockwise to fully counterclockwise position. Adjust Δ SYM adjust A9R71 for a total frequency change of 1 MHz.

6. With MANUAL control fully counterclockwise, adjust the SYM CAL adjust A9R76 for a counter reading of 4.500 MHz. Rotate MANUAL control fully clockwise and counter should indicate 5.500 MHz.

NOTE

These two adjustments interact, so repeat steps 5 and 6 until no further adjustment is required.

7. Set 8601A CW/SWEEP to CW and note counter reading.

ADJUSTMENTS

5-20. Sweep Width Adjustment (Cont)

8. Turn MANUAL control full clockwise. Set CW/SWEEP to VIDEO and adjust VIDEO SWEEP STOP adjust A9R24 to obtain same counter reading as in CW (step 7).

9. Set CW/SWEEP back to CW and tune FREQUENCY to 0.1 MHz. Note counter reading.

10. Set CW/SWEEP to VIDEO and adjust VIDEO START adjust A9R34 to obtain same counter reading as in CW (step 9).

11. Repeat steps 7 through 10 until no further adjustment is required.

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering replaceable parts. Table 6-1 gives the meanings of the abbreviations and reference designations used in the table of replaceable parts.

6-3. Table 6-2 is the table of replaceable parts and is organized as follows:

1. Electrical assemblies and their component parts in alpha-numerical order by reference designation.

2. Chassis parts in alpha-numerical order by reference designation.

3. Miscellaneous parts.

4. Illustrated parts breakdown, if appropriate.

6-4. The information given for each part consists of:

1. The Hewlett-Packard part number.

2. Total quantity (TQ) in the instrument. Total quantity for each part is given only once — at the first appearance of the part number.

3. Description of the part.

4. Typical manufacturer of the part, in a five-digit code.

5. The manufacturer's number for the part.

6-5. Table 6-3 contains the names and addresses that correspond to the manufacturer's code numbers.

6-6. ORDERING INFORMATION

6-7. To order a part listed in the replaceable parts table, quote the Hewlett-Packard part number, indicate the quantity required, and address the order to the nearest Hewlett-Packard office.

6-8. To order a part that is not listed in the replaceable parts table, include the instrument model number, instrument serial number, the description and function of the part, and the number of parts required. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATORS

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

ABBREVIATIONS

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

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1	08601-6072	1	DISCRIMINATOR ASSY	28480	08601-6072
A1			INCL C1-C4,J1-J3,A1A1ASSY & COVER		
A1	08601-6051	1	DISCRIMINATOR ASSY(OPT 001,002,011 ONLY)	28480	08601-6051
A1			(INCL C1-4,J1-4, A1A1 ASSY & COVER)		
A1	08601-2027	1	FRONT PANEL:DISC ASSY	28480	08601-2027
A1	08601-2017	1	BOX:DISC ASSY	28480	08601-2017
A1C1	0160-2152	1	C:FXD CER 10 PF 20% 500VDCW	28480	0160-2152
A1C2	0160-2049	20	C:FXD CER 5000 PF 80/20%	28480	0160-2049
A1C3	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A1C4	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A1J1	1250-0829	23	CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A1J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A1J3	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A1J4	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A1J4			(OPT 001, 002, 011 ONLY)		
A1A1	08601-6042	1	BOARD ASSY:DISCRIMINATOR/DC AMPL	28480	08601-6042
A1A1C1	0180-0116	3	C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1C2	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1C3	0160-2327	3	C:FXD CER 1000 PF 20% 100VDCW	96733	B104BX102M
A1A1C4	0160-2262	2	C:FXD CER 16 PF 5% 500VDCW	72982	301-000 C0G0 160J
A1A1C5	0160-2262		C:FXD CER 16 PF 5% 500VDCW	72982	301-000 C0G0 160J
A1A1C6	0121-0452	2	C:VAR AIR 1.3 TO 5.4 PF 250VDCW	28480	0121-0452
A1A1C7	0180-0291	10	C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A1A1C8	0160-0161	2	C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A1A1C9	0160-0298	2	C:FXD MY 0.0015 UF 10% 200VDCW	56289	192P15292-PTS
A1A1C10	0160-2201	3	C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A1A1C11	0160-0303	1	C:FXD MYLAR .15 UF 10% 200VDCW	28480	0160-0303
A1A1C12	0180-0161	3	C:FXD ELECT 3.3 UF 20% 35VDCW	56289	150D335X0035B2-DYS
A1A1C13	0180-0116		C:FXD ELECT 6.8 UF 10% 35VDCW	56289	150D685X9035B2-DYS
A1A1CR1	1901-0535	3	DIODE:HYBRID HOT CARRIER	28480	1901-0535
A1A1CR2	1901-0535		DIODE:HYBRID HOT CARRIER	28480	1901-0535
A1A1CR3	1901-0535		DIODE:HYBRID HOT CARRIER	28480	1901-0535
A1A1CR4	1902-3149	1	DIODE BREAKDOWN:9.09V 5%	28480	1902-3149
A1A1CR5	1901-0033	43	DIODE:SILICON 100MA 180WV	07263	FD3369
A1A1K1	0490-0399	2	RELAY:REED ASSY, 1200 OHM 12VDC	28480	0490-0399
A1A1L1	9100-1618	3	COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A1A1L2	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A1A1Q1	1853-0012	2	TSTR:SI PNP	80131	2N2904A
A1A1Q2	1854-0071	38	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1A1Q3	1853-0012		TSTR:SI PNP	80131	2N2904A
A1A1Q4	1853-0020	9	TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A1A1Q5	1854-0221	6	TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A1A1Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1A1Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1A1Q8	1853-0075	1	TSTR:SI PNP	28480	1853-0075
A1A1Q9	1854-0009	5	TSTR:SI NPN	80131	2N709
A1A1Q10	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q11	1854-0009		TSTR:SI NPN	80131	2N709
A1A1Q12			NOT ASSIGNED		
A1A1Q13	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A1A1R1	0757-0346	8	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A1A1R2	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A1A1R3	0698-3440	3	R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A1A1R4	0698-3410	2	R:FXD MET FLM 3.16K OHM 1% 1/2W	28480	0698-3410
A1A1R5	0698-4311	1	R:FXD MET FLM 1000 OHM 1% 1/8W	28480	0698-4311
A1A1R6	0698-6319	1	R:FXD MET FLM 300 OHM 1% 1/8W	28480	0698-6319
A1A1R7	0698-3274	1	R:FXD MET FLM 10K OHM 1% 1/8W	28480	0698-3274
A1A1R8	0757-0428	6	R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A1A1R9	0698-0082	5	R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A1A1R10	0757-0421	2	R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A1A1R11	0757-0424	2	R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A1A1R12	0698-5674	1	R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0698-5674
A1A1R13	0698-5133	1	R:FXD FLM 3160 OHM 1% 1/8W	28480	0698-5133
A1A1R14	0757-0419	4	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A1A1R15	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A1A1R16	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A1A1R17	0757-0442	41	R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1A1R18			THRU		
A1A1R25			NOT ASSIGNED		
A1A1R26	0757-0465	12	R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A1A1R27	0757-0394	8	R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A1A1R28	0698-3459	3	R:FXD MET FLM 383K OHM 1% 1/8W	28480	0698-3459
A1A1R29	2100-0969	5	R:VAR MET FLM 50K OHM 20%	75042	CT150
A1A1R30	0757-0461	1	R:FXD MET FLM 68.1K OHM 1% 1/8W	28480	0757-0461

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1R31	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A1A1R32	0757-0280	49	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R33	0757-0420	3	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A1A1R34	0698-3156	6	R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A1A1R35	0757-0418	3	R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A1A1R36	0698-3406	1	R:FXD MET FLM 1.33K OHM 1% 1/2W	28480	0698-3406
A1A1R37	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R38	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1A1R39	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R40	0757-0317	7	R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A1A1R41	0757-0401	14	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A1A1R42	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A1A1R43	0757-0833	2	R:FXD MET FLM 5.11K OHM 1% 1/2W	28480	0757-0833
A1A1R44	0757-0833		R:FXD MET FLM 5.11K OHM 1% 1/2W	28480	0757-0833
A1A1R45	0698-3442	2	R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A1A1R46	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R47	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A1A1R48	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R49	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R50	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A1A1R51	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A1A1R52	0698-3260	4	R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A1A1R53	0698-3458	2	R:FXD MET FLM 348K OHM 1% 1/8W	28480	0698-3458
A2	08601-6071	1	DIVIDER ASSY	28480	08601-6071
A2			INCL C1-C4,J1-J3,A2A1 ASSY & COVER		
A2	08601-2028	1	FRONT PANEL:DIVIDER ASSY	28480	08601-2028
A2	08601-2016	2	BOX:SHIELD	28480	08601-2016
A2C1	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A2C2	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A2C3	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A2C4	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A2J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A2J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A2J3	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A2A1	08601-6043	1	BOARD ASSY:DIVIDER	28480	08601-6043
A2A1C1	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C2	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A2A1C3	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A2A1C4	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C5	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A2A1C6	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A2A1C7			NOT ASSIGNED		
A2A1C8	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A2A1C9	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C10	0140-0198	1	C:FXD MICA 200 PF 5%	72136	RDM15F201J3C
A2A1C11	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C12	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A2A1C13	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C14	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C15	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1CR1	1902-0579	1	DIODE BREAKDOWN:5.11V	28480	1902-0579
A2A1CR2	1902-0041	1	DIODE:BREAKDOWN 5.11V 5%	04713	SZ10939-98
A2A1IC1	1820-0101	1	INTEGRATED CIRCUIT:DIFFERENTIAL AMPL	04713	MC1034P
A2A1IC2	1820-0102	3	INTEGRATED CIRCUIT:J-K FLIP FLOP	04713	MC1013P
A2A1IC3	1820-0102		INTEGRATED CIRCUIT:J-K FLIP FLOP	04713	MC1013P
A2A1IC4	1820-0102		INTEGRATED CIRCUIT:J-K FLIP FLOP	04713	MC1013P
A2A1IC5	1820-0387	1	INTEGRATED CIRCUIT	28480	1820-0387
A2A1L1	9100-1624	1	COIL/CHOKE 30 UH 5%	82142	15-4465-1J
A2A1L2	9100-1618		COIL:MOLDED CHOKE 5.60 UH	28480	9100-1618
A2A1L3	9140-0237		COIL:FXD 200 UH 5%	28480	9140-0237
A2A1L4	9140-0237		COIL:FXD 200 UH 5%	28480	9140-0237
A2A1L5	9140-0158	5	COIL:FXD RF 1 UH 10%	99800	1025-20
A2A1Q1	1853-0034	2	TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A2A1Q2	1853-0034		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0034
A2A1Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A2A1R1	0757-0399	2	R:FXD MET FLM 82.5 OHM 1% 1/8W	28480	0757-0399
A2A1R2	0698-3444	3	R:FXD MET FLM 316 OHM 1% 1/8W	28480	0698-3444
A2A1R3	0698-3432	3	R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A2A1R4	0698-3441	8	R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A2A1R5	0698-3629	1	R:FXD MET OX 270 OHM 5% 2W	28480	0698-3629
A2A1R6	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R7	0698-3444		R:FXD MET FLM 316 OHM 1% 1/8W	28480	0698-3444
A2A1R8	0811-1675	1	R:FXD WW 5.6 OHM 5% 2W	28480	0811-1675
A2A1R9	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R10	0698-3432		R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2A1R11	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A2A1R12			NOT ASSIGNED		
A2A1R13	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R14	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A2A1R15	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2A1R16			NOT ASSIGNED		
A2A1R17	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R18	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A2A1R19	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3	08601-6003	1	LOOP AMPLIFIER ASSY	28480	08601-6003
A3			INCL C1-C4,J1-J4,A3A1,A3A2 ASSYS&COVER		
A3	08601-2029	1	FRONT PANEL:LOOP AMPL ASSY	28480	08601-2029
A3	08601-2016		BOX:SHIELD	28480	08601-2016
A3	08698-0013	2	COVER:CAN BOTTOM	28480	08698-0013
A3C1	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A3C2	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A3C3	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A3C4	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A3J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A3J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A3J3	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A3J4	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A3A1	08601-6023	1	BOARD ASSY:LOOP AMPLIFIER	28480	08601-6023
A3A1C1	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A3A1C2	0160-2150	3	C:FXD MICA 33 PF 5%	28480	0160-2150
A3A1C3	0160-2200	2	C:FXD MICA 43 PF 5%	72136	RDM15E430J3C
A3A1C4	0140-0191	3	C:FXD MICA 56 PF 5% 300VDCW	19701	RDM15E560J 300V
A3A1C5	0160-2200		C:FXD MICA 43 PF 5%	72136	RDM15E430J3C
A3A1C6	0160-2150		C:FXD MICA 33 PF 5%	28480	0160-2150
A3A1C7	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A3A1C8	0160-0174	3	C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A3A1C9	0180-1735	7	C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A3A1C10	0160-2150		C:FXD MICA 33 PF 5%	28480	0160-2150
A3A1C11	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A3A1C12	0180-1735		C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A3A1C13	0180-1735		C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A3A1C14	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A3A1C15	0160-2307	1	C:FXD MICA 47 PF 5%	28480	0160-2307
A3A1C16	0160-2202	1	C:FXD MICA 75 PF 5%	28480	0160-2202
A3A1C17	0160-2216	1	C:FXD MICA 820 PF 5%	28480	0160-2216
A3A1C18	0180-1735		C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A3A1C19	0160-2201		C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A3A1C20	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A3A1C21	0160-2236	1	C:FXD CER 1.0 PF 500VDCW	72982	301-000-COK0-109C
A3A1C22	0180-1735		C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A3A1C23	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A3A1C24	0160-0153	3	C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
A3A1C25	0160-0153		C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
A3A1C26	0180-1735		C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A3A1C27	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A3A1C28	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A3A1C29	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A3A1CR1			NOT ASSIGNED		
A3A1CR2	1901-0456	1	DIODE:SILICON HOT CARRIER	28480	1901-0456
A3A1CR3	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A3A1CR4	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A3A1E1	1820-0149	2	INTEGRATED CIRCUIT	28480	1820-0149
A3A1L1	9140-0096	3	COIL:FXD RF 1 UH	28480	9140-0096
A3A1L2	9100-1613	1	COIL:FXD 0.47 UH 20%	28480	9100-1613
A3A1L3			NSR,PART OF BD ASSY,TYPICAL VALUE 40NH		
A3A1L4			NSR,PART OF BD ASSY,TYPICAL VALUE 40NH		
A3A1L5			NSR,PART OF BD ASSY,TYPICAL VALUE 40NH		
A3A1L6			NSR,PART OF BD ASSY,TYPICAL VALUE 40NH		
A3A1L7	9140-0096		COIL:FXD RF 1 UH	28480	9140-0096
A3A1L8	9140-0096		COIL:FXD RF 1 UH	28480	9140-0096
A3A1L9	9100-1622	1	COIL/CHOKE 24.0 UH 5%	28480	9100-1622
A3A1L10	9100-1610	6	COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A3A1Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3A1Q2	1854-0247	3	TSTR:SI NPN	28480	1854-0247
A3A1Q3	1855-0082	1	TSTR:SI FET P-CHANNEL	28480	1855-0082
A3A1Q4	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3A1Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A3A1R1	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3A1R2	0757-0403	1	R:FXD MET FLM 121 OHM 1% 1/8W	28480	0757-0403
A3A1R2			FACTORY SELECTED PART		

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A1R3	0698-3431	1	R:FXD MET FLM 23.7 OHM 1% 1/8W	28480	0698-3431
A3A1R3			FACTORY SELECTED PART		
A3A1R4	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A3A1R5	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3A1R6	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3A1R7	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A3A1R8	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A3A1R9	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A3A1R10	0698-3432		R:FXD MET FLM 26.1 OHM 1% 1/8W	28480	0698-3432
A3A1R11	0698-3443	3	R:FXD MET FLM 287 OHM 1% 1/8W	28480	0698-3443
A3A1R12	0698-3136	1	R:FXD MET FLM 17.8K OHM 1% 1/8W	28480	0698-3136
A3A1R13	0757-0440		R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A3A1R14	0757-0422		R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A3A1R15	0757-0274	1	R:FXD MET FLM 1.21K OHM 1% 1/8W	28480	0757-0274
A3A1R16	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A3A1R17	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A3A1R18	0698-3458		R:FXD MET FLM 348K OHM 1% 1/8W	28480	0698-3458
A3A1R19	0698-3153		R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A3A1R20	0757-0439	2	R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A3A1R21	0757-0289	2	R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A3A1R22	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A3A1R23	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3A1R24	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3A1R25	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A3A1R26	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A3A1R27	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A3A1R28	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A3A1R29	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A3A1R30	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A3A1Y1	0410-0170	1	CRYSTAL:QUARTZ 5.000MHZ	28480	0410-0170
A3A2A1	08601-6041	2	MIXER ASSY	28480	08601-6041
A3A2A1	08698-0007	2	BOX:MIXER	28480	08698-0007
A3A2A1	08698-0009	2	PLATE:INSULATOR	28480	08698-0009
A3A2A1C1	0160-2264	3	C:FXD CER 20 PF 5% 500VDCW	72982	301-000-COGO-200J
A3A2A1C2	0150-0021	4	C:FXD TI DIOX 0.47PF 5% 500VDCW	78488	TYPE GA
A3A2A1C3	0150-0021		C:FXD TI DIOX 0.47PF 5% 500VDCW	78488	TYPE GA
A3A2A1C4	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A3A2A1C5	0160-0301	2	C:FXD MY 0.012 UF 10% 200VDCW	56289	192P12392-PTS
A3A2A1IC1	1901-0557	2	DIODE:MULTIPLE	28480	1901-0557
A3A2A1L1	9100-0368	4	COIL:FXD 0.33 UH 10%	36196	1A-3303M
A3A2A1L2	9100-0368		COIL:FXD 0.33 UH 10%	36196	1A-3303M
A3A2A1L3	08698-6013	2	COIL:VAR	28480	08698-6013
A3A2A1L4	9140-0094	3	COIL:FXD RF: 0.68UH	99800	1537-08
A3A2A1L5	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A3A2A1R1			NOT ASSIGNED		
A3A2A1R2	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A3A2A1T1	08698-6012	2	TRANSFORMER:MIXER	28480	08698-6012
A4	08601-6004	1	FIXED OSCILLATOR ASSY	28480	08601-6004
A4			INCL C1,C2,J1-J3,A4A1-A4A3 ASSYS&COVER		
A4	08601-2030	1	FRONT PANEL:FXD OSC ASSY	28480	08601-2030
A4	08601-2016	2	BOX:SHIELD	28480	08601-2016
A4	08698-0013		COVER:CAN BOTTOM	28480	08698-0013
A4	08698-0031	1	BRACKET:RETAINING	28480	08698-0031
A4C1	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A4C2	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A4J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A4J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A4J3	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A4A1	08601-6024	1	BOARD ASSY:FIXED OSCILLATOR	28480	08601-6024
A4A1C1	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102?S26-CDH
A4A1C2	0160-2327		C:FXD CER 1000 PF 20% 100VDCW	96733	B104BX102M
A4A1C3	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1C4	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1C5	0160-2327		C:FXD CER 1000 PF 20% 100VDCW	96733	B104BX102M
A4A1C6	0160-2253	1	C:FXD CER 6.8 PF 500VDCW	72982	301-NPO-6.8 PF
A4A1C7	0160-2259	1	C:FXD CER 12 PF 5% 500VDCW	72982	301-000-COGO-120J
A4A1C8	0160-2261	1	C:FXD CER 15 PF 5% 500VDCW	72982	301-NPO-15 PF
A4A1C9	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-COGO-240J
A4A1C10	0160-2257	5	C:FXD CER 10 PF 5% 500VDCW	72982	301-000-COHO-100J
A4A1C11	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-COGO-240J
A4A1C12	0160-2241	1	C:FXD CER 2.2 PF 500VDCW	72982	301-000-COJO-229C
A4A1C13	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A4A1C14	0160-2139	4	C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A4A1C15	0160-2260	2	C:FXD CER 13 PF 5% 500VDCW	72982	301-000-COGO 130J
A4A1C16	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A1C17	0160-2260		C:FXD CER 13 PF 5% 500VDCW	72982	301-000-C0G0 130J
A4A1C18	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A4A1C19	0160-2139		C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A4A1C20	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A4A1C21	0160-2139		C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A4A1C22	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A4A1C23	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A4A1C24	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A4A1C25	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1L1	9100-2249	2	COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A4A1L2	9140-0158		COIL:FXD RF 1 UH 10%	99800	1025-20
A4A1L3	9100-2249		COIL/CHOKE 0.15 UH 10%	28480	9100-2249
A4A1L4	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A4A1L5	08601-8004	1	COIL:VAR	28480	08601-8004
A4A1L6	9140-0158		COIL:FXD RF 1 UH 10%	99800	1025-20
A4A1L7	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A4A1L8	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A4A1L9	9140-0210	1	COIL/CHOKE 100 UH 5%	82142	15-1315-12J
A4A1L10	9140-0158		COIL:FXD RF 1 UH 10%	99800	1025-20
A4A1L11	9140-0158		COIL:FXD RF 1 UH 10%	99800	1025-20
A4A1Q1	1854-0345		TSTR:SI NPN	80131	2N5179
A4A1Q2	1854-0345		TSTR:SI NPN	80131	2N5179
A4A1Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A4A1Q4			NOT ASSIGNED		
A4A1Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4A1Q6	1854-0345		TSTR:SI NPN	80131	2N5179
A4A1Q7	1854-0345		TSTR:SI NPN	80131	2N5179
A4A1R1	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A4A1R2	0757-0278		R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A4A1R3	0757-0424		R:FXD MET FLM 1.10K OHM 1% 1/8W	28480	0757-0424
A4A1R4	0698-3445	2	R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A4A1R5	0698-0083	6	R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R6	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R7	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A4A1R7			FACTORY SELECTED PART		
A4A1R8	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4A1R9	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4A1R10	0698-3444		R:FXD MET FLM 316 OHM 1% 1/8W	28480	0698-3444
A4A1R11	0757-0419		R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A4A1R12	0698-3445		R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A4A1R13	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R14	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R15	0698-0082		R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A4A1R16	0698-3378	1	R:FXD CARBON 51 OHM 5% 1/8W	28480	0698-3378
A4A1R17	0698-3435	1	R:FXD MET FLM 38.3 OHM 1% 1/8W	28480	0698-3435
A4A1R18	0698-3446	2	R:FXD MET FLM 383 OHM 1% 1/8W	28480	0698-3446
A4A1R19	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A4A1R20	0758-0003	1	R:FXD MET OX 1K OHM 5% 1/4W	28480	0758-0003
A4A1R21	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4A1R22	0698-3442		R:FXD MET FLM 237 OHM 1% 1/8W	28480	0698-3442
A4A1RFC1	9100-1788	5	COIL:CHOKE	02114	VK200-10/4B
A4A1RFC2	9100-1788		COIL:CHOKE	02114	VK200-10/4B
A4A1RFC3	9100-1788		COIL:CHOKE	02114	VK200-10/4B
A4A1Y1	0410-0199	1	CRYSTAL:QUARTZ 200 MHZ	28480	0410-0199
A4A2	08698-6029	1	OSC LOW PASS FILTER ASSY	28480	08698-6029
A4A2	08698-0005	1	CAN:FILTER	28480	08698-0005
A4A2	08698-0008	1	COVER:CAN	28480	08698-0008
A4A2J1	1250-0826	1	CONNECTOR:RF	98291	50-027-0000
A4A2A1	08698-6009	1	OSC &LOW PASS FILTER BD ASSY	28480	08698-6009
A4A2A1C1	0140-0190	2	C:FXD MICA 39 PF 5%	72136	RDM15E390J3C
A4A2A1C2	0140-0191		C:FXD MICA 56 PF 5% 300VDCW	19701	RDM15E560J 300V
A4A2A1C3	0160-2201		C:FXD MICA 51 PF 5%	72136	RDM15E510J1C
A4A2A1C4	0140-0191		C:FXD MICA 56 PF 5% 300VDCW	19701	RDM15E560J 300V
A4A2A1C5	0140-0190		C:FXD MICA 39 PF 5%	72136	RDM15E390J3C
A4A2A1L1			NSR PART OF BD ASSY,TYPICAL VALUE 60NH		
A4A2A1L2			NSR PART OF BD ASSY,TYPICAL VALUE 60NH		
A4A2A1L3			NSR PART OF BD ASSY,TYPICAL VALUE 60NH		
A4A2A1L4			NSR PART OF BD ASSY,TYPICAL VALUE 60NH		
A4A3A1	08601-6041		MIXER ASSY	28480	08601-6041
A4A3A1	08698-0007		BOX:MIXER	28480	08698-0007
A4A3A1	08698-0009		PLATE:INSULATOR	28480	08698-0009
A4A3A1C1	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A4A3A1C2	0150-0021		C:FXD TI DIOX 0.47PF 5% 500VDCW	78488	TYPE GA
A4A3A1C3	0150-0021		C:FXD TI DIOX 0.47PF 5% 500VDCW	78488	TYPE GA
A4A3A1C4	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A3A1C5	0160-0301		C:FXD MY 0.012 UF 10% 200VDCW	56289	192P12392-PTS
A4A3A1IC1	1901-0557		DIODE:MULTIPLE	28480	1901-0557
A4A3A1L1	9100-0368		COIL:FXD 0.33 UH 10%	36196	1A-3303M
A4A3A1L2	9100-0368		COIL:FXD 0.33 UH 10%	36196	1A-3303M
A4A3A1L3	08698-6013		COIL:VAR	28480	08698-6013
A4A3A1L4	9140-0094		COIL:FXD RF: 0.68UH	99800	1537-08
A4A3A1L5	9100-2247		COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A4A3A1R1			NOT ASSIGNED		
A4A3A1R2	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A4A3A1T1	08698-6012		TRANSFORMER:MIXER	28480	08698-6012
A5	08601-6005	1	OSCILLATOR ASSY:VOLTAGE TUNED	28480	08601-6005
A5			INCL C1-C4,J1-J4,A5A1 ASSY & COVER		
A5	08601-2031	1	FRONT PANEL:VTO ASSY	28480	08601-2031
A5	08601-2057		BOX: VTO	28480	08601-2057
A5C1	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A5C2	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A5C3	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A5C4	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A5J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A5J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A5J3	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A5J4	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A5A1	08601-6044	1	BOARD ASSY:VTO	28480	08601-6044
A5A1C1	0160-0194	1	C:FXD MY 0.015 UF 10%	56289	192P15392-PTS
A5A1C2	0140-0069	1	C:FXD MICA 550 PF 10% 500VDCW	00853	TYPE M 100E10
A5A1C3	0160-2140	2	C:FXD CER 470 PF +80-20% 1000VDCW	91418	TYPE B
A5A1C4	0160-2140		C:FXD CER 470 PF +80-20% 1000VDCW	91418	TYPE B
A5A1C5	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C6	0160-2139		C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A5A1C7	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A5A1C8	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C9	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C10	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C11	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C12	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C13	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C14	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C15	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A5A1C16	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C17	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C18	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C19	0160-2266		C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A5A1C20	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A5A1C21	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A5A1C22	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A5A1C23	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C24	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C25	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C26	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C27	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C28	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C29	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C30	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1C31	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A5A1CR1	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A5A1CR2	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A5A1CR3	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A5A1CR4	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A5A1CR5	0122-0274	1	C:VOLTAGE VAR 18 PF 5%	28480	0122-0274
A5A1K1	0490-0399		RELAY:REED ASSY, 1200 OHM 12VDC	28480	0490-0399
A5A1L1	08553-6015	1	INDUCTOR:FXD(CW)GREEN	28480	08553-6015
A5A1L2	08553-6016	1	INDUCTOR:FXD(CCW)BLUE	28480	08553-6016
A5A1L3	9100-1610		COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A5A1L4	9140-0094		COIL:FXD RF: 0.68UH	99800	1537-08
A5A1L5	9100-1610		COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A5A1L6	9100-1610		COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A5A1L7	9100-1610		COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A5A1L8	9100-1610		COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A5A1Q1	1854-0247		TSTR:SI NPN	28480	1854-0247
A5A1Q2	1854-0345		TSTR:SI NPN	80131	2N5179
A5A1Q3	1854-0247		TSTR:SI NPN	28480	1854-0247
A5A1Q4	1854-0345		TSTR:SI NPN	80131	2N5179
A5A1Q5	1854-0021	1	TSTR:SI NPN	80131	2N918
A5A1Q6	1854-0345		TSTR:SI NPN	80131	2N5179
A5A1Q7	1854-0345		TSTR:SI NPN	80131	2N5179

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A5A1Q8	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A5A1Q9	1854-0022		TSTR:SI NPN	07263	S17843
A5A1R1	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A5A1R2	0757-0439		R:FXD MET FLM 6.81K OHM 1% 1/8W	28480	0757-0439
A5A1R3	0698-3150		R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A5A1R4	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A5A1R5	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A5A1R6	0698-3150		R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A5A1R7	0757-0837	1	R:FXD MET FLM 8.25K OHM 1% 1/2W	28480	0757-0837
A5A1R8	0698-3447	1	R:FXD MET FLM 422 OHM 1% 1/8W	28480	0698-3447
A5A1R9	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A5A1R10	0698-3158		R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A5A1R11	2100-2030	1	R:VAR FLM 20K OHM 10% LIN 1/2W	28480	2100-2030
A5A1R12	0757-0470	2	R:FXD MET FLM 162K OHM 1% 1/8W	28480	0757-0470
A5A1R13	2100-2655	1	R:VAR FLM 100K OHM 10% LIN 1/2W	28480	2100-2655
A5A1R14	0698-3451	2	R:FXD MET FLM 133K OHM 1% 1/8W	28480	0698-3451
A5A1R15	0757-0441		R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A5A1R16	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A5A1R17	0757-0199	4	R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A5A1R18	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A5A1R19	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A5A1R20	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A5A1R21	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A5A1R22	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A5A1R23	0757-0421		R:FXD MET FLM 825 OHM 1% 1/8W	28480	0757-0421
A5A1R24	0698-3152	2	R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A5A1R25	0698-3446		R:FXD MET FLM 383 OHM 1% 1/8W	28480	0698-3446
A5A1R26	0757-0819	1	R:FXD MET FLM 909 OHM 1% 1/2W	28480	0757-0819
A5A1R27	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A5A1R28	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A5A1R29	0757-0417	2	R:FXD MET FLM 562 OHM 1% 1/8W	28480	0757-0417
A5A1R30	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A5A1R31	0698-0090	2	R:FXD MET FLM 464 OHM 1% 1/2W	28480	0698-0090
A5A1R32	0757-1060	2	R:FXD MET FLM 196 OHM 1% 1/2W	28480	0757-1060
A5A1R33	0698-3440		R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A5A1R34	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A5A1R35	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A5A1R36	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A5A1R37	0757-0417		R:FXD MET FLM 562 OHM 1% 1/8W	28480	0757-0417
A5A1R38	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A5A1R39	0698-0090		R:FXD MET FLM 464 OHM 1% 1/2W	28480	0698-0090
A5A1R40	0757-1060		R:FXD MET FLM 196 OHM 1% 1/2W	28480	0757-1060
A5A1RFC1	9100-1788		COIL:CHOKE	02114	VK200-10/4B
A5A1RFC2	9100-1788		COIL:CHOKE	02114	VK200-10/4B
A5A1RFC3	9170-0016	2	BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A5A1RFC4	9170-0016		BEAD:MAGNETIC SHIELDING	02114	56-590-65/3B
A6	08601-6006	1	AMPLIFIER ASSY:VIDEO	28480	08601-6006
A6			INCL C1-2, J1-2, A6A1 ASSY & COVER		
A6	08601-0007	1	COVER:VIDEO AMPLIFIER	28480	08601-0007
A6	08601-2010	1	HOUSING:VIDEO AMPLIFIER	28480	08601-2010
A6C1	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A6C2	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A6J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A6J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A6A1	08601-6026	1	BOARD ASSY:VIDEO AMPLIFIER	28480	08601-6026
A6A1C1	0180-0097		C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
A6A1C2	0180-0376	3	C:FXD ELECT 0.47 UF 10% 35VDCW	56289	150D474X9035A2-DYS
A6A1C3	0180-0097		C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
A6A1C4	0160-3060	2	C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A6A1C5	0160-3060		C:FXD CER 0.1 UF 20% 25VDCW	56289	3C42A-CML
A6A1C6			NOT ASSIGNED		
A6A1C7	0180-0376		C:FXD ELECT 0.47 UF 10% 35VDCW	56289	150D474X9035A2-DYS
A6A1C8	0180-0376		C:FXD ELECT 0.47 UF 10% 35VDCW	56289	150D474X9035A2-DYS
A6A1E1	1820-0149		INTEGRATED CIRCUIT	28480	1820-0149
A6A1E2	1820-0150	1	INTEGRATED CIRCUIT	28480	1820-0150
A6A1L1	9140-0142	2	COIL:FXD RF 2.20 UH 10%	82142	09-4436-4K
A6A1L2	9140-0142		COIL:FXD RF 2.20 UH 10%	82142	09-4436-4K
A6A1R1	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A6A1R2	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A6A1R3	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A6A1R4	0698-3152		R:FXD MET FLM 3.48K OHM 1% 1/8W	28480	0698-3152
A6A1R5	0757-0444	3	R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A6A1R6	0698-3380	1	R:FXD CARBON 75 OHM 5% 1/8W	28480	0698-3380
A6A1R6			FACTORY SELECTED PART		
A7	08601-6007	1	ATTENUATOR ASSY	28480	08601-6007

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A7	08601-6057	1	ATTENUATOR ASSY	28480	08601-6057
A7			(OPT 008, 009, 010 ONLY)		
A7J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A7MP1	08601-2001	1	HOUSING:ATTENUATOR ASSY	28480	08601-2001
A7R1	0727-0028	4	R:FXD DEPC 53.3 OHM 1/2% 1/2W	28480	0727-0028
A7R2	0727-0091	3	R:FXD DEPC 790 OHM 1/2% 1/2W	28480	0727-0091
A7R3	0727-0028		R:FXD DEPC 53.3 OHM 1/2% 1/2W	28480	0727-0028
A7R4	0727-0034	2	R:FXD DEPC 61.11 OHM 1/2% 1/2W	28480	0727-0034
A7R5	0727-0062	1	R:FXD DEPC 247.5 OHM 1/2% 1/2W	28480	0727-0062
A7R6	0727-0034		R:FXD DEPC 61.11 OHM 1/2% 1/2W	28480	0727-0034
A7R7	0727-0042	2	R:FXD DEPC 96.25 OHM 1/2% 1/2W	28480	0727-0042
A7R8	0727-0037	1	R:FXD DEPC 71.16 OHM 1/2% 1/2W	28480	0727-0037
A7R9	0727-0042		R:FXD DEPC 96.25 OHM 1/2% 1/2W	28480	0727-0042
A7R10	0727-0028		R:FXD DEPC 53.3 OHM 1/2% 1/2W	28480	0727-0028
A7R11	0727-0091		R:FXD DEPC 790 OHM 1/2% 1/2W	28480	0727-0091
A7R12	0727-0016	1	R:FXD DEPC 26.63 OHM 1/2% 1/2W	28480	0727-0016
A7R13	0727-0091		R:FXD DEPC 790 OHM 1/2% 1/2W	28480	0727-0091
A7R14	0727-0028		R:FXD DEPC 53.3 OHM 1/2% 1/2W	28480	0727-0028
A7R15	0683-2405	1	R:FXD COMP 24 OHM 5% 1/4W	01121	CB 2405
A7R15			(OPT 008, 009, 010 ONLY)		
A7S1	3102-0006	4	SWITCH: SENSITIVE SPDT PIN PLUNGER	91929	22SM261
A7S2	3102-0006		SWITCH: SENSITIVE SPDT PIN PLUNGER	91929	22SM261
A7S3	3102-0006		SWITCH: SENSITIVE SPDT PIN PLUNGER	91929	22SM261
A7S4	3102-0006		SWITCH: SENSITIVE SPDT PIN PLUNGER	91929	22SM261
A7MP1	08601-0009	1	DIAL-KNOB ASSY:ATTENUATOR	28480	08601-0009
A8	08601-6018	1	BOARD ASSY:RECTIFIER	28480	08601-6018
A8C1	0150-0082	2	C:FXD CER 8200 PF 500VDCW	04222	TYPE D1-4
A8C2	0150-0082		C:FXD CER 8200 PF 500VDCW	04222	TYPE D1-4
A8CR1	1901-0418	2	DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR2	1901-0418		DIODE:SILICON 400PIV 1N5000	04713	1N5000
A8CR3	1901-0028	2	DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A8CR4	1901-0028		DIODE:SILICON 0.75A 400PIV	04713	SR1358-9
A8F1	2110-0006	1	FUSE:CARTRIDGE 2AMP 125V SLOW BLOW	71400	MDL2
A8F2	2110-0064	1	FUSE:0.125A 125V SLO-BLO	28480	2110-0064
A9	08601-6019	1	BOARD ASSY:FREQ CONTROL & LEVELING	28480	08601-6019
A9	08601-6061	1	BOARD ASSY:FREQUENCY CONTROL & LEVELING	28480	08601-6061
A9			(OPT 001 ONLY)		
A9	08601-6064	1	BOARD ASSY:FREQUENCY CONTROL & LEVELING	28480	08601-6064
A9			(OPT 002 ONLY)		
A9	08601-6069	1	BOARD ASSY:FREQUENCY CONTROL & LEVELING	28480	08601-6069
A9			(OPT 003 ONLY)		
A9	08601-6070	1	BOARD ASSY:FREQUENCY CONTROL & LEVELING	28480	08601-6070
A9			(OPT 005 ONLY)		
A9	08601-6068	1	BOARD ASSY:FREQUENCY CONTROL & LEVELING	28480	08601-6068
A9			(OPT 006 ONLY)		
A9	08601-6077	1	BOARD ASSY:FREQUENCY CONTROL & LEVELING	28480	08601-6077
A9			(OPT 011 ONLY)		
A9C1	0180-0231	1	C:FXD ELECT 3.5 UF 75VDCW	56289	109D355C2075C2
A9C2	0180-2186	1	C:FXD TA 300 UF 20% 30VDCW	56289	109D307X0030W2-DYP
A9C3	0170-0040	1	C:FXD MY 0.047 UF 10% 200VDCW	56289	192P47392-PTS
A9C4	0160-2214	1	C:FXD MICA 680 PF 5%	28480	0160-2214
A9C5	0160-2225	2	C:FXD MICA 2000 PF 5% 300VDCW	72136	RDM19F202J3C
A9C6	0180-0229	1	C:FXD ELECT 33 UF 10% 10VDCW	28480	0180-0229
A9C7	0180-1746	2	C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A9C8	0180-1746		C:FXD ELECT 15 UF 10% 20VDCW	28480	0180-1746
A9C9	0180-0050	1	C:FXD ELECT 40 UF +75-10% 50VDCW	28480	0180-0050
A9C10	0160-2146	3	C:FXD CER 0.02 UF +80-20% 100VDCW	91418	TA
A9C11	0160-2146		C:FXD CER 0.02 UF +80-20% 100VDCW	91418	TA
A9C12	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A9C13	0160-0153		C:FXD MY 0.001 UF 10% 200VDCW	56289	192P10292-PTS
A9C14	0160-0174		C:FXD CER 0.47 UF +80-20% 25VDCW	56289	5C11B7S-CML
A9C15	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A9C16	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A9C17	0180-1747	1	C:FXD ELECT 150 UF 20% 15VDCW	28480	0180-1747
A9C18	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A9C19	0160-0298		C:FXD MY 0.0015 UF 10% 200VDCW	56289	192P15292-PTS
A9C20	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A9C21			NOT ASSIGNED		
A9C23			NOT ASSIGNED		
A9C24	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A9C25	0160-2225		C:FXD MICA 2000 PF 5% 300VDCW	72136	RDM19F202J3C
A9C26	0160-2229	1	C:FXD MICA 3000 PF 5%	28480	0160-2229
A9C27	0180-0228	1	C:FXD ELECT 22 UF 10% 15VDCW	56289	150D226X9015B2-DYS
A9C28	0160-0161		C:FXD MY 0.01 UF 10% 200VDCW	56289	192P10392-PTS
A9C29	0180-1731	1	C:FXD ELECT 4.7 UF 10% 50VDCW	56289	150D475X9050B2-DYS

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9C30	0180-1735		C:FXD ELECT 0.22 UF 10% 35VDCW	28480	0180-1735
A9C31	0140-0184	2	C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A9C31	0140-0166	1	C:FXD MICA 17,000PF 2% 300VDCW	28480	0140-0166
A9C31			(OPT 005 ONLY)		
A9C32	0160-2228	2	C:FXD MICA 2700 PF 5%	28480	0160-2228
A9C32	0140-0184		C:FXD MICA 8200 PF 1% 100VDCW	28480	0140-0184
A9C32			(OPT 005 ONLY)		
A9C33	0160-2217	1	C:FXD MICA 910 PF 5%	28480	0160-2217
A9C33	0160-2228		C:FXD MICA 2700 PF 5%	28480	0160-2228
A9C33			(OPT 005 ONLY)		
A9C34	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A9C35	0160-0163	1	C:FXD MY 0.033 UF 10% 200VDCW	56289	192P33392-PTS
A9C35	0160-0168	2	C:FXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
A9C35			(OPT 005 ONLY)		
A9C36	0160-2146		C:FXD CER 0.02 UF +80-20% 100VDCW	91418	TA
A9C37	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A9C37	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A9C37			(OPT 005 ONLY)		
A9C38	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A9C38	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A9C38			(OPT 005 ONLY)		
A9C39	0180-0159	1	C:FXD ELECT 220 UF 20% 10VDCW	28480	0180-0159
A9C40	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A9C41	0160-2917	1	C:FXD CER 0.05 UF +80-20% 100VDCW	84411	TYPE TA
A9CR1	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR2	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR3	1902-3104	2	DIODE:BREAKDOWN 5.62V 5%	04713	SZ10939-110
A9CR4	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR5	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR6	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR7	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR8	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR9	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR10	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR11	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR12	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR13	1902-3104		DIODE:BREAKDOWN 5.62V 5%	04713	SZ10939-110
A9CR14	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR15	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR16			NOT ASSIGNED		
A9CR17	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR18	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR19	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR20	1902-0025	1	DIODE,BREAKDOWN:10.0V 5% 400 MW	28480	1902-0025
A9CR21			NOT ASSIGNED		
A9CR22	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR23	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR24	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR25	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR26	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR27	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR28	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR29	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9CR30			NOT ASSIGNED		
A9CR31	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A9E1	1820-0203	1	IC:OPERATIONAL AMPLIFIER	07263	SL8940
A9L1			NOT ASSIGNED		
A9L2	9140-0131	1	COIL:FXD RF 10 MH	28480	9140-0131
A9L2	9100-2867	1	COIL/CHOKE 24000 UH 5%	82142	10289-3
A9L2			(OPT 005 ONLY)		
A9Q1	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A9Q2	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q3	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q4	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q5	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A9Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q7	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q8	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q9	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q10	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q11			NOT ASSIGNED		
A9Q12	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A9Q13	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A9Q14	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q15	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9Q16	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q17			NOT ASSIGNED		
A9Q18	1854-0295	1	TSTR:SI NPN	28480	1854-0295
A9Q19	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q20	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q21	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q22	1854-0009		TSTR:SI NPN	80131	2N709
A9Q23	1854-0009		TSTR:SI NPN	80131	2N709
A9Q24	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q25	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q26	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q27	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q28	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q29	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q30	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q31	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q32	1853-0020		TSTR:SI PNP(SELECTED FROM 2N3702)	28480	1853-0020
A9Q33	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q34	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q35	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q36	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q37	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A9Q38	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q39	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q40	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9Q41			NOT ASSIGNED		
A9Q42	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A9R1	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R2	0757-0438	4	R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A9R3	0757-0443	6	R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9R4	0757-0458		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A9R5	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R6	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A9R7	0698-3158		R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A9R8	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R9	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A9R10	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R11	0757-0440		R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A9R12	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9R13	0698-3158		R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A9R14	0757-0200	3	R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A9R15	0698-3454		R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A9R16	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R17	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R18	0698-3459		R:FXD MET FLM 383K OHM 1% 1/8W	28480	0698-3459
A9R19	0698-3459		R:FXD MET FLM 383K OHM 1% 1/8W	28480	0698-3459
A9R20	2100-0969		R:VAR MET FLM 50K OHM 20%	75042	CT150
A9R21	0698-3454		R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A9R22	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R23	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A9R24	2100-1772	1	R:VAR WW 500 OHM 5% TYPE H 1W	28480	2100-1772
A9R25	0698-3443		R:FXD MET FLM 287 OHM 1% 1/8W	28480	0698-3443
A9R26	0698-3443		R:FXD MET FLM 287 OHM 1% 1/8W	28480	0698-3443
A9R27	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A9R28	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A9R29	0698-3439	1	R:FXD MET FLM 178 OHM 1% 1/8W	28480	0698-3439
A9R30	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R31	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R32	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A9R33	0698-3452	2	R:FXD MET FLM 147K OHM 1% 1/8W	28480	0698-3452
A9R34	2100-1775	2	R:VAR WW 5K OHM 5% TYPE H 1W	28480	2100-1775
A9R35	0698-3161	2	R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161
A9R36	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R37	0698-0085	2	R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A9R38	0757-0460	1	R:FXD MET FLM 61.9K OHM 1% 1/8W	28480	0757-0460
A9R39	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A9R40	0698-3162	2	R:FXD MET FLM 46.4K OHM 1% 1/8W	28480	0698-3162
A9R41	0757-0441		R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A9R42	0698-3449		R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A9R43			NOT ASSIGNED		
A9R44	0698-0082		R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A9R45	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R46	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R47	0698-3455	1	R:FXD MET FLM 261K OHM 1% 1/8W	28480	0698-3455
A9R48	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9R49	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A9R50	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R51	0698-3158		R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A9R52	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A9R53	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R54	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R55	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R56	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A9R57	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A9R58	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R59	0698-3162		R:FXD MET FLM 46.4K OHM 1% 1/8W	28480	0698-3162
A9R60	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9R61	0698-3150		R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A9R62	0757-0316	1	R:FXD MET FLM 42.2 OHM 1% 1/8W	28480	0757-0316
A9R63	0757-0200		R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A9R64	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A9R65	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A9R66	0757-0422		R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A9R67	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R68	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9R69	0698-3460	2	R:FXD MET FLM 422K OHM 1% 1/8W	28480	0698-3460
A9R70	0698-3460		R:FXD MET FLM 422K OHM 1% 1/8W	28480	0698-3460
A9R71	2100-0969		R:VAR MET FLM 50K OHM 20%	75042	CT150
A9R72	0698-3450		R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A9R73	0698-3456	1	R:FXD MET FLM 287K OHM 1% 1/8W	28480	0698-3456
A9R74	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R75	0698-3160	6	R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A9R76	2100-0969		R:VAR MET FLM 50K OHM 20%	75042	CT150
A9R77	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A9R78	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R79	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A9R80	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R81	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R82	0757-0279		R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A9R83	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A9R84	0698-0085		R:FXD MET FLM 2.61K OHM 1% 1/8W	28480	0698-0085
A9R85	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9R86	0757-0443		R:FXD MET FLM 11.0K OHM 1% 1/8W	28480	0757-0443
A9R87	0698-3158		R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A9R88	2100-1768	3	R:VAR WW 20 OHM 5% TYPE H 1W	28480	2100-1768
A9R89	0757-0422		R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A9R90	0757-0395	1	R:FXD MET FLM 56.2 OHM 1% 1/8W	28480	0757-0395
A9R91	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A9R92	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R93	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R94	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A9R95	2100-1775		R:VAR WW 5K OHM 5% TYPE H 1W	28480	2100-1775
A9R96	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R97	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R98	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R99	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R100-A9R105			NOT ASSIGNED NOT ASSIGNED		
A9R106	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R107	0757-0428		R:FXD MET FLM 1.62K OHM 1% 1/8W	28480	0757-0428
A9R107	0698-4087	1	R:FXD MET FLM 24.6 OHM 1% 1/8W	28480	0698-4087
A9R107			(OPT 003 AND 011 ONLY)		
A9R108	0698-3637	1	R:FXD MET OX 820 OHM 5% 2W	28480	0698-3637
A9R109	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R110	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A9R111	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R112	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A9R112	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A9R112			(OPT 006 ONLY)		
A9R113	0757-0378		R:FXD MET FLM 11.0 OHM 1% 1/8W	28480	0757-0378
A9R113	0698-3428		R:FXD MET FLM 14.7 OHM 1% 1/8W	28480	0698-3428
A9R113			(OPT 001 ONLY)		
A9R113	0683-0565		R:FXD COMP 5.6 OHM 5% 1/4W	01121	CB 0565
A9R113			(OPT 002 AND 011 ONLY)		
A9R114	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R115	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A9R116	0757-0399		R:FXD MET FLM 82.5 OHM 1% 1/8W	28480	0757-0399
A9R117	2100-1768		R:VAR WW 20 OHM 5% TYPE H 1W	28480	2100-1768
A9R118	0757-0200		R:FXD MET FLM 5.62K OHM 1% 1/8W	28480	0757-0200
A9R119	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A9R120	2100-1768		R:VAR WW 20 OHM 5% TYPE H 1W	28480	2100-1768
A9R121	0757-0402	1	R:FXD MET FLM 110 OHM 1% 1/8W	28480	0757-0402
A9R122	0757-0447		R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A9R122			FACTORY SELECTED PART		
A9R123	0698-6276	1	R:FXD FLM 12.5K OHM 1% 1/8W	28480	0698-6276
A9R124			NOT ASSIGNED		
A9R125			NOT ASSIGNED		
A9R126	0698-4317	1	R:FXD MET FLM 5620 OHM 1.0% 1/2W	28480	0698-4317
A9R127			NOT ASSIGNED		
A9R128	0757-0317		R:FXD MET FLM 1.33K OHM 1% 1/8W	28480	0757-0317
A9R129	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A9R130			NOT ASSIGNED		
A9R131	2100-1777	3	R:VAR WW 20K OHM 5% TYPE H 1W	28480	2100-1777
A9R132	0757-0441		R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A9R133	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A9R134	0757-1094	4	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A9R135	0698-3449		R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A9R136	2100-1777		R:VAR WW 20K OHM 5% TYPE H 1W	28480	2100-1777
A9R137	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A9R138	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A9R139	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A9R140	0698-0082		R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A9R141	0698-0082		R:FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
A9R142	0757-0289		R:FXD MET FLM 13.3K OHM 1% 1/8W	28480	0757-0289
A9R143	0757-0470		R:FXD MET FLM 162K OHM 1% 1/8W	28480	0757-0470
A9R144	0698-3452		R:FXD MET FLM 147K OHM 1% 1/8W	28480	0698-3452
A9R145	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A9R146	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A9R147	0698-3155	1	R:FXD MET FLM 4.64K OHM 1% 1/8W	28480	0698-3155
A9R148	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R149	0757-0839		R:FXD MET FLM 10K OHM 1% 1/2W	28480	0757-0839
A9R150	0698-3449		R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A9R151	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A9R152	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A9R153	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A9R154	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A9R155	0757-0444		R:FXD MET FLM 12.1K OHM 1% 1/8W	28480	0757-0444
A9R156	0757-0199		R:FXD MET FLM 21.5K OHM 1% 1/8W	28480	0757-0199
A9R157	0757-1094		R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A9R158	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R159	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
A9R159	0698-3449		R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A9R159			(OPT 005 ONLY)		
A9R160	2100-1776	2	R:VAR WW 10K OHM 5% TYPE H 1W	28480	2100-1776
A9R161	0757-0464	1	R:FXD MET FLM 90.9K OHM 1% 1/8W	28480	0757-0464
A9R162	2100-1776		R:VAR WW 10K OHM 5% TYPE H 1W	28480	2100-1776
A9R162	2100-0969		R:VAR MET FLM 50K OHM 20%	75042	CT150
A9R162			(OPT 001 AND 002 ONLY)		
A9R163	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R163	0757-0438		R:FXD MET FLM 5.11K OHM 1% 1/8W	28480	0757-0438
A9R163			(OPT 005 ONLY)		
A9R164	0698-3154	2	R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A9R165	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R166	0698-3260		R:FXD MET FLM 464K OHM 1% 1/8W	28480	0698-3260
A9R167	0698-3410		R:FXD MET FLM 3.16K OHM 1% 1/2W	28480	0698-3410
A9R168	0698-3417		R:FXD MET FLM 23.7K OHM 1% 1/2W	28480	0698-3417
A9R169	0757-0440		R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A9R170	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R171	0698-0084		R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A9R172	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A9R173	0757-0397	1	R:FXD MET FLM 68.1 OHM 1% 1/8W	28480	0757-0397
A9R174	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R175	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R176	0757-0180	1	R:FXD MET FLM 31.6 OHM 1% 1/8W	28480	0757-0180
A9R177	0698-3154		R:FXD MET FLM 4.22K OHM 1% 1/8W	28480	0698-3154
A9R178	0698-3631	1	R:FXD MET OX 330 OHM 5% 2W	28480	0698-3631
A9R179	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A9R180	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R181	2100-1777		R:VAR WW 20K OHM 5% TYPE H 1W	28480	2100-1777
A9R182	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A9R183	2100-2497	1	R:VAR CERMET 2000 OHM 30% LIN 1/2W	28480	2100-2497
A9R184	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A9R185	0698-3161		R:FXD MET FLM 38.3K OHM 1% 1/8W	28480	0698-3161

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A10	08601-6020	1	BOARD ASSY:POWER SUPPLY	28480	08601-6020
A10C1	0180-0100	1	C:FXD ELECT 4.7 UF 10% 35VDCW	56289	150D475X9035B2-DYS
A10C2	0180-0161		C:FXD ELECT 3.3 UF 20% 35VDCW	56289	150D335X0035B2-DYS
A10C3	0180-0094	2	C:FXD ELECT 100 UF +75-10% 25VDCW	56289	30D107G025DD2-DSM
A10C4	0180-0161		C:FXD ELECT 3.3 UF 20% 35VDCW	56289	150D335X0035B2-DYS
A10C5	0160-2055	18	C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A10C6	0180-0097	4	C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
A10C7	0180-1743	7	C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A10C8	0180-0097		C:FXD TANT. 47 UF 10% 35VDCW	56289	150D476X9035S2-DYS
A10C9	0180-1797	1	C:FXD ELECT 50 UF +50-10% 150VDCW	28480	0180-1797
A10C10	0180-0094		C:FXD ELECT 100 UF +75-10% 25VDCW	56289	30D107G025DD2-DSM
A10C11	0180-0089	2	C:FXD ELECT 10UF-10%+100% 150VDCW	56289	30D106G150DF4
A10C12	0180-0089		C:FXD ELECT 10UF-10%+100% 150VDCW	56289	30D106G150DF4
A10CR1	1902-3036	2	DIODE:BREAKDOWN 3.16V 5%	04713	SZ10939-38
A10CR2	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR3	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR4	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR5	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR6	1902-0071	1	DIODE:BREAKDOWN 9.0V 5%	28480	1902-0071
A10CR7	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR8	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR9	1902-3036		DIODE:BREAKDOWN 3.16V 5%	04713	SZ10939-38
A10CR10	1902-3125	1	DIODE:BREAKDOWN 6.98V 2% 400MW	28480	1902-3125
A10CR11	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR12	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR13	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10CR14	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
A10Q1	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A10Q2	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10Q3	1853-0001	1	TSTR:SI PNP(SELECTED FROM 2N1132)	28480	1853-0001
A10Q4	1853-0010	5	TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A10Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10Q6	1853-0037	2	TSTR:SI PNP	04713	SS 2109
A10Q7	1854-0022	2	TSTR:SI NPN	07263	S17843
A10Q8	1853-0037		TSTR:SI PNP	04713	SS 2109
A10Q9	1854-0039	1	TSTR:SI NPN	80131	2N3053
A10Q10	1854-0221		TSTR:SI NPN(REPL.BY 2N4044)	28480	1854-0221
A10Q11	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A10Q12	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A10Q13	1853-0010		TSTR:SI PNP(SELECTED FROM 2N3251)	28480	1853-0010
A10R1	0757-0839	2	R:FXD MET FLM 10K OHM 1% 1/2W	28480	0757-0839
A10R2	0698-3434	1	R:FXD MET FLM 34.8 OHM 1% 1/8W	28480	0698-3434
A10R3	0757-0346		R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A10R4	0761-0047	1	R:FXD MET OX 130 OHM 5% 1W	28480	0761-0047
A10R5	0761-0048	1	R:FXD MET OX 160 OHM 5% 1W	28480	0761-0048
A10R6	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R7	0698-3157	4	R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A10R8	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10R9	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R10	0757-0447	2	R:FXD MET FLM 16.2K OHM 1% 1/8W	28480	0757-0447
A10R11	2100-1773	1	R:VAR WW 1K OHM 5% TYPE H 1W	28480	2100-1773
A10R12	0757-0441	4	R:FXD MET FLM 8.25K OHM 1% 1/8W	28480	0757-0441
A10R13	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A10R14	0757-0465		R:FXD MET FLM 100K OHM 1% 1/8W	28480	0757-0465
A10R15	0698-3450	2	R:FXD MET FLM 42.2K OHM 1% 1/8W	28480	0698-3450
A10R16	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R17	0698-3409	1	R:FXD MET FLM 2.37K OHM 1% 1/2W	28480	0698-3409
A10R18	0698-3157		R:FXD MET FLM 19.6K OHM 1% 1/8W	28480	0698-3157
A10R19	0757-0290	1	R:FXD MET FLM 6.19K OHM 1% 1/8W	28480	0757-0290
A10R20	0698-3243	1	R:FXD MET FLM 178K OHM 1% 1/8W	28480	0698-3243
A10R21	0698-3449	5	R:FXD MET FLM 28.7K OHM 1% 1/8W	28480	0698-3449
A10R22	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A10R23	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R24	0698-3158	6	R:FXD MET FLM 23.7K OHM 1% 1/8W	28480	0698-3158
A10R25	0698-0084	2	R:FXD MET FLM 2.15K OHM 1% 1/8W	28480	0698-0084
A10R26	0698-3153	2	R:FXD MET FLM 3.83K OHM 1% 1/8W	28480	0698-3153
A10R27	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A10R28	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A10R29	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A10R30	0811-1678	1	R:FXD WW 10 OHM 5% 2W	28480	0811-1678
A10R31	0698-3417	2	R:FXD MET FLM 23.7K OHM 1% 1/2W	28480	0698-3417
A10R32	0757-0278	2	R:FXD MET FLM 1.78K OHM 1% 1/8W	28480	0757-0278
A10R33	0698-3416	1	R:FXD MET FLM 21.5K OHM 1% 1/2W	28480	0698-3416
A10R34	0698-3150	4	R:FXD MET FLM 2.37K OHM 1% 1/8W	28480	0698-3150
A11	08601-6010	1	SWITCH ASSY:SWEEP WIDTH	28480	08601-6010

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A11R1	0757-0123	2	R:FXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
A11R2	0698-6998	1	R:FXD MET FLM 6.75K OHM 1% 1/8W	28480	0698-6998
A11R3	0757-0427	1	R:FXD MET FLM 1.5K OHM 1% 1/8W	28480	0757-0427
A11R4	0698-6999	1	R:FXD MET FLM 371 OHM 1% 1/8W	28480	0698-6999
A11R5	0698-4417	1	R:FXD MET FLM 174 OHM 1% 1/8W	28480	0698-4417
A11R6	2100-2424	1	R:VAR COMP 50K OHM 20% LIN 1/2W	28480	2100-2424
A11R7	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A11R8	0698-3156		R:FXD MET FLM 14.7K OHM 1% 1/8W	28480	0698-3156
A11R9	0757-0416	6	R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
A11S1	3100-2088	1	SWITCH:ROTARY 6 POSITION	28480	3100-2088
A11S1	08601-0010	1	DIAL-KNOB ASSY:SYM. SWEEP WIDTH	28480	08601-0010
A12	08601-6027	1	SWITCH ASSY:FUNCTION	28480	08601-6027
A12C1	0180-0106	2	C:FXD ELECT 60 UF 20% 6VDCW	28480	0180-0106
A12C2	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A12C3	0180-0106		C:FXD ELECT 60 UF 20% 6VDCW	28480	0180-0106
A12R1	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A12R2	0757-0378	2	R:FXD MET FLM 11.0 OHM 1% 1/8W	28480	0757-0378
A12R2	0698-3428	2	R:FXD MET FLM 14.7 OHM 1% 1/8W	28480	0698-3428
A12R2			(OPT 001 ONLY)		
A12R2	0683-0565	2	R:FXD COMP 5.6 OHM 5% 1/4W	01121	CB 0565
A12R2			(OPT 002 AND 011 ONLY)		
A12S1	3100-2464	1	SWITCH:LEVER 4 POSITION 3 SECTION	28480	3100-2464
A12S1	0370-0433	1	KNOB:LEVER GRAY	28480	0370-0433
A13	08601-6011	1	FREQUENCY READOUT ASSY (SEE FIG. 6-1)	28480	08601-6011
1	1140-0006	1	WHEEL:COUNTER 0 TO 9 NUMERALS	18911	CC-2391-NR-WH
2	1140-0044	1	WHEEL:END COUNTER 0 TO 9 NUMERALS	18911	CC-2391-ENR-WH
3	1140-0045	1	WHEEL:UNIT 0 TO 9 NUMERALS	18911	CC-2365-UNR-G-WH
4	1410-0142	1	BUSHING:BEARING FLANGED	71041	FB-46-5
5	1430-0035	2	GEAR:PINION 22 PITCH 8 TEETH	18911	BB-2219
6	1430-0064	2	GEAR:MITER 16 TEETH,32 PITCH	28480	1430-0064
7	2100-2335	1	R:VAR WW 1K OHM 3% LIN 2W	28480	2100-2335
8	2140-0092	2	LAMP:INCANDESCENT 5.0V 0.060A	71744	CM 685
9	00695-285	1	GEAR STOP-OFFSET	28480	00695-285
10	08614-218	1	SPACER:SHOULDERED	28480	08614-218
11	08601-0004	2	CONTACT:LAMP	28480	08601-0004
12	08601-2005	1	SUPPORT:READOUT	28480	08601-2005
13	08601-2006	1	SHAFT:READOUT	28480	08601-2006
14	08601-2007	1	SHAFT:KNOB	28480	08601-2007
15	08601-2008	1	SHAFT:DRIVE	28480	08601-2008
16	08601-2012	1	GEAR:POT	28480	08601-2012
17	08601-2013	1	GEAR:SHAFT READOUT	28480	08601-2013
18	08601-2014	1	GEAR:SHAFT DRIVE	28480	08601-2014
19	08601-2015	1	GEAR STOP	28480	08601-2015
20	08601-2032	1	SHAFT:PINION	28480	08601-2032
21	0510-0091	2	RING:RETAINING STL EXTERNAL	79136	5103-25-S-MD
22	0570-0034	2	SCREW:NYLON 4-40 X .250	00000	OBD
23	1480-0072	1	PIN:ROLL .062 DIA X .375 LG	72962	92-012-062-0375
24	2190-0006	1	WASHER:SPLIT LOCK FOR #6 SCREW	80120	OBD
25	2190-0016	1	WASHER:LOCK PH BRZ NP	00000	OBD
26	2190-0401	2	WASHER:FIBER FOR #4 SCREW	00000	OBD
27	2360-0197	1	SCREW:SST PAN HD 6-32 X .375	00000	OBD
28	2950-0001	1	NUT:HEX BRS NP 3/8-32 X 1/2	73734	9002
29	3030-0022	8	SCREW:SET 6-32 X 0.125" LG	00000	OBD
30	3050-0017	4	WASHER:FLAT PHOS BRONZE	00000	OBD
31	3050-0066	1	WASHER:FLAT BRS FOR #6 SCREW	28480	3050-0066
32	3050-0161	1	WASHER:SPRING STL WAVY TYPE	28480	3050-0161
33	3050-0177	1	WASHER:FLAT SST	18911	AA-0107-ISS
34	9300-0048		CABLE:LACING VIOLET(SPECIAL)	87473	EP127 CORD

See introduction to this section for ordering information

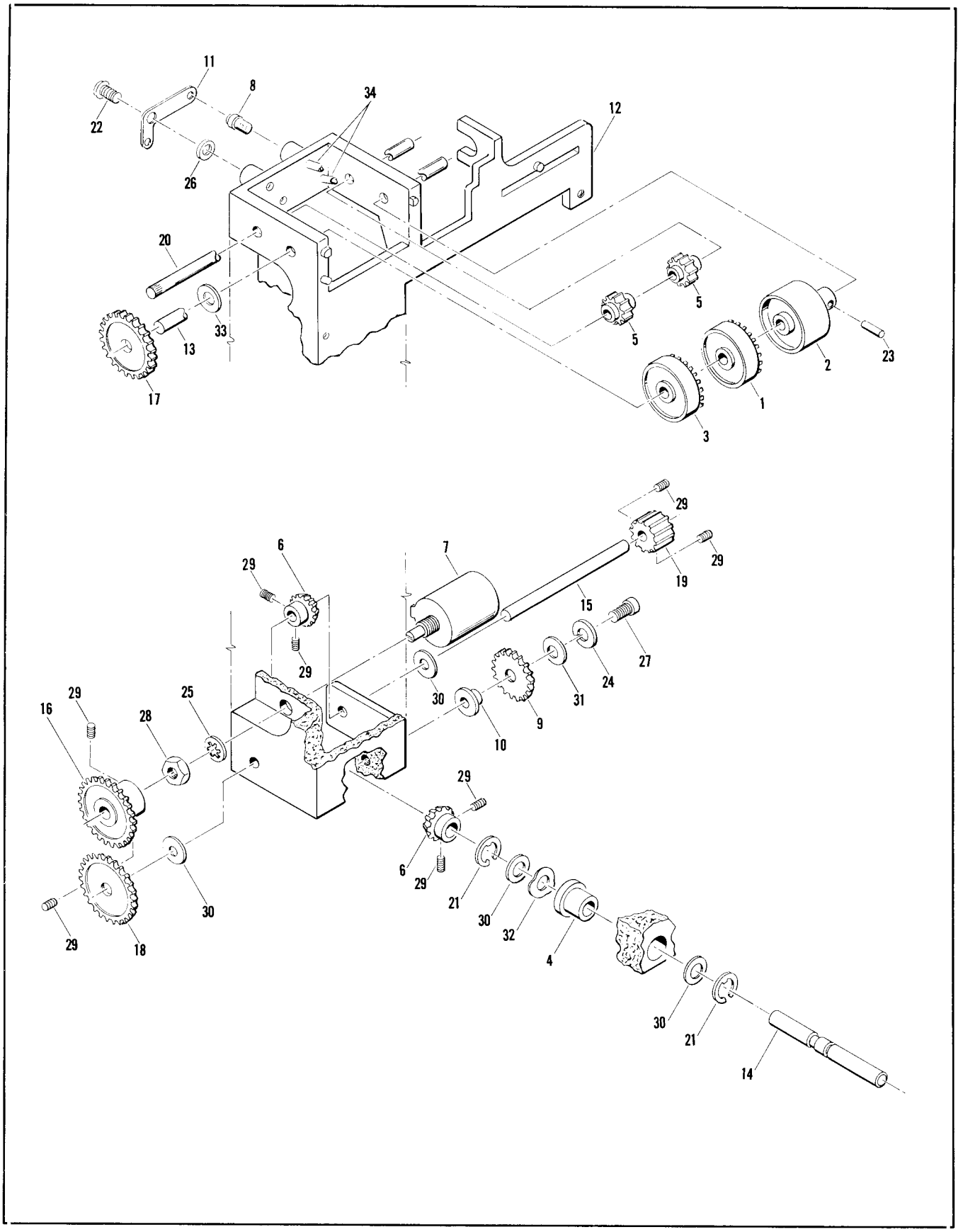


Figure 6-1. Frequency Readout, A13 Assembly

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A14	08601-6047	1	BROADBAND AMPLIFIER ASSY	28480	08601-6047
A14			(INCL C1,J1-2, A14A1 ASSY & COVER)		
A14			(OPT 007 ONLY)		
A14	08601-2051	1	BOX:BB AMPL ASSY SHIELD	28480	08601-2051
A14C1	0160-2049		C:FXD CER 5000 PF 80/20%	28480	0160-2049
A14J1	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A14J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A14A1	08601-6046	1	BOARD ASSY:BROADBAND AMPLIFIER	28480	08601-6046
A14A1C1	0150-0050	24	C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C2	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C3	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C4	0160-2266	12	C:FXD CER 24 PF 5% 500VDCW	72982	301-000-COGD-240J
A14A1C5	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C6	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C7	0160-2250	1	C:FXD CER 5.1 PF 500VDCW	72982	301-000-COHO-519E
A14A1C7			FACTORY SELECTED PART		
A14A1C8	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C9	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1C10	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A14A1L1			NSR:P/O BD. ASSY,TYPICAL VALUE 20/30NH		
A14A1L2			NSR:P/O BD. ASSY,TYPICAL VALUE 20/30NH		
A14A1L3	9100-2247	6	COIL:FXD RF 0.10 UH 10%	28480	9100-2247
A14A1Q1	1854-0345	13	TSTR:SI NPN	80131	2N5179
A14A1Q2	1854-0345		TSTR:SI NPN	80131	2N5179
A14A1Q3	1854-0345		TSTR:SI NPN	80131	2N5179
A14A1R1	0683-6805	1	R:FXD COMP 68 OHM 5% 1/4W	01121	CB 6805
A14A1R2	0683-5625	4	R:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A14A1R3	0683-5625		R:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A14A1R4	0683-5605	3	R:FXD COMP 56 OHM 5% 1/4W	01121	CB 5605
A14A1R5	0683-8215	2	R:FXD COMP 820 OHM 5% 1/4W	01121	CB 8215
A14A1R6	0683-5625		R:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A14A1R7	0683-5625		R:FXD COMP 5600 OHM 5% 1/4W	01121	CB 5625
A14A1R8	0683-1015	1	R:FXD COMP 100 OHM 5% 1/4W	01121	CB 1015
A14A1R9	0683-5605		R:FXD COMP 56 OHM 5% 1/4W	01121	CB 5605
A14A1R10	0683-8215		R:FXD COMP 820 OHM 5% 1/4W	01121	CB 8215
A14A1R11	0683-3325	1	R:FXD COMP 3300 OHM 5% 1/4W	01121	CB 3325
A14A1R12	0683-1035	1	R:FXD COMP 10K OHM 5% 1/4W	01121	CB 1035
A14A1R13	0683-5605		R:FXD COMP 56 OHM 5% 1/4W	01121	CB 5605
A14A1R14	0683-2715	1	R:FXD COMP 270 OHM 5% 1/4W	01121	CB 2715
A14A1R15	0683-1525	2	R:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525
A14A1R16	0683-1525		R:FXD COMP 1500 OHM 5% 1/4W	01121	CB 1525
A15	08601-6062	1	AM/FM MONITOR ASSY	28480	08601-6062
A15			(OPT 001 ONLY)		
A15	08601-6075	1	AM/FM MONITOR ASSY	28480	08601-6075
A15			(OPT 002 AND 011 ONLY)		
A15C1	0180-1743		C:FXD ELECT 0.1 UF 10% 35VDCW	56289	150D104X9035A2-DYS
A15C2	0160-0154	2	C:FXD MICA MY 0.0022 UF 10% 200VDCW	56289	192P22292-PTS
A15C3	0180-2206	1	C:FXD ELECT 60 UF 10% 6VDCW	56289	150D606X9006B2
A15C4			NOT ASSIGNED		
A15C5	0160-0203	1	C:FXD MICA 150 PF 1% 300VDCW	28480	0160-0203
A15C6	0160-3471	1	C:FXD MICA 1060 PF 1.0% 300VDCW	00853	RDM19F(1060)F3C
A15C7	0180-0374	5	C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A15C8	0180-0197	16	C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A15C9	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A15C10	0160-2055		C:FXD CER 0.01 UF +80-20% 100VDCW	56289	C023F101F103ZS22-CDH
A15C11	0160-0154		C:FXD MICA MY 0.0022 UF 10% 200VDCW	56289	192P22292-PTS
A15C12	0180-2208	1	C:FXD ELECT 220 UF 10% 10VDCW	56289	150D227X9010S2-DYS
A15C13	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A15C14	0180-0374		C:FXD TANT. 10 UF 10% 20VDCW	56289	150D106X9020B2-DYS
A15C15	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A15C16	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A15CR1	1901-0050	6	DIODE:SI 200 MA AT 1V	07263	FDA 6308
A15CR2	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A15CR3	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A15CR4	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A15CR5	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A15CR6	1901-0050		DIODE:SI 200 MA AT 1V	07263	FDA 6308
A15L1	9140-0237	4	COIL:FXD 200 UH 5%	28480	9140-0237
A15L2	9140-0237		COIL:FXD 200 UH 5%	28480	9140-0237
A15Q1	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A15Q2	1855-0020	4	TSTR:SI FET N-CHANNEL	28480	1855-0020
A15Q3	1855-0020		TSTR:SI FET N-CHANNEL	28480	1855-0020
A15Q4	1855-0020		TSTR:SI FET N-CHANNEL	28480	1855-0020
A15Q5	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A15Q6	1854-0071		TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A15Q7	1855-0020		TSTR:SI FET N-CHANNEL	28480	1855-0020
A15Q8	1855-0062	1	TSTR:SI FET 30V	01295	2N1595
A15R1	0683-5145	3	R:FXD COMP 510K OHM 5% 1/4W	01121	CB 5145
A15R2	0757-0458	5	R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A15R3	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R4	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R5	0757-0440	4	R:FXD MET FLM 7.50K OHM 1% 1/8W	28480	0757-0440
A15R5			(OPT 001 ONLY)		
A15R5	0698-3159	8	R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A15R5			(OPT 002 AND 011 ONLY)		
A15R6	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R7	0757-0422	4	R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A15R8	0757-0288	1	R:FXD MET FLM 9.09K OHM 1% 1/8W	28480	0757-0288
A15R9	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R10	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R11	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A15R12	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R13	0698-3159		R:FXD MET FLM 26.1K OHM 1% 1/8W	28480	0698-3159
A15R14	0757-0279	3	R:FXD MET FLM 3.16K OHM 1% 1/8W	28480	0757-0279
A15R15	2100-2489	2	R:VAR FLM 5K OHM 10% LIN 1/2W	28480	2100-2489
A15R16	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R17	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R18	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R19	0698-3454	4	R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A15R20	0683-5145		R:FXD COMP 510K OHM 5% 1/4W	01121	CB 5145
A15R21	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R22	2100-2489		R:VAR FLM 5K OHM 10% LIN 1/2W	28480	2100-2489
A15R23	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R24	0757-0458		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A15R25	0757-0458		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A15R26	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R27	0757-0458		R:FXD MET FLM 51.1K OHM 1% 1/8W	28480	0757-0458
A15R28	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A15R29	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R30	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R31	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A15R32	0757-0442		R:FXD MET FLM 10.0K OHM 1% 1/8W	28480	0757-0442
A15R33	0698-3454		R:FXD MET FLM 215K OHM 1% 1/8W	28480	0698-3454
A15R34	2100-2517	1	R:VAR FLM 50K OHM 10% LIN 1/2W	28480	2100-2517
A15R35	0757-0463	1	R:FXD MET FLM 82.5K OHM 1% 1/8W	28480	0757-0463
A15R35			FACTORY SELECTED PART		
A15U1	1820-0201	2	INTEGRATED CIRCUIT:OPERATIONAL AMPL	04713	MC1439G
A15U2	1820-0201		INTEGRATED CIRCUIT:OPERATIONAL AMPL	04713	MC1439G

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CHASSIS PARTS		
C1	0180-0198	2	C:FXD ELECT 1500 UF 50/60VDCW	56289	D42962 DFP
C2	0180-0198		C:FXD ELECT 1500 UF 50/60VDCW	56289	D42962 DFP
C3	0160-0168		C:FXD MY 0.1 UF 10% 200VDCW	56289	192P10492-PTS
C4	0180-0291		C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
CR1	1901-0033		DIODE:SILICON 100MA 180WV	07263	FD3369
CR2	1902-1225	1	DIODE BREAKDOWN:7.5V 10%	04713	1N2971RA
F1	2110-0202	1	FUSE:0.50A 250V SLOW-BLOW	75915	313.500S
F1			230V OPERATION		
F1	2110-0312	1	FUSE:CARTRIDGE 1 AMP 250V SLOW-BLOW	71400	MDL-1
F1			115V OPERATION		
FL1	9100-3115	1	FILTER:LINE 6A 115/230V	28480	9100-3115
J1	1250-0102	7	CONNECTOR:BNC	28480	1250-0102
J2	1250-0083	6	CONNECTOR:BNC	02660	31-221-1020
J3	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J4	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J5	1250-0102		CONNECTOR:BNC	28480	1250-0102
J6	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J7	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J8	1250-0102		CONNECTOR:BNC	28480	1250-0102
J9	1250-0083		CONNECTOR:BNC	02660	31-221-1020
J10	1250-0102		CONNECTOR:BNC	28480	1250-0102
J11	1250-0102		CONNECTOR:BNC	28480	1250-0102
J11			(OPT 004)		
J12	1250-0102		CONNECTOR:BNC	28480	1250-0102
J12			(OPT 007)		
J13	1250-0102		CONNECTOR:BNC	28480	1250-0102
J13			(OPT 007)		
M1	1120-1483	1	METER	28480	1120-1483
M1	1120-1515	1	METER:100 UA	28480	1120-1515
M1			(OPT 008, 009, AND 010 ONLY)		
Q1	1854-0063	1	TSTR:SI NPN	80131	2N3055
Q1	1200-0043	1	INSULATOR:TRANSISTOR MOUNTING	71785	293011
Q2	1853-0052	1	TSTR:SI PNP	80131	2N3740
Q2	0340-0162	2	INSULATOR:TRANSISTOR	28480	0340-0162
Q3	1854-0237	1	TSTR:SI NPN	80131	2N3738
Q3	0340-0162		INSULATOR:TRANSISTOR	28480	0340-0162
R1	2100-2652	1	R:VAR WW 20 OHM 3% LIN 2W	28480	2100-2652
R2	2100-2352	1	R:VAR CERMET 1K OHM 20% LIN 2W	28480	2100-2352
R3	2100-1831	1	R:VAR COMP 100 OHM 10% LIN 1/2W	28480	2100-1831
R4	2100-2651	1	R:VAR COMP 500K OHM 20% LIN 1/2W	28480	2100-2651
R5			NOT ASSIGNED		
R6			NOT ASSIGNED		
R7	0757-0416		R:FXD MET FLM 511 OHM 1% 1/8W	28480	0757-0416
R8	2100-2335		R:VAR WW 1K OHM 3% LIN 2W	28480	2100-2335
R9	0698-3430	1	R:FXD MET FLM 21.5 OHM 1% 1/8W	28480	0698-3430
R10			NOT ASSIGNED		
R11	0757-0123		R:FXD MET FLM 34.8K OHM 1% 1/8W	28480	0757-0123
R12	0698-3160		R:FXD MET FLM 31.6K OHM 1% 1/8W	28480	0698-3160
R12	0698-3451		R:FXD MET FLM 133K OHM 1% 1/8W	28480	0698-3451
R12			(OPT 006 ONLY)		
R13	0683-5145		R:FXD COMP 510K OHM 5% 1/4W	01121	CB 5145
R13			(OPT 001 AND 011 ONLY)		
R14	2100-1904	1	R:VAR COMP 10K OHM 20% LIN 1/4W	28480	2100-1904
R14			(OPT 001, 002 AND 011 ONLY)		
R15	0686-4725	1	R:FXD COMP 4700 OHM 5% 1/2W	01121	EB 4725
R15			(OPT 001, 002 ONLY)		
S1	3100-2485	1	SWITCH:LEVER SINGLE SECTION	76854	TYPE 184
S1	0370-0432	5	KNOB:BLACK LEVER	28480	0370-0432
S2	3100-2028	1	SWITCH:LEVER SINGLE SECTION 2 POSITION	76854	TYPE 184
S2	0370-0432		KNOB:BLACK LEVER	28480	0370-0432
S3	3101-0044	1	SWITCH:PUSHBUTTON SPST	81073	39-1 N.O.
S4	3100-2055	3	SWITCH:LEVER	28480	3100-2055
S4	0370-0432		KNOB:BLACK LEVER	28480	0370-0432
S5	3100-2055		SWITCH:LEVER	28480	3100-2055
S5	0370-0432		KNOB:BLACK LEVER	28480	0370-0432
S6	3100-2055		SWITCH:LEVER	28480	3100-2055
S6	0370-0432		KNOB:BLACK LEVER	28480	0370-0432
S7	3101-1248	1	SWITCH:PUSHBUTTON SPDT ILLUMINATED	87034	53-55480-121/A1H
S7	2140-0244	1	LAMP:GLOW MINIATURE 95V	87034	A1H
S8	3101-0033	1	SWITCH:SLIDE DPDT	82389	11A-1009A
S8			(AC LINE)		
S9	3101-1081	2	SWITCH:SENSITIVE SPDT SUB-MINIATURE	91929	11SM23
S9	3101-1081		SWITCH:SENSITIVE SPDT SUB-MINIATURE	91929	11SM23
S10	3101-0011	1	SWITCH:SLIDE DPDT	82389	11A-1013

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
S11	3101-1205	1	SWITCH:SENSITIVE	28480	3101-1205
S11			(OPT 001, 002, 011 ONLY)		
S11	3101-1206	1	ACTUATOR:SENSITIVE SWITCH	28480	3101-1206
S11			(OPT 001, 002, 011 ONLY)		
S11	08601-2047	1	PUSHBUTTON(MOD)	28480	08601-2047
S11	08601-2054	1	KNOB(MOD)	28480	08601-2054
T1	9100-2731	1	TRANSFORMER:POWER	28480	9100-2731
W1	8120-1348	1	CABLE ASSY:POWER, DETACHABLE	70903	KHS-7041
W2	08601-6039	1	CABLE ASSY:GRAY	28480	08601-6039
W2			(VTO/LOOP AMPL)		
W3	08601-6037	3	CABLE:BLUE	28480	08601-6037
W3			(VTO/VTO BNC JACK)		
W4	08601-6029	3	CABLE:BLACK	28480	08601-6029
W4			(VTO/XTAL OSC)		
W5	08601-6032	1	CABLE:GREEN	28480	08601-6032
W5			(DISC./VTO TV)		
W6	08601-6031	1	CABLE:RED	28480	08601-6031
W6			(LPF/VIDEO AMPL)		
W7	08601-6030	1	CABLE:BROWN	28480	08601-6030
W7			(XTAL OSC/LOOP AMPL)		
W8	08601-6038	1	CABLE:VIOLET	28480	08601-6038
W8			(LOOP AMPL/UNCAL BNC JACK)		
W9	08601-6029		CABLE:BLACK	28480	08601-6029
W9			(LOOP AMPL/DIV.)		
W10	08601-6029		CABLE:BLACK	28480	08601-6029
W10			(DIV./DISC.)		
W11	08601-6036	1	CABLE:WHITE	28480	08601-6036
W11			(ATTEN/RF OUT JACK)		
W11	08601-6054	1	OUTPUT CABLE:BNC 75 OHM	28480	08601-6054
W11			(OPT 008 ONLY)		
W11	08601-6055	1	OUTPUT CABLE:TNC 75 OHM	28480	08601-6055
W11			(OPT 009 ONLY)		
W11	08601-6056	1	OUTPUT CABLE:WE 75 OHM	28480	08601-6056
W11			(OPT 010 ONLY)		
W12	08601-6037		CABLE:BLUE	28480	08601-6037
W12			(DIV/AUX OUT)		
W13	08601-6037		CABLE:BLUE	28480	08601-6037
W13			(DIV/AUX OUT) OPT 004 ONLY		
W14	08601-6052	1	CABLE:YELLOW	28480	08601-6052
W14			(LO INPUT/BB AMPL)		
W15	08601-6078	1	CABLE:WHITE	28480	08601-6078
W15			(VTO OUT/VTO) OPT 007 ONLY		
W16	08601-6034	1	CABLE:ORANGE	28480	08601-6034
W16			(AM OUT/XTAL OSC) OPT 007 ONLY		
W17	08601-6033	1	CABLE:YELLOW	28480	08601-6033
W17			(ALC SIG/FREQ CONT)		
W18	08601-6035	1	CABLE:GRAY	28480	08601-6035
W18			(SW/DISC.)		
W19	10502-6001	1	CABLE:GRAY(VTO OUT/LO INPUT)	28480	10502-6001
W20	11592-60013	1	CABLE ASSY(OPTION 007)	28480	11592-60013
			MISCELLANEOUS		
	1200-0768	1	SOCKET:INTEGRATED CIRCUIT 14 CONTACT	91506	314-AG50-3R
	1250-0838	1	CONNECTOR:RF ADAPTER TEE	98291	50-085-0000
			(OPT 004 ONLY)		
	1490-0849	4	BRACKET:COVER ATTACHMENT	28480	1490-0849
	5040-0170	2	GUIDE:PLUG-IN PC BOARD	28480	5040-0170
			(OPT 001, 002, 011 ONLY)		
	8160-0084	1	BRAID:RF	12881	10-541
	08601-0014	1	BRACKET:POT	28480	08601-0014
			(OPT 007 ONLY)		
	08698-0012	1	GASKET:RFI	28480	08698-0012
			FRONT PANEL		
	0370-0134	1	KNOB:ROUND FOR 0.125" DIA SHAFT	28480	0370-0134
	0370-0487	1	KNOB:THUMB WHEEL	28480	0370-0487
	0370-0125	1	KNOB:ROUND FOR 0.125" DIA SHAFT	28480	0370-0125
	0370-0149	1	KNOB:BLACK,CRANK ASSY	28480	0370-0149
	4040-0328	1	BEZEL:METER WINDOW,BLACK	28480	4040-0328
	08601-2009	1	ADAPTER:SHAFT	28480	08601-2009
	08601-0002		PANEL:FRONT	28480	08601-0002
	08601-0015	1			
			(OPT 001, 002)		
	08601-0025	1	PANEL:FRONT	28480	08601-0025
			(OPT 011)		
			REAR PANEL MISCELLANEOUS		
	1400-0084	1	FUSEHOLDER:EXTRACTOR POST TYPE	75915	342014
	6960-0002	1	PLUG:HOLE FOR 1/2" DIA	76530	SS-48152
	08601-00032		PANEL:REAR	28480	08601-00032

See introduction to this section for ordering information

Table 6-2. Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
			CABINET PARTS		
1	08601-0006	1	COVER:TOP	28480	08601-0006
2	1440-0076	1	HANDLE:BLACK CARRYING	12136	1775-354(Y31061)
3	1440-0077	1	RETAINER:HANDLE	12136	346
4	08601-00032	2	PANEL:REAR	28480	08601-00032
5	5000-0704	1	COVER:SIDE	28480	5000-0704
6	5060-0704	2	FRAME ASSY:6 X 16 SM	28480	5060-0704
7	08601-0001	1	DECK:MAIN	28480	08601-0001
8	5000-0136	1	COVER ASSY:BOTTOM	28480	5000-0136
9	08601-0002	2	PANEL:FRONT	28480	08601-0002
10	08601-0003	1	PANEL:SUB	28480	08601-0003
11	08601-2004	1	PANEL:READOUT	28480	08601-2004
12	08601-2011	1	METER TRIM:TOP	28480	08601-2011
13	5060-0728	2	FOOT ASSY:HALF MODULE	28480	5060-0728
14	5040-0700	2	HINGE	28480	5040-0700
15	1490-0032	1	STAND:TILT HALF-MODULE	28480	1490-0032

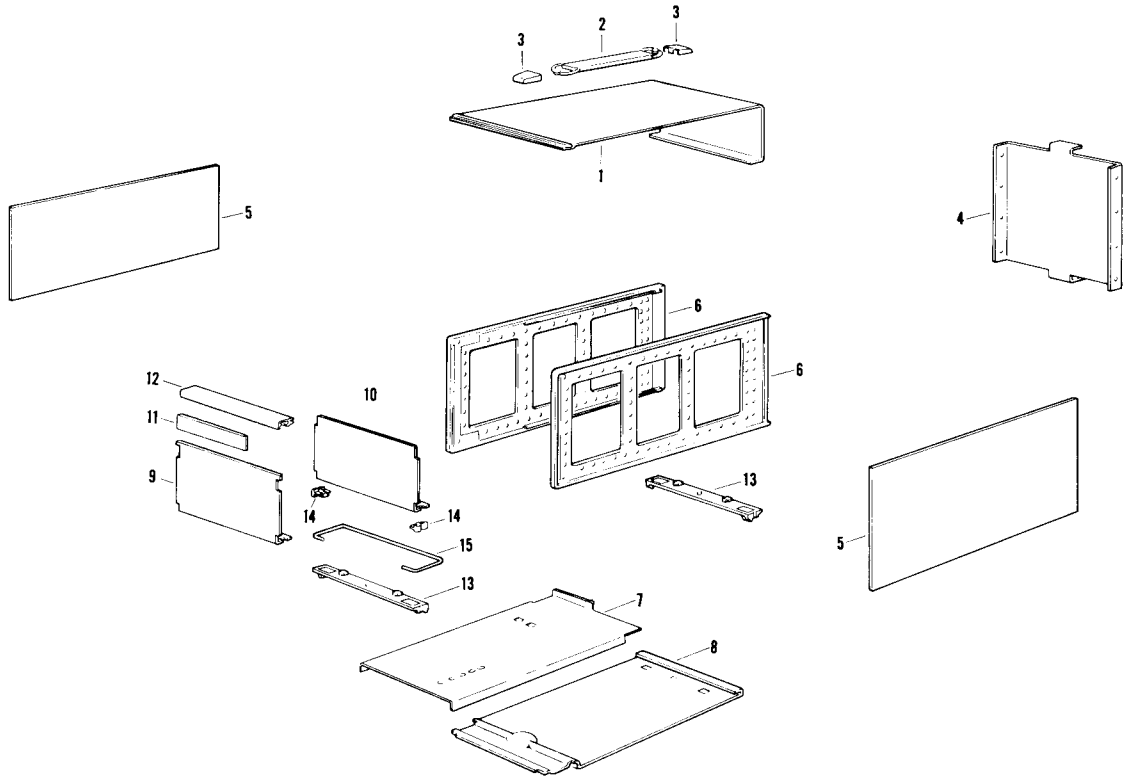


Figure 6-2. Cabinet Parts

Table 6-3. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements.

Code No.	Manufacturer	Address
00000	U.S.A. Common	Any Supplier of U.S.A.
00853	Sangamo Electric Co. Pickens Division	Pickens, S.C. 29671
01121	Allen Bradley Co.	Milwaukee, Wisc. 53204
01295	Texas Instruments Inc. Semiconductor Components Division	Dallas, Texas 75231
02114	Ferroxcube Corp.	Saugerties, N.Y. 12477
02660	Amphenol Corp.	Broadview, Ill. 60153
04222	HI-Q Division of Aerovox Corp.	Myrtle Beach, S.C. 29577
04713	Motorola Semiconductor Products Division	Phoenix, Ariz. 85008
07263	Fairchild Camera and Instrument Corporation, Semiconductor Division	Mountain View, Cal. 94040
12136	Philadelphia Handle Company	Camden, N.J. 08103
12881	Metex Corp.	Edison, N.J. 08817
18911	Durant Mfg. Co.	Milwaukee, Wisc. 53201
19701	Electra/Midland Corp.	Mineral Wells, Tex. 76067
28480	Hewlett-Packard Co.	Palo Alto, Cal. 94304
36196	Stanwyck Coil Products Ltd.	Hawksbury, Ontario, Canada
56289	Sprague Electric Company	N. Adams, Mass. 01247
70903	Belden Corp.	Chicago, Ill. 60644
71041	Boston Gear Works, Division North American Rockwell Corporation	Quincy, Mass. 02171
71400	Bussmann Manufacturing, Division McGraw-Edison Co,	St. Louis, Mo. 63017
71744	Chicago Miniature Lamp Works	Chicago, Ill. 60640
71785	Cinch Manufacturing Co., Division United Carr Fastener Corp.	Chicago, Ill. 60624
72136	Electro Motive Mfg. Co., Inc.	Willimantic, Conn. 06226
72862	Elastic Stop Nut, Division Amerace Esna Corp.	Union, N.J. 07083
72982	Erie Technological Products, Inc.	Erie, Pa. 16512
73734	Federal Screw Prod. Inc.	Chicago, Ill. 60618
75042	International Resistance Co., Inc.	Philadelphia, Pa. 19108
75915	Littlefuse, Inc.	DesPlaines, Ill. 60016
76530	Cinch Monadnock Mills, Division United Carr Fastener Corp.	City of Industry, Cal. 91746
76854	Oak Manufacturing Co., Division Oak Electro/Netics Corporation	Crystal Lake, Ill. 60014
78488	Stackpole Carbon Co.	St. Marys, Pa. 15857
79136	Waldes Kohinoor Inc.	Long Island City, N.Y. 11101
80120	Schnitzer Alloy Products Company	Elizabeth, N.J. 07206
80131	Electronic Industries Association	Washington, D.C. 20006
81073	Grayhill	LaGrange, Ill. 60525
82142	Airco Speed Electric Company	DuBois, Pa. 15801
82389	Switchcraft Inc.	Chicago, Ill. 60630
84411	TWR Capacitor Div.	Ogallala, Neb. 69153
87034	Marco & Oak Industries, Division Oak Electro/Netics Corp.	Anaheim, Calif. 92803
87473	Western Fibrous Glass Products Co.	San Francisco, Cal. 94107
91418	Radio Materials Co.	Chicago, Ill. 60646
91506	Augat Inc.	Attleboro, Mass. 02703
91929	Honeywell Inc., Microswitch Div.	Freeport, Ill. 61032
96733	San Fernando Electric Mfg. Co.	San Fernando, Cal. 91341
98291	Sealectro Corp.	Mamaroneck, N.Y. 10544
99800	Delevan Electronics Corp.	E. Aurora, N.Y. 14052

SECTION VII
MANUAL CHANGES

7-1. INTRODUCTION

7-2. This manual includes information that applies directly to HP Model 8601A instruments serial prefixed 969-. To adapt this manual to instruments with serial numbers prefixed 959-, 954-, 945-, 912-, 839-, 838-, 828-, 826-, or 818-, make the necessary changes listed in Table 7-1. A summary of the circuit assembly components or assemblies affected is given in Table 7-2.

NOTE

Some changes are already shown or noted in the schematic section. If differences are detailed on the schematic diagram, the serial prefix numbers are given in the schematic notes.

7-3. Information for adapting this manual to instruments with serial number prefixes greater than 969- is given in a Manual Changes sheet, included with this manual.

Table 7-1. Change Information for Serial Prefixes 959- thru 818-

Serial Prefix or Number	Make Manual Changes
959-	1
954-	1, 2
945-	1 thru 3
912-00881 thru 912-01030	1 thru 4
912-00581 thru 912-00880	1 thru 5
912-00531 thru 912-00580	1 thru 6
839-00530 -00529 -00527 -00523 -00496 -00468 -00467 839-00460 thru -00462	1 thru 7
839-00528 839-00524 thru -00526 839-00497 thru -00522 839-00469 thru -00495 839-00463 thru -00466 839-00381 thru -00459	1 thru 8
839-00331 thru -00380	1 thru 9
838-	10
828-	10, 11
826-	10 thru 12
818-	10 thru 13

Table 7-2. Changes Summary

Change	Assembly (s) Affected													
	A1 Assy	A2 Assy	A2 Assy	A4 Assy	A5 Assy	A6 Assy	A7 Assy	A8 Assy	A9 Assy	A10 Assy	A11 Assy	A12 Assy	A13 Assy	No Prefix
1		A1C14 A1C15												FL1, F1, S7, S8, W1
2		A1L5												
3	A1	A1R16 A1R19 A1R12		A1					Q11/42 R3/18/19 R173/124			C2 (wiring)		R5/6/10 C4
4														R2 Bracket
5					Module Box									
6										CR14				
7		A1C7 A1R1—2	A1C27 A1C28 A1C29	A1C17	A1R9-10 A1R12-13					R10 R12				
8	A1C5 A1C10 A1L1 A1R19 A1R22 A1R30													
9														Q3
10	A1	A1	A2	A1	A1				Q17/18 R11/23 R157/165					FL1 S10 and specifications
11						A1R6			R180 C14					
12		A1R8 A1R2	A1C8	A2	A1R2 A1C14/C34									
13				A1R20	A1Q6	A1			R169 R134 R181					

CHANGE 1

Schematic Sheet 2; Divider, Divider Bypass A2:
Delete capacitors A2A1C14 and A2A1C15, replace with open circuit.

Schematic Sheet 8, Power Supply:
AC Primary circuit is as shown in Figure 7-1.

Table 6-2, Replaceable Parts:
Change fuse F1 (115V) to HP Part No. 2110-0007.
Change fuse F1 (230V) to HP Part No. 2110-0008.
Change line filter FL1 to HP Part No. 9100-2821. The ac receptacle is an integral part of the filter unit.
Change switch S7 to HP Part No. 3101-0100.
Change switch S8 to HP Part No. 3101-0033.
Change power cable W1 to HP Part No. 8120-0078.
Change rear panel to HP Part No. 08601-00033.

CHANGE 2

Schematic Sheet 2; Divider, Divider Bypass, A2:
Delete inductor A2A1L5, replace with short circuit (see Operation discussion opposite schematic).

CHANGE 3

Schematic Sheet 1; A1 Discriminator Assembly:
Schematic Diagram is changed as shown in Figure 7-3. Component identification photo is as shown in Figure 7-2.

Schematic Sheet 2; A2 Divider Assembly:
Delete resistor A2A1R19.
Connect resistor A2A1R16, 100 ohms, between A2J2 and ground.
Connect resistor A2A1R12, 33 ohms, in parallel with A2A1C8.

Schematic Sheet 4, A4 Crystal Oscillator Assembly:
Schematic diagram is changed as shown in Figure 7-4. Component identification photo is as shown in Figure 7-5.

Schematic Sheet 9:
Delete A9Q11, A9R185, A9R184, and SWEEP INHIBIT input connector.
Change A9C1 to 1.5 μF.
Replace A9CR31 with short circuit.
Change A9R3 to 23.7K and A9R2 to 9090 ohms.
Change A9C11 to 0.01 μF.
Component identification photo is as shown in Figure 7-6.

Schematic Sheet 10:
Change A9R126 to 1000 and A9R123 to 4220.
Add A9R125, 1100 ohms, in parallel with A9R126.
Add A9R124, 100 ohm, in parallel with A9R123.
Component identification photo is as shown in Figure 7-7.
Add Sweep reference circuit as shown in Figure 7-8.

Schematic Sheet 12:
Add resistor R5, 34.8 ohm, in parallel with R3.
Add resistor R6, 5 ohm, in parallel with R1.
Change capacitor A12C2 to 60 μF.
Change capacitor C4 to 0.33 μF.

Table 6-2, Replaceable Parts:
Change capacitor A9C1 to HP Part No. 0180-1745 C:FXD 1.5 μF 10% 35 VDCW.
Change capacitor A9C11 to HP Part No. 0150-0093 C:FXD CER 0.01 μF +80 −20% 100 VDCW.

Change resistor A9R3 to HP Part No. 0698-3158 R:FXD MET FLM 23.7K ohm 1% 1/8W.
Change resistor A9R18 to HP Part No. 0698-3460 R:FXD MET FLM 422K ohm 1% 1/8W.
Change resistor A9R19 to HP Part No. 0698-3260 R:FXD MET FLM 464K ohm 1% 1/8W.
Change resistor A9R173 to HP Part No. 0698-3434 R:FXD MET FLM 34.8 ohm 1% 1/8W.
Change rear panel to HP Part No. 08601-00005.
Change resistor A9R123 to HP Part No. 0698-3154 R:FXD MET FLM 4.22K ohm 1% 1/8W.
Change resistor A9R126 to HP Part No. 0757-0159 R:FXD MET FLM 1K ohm 1% 1/2W.
Change capacitor A12C2 to HP Part No. 0180-0106 C:FXD ELEC TA 60 μF 20% 6 VDCW.
Change capacitor C4 to HP Part No. 0160-0163 C:FXD MY 0.033 μF 10% 200 VDCW.

CHANGE 4

The POWER LEVEL VERNIER potentiometer, R2, is attached (with machine-screw threads) to output attenuator body assembly.

CHANGE 5

Module box that houses A5 VTO assembly does not have side holes allowing adjustment access.

Table 6-2:
Change A5 HP Part No. to 08601-2016.

CHANGE 6

Schematic Sheet 8:
Replace A10CR14 with short circuit.

NOTE

Diode, A10CR14, prevents momentary −75 volt power supply shorts from damaging transistors A10Q6 and A10Q7. It is recommended that A10CR14 be added to all −75 volt power supplies.

CHANGE 7

Schematic Sheet 2, A2 Divider Assembly:
Add A2A1C7, 10 pF, in parallel with A2A1R9.
Change A2A1R1 to 61.9 ohm; also A2A1R2 to 261 ohm.

Schematic Sheet 3, A3 Loop Mixer Assembly:
Change A3A1C27 and A3A1C29 to 2000 pF.
Change A3A1C28 to 4.7 μF.

Schematic Sheet 4, A4 Crystal Oscillator Assembly:
Circuitry is same as Figure 7-4 except capacitor A4A1C17 is 20 pF.

NOTE

In event of A4A1Q6 failure or replacement, change capacitor A4A1C17 to 24 pF.

Schematic Sheet 5, A5 Voltage Tuned Oscillator Assembly:
Change A5A1R9 to 1470 ohm, A5A1R10 to 26.1K ohm, A5A1R12 to 237K ohm, and A5A1R13 to 50K ohm.

Schematic Sheet 8, A10 Power Supply Assembly:
Change A10R10 to 19.6K ohm and A10R12 to 10K ohm.

Table 6-2, Replaceable Parts:
Add A2A1C7, HP Part No. 0160-2257 C:FXD CER 10 pF 5% 500 VDCW.
Change A2A1R1 to HP Part No. 0757-0276 R:FXD MET FLM 61.9 ohm 1% 1/8W.
Change A2A1R2 to HP Part No. 0698-3132 R:FXD MET FLM 261 ohm 1% 1/8W.
Change A3A1C27 and A3A1C29 to HP Part No. 0160-2143 C:FXD CER 2000 pF +80 −20% 1000 VDCW.

Change A3A1C28 to HP Part No. 0180-1735 C:FXD ELECT 4.7 μF 10% 35 VDCW.
Change A5A1R9 to HP Part No. 0757-1094 R:FXD MET FLM 1.47K ohm 1% 1/8W.
Change A5A1R10 to HP Part No. 0698-3159 R:FXD MET FLM 26.1K ohm 1% 1/8W.
Change A5A1R12 to HP Part No. 0698-3266 R:FXD MET FLM 237K ohm 1% 1/8W.
Change A5A1R13 to HP Part No. 2100-2031 R:VAR CER MET 50K ohm 30% LIN 1/2W.
Change A10R10 to HP Part No. 0698-3157 R:FXD MET FLM 19.6K ohm 1% 1/8W.
Change A10R12 to HP Part No. 0757-0442 R:FXD MET FLM 10K ohm 1% 1/8W.

CHANGE 8

Schematic Sheet 1, A1 Discriminator Assembly:
Circuitry is as shown in Figure 7-3, except;
Change A1A1C5 to 0.47 μF, A1A1C10 to 1000 pF, A1A1L1 to 200 μH, A1A1R22 to 2150 ohm, A1A1R30 to 68.1K ohm, and A1A1R19 to 1780 ohms.

Table 6-2, Replaceable Parts:
Change A1A1R19 to HP Part No. 0757-0278 R:FXD MET FLM 1.78K ohm 1% 1/8W.
Change A1A1C5 to HP Part No. 0160-0174 C:FXD CER 0.47 μF +80 —20% 25 VDCW.
Change A1A1C10 to HP Part No. 0160-0153 C:FXD MY 1000 pF 10% 200 VDCW.
Change A1A1L1 to HP Part No. 9140-0237 COIL:FXD RF 200 μH.
Change A1A1R22 to factory selected component, HP Part No. 0698-0084 R:FXD MET FLM 2.15K ohm 1% 1/8W.
Change A1A1R30 to HP Part No. 0757-0461 R:FXD MET FLM 68.1K ohm 1% 1/8W.

CHANGE 9

Schematic Sheet 8:
Q3 is HP Part No. 1854-0253 which is a discontinued part. Recommended replacement is HP Part No. 1854-0237.

CHANGE 10

Schematic Sheet 1, A1 Discriminator Assembly:
Schematic diagram is changed as shown in Figure 7-10. Component identification photo is as shown in Figure 7-9.

Schematic Sheet 2, A2 Divider Assembly:
Schematic Diagram is changed as shown in Figure 7-12. Component identification photo is as shwon in Figure 7-11. Replaceable parts information is given in Table 7-3.

Schematic Sheet 3, A3 Loop Mixer Assembly:
A3A2A1 Mixer Assembly is changed as shown in Figures 7-13 and 7-14.

Schematic Sheet 4, A4 Crystal Oscillator Assembly:
Schematic Diagram is changed as shown in Figure 7-16. Component identification photo is as shown in Figure 7-15. Replaceable parts information is given in Table 7-4.

Schematic Sheet 5, A5 VTO Assembly:
Schematic diagram is changed as shown in Figure 7-18. Component identification photo is as shown in Figure 7-17.

Table 1 1, Specifications:
The following specification changes are made:

Stability in CW: (0.01% +500 Hz) 10 min, high range, after one hour warm-up.
(0.01% +50 Hz)/10 min, low range, after one hour warm-up.

Sweep Width Accuracy: ±5% of sweep width or ±10 kHz, high range, ±5% of sweep width or ±1 kHz, low range, whichever is greater.

Internal FM:
High Range: 75 kHz ±20% peak deviation, 1 kHz range.
Low Range: 7.5 kHz ±20% peak deviation, 1 kHz rate.
Less than 3% distortion, typically less than 1%.

Schematic Sheet 9, A9 Assembly:
Change A9Q18B to A9Q18, HP Part No. 1854-0071.
Change A0Q18A to A9Q17, HP Part No. 1854-0071.
Change A9R23 to 1470 ohms.
Delete S10 (replace with short circuit).

Schematic Sheet 10, A9 Assembly:
Change A9R111 to 14.6K ohms.

Schematic Sheet 11, A9 Assembly:
Change A9R157 to 21.5K and A9R165 to 1000 ohms.
Delete S10 (replace with short circuit).

Table 6-2, Replaceable Parts:
Change A9Q18 and A9Q17 to HP Part No. 1854-0071.
Change A9R23 to HP Part No. 0757-1094 R:FXD 1470 ohms.
Change A9R111 to HP Part No. 0698-3156 R:FXD 14.6K
Change A9R157 to HP Part No. 0757-0199 R:FXD 21.5K
Change A9R165 to HP Part No. 0757-0280 R:FXD 1000 ohms.

CHANGE 11

Schematic Sheet 6, A6 Assembly:
Delete A6A1R6 (replace with short circuit).

Schematic Sheet 9, A9 Assembly:
Change A9R180 to 2870 ohms and A9C14 to 0.1 μF.

Table 6-2, Replaceable Parts:
Change A9R180 to HP Part No. 0698-3151 R:FXD 2870 ohms.
Change A9C14 to HP Part No. 0180-1743 C:FXD 0.1 μF.

CHANGE 12

Schematic Sheet 5, A5 VTO Assembly:
Schematic diagram is as shown in Figure 7-14 with the following changes;
A5A1R2 is 8.25K, HP Part No. 0757-0441.
A5A1C14 and A5A1C34 are 10 pF, HP Part No. 0160-2257.

CHANGE 13

Schematic Sheet 6, A6 Assembly:
Add capacitor C6, 1.5 pF and coil L3, 0.15 μH in series between A6A1E1 case and ground.

Section V, paragraph 5-16:
Change Meter Adjustment procedure as follows:

1. Connect power meter to 8601A RF OUTPUT.

2. Set 8601A controls as follows:

CW/SWEEP	CW	RANGE	110
		FREQUENCY	60 MHz

3. Set OUTPUT LEVEL to +10 dBm position and adjust OUTPUT LEVEL VERNIER for +10 dBm power meter reading.

4. Adjust METER adjust A9R131 for +10 dBm reading (0 dBm on scale).

5. Adjust OUTPUT LEVEL VERNIER for 0 dBm power meter reading.

6. Adjust meter mechanical adjustment for 0 dBm reading (-10 dBm on scale).

7. Repeat steps 3 through 6 until no further adjustment is required.

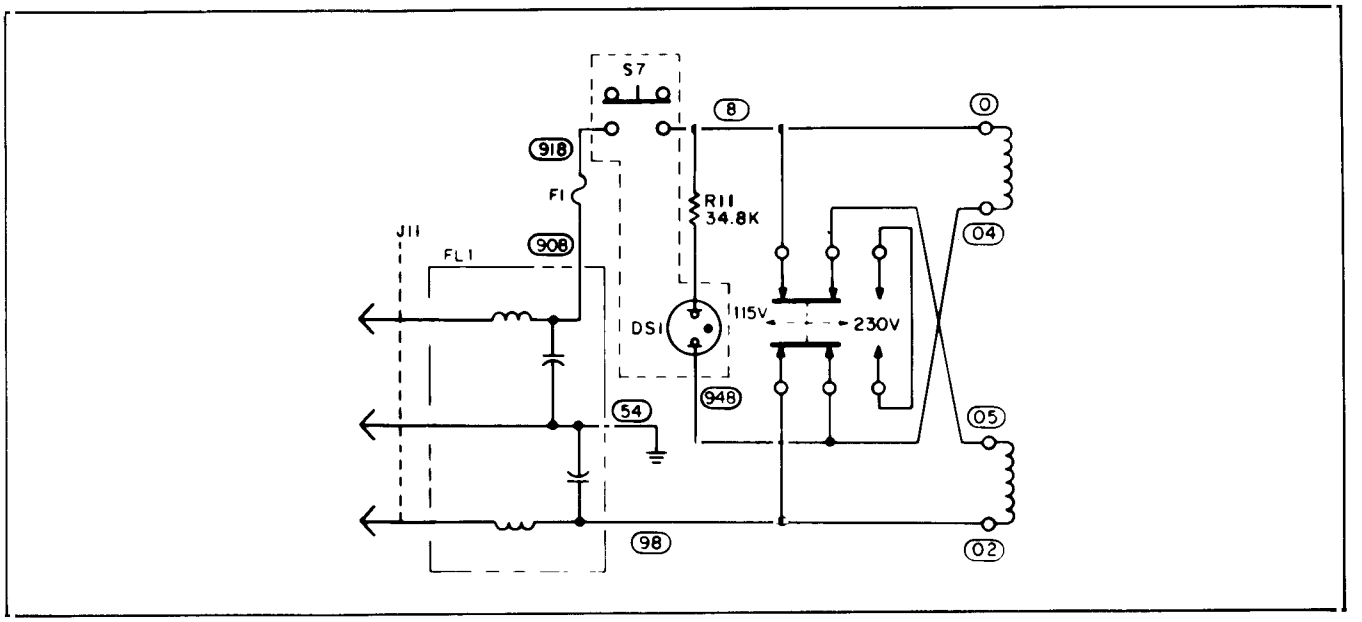


Figure 7-1. AC Primary Circuit
(Part of Change 1)

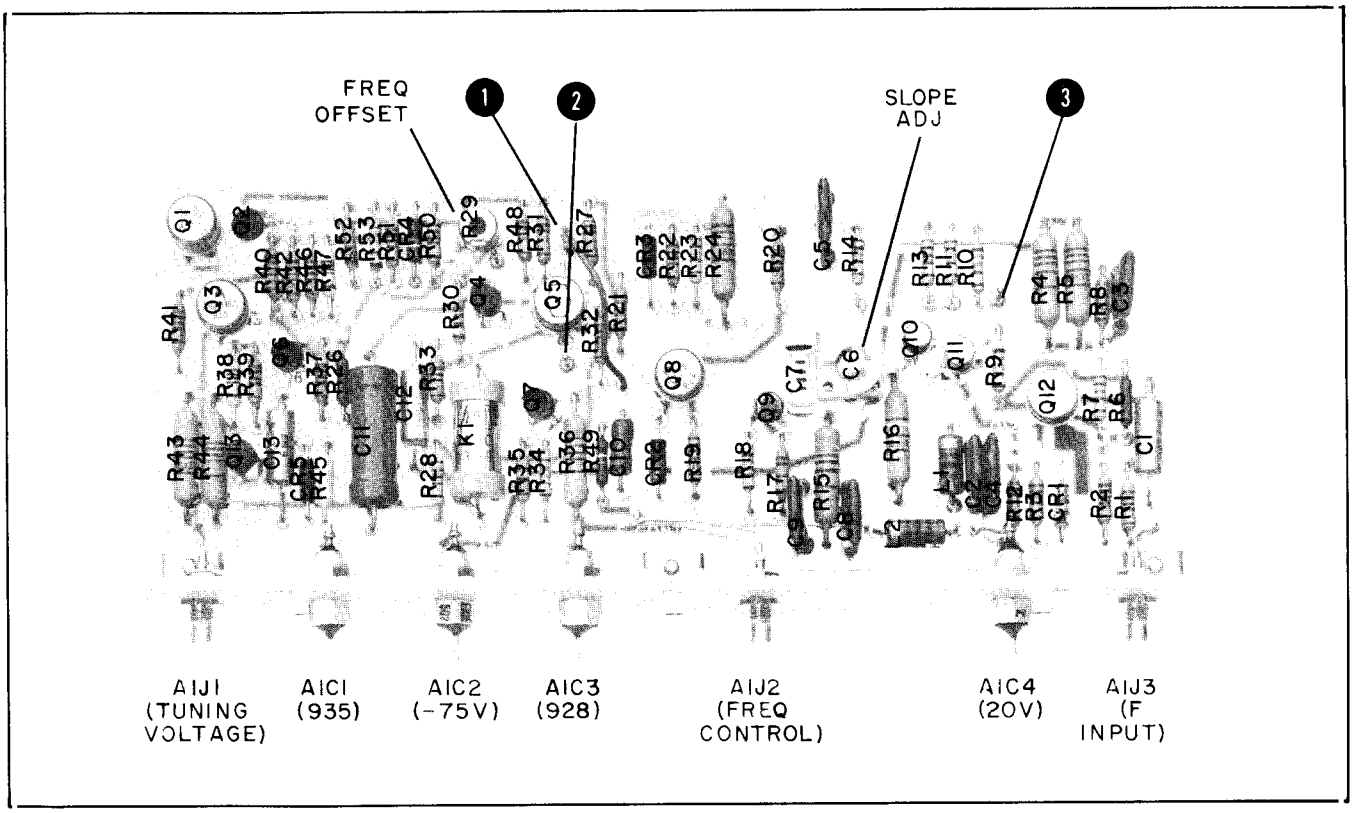


Figure 7-2. Component Identification A1A1 Discriminator Assembly
(Part of Change 3)

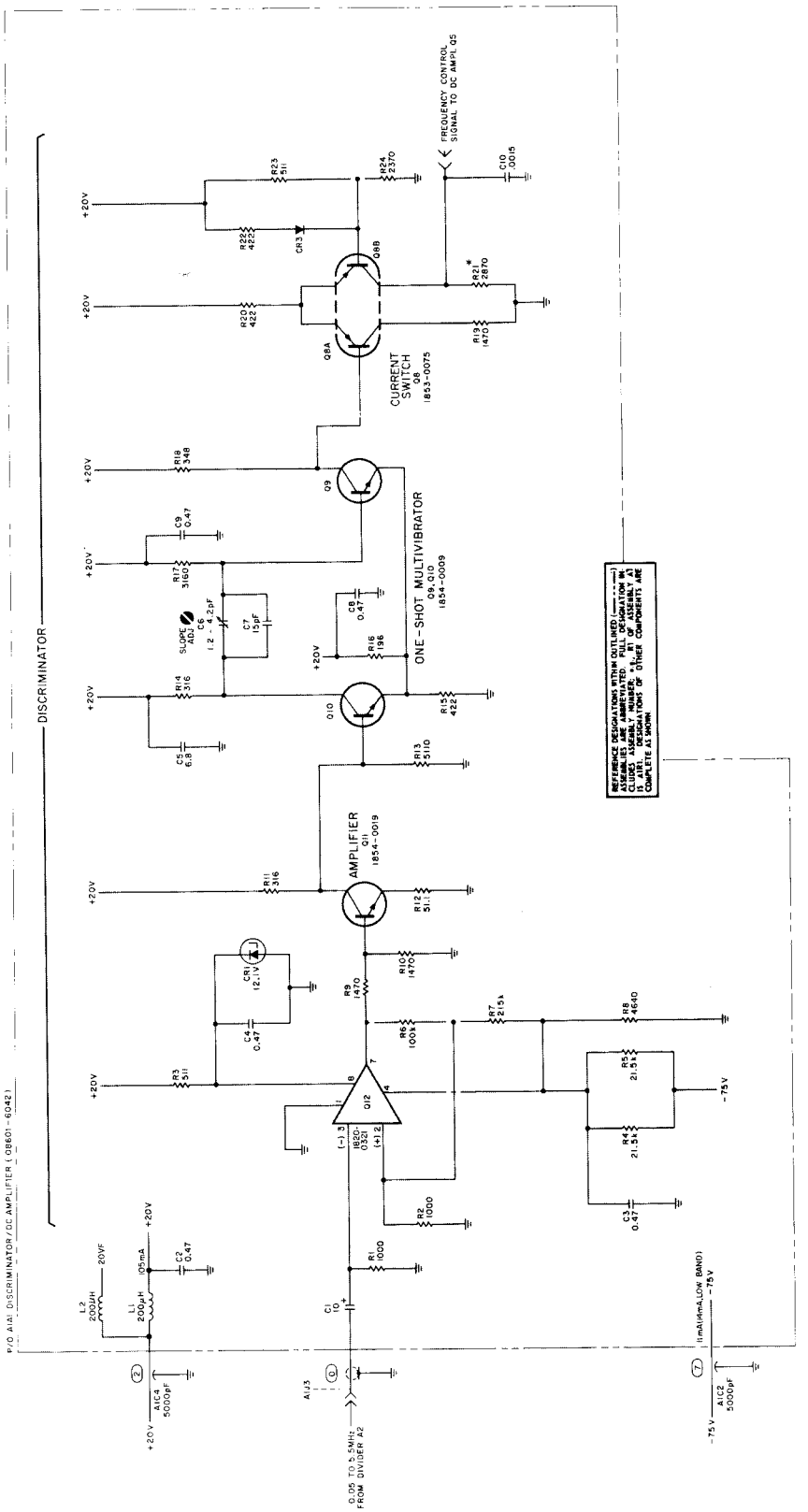


Figure 7-3. A1A1 Discriminator Circuit, Schematic Diagram
(Part of Change 3)

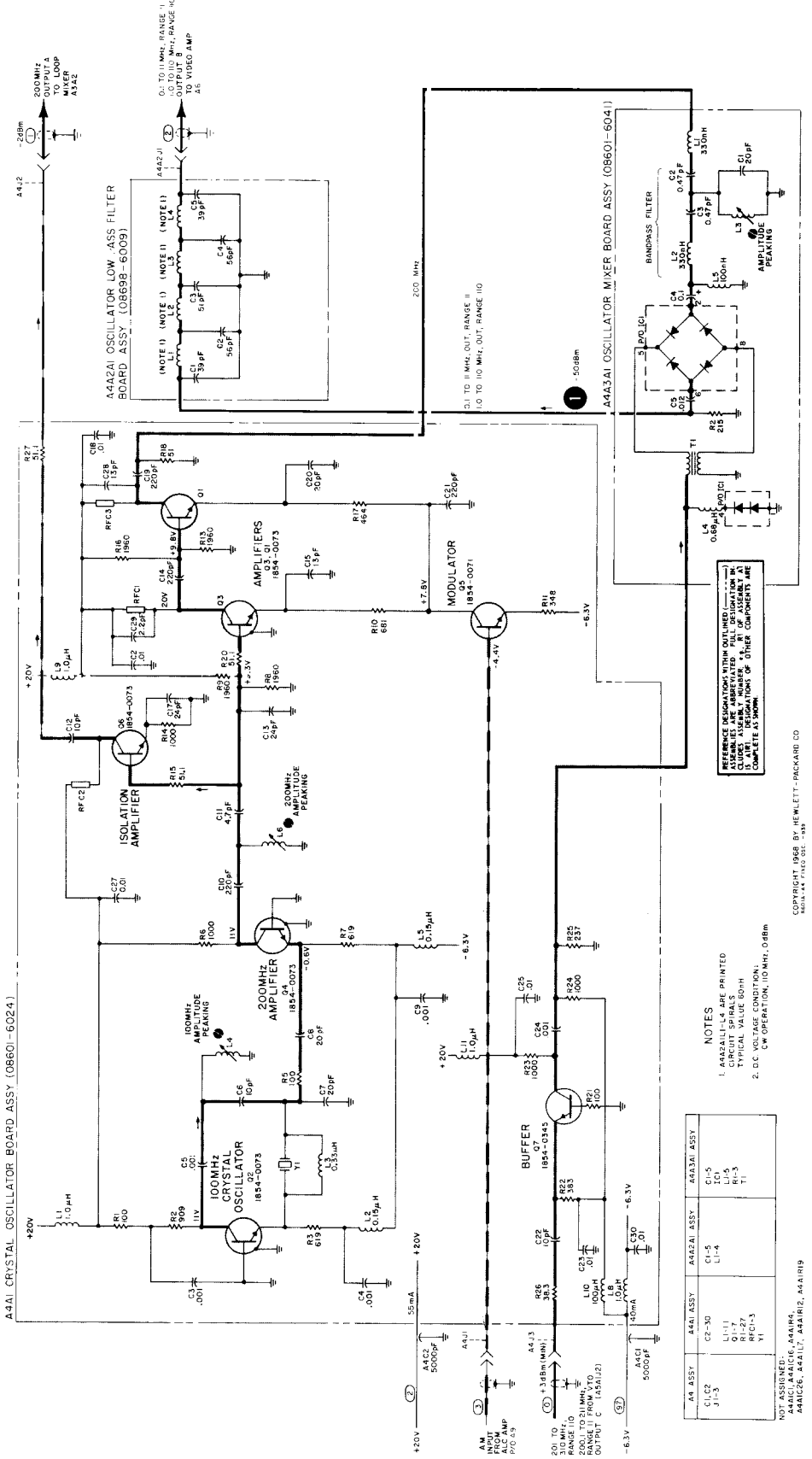


Figure 7-4. A4 Crystal Oscillator, Modulator, Oscillator Mixer, Oscillator Low Pass Filter, Schematic Diagram
(Part of Change 3)

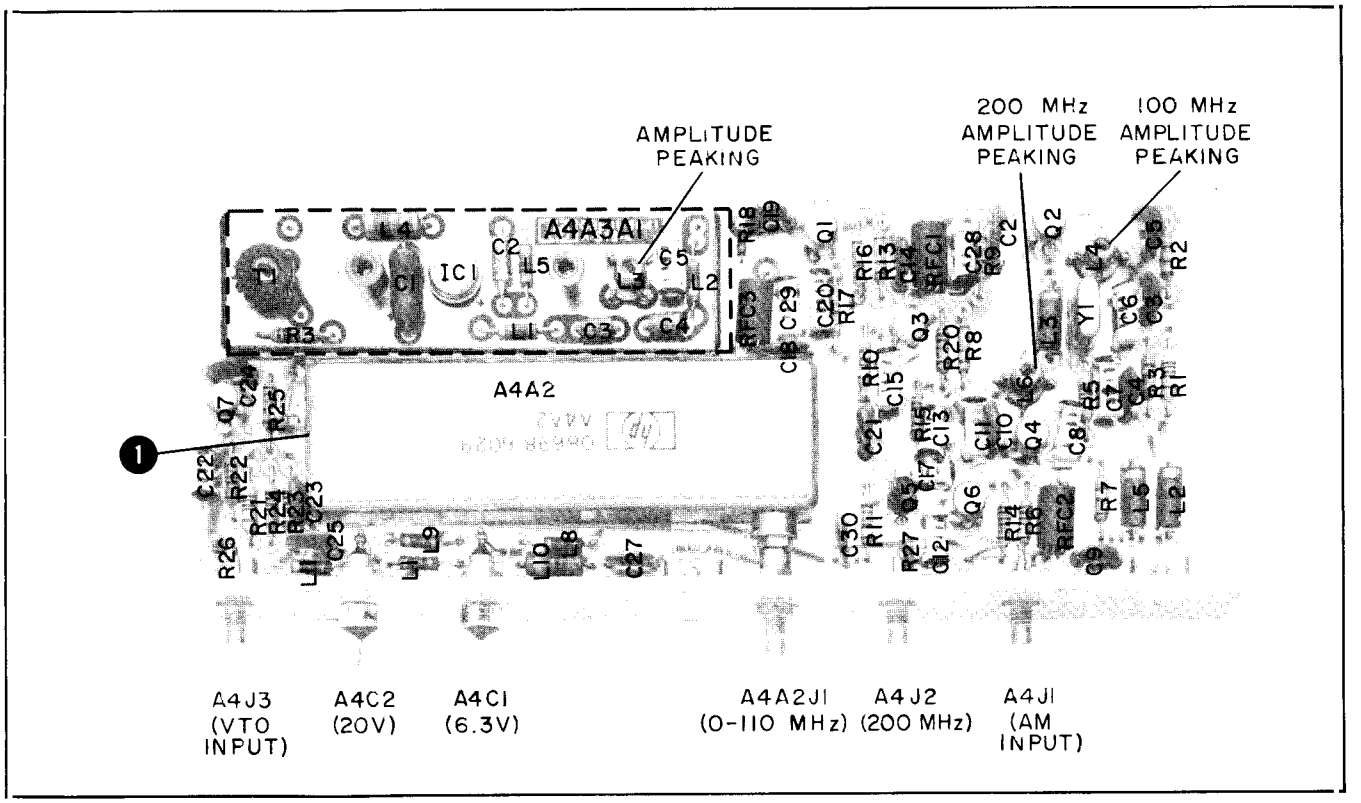


Figure 7-5. Component Identification, A4A1 Crystal Oscillator Assembly
(Part of Change 3)

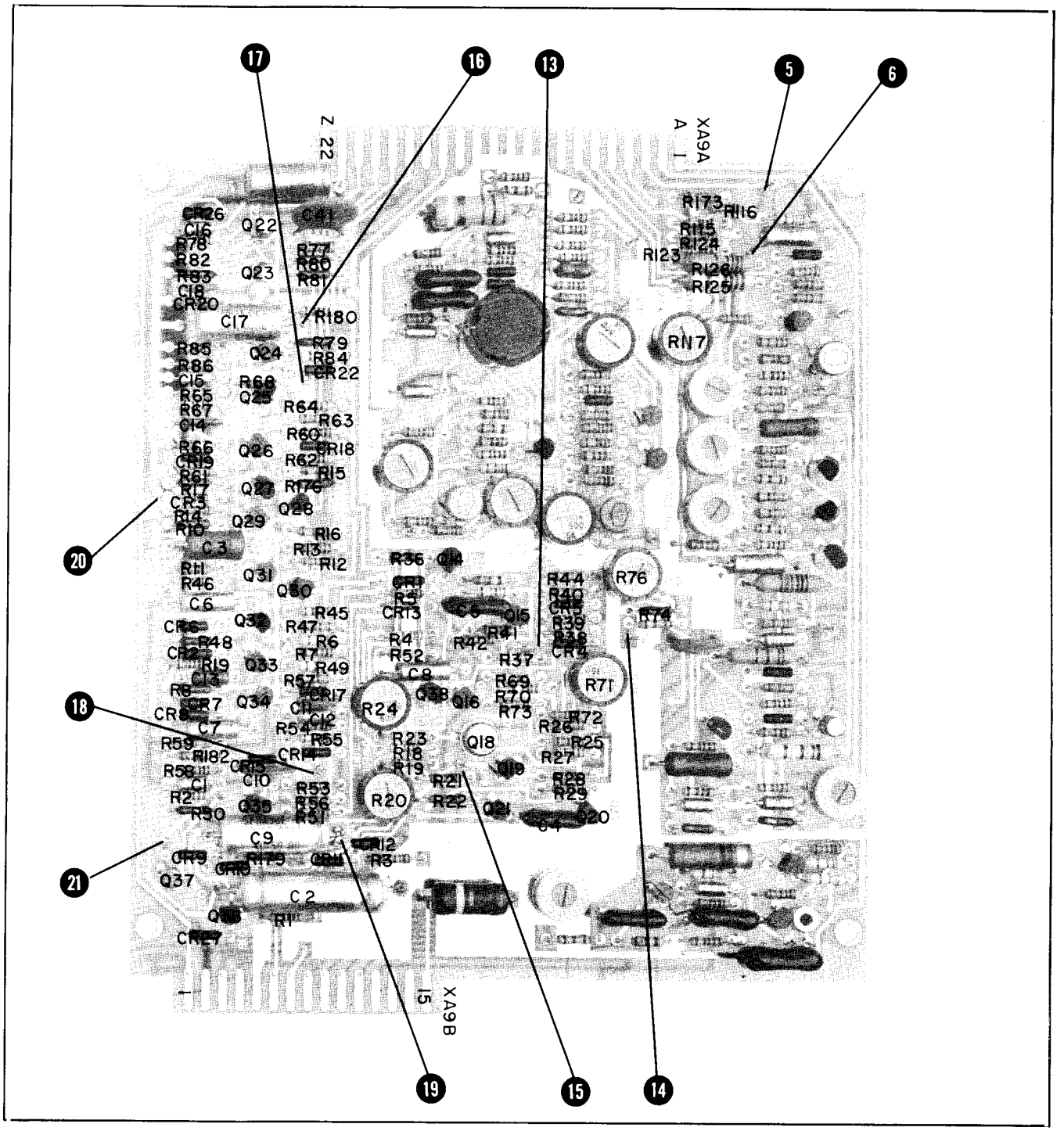


Figure 7-6. Component Identification, Sweep Generator, P/O A9
(Part of Change 3)

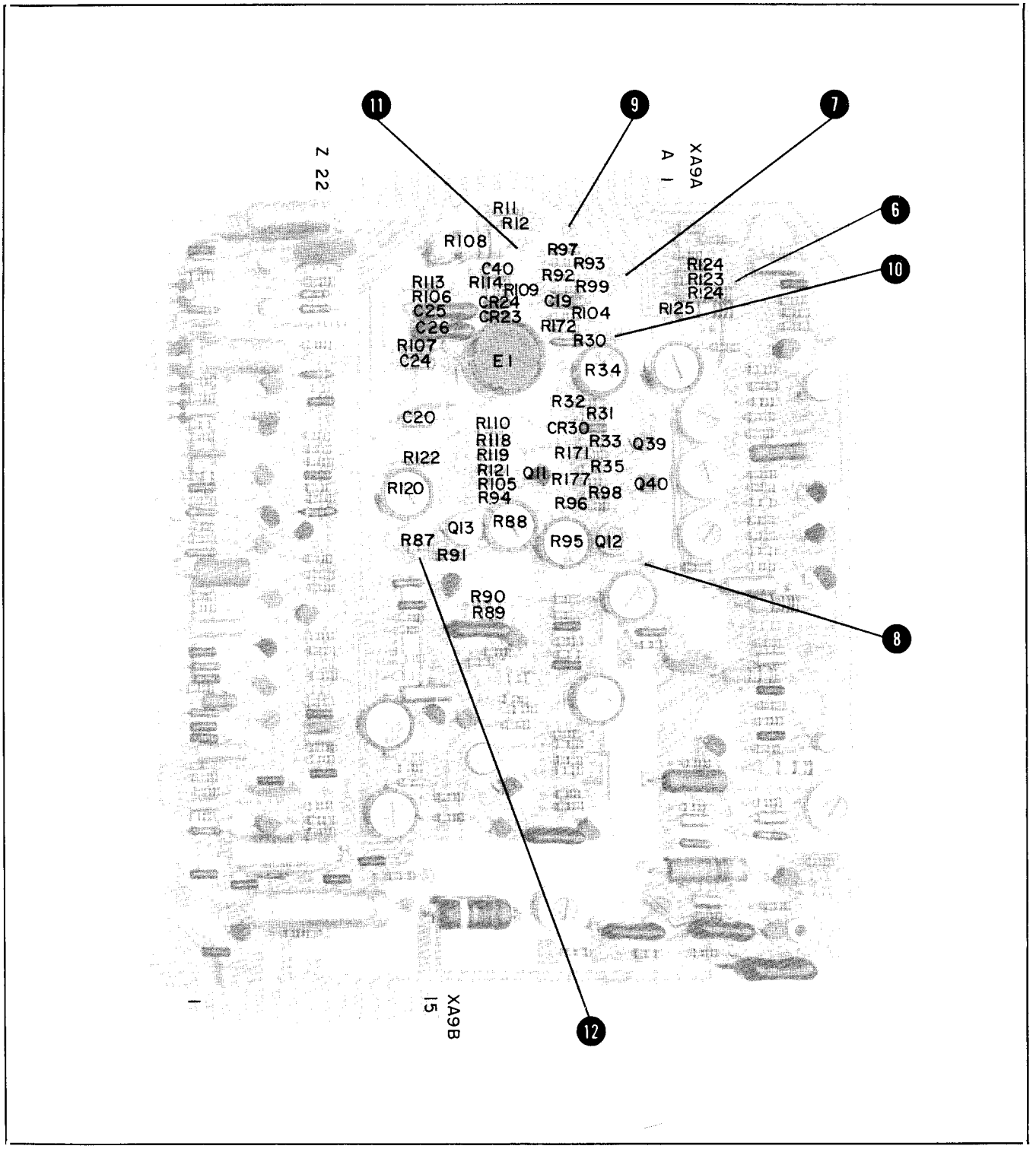


Figure 7-7. Component Identification, Summing Amplifier, P/O A9
(Part of Change 3)

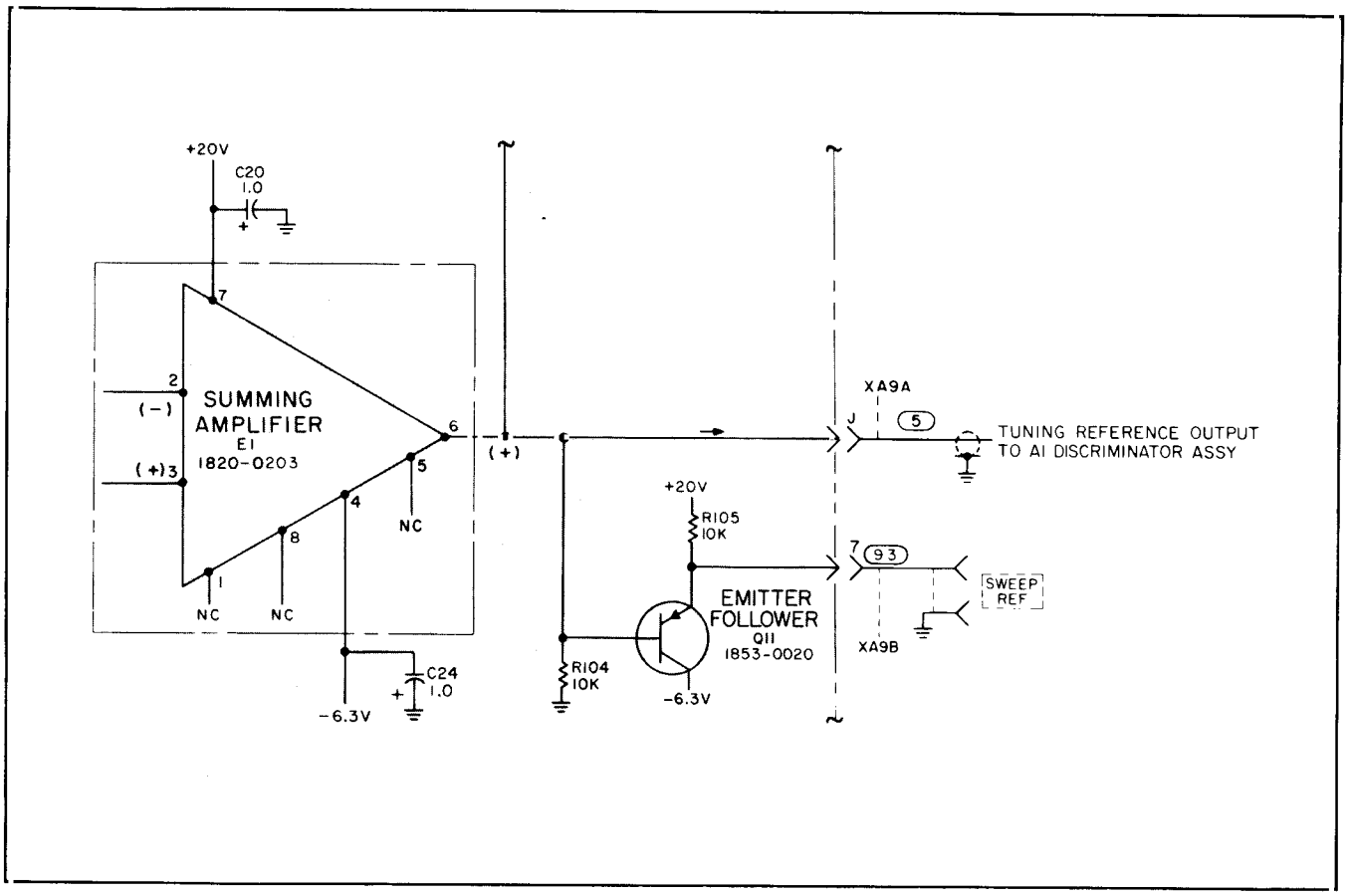


Figure 7-8. Sweep Reference Circuit, P/O A9
(Part of Change 3)

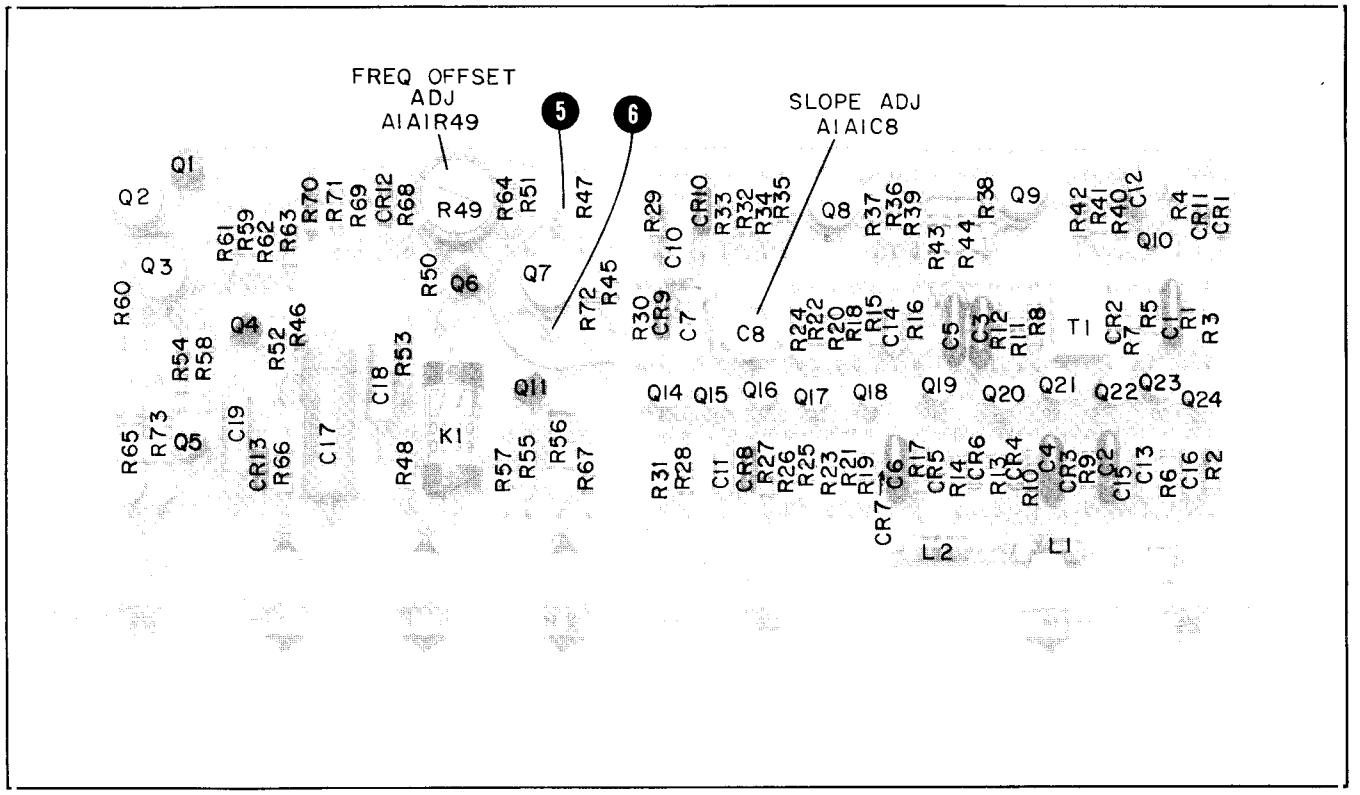


Figure 7-9. Component Identification, A1A1 Discriminator Assembly
(Part of Change 10)

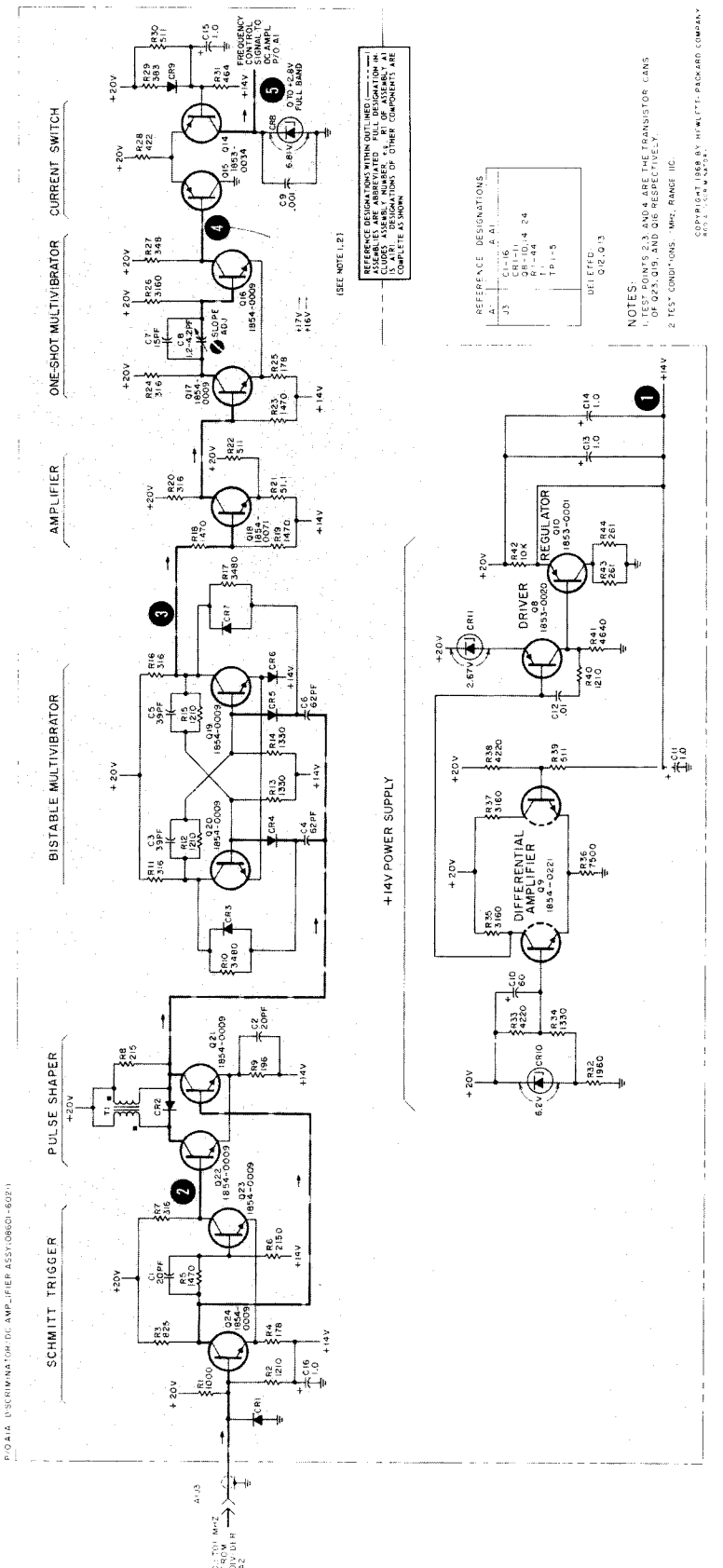


Figure 7-10. A1A1 Discriminator Circuit, Schematic Diagram
(Part of Change 10)

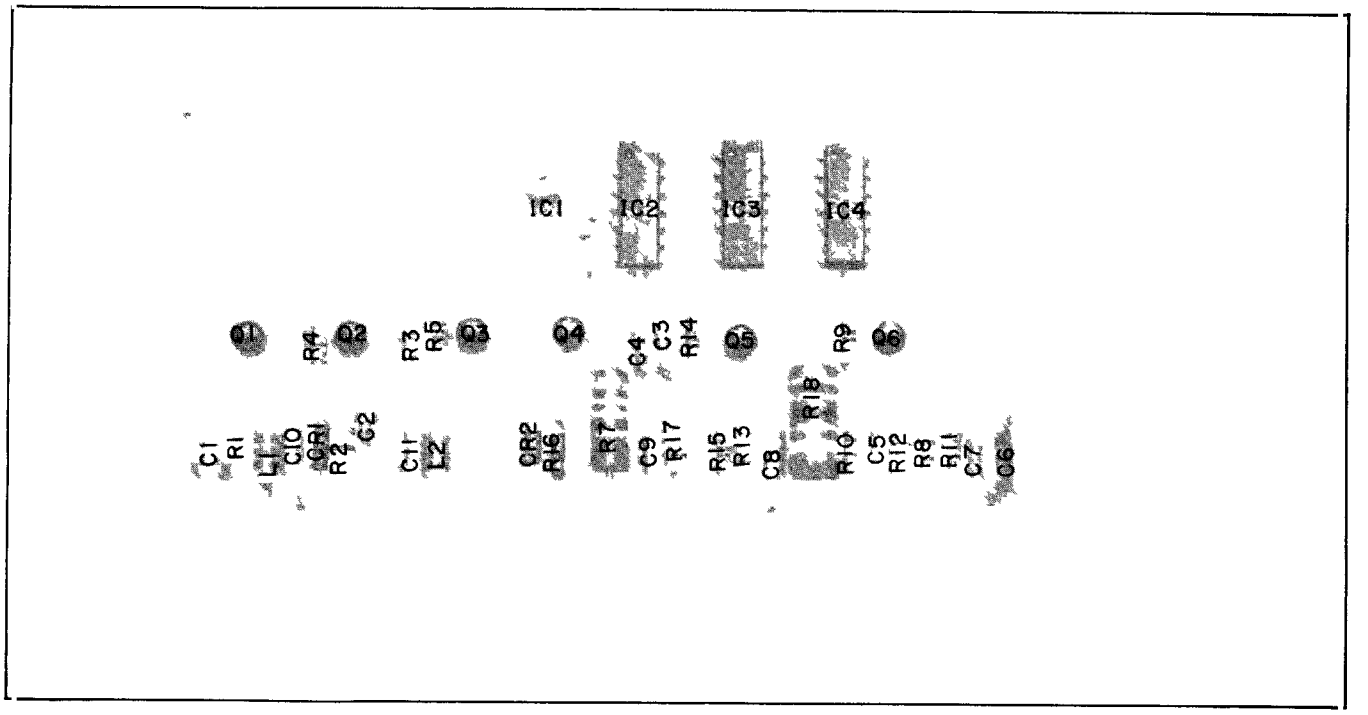


Figure 7-11. Component Identification, A2 Divider Assembly
(Part of Change 10)

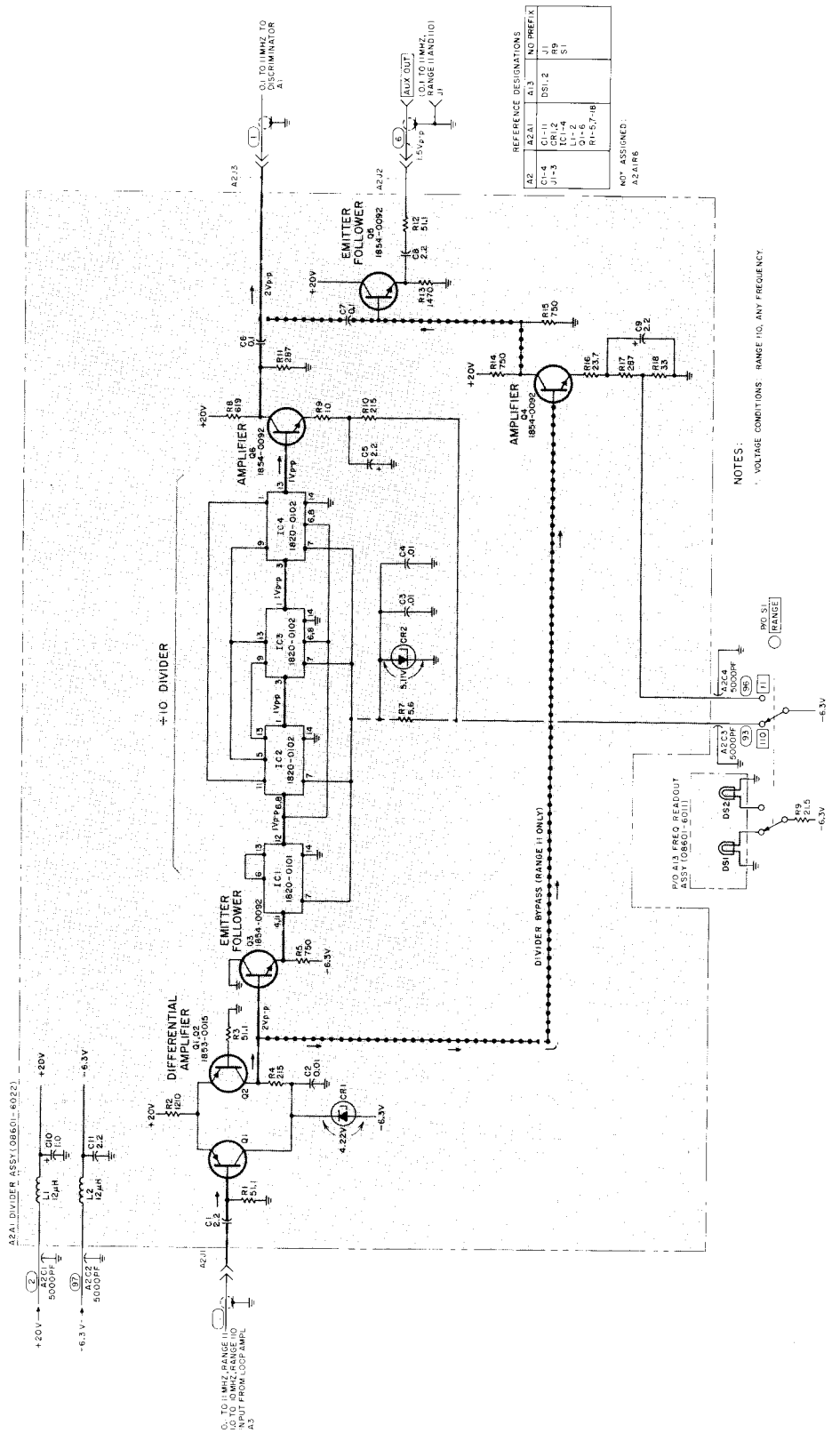


Figure 7-12. A2 Divider Assembly, Schematic Diagram
(Part of Change 10)

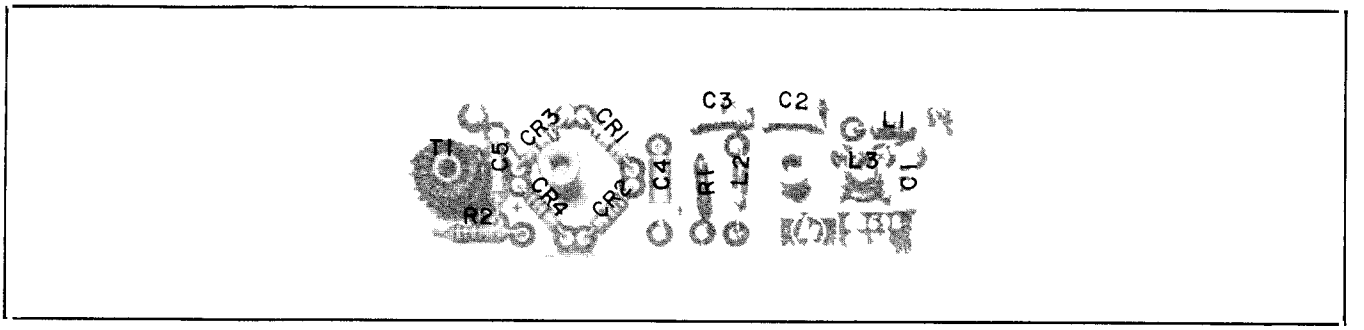


Figure 7-13. Component Identification, A3A2A1 Mixer Assembly
(Part of Change 10)

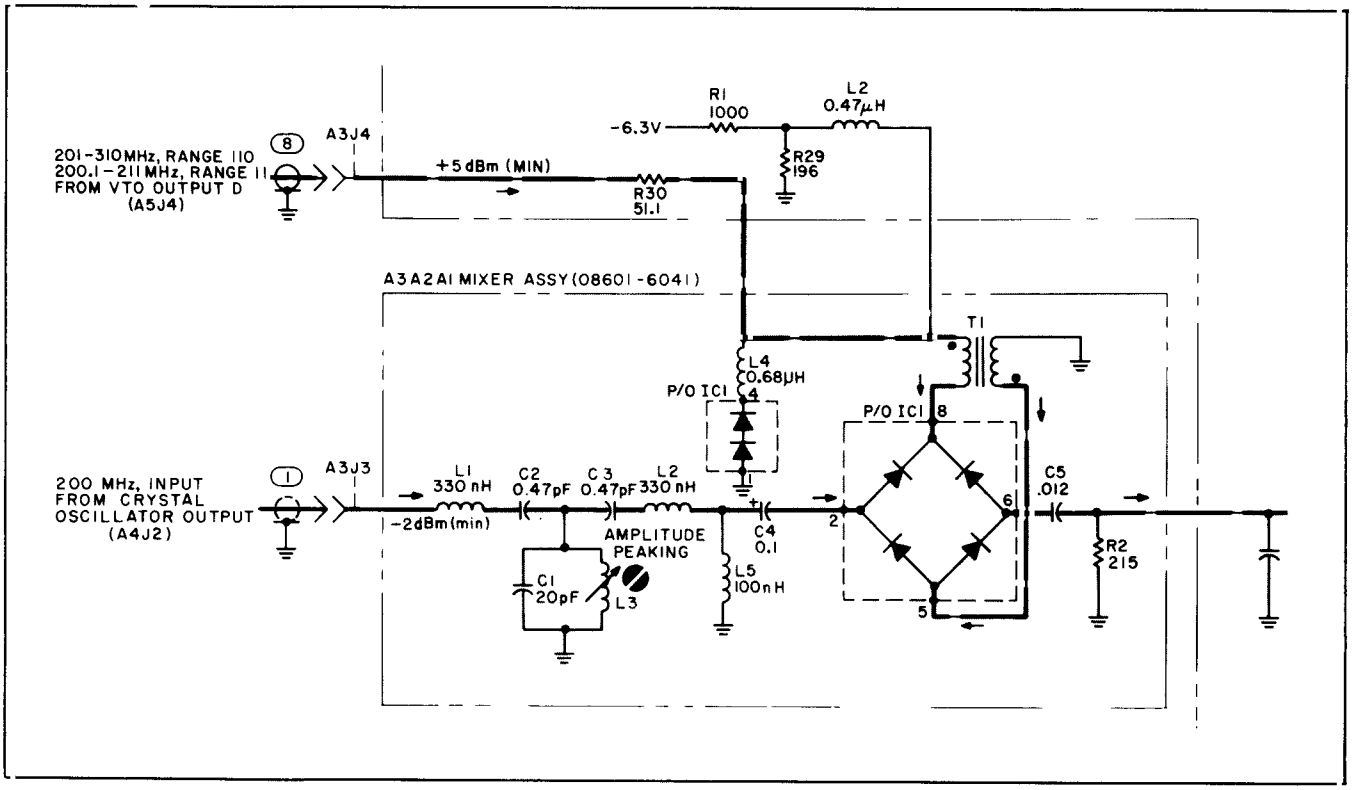


Figure 7-14. A3A2A1 Mixer Assembly, Schematic Diagram
(Part of Change 10)

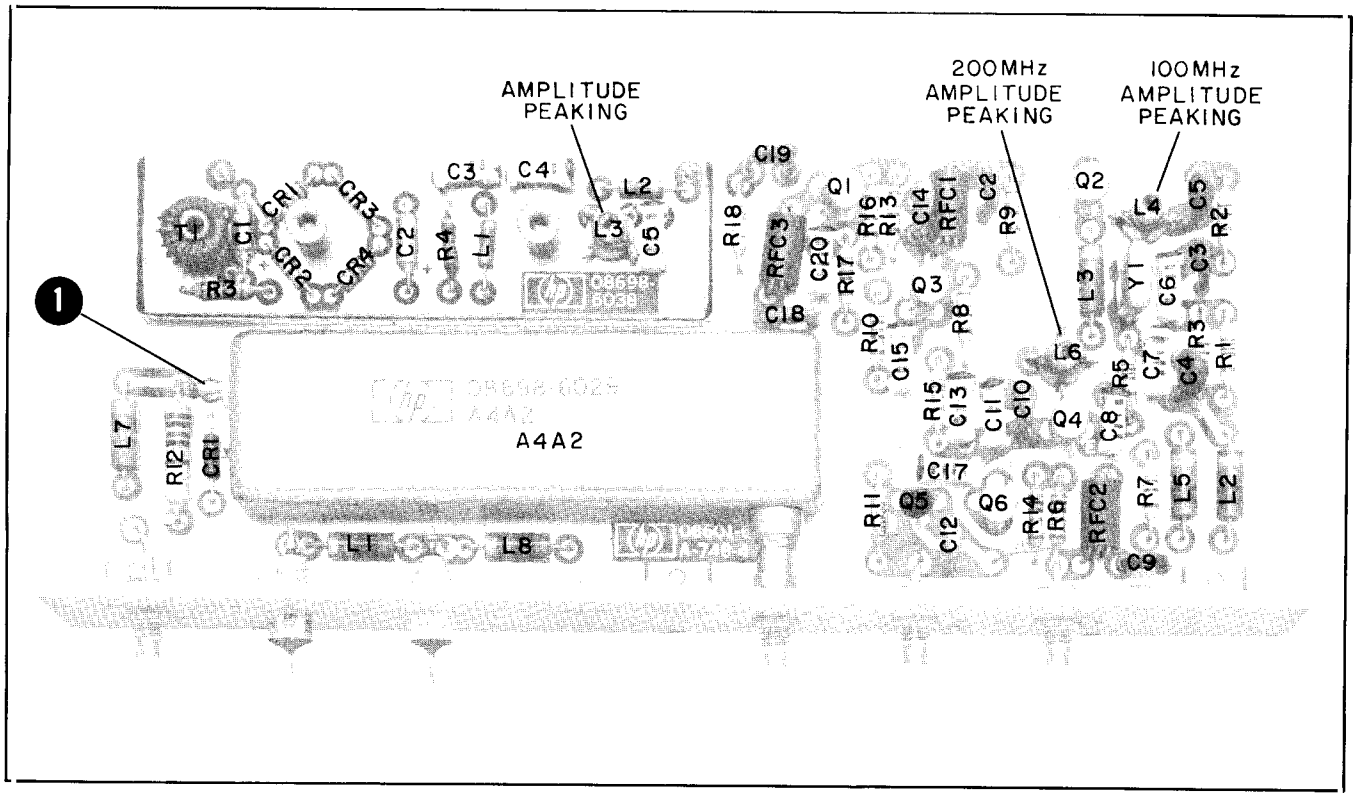


Figure 7-15. Component Identification, A4A1 Crystal Oscillator Assembly
(Part of Change 10)

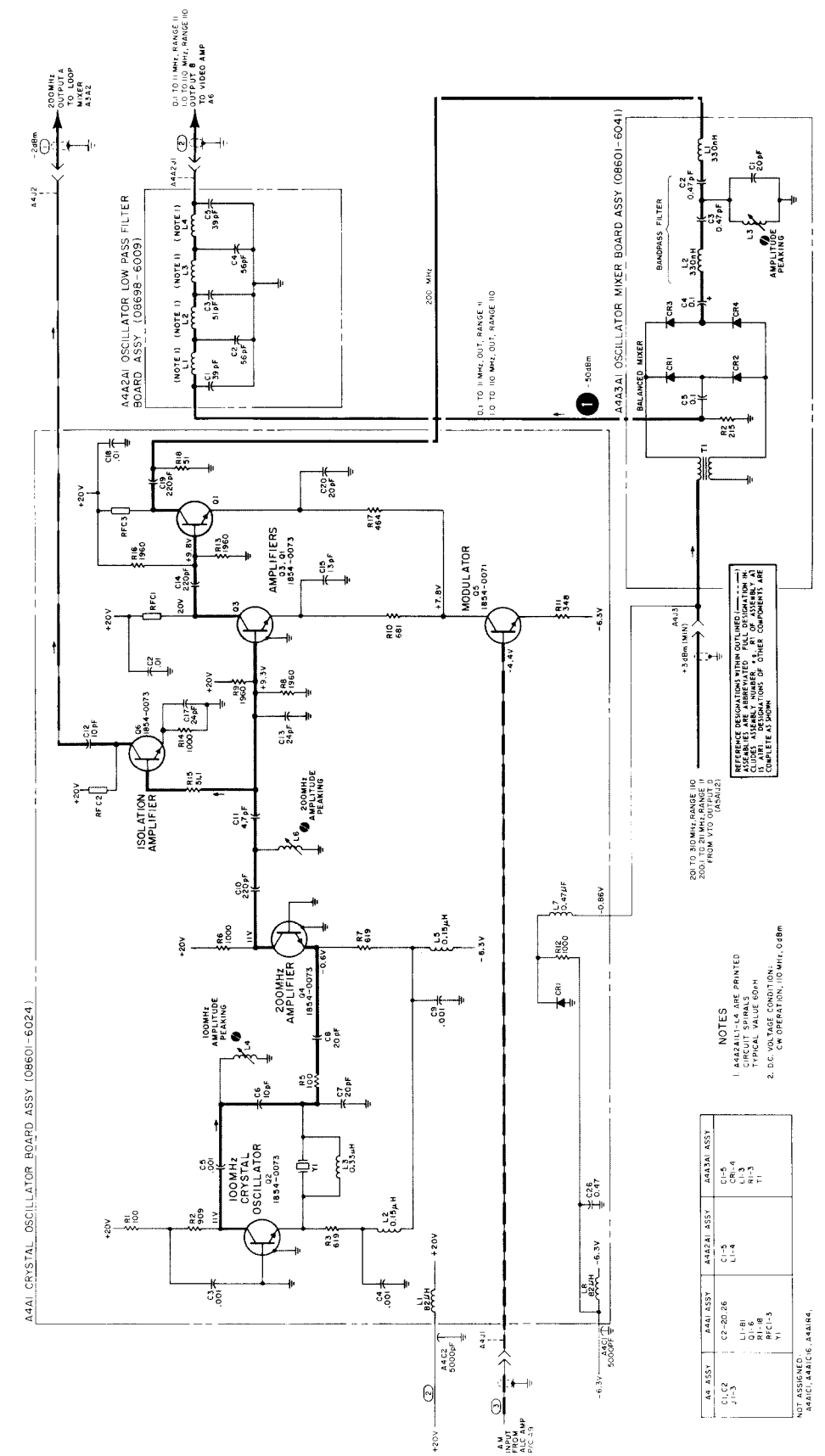


Figure 7-16. A4 Crystal Oscillator Assembly, Schematic Diagram
(Part of Change 10)

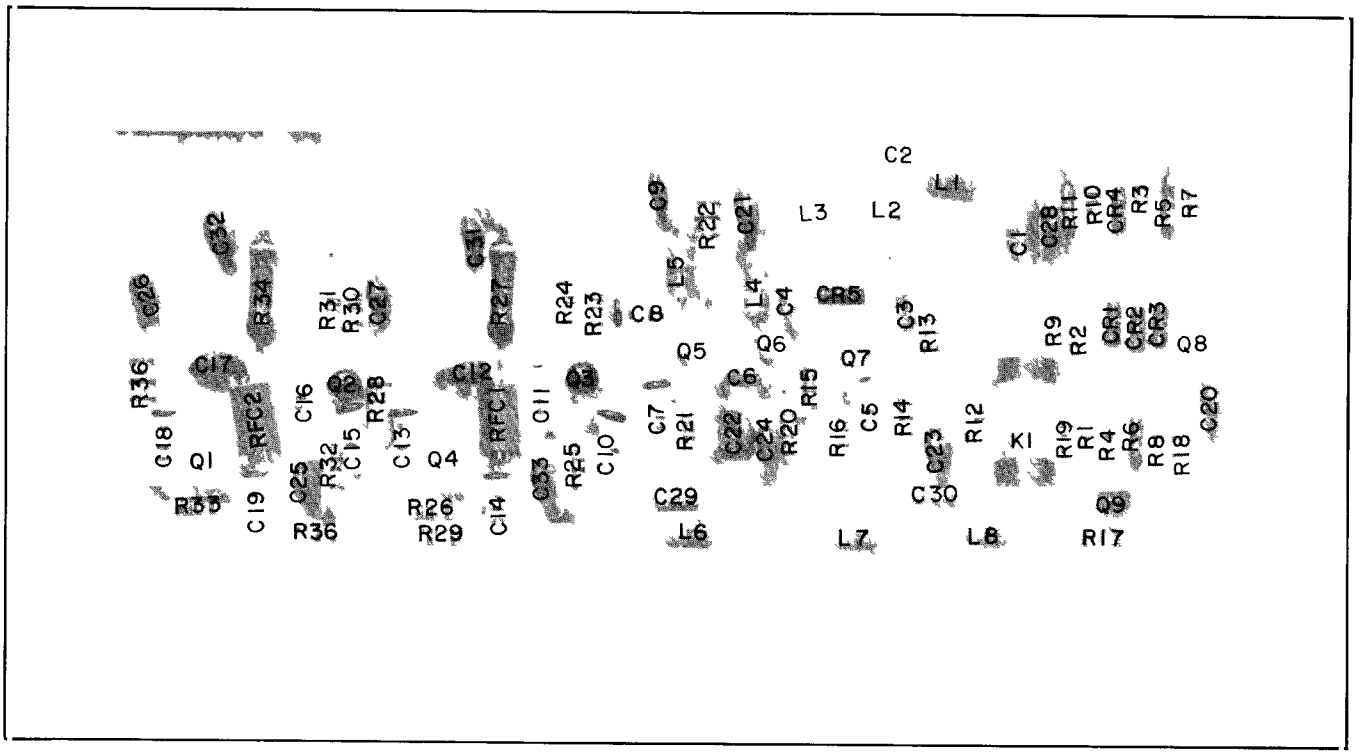


Figure 7-17. Component Identification, A5 VTO Assembly
(Part of Change 10)

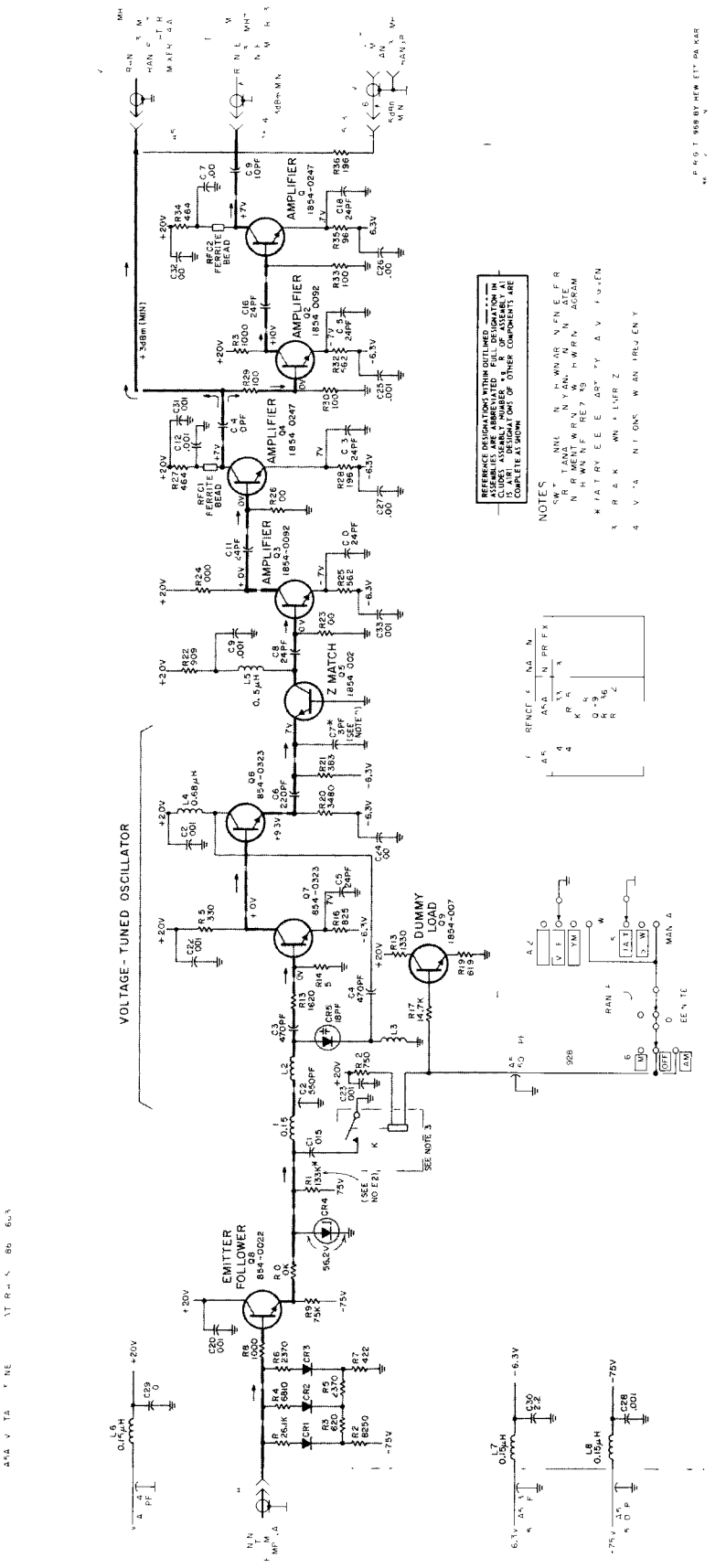


Figure 7-18. A5 VTO Assembly, Schematic Diagram (Part of Change 10)

Table 7-3. A2 Assy Replaceable Parts
(Part of Change 10)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A2	08601-6002	1	DIVIDER ASSY	28480	08601-6002
A2			INCL C1-C4,J1-J3, A2A1 ASSY & COVER		
A2C1	0160-2049	4	C:FXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
A2C2	0160-2049		C:FXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
A2C3	0160-2049		C:FXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
A2C4	0160-2049		C:FXD CER FEED-THRU 5000 PF +80-20%	28480	0160-2049
A2J1	1250-0829	3	CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A2J2	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A2J3	1250-0829		CONNECTOR:RF 50-OHM SCREW ON TYPE	98291	50-045-4610
A2Z	8160-0084	1	BRAID:RF	12881	10-541
A2Z	08698-0012	1	GASKET:RFI	28480	08698-0012
A2Z	08601-2016	1	COVER	28480	08601-2016
A2A1	08601-6022	1	BOARD ASSY:DIVIDER	28480	08601-6022
A2A1C1	0180-0197	5	C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C2	0160-2930	5	C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A2A1C3	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A2A1C4	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A2A1C5	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C6	0150-0121	2	C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A2A1C7	0150-0121		C:FXD CER 0.1 UF +80-20% 50VDCW	56289	5C50B1S-CML
A2A1C8	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C9	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1C10	0180-0291	1	C:FXD ELECT 1.0 UF 10% 35VDCW	56289	150D105X9035A2-DYS
A2A1C11	0180-0197		C:FXD ELECT 2.2 UF 10% 20VDCW	56289	150D225X9020A2-DYS
A2A1CR1	1902-3070	1	DIODE:BREAKDOWN 4.22V 5%	04713	SZ10939-74
A2A1CR2	1902-0579	1	DIODE BREAKDOWN:5.11V	28480	1902-0579
A2A1IC1	1820-0101	1	INTEGRATED CIRCUIT:DIFFERENTIAL AMPL	04713	MC1034P
A2A1IC2	1820-0102	3	INTEGRATED CIRCUIT:J-K FLIP FLOP	04713	MC1013P
A2A1IC3	1820-0102		INTEGRATED CIRCUIT:J-K FLIP FLOP	04713	MC1013P
A2A1IC4	1820-0102		INTEGRATED CIRCUIT:J-K FLIP FLOP	04713	MC1013P
A2A1L1	9140-0178	2	COIL:FXD 12 UH 10%	28480	9140-0178
A2A1L2	9140-0178		COIL:FXD 12 UH 10%	28480	9140-0178
A2A1Q1	1853-0015	2	TSTR:SI PNP	80131	2N3640
A2A1Q2	1853-0015		TSTR:SI PNP	80131	2N3640
A2A1Q3	1854-0092	4	TSTR:SI NPN	80131	2N3563
A2A1Q4	1854-0092		TSTR:SI NPN	80131	2N3563
A2A1Q5	1854-0092		TSTR:SI NPN	80131	2N3563
A2A1Q6	1854-0092		TSTR:SI NPN	80131	2N3563
A2A1R1	0757-0394	6	R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R2	0757-0821	1	R:FXD MET FLM 1.21K OHM 1% 1/2W	28480	0757-0821
A2A1R3	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R4	0698-3441	2	R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A2A1R5	C757-0420	3	R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R6			NOT ASSIGNED		
A2A1R7	0811-1675	1	R:FXD WW 5.6 OHM 5% 2W	28480	0811-1675
A2A1R8	0757-0418	3	R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A2A1R9	0757-0346	1	R:FXD MET FLM 10 OHM 1% 1/8W	28480	0757-0346
A2A1R10	0698-3441		R:FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
A2A1R11	0698-3443	2	R:FXD MET FLM 287 OHM 1% 1/8W	28480	0698-3443
A2A1R12	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A2A1R13	0757-1094	1	R:FXD MET FLM 1.47K OHM 1% 1/8W	28480	0757-1094
A2A1R14	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R15	0757-0420		R:FXD MET FLM 750 OHM 1% 1/8W	28480	0757-0420
A2A1R16	0698-3431	1	R:FXD MET FLM 23.7 OHM 1% 1/8W	28480	0698-3431
A2A1R17	0698-3443		R:FXD MET FLM 287 OHM 1% 1/8W	28480	0698-3443
A2A1R18	0764-0033	1	R:FXD MET OX 33 OHM 5% 2W	28480	0764-0033

Table 7-4. A4A1 Assy Replaceable Parts
(Part of Change 10)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A1	08601-6024	1	BOARD ASSY:FIXED OSCILLATOR	28480	08601-6024
A4A1C1			NOT ASSIGNED		
A4A1C2	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A4A1C3	0150-0050	4	C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1C4	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1C5	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1C6	0160-2257	2	C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A4A1C7	0160-2264	4	C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A4A1C8	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A4A1C9	0150-0050		C:FXD CER 1000 PF +80-20% 1000VDCW	56289	C067B102E102ZS26-CDH
A4A1C10	0160-2139	3	C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A4A1C11	0160-2249	1	C:FXD CER 4.7 PF 500VDCW	72982	301-NP0-4.7 PF
A4A1C12	0160-2257		C:FXD CER 10 PF 5% 500VDCW	72982	301-000-C0H0-100J
A4A1C13	0160-2266	1	C:FXD CER 24 PF 5% 500VDCW	72982	301-000-C0G0-240J
A4A1C14	0160-2139		C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A4A1C15	0160-2260	1	C:FXD CER 13 PF 5% 500VDCW	72982	301-000-C0G0 130J
A4A1C16			NOT ASSIGNED		
A4A1C17	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A4A1C18	0160-2930		C:FXD CER 0.01 UF +80-20% 100VDCW	91418	TA
A4A1C19	0160-2139		C:FXD CER 220 PF +80-20% 1000VDCW	91418	TYPE B
A4A1C20	0160-2264		C:FXD CER 20 PF 5% 500VDCW	72982	301-000-C0G0-200J
A4A1CR1	1901-0033	1	DIODE:SILICON 100MA 180WV	07263	FD3369
A4A1L2	9100-1610	2	COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A4A1L3	9100-1612	1	COIL:FXD RF 0.33 UH 20%	28480	9100-1612
A4A1L4	08698-6016	1	COIL:VAR 100MHZ	28480	08698-6016
A4A1L5	9100-1610		COIL:MOLDED CHOKE 0.15 UH 20%	28480	9100-1610
A4A1L6	08698-6015	1	COIL:VAR 200MHZ	28480	08698-6015
A4A1L7	9100-1613	1	COIL:FXD 0.47 UH 20%	28480	9100-1613
A4A1L8	9140-0238		COIL:FXD 82 UH 5%	28480	9140-0238
A4A1Q1	1854-0073	5	TSTR:SI NPN(SELECTED FROM 2N2857)	28480	1854-0073
A4A1Q2	1854-0073		TSTR:SI NPN(SELECTED FROM 2N2857)	28480	1854-0073
A4A1Q3	1854-0073		TSTR:SI NPN(SELECTED FROM 2N2857)	28480	1854-0073
A4A1Q4	1854-0073		TSTR:SI NPN(SELECTED FROM 2N2857)	28480	1854-0073
A4A1Q5	1854-0071	1	TSTR:SI NPN(SELECTED FROM 2N3704)	28480	1854-0071
A4A1Q6	1854-0073		TSTR:SI NPN(SELECTED FROM 2N2857)	28480	1854-0073
A4A1R1	0757-0401	2	R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A4A1R2	0757-0422	1	R:FXD MET FLM 909 OHM 1% 1/8W	28480	0757-0422
A4A1R3	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A4A1R4			NOT ASSIGNED		
A4A1R5	0757-0401		R:FXD MET FLM 100 OHM 1% 1/8W	28480	0757-0401
A4A1R6	0757-0280	2	R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4A1R7	0757-0418		R:FXD MET FLM 619 OHM 1% 1/8W	28480	0757-0418
A4A1R8	0698-0083	4	R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R9	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R10	0757-0419	1	R:FXD MET FLM 681 OHM 1% 1/8W	28480	0757-0419
A4A1R11	0698-3445	1	R:FXD MET FLM 348 OHM 1% 1/8W	28480	0698-3445
A4A1R12	0757-0799	1	R:FXD MET FLM 121 OHM 1% 1/2W	28480	0757-0799
A4A1R13	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R14	0757-0280		R:FXD MET FLM 1K OHM 1% 1/8W	28480	0757-0280
A4A1R15	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4A1R16	0698-0083		R:FXD MET FLM 1.96K OHM 1% 1/8W	28480	0698-0083
A4A1R17	0698-0090	1	R:FXD MET FLM 464 OHM 1% 1/2W	28480	0698-0090
A4A1R18	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4A1R19	0698-3440	1	R:FXD MET FLM 196 OHM 1% 1/8W	28480	0698-3440
A4A1R20	0757-0394		R:FXD MET FLM 51.1 OHM 1% 1/8W	28480	0757-0394
A4A1RFC1	9100-1788	3	COIL:CHOKE	02114	VK200-10/4B
A4A1RFC2	9100-1788		COIL:CHOKE	02114	VK200-10/4B
A4A1RFC3	9100-1788		COIL:CHOKE	02114	VK200-10/4B
A4A1Y1	0410-0172	1	CRYSTAL:QUARTZ 100MHZ	28480	0410-0172
A4A2	08698-6029	1	OSC LOW PASS FILTER ASSY	28480	08698-6029
A4A2	08698-0005	1	CAN:FILTER	28480	08698-0005
A4A2	08698-0008	1	COVER:CAN	28480	08698-0008
A4A2J1	1250-0826	1	CONNECTOR:RF	98291	50-027-0000
A4A2A1	08698-6009	1	OSC &LOW PASS FILTER BD ASSY	28480	08698-6009
A4A2A1C1	0160-2200	2	C:FXD MICA 43 PF 5%	72136	RDM15E430J3C
A4A2A1C2	0140-0205	4	C:FXD MICA 62 PF 5%	28480	0140-0205
A4A2A1C3	0140-0205		C:FXD MICA 62 PF 5%	28480	0140-0205
A4A2A1C4	0140-0205		C:FXD MICA 62 PF 5%	28480	0140-0205
A4A2A1C5	0160-2200		C:FXD MICA 43 PF 5%	72136	RDM15E430J3C
A4A2A1L1			NSR, P/O BD ASSY, TYPICAL VALUE 60 NH		
A4A2A1L2			NSR, P/O BD ASSY, TYPICAL VALUE 60 NH		
A4A2A1L3			NSR, P/O BD ASSY, TYPICAL VALUE 60 NH		
A4A2A1L4			NSR, P/O BD ASSY, TYPICAL VALUE 60 NH		

See introduction to this section for ordering information

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section contains principles of operation, circuit descriptions, troubleshooting information, component identification photographs, schematic diagrams and repair procedures.

8-3. PRINCIPLES OF OPERATION

8-4. An overall block diagram is presented in Figure 8-4. An overall theory of operation is shown opposite the block diagram. A detailed circuit description is placed opposite each Service Sheet with information relating to the appropriate schematic diagram.

8-5. TROUBLESHOOTING

8-6. An overall troubleshooting tree to the modular level is presented in Figure 8-5. Detailed troubleshooting to the circuit level is shown opposite each schematic diagram.

8-7. RECOMMENDED TEST EQUIPMENT

8-8. Recommended test equipment is listed in Table 1-2. If recommended test equipment is not available, other equipment may be subsituted if performance meets the Measurement Requirements listed in the table.

8-9. REPAIR

8-10. Part Location Aids

8-11. The locations of adjustment points and major assemblies are shown in Figures 8-40 through 8-45. The location of individual components mounted on a printed circuit board are shown opposite the related schematic diagram. The part reference designator may be found from the schematic diagram, then located on the board.

8-12. Circuit Board Repair

8-13. The printed circuit boards in the Model 8601A are of the plated-through type consisting of metallic conductors bonded to both sides of insulating material. Soldering can be done from either side of the board with equally good results. Following are recommendations and precautions pertinent to printed circuit repair work.

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

2. Do not use a high-power soldering iron. Excessive heat may lift a conductor or damage the board.

3. Use a suction device (such as a Soldapullt, by the Edsyn Company, Arleta, California) 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.*

4. After soldering, remove excess flux from the soldered area and apply a protective coating to prevent contamination and corrosion.

8-14. A broken or burned section of conductor can be repaired by bridging the damaged section with a length of tinned copper wire. Allow adequate overlap and remove any varnish from the conductor before soldering wire into place.

8-15. Component Replacement

8-16. A general procedure for replacing a component is as follows:

1. Remove defective component from circuit board.

2. Remove solder from mounting holes using a suction desoldering aid or wooden toothpick.

3. Shape leads or replacement component to match mounting hole spacing.

4. Insert component leads into mounting holes and position component as original was positioned. *Do not force leads of replacement component into mounting holes.* Sharp lead ends may damaged plated-through conductor.

NOTE

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

8-17. Transistor Replacement

8-18. A general procedure for replacing a transistor is as follows:

1. Do not apply excessive heat.

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

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

8-19. SCHEMATIC DIAGRAMS

8-20. The schematic diagrams in this section represent the circuits electrically. They are not wiring diagrams, though wire colors are given where practical.

8-21. The circuits are arranged according to signal flow; consequently, some switch and circuit assemblies may be shown in part on more than one diagram. If so, the reference designation is preceded by P/O, for Part of, and is followed by a notation of the number of parts into which the assembly has been divided.

8-22. The large numbers in the lower right corners of the schematics are the Service Sheet numbers. These numbers are used to cross-reference connections between schematics.

8-23. Some of the general information obtainable from the schematics is shown in Figure 8-1. Notes and explanations of symbols pertaining to all the diagrams are contained in Figure 8-2. Notes about specific components, circuits, or conditions are given on the diagram to which they apply.

8-24. As an aid to finding components and assemblies in the set of diagrams, each diagram has a box labeled Reference Designations that contains all the reference designations appearing on the diagram.

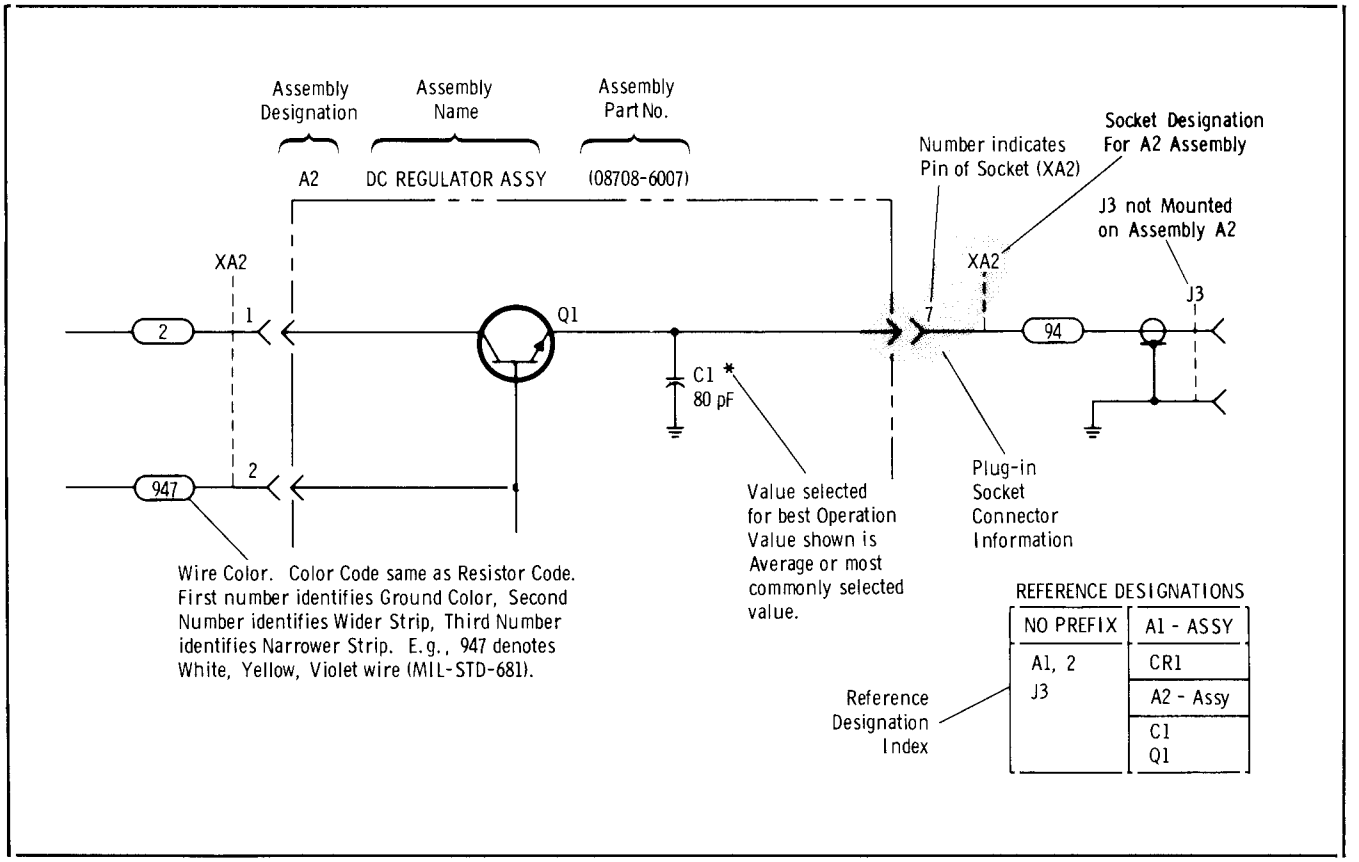


Figure 8-1. General Information on Schematic Diagrams

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

P/O = part of.

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

Screwdriver adjustment.

Panel control.

Encloses front panel designations.

Encloses rear panel designation.

Circuit assembly borderline.

Other assembly borderline.

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

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

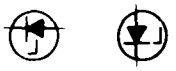
CW

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.

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



Voltage regulator (breakdown diode).

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

Denotes FET with P-type base.

Denotes Capacitive diode (Varicap, varactor).

Denotes Silicon Controlled Rectifier(SCR).

P-Type Metal Oxide Substrate FET (MOSFET)

N-Type Metal Oxide Substrate FET (MOSFET)

Figure 8-2. Schematic Diagram Notes

8-25. OPERATION

8-26. Figure 8-3 is a simplified block diagram of the 8601A. A detailed block diagram is shown in Figure 8-4. The 8601A consists of four major sections: the primary signal path, the automatic leveling control (ALC) feedback loop, the frequency control feedback loop, and the frequency tuning control.

8-27. Primary Signal Path

8-28. The primary signal path begins in a 200 MHz crystal oscillator. The 200 MHz output is applied to (1) the primary signal mixer and (2) the frequency control loop mixer. Both mixers heterodyne the 200 MHz signal with a 200.1 to 310 MHz signal from a voltage tuned oscillator (VTO) to provide a 0.1 to 110 MHz output. The 0.10 to 110 MHz signal is coupled through a low pass filter to a video amplifier. The video amplifier output is applied to a calibrated attenuator that enables the leveled signal at the 50 ohm RF OUT terminal to be varied from +20 to —110 dBm.

8-29. ALC Feedback Loop

8-30. The video amplifier contains a detector that samples the signal power at the video amplifier output. The detector output is a voltage level proportional to the signal power. The detector output is applied to an ALC level control circuit where it is compared to a reference voltage that is determined by the OUTPUT LEVEL VERNIER control setting. The level control output is amplified by an ALC amplifier and coupled back to the 200 MHz amplifier/modulator. The ALC amplifier output controls the power level of the 200 MHz amplifier/modulator output in the primary signal path. The three modulation functions, RF blanking, frequency markers, and amplitude modulation, are also applied to the ALC level control and amplifier circuits.

8-31. Frequency Control Feedback Loop

8-32. The frequency control feedback loop ensures high-frequency accuracy, stability, and linearity by controlling the 200.1 to 310 MHz VTO. The loop compensates for any 200 MHz oscillator drift and keeps the VTO output frequency independent of the VTO's non-linear tuning characteristic. The loop locks the RF output frequency to the sweep generator linear output tuning voltage.

8-33. The 200 MHz fixed-oscillator output is mixed with the 200.1 to 310 MHz VTO output in the loop mixer. The 0.1 to 11 MHz difference frequency output is applied to a frequency discriminator. (Because the discriminator frequency range is limited, a divide by 10 divider precedes the discriminator during 1.0 to 110 MHz operation.) The discriminator output is a voltage level proportional to the input frequency. This voltage level is applied to a dc amplifier where it is compared to a voltage reference determined by the frequency control setting and the sweep generator mode of operation. (In a sweep mode, the reference is a linear voltage ramp; for CW, the reference is a dc value.) The difference voltage output is amplified by the dc amplifier and tunes the VTO.

8-34. The voltage comparison is a continuous process at either a CW frequency or a sweep over any portion of the 110 MHz range. Thus, the frequency control feedback loop keeps the discriminator output equal to the reference tuning voltage at all times. The dc amplifier also contains a search circuit to ensure that the VTO tuning voltage tunes the VTO upward from 200 MHz.

8-35. Frequency Tuning Control

8-36. The sweep generator produces the tuning voltage reference for the dc amplifier in both sweep and CW modes. The sweep generator tuning ramp output, when applied directly to the dc amplifier, causes the VTO to sweep the full range; 0.1 to 11 MHz in range 11 or 1.0 to 110 MHz in range 110. In the VIDEO mode, the tuning ramp's upper limit is determined by the FREQUENCY control setting, so the sweep is from the bottom of the band (0.1 or 1.0 MHz) to the FREQUENCY setting. In the SYM mode, the tuning ramp is centered on a CW frequency determined by the FREQUENCY control. The tuning ramp amplitude is determined by the SYM SWEEP WIDTH control. In the CW mode, no ramp is generated. A dc voltage, determined by the FREQUENCY control, is applied to the dc amplifier.

8-37. Internal and external frequency-modulation signals are imposed on the sweep generator tuning voltage at the summing amplifier during the SYM mode of operation.

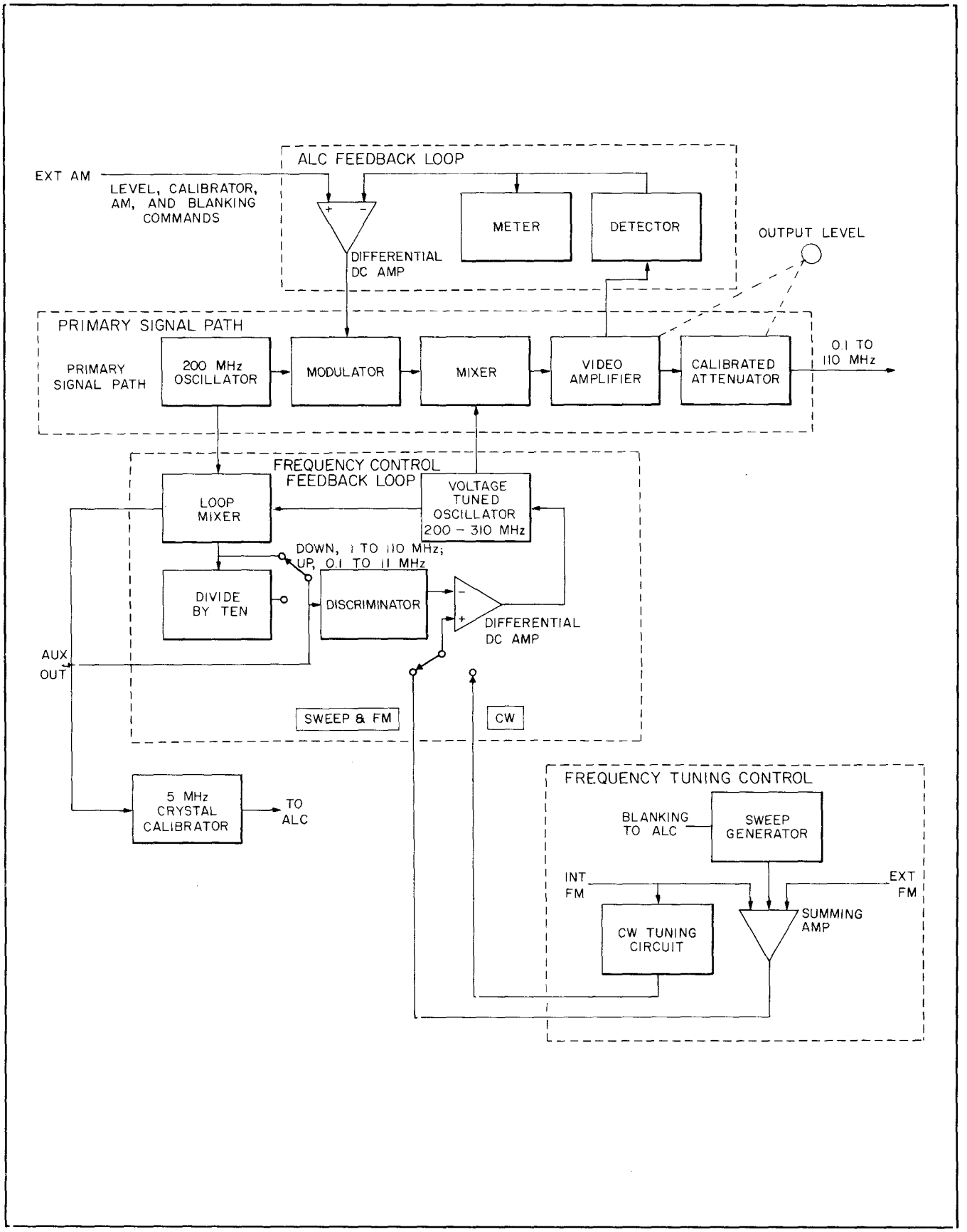
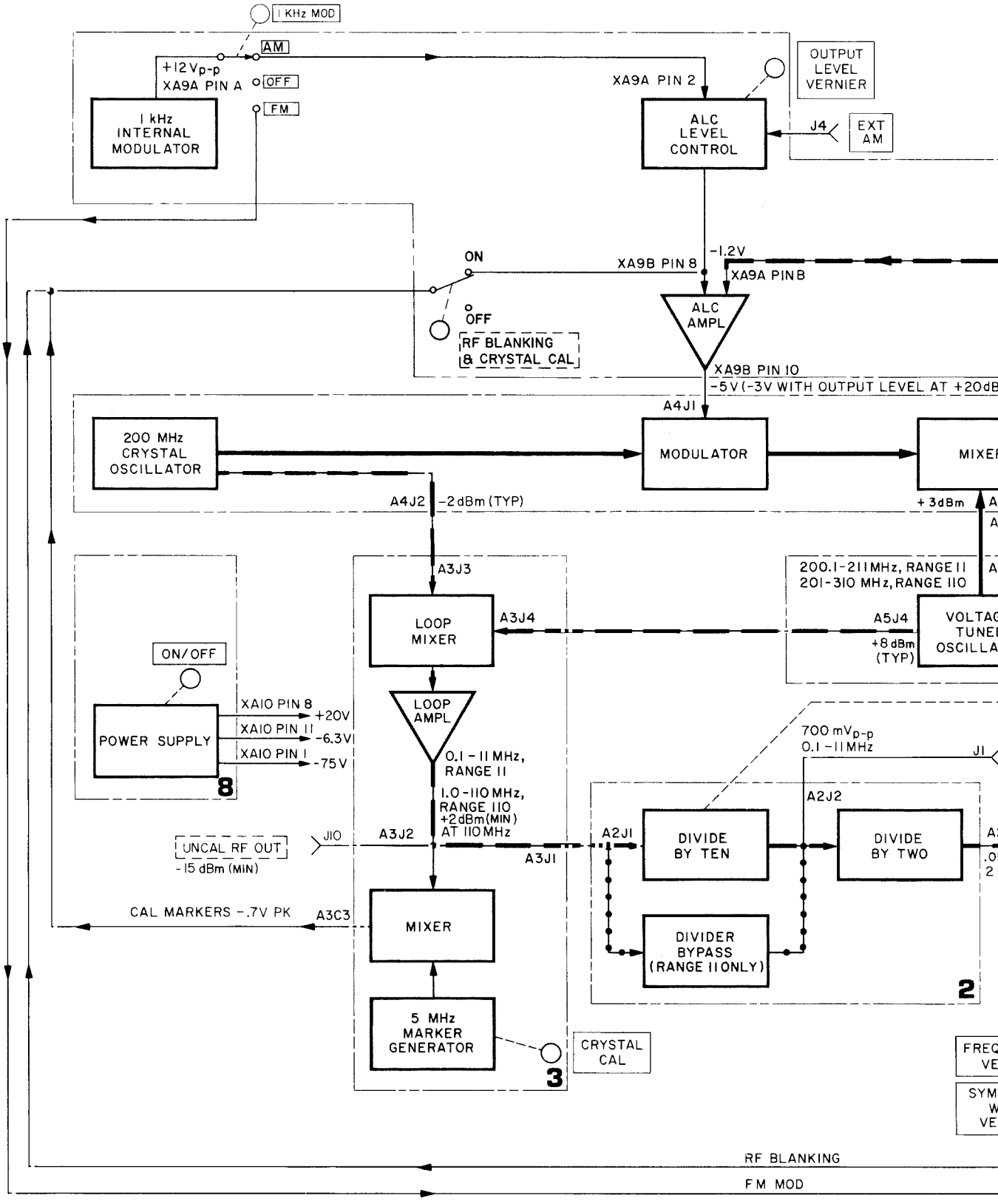


Figure 8-3. 8601A Simplified Block Diagram

BLOCK DIAGRAM


1 KHz MOD
AM
+12 Vp-p
XA9A PIN A
OFF
FM
1 kHz
INTERNAL
MODULATOR
XA9A PIN 2
OUTPUT
LEVEL
VERNIER
ALC
LEVEL
CONTROL
J4
EXT
AM
ON
XA9B PIN 8
-1.2V
XA9A PIN B
OFF
RF BLANKING
& CRYSTAL CAL
ALC
AMPL
XA9B PIN 10
-5V (-3V WITH OUTPUT LEVEL AT +20dB
A4J1
200 MHz
CRYSTAL
OSCILLATOR
MODULATOR
MIXER
A4J2
-2dBm (TYP)
+3dBm
A3J3
200.1-211MHz, RANGE II
201-310 MHz, RANGE IIO
LOOP
MIXER
A3J4
A5J4
+8 dBm
(TYP)
VOLTAG
TUNE
OSCILLA
ON/OFF
POWER SUPPLY
XA10 PIN 8
+20V
XA10 PIN 11
-6.3V
XA10 PIN 1
-75V
8
LOOP
AMPL
0.1 - 11 MHz,
RANGE II
1.0 - 110 MHz,
RANGE 110
+2dBm(MIN)
AT 110MHz
700 mVp-p
0.1 - 11MHz
J1
A2J2
A2J1
DIVIDE
BY TEN
DIVIDE
BY TWO
UNCAL RF OUT
-15 dBm (MIN)
J10
A3J2
A3J1
DIVIDER
BYPASS
(RANGE II ONLY)
2
CAL MARKERS -.7V PK
A3C3
MIXER
5 MHz
MARKER
GENERATOR
3
CRYSTAL
CAL
FREQ
VE
SYM
W
VE
RF BLANKING
FM MOD

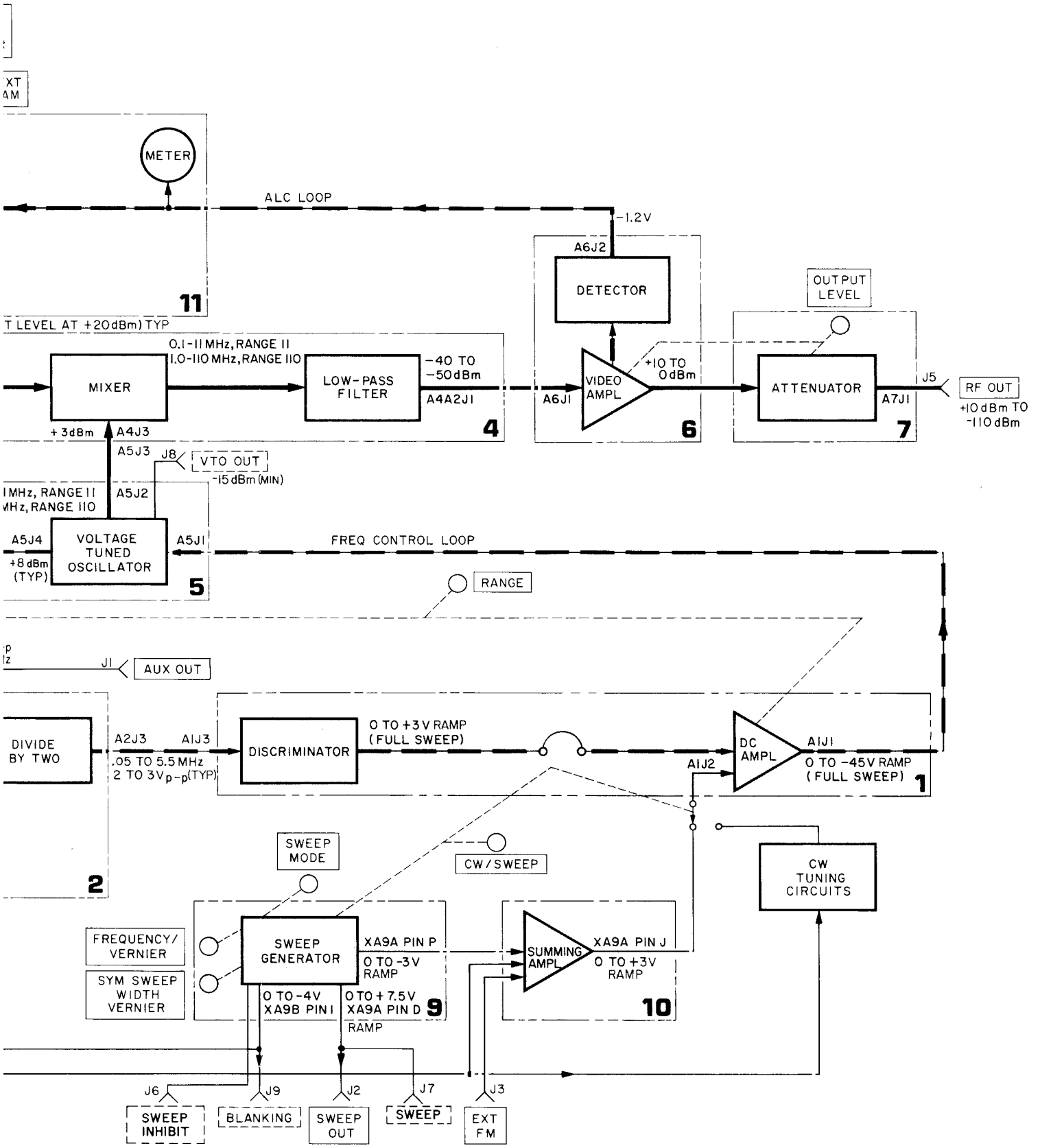
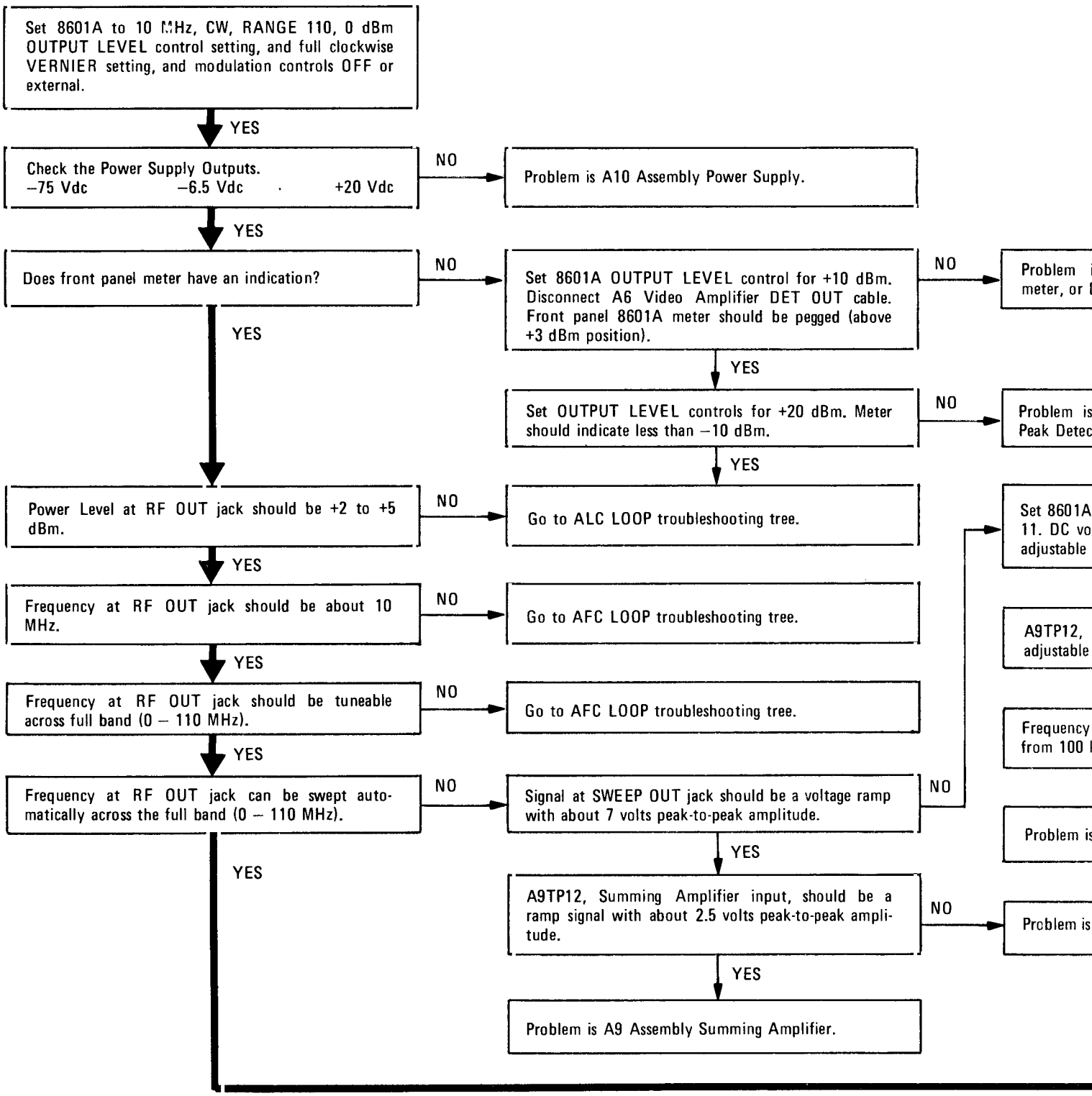
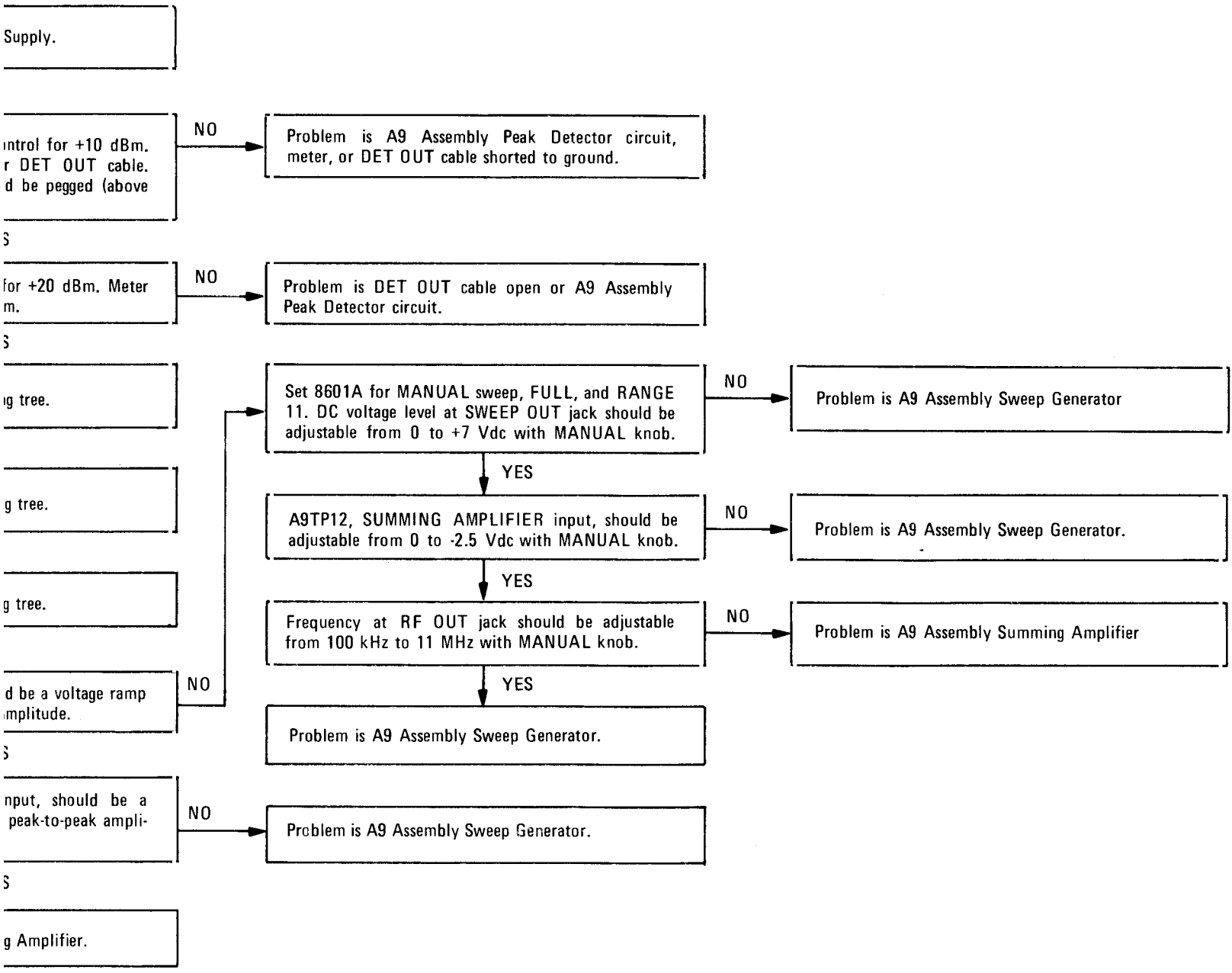


Figure 8-4. Detailed Block Diagram


Set 8601A to 10 MHz, CW, RANGE 110, 0 dBm OUTPUT LEVEL control setting, and full clockwise VERNIER setting, and modulation controls OFF or external.
YES
Check the Power Supply Outputs. −75 Vdc −6.5 Vdc +20 Vdc
NO
Problem is A10 Assembly Power Supply.
YES
Does front panel meter have an indication?
NO
Set 8601A OUTPUT LEVEL control for +10 dBm. Disconnect A6 Video Amplifier DET OUT cable. Front panel 8601A meter should be pegged (above +3 dBm position).
NO
Problem meter, or
YES
YES
Set OUTPUT LEVEL controls for +20 dBm. Meter should indicate less than −10 dBm.
NO
Problem is Peak Detec
YES
Power Level at RF OUT jack should be +2 to +5 dBm.
NO
Go to ALC LOOP troubleshooting tree.
YES
Frequency at RF OUT jack should be about 10 MHz.
NO
Go to AFC LOOP troubleshooting tree.
YES
Frequency at RF OUT jack should be tuneable across full band (0 – 110 MHz).
NO
Go to AFC LOOP troubleshooting tree.
YES
Frequency at RF OUT jack can be swept automatically across the full band (0 – 110 MHz).
NO
Signal at SWEEP OUT jack should be a voltage ramp with about 7 volts peak-to-peak amplitude.
NO
Set 8601A 11. DC vo adjustable
YES
A9TP12, Summing Amplifier input, should be a ramp signal with about 2.5 volts peak-to-peak amplitude.
NO
Problem is
YES
Problem is A9 Assembly Summing Amplifier.
A9TP12, adjustable
Frequency from 100
Problem is
Problem is
YES

OVERALL TROUBLESHOOTING TREE



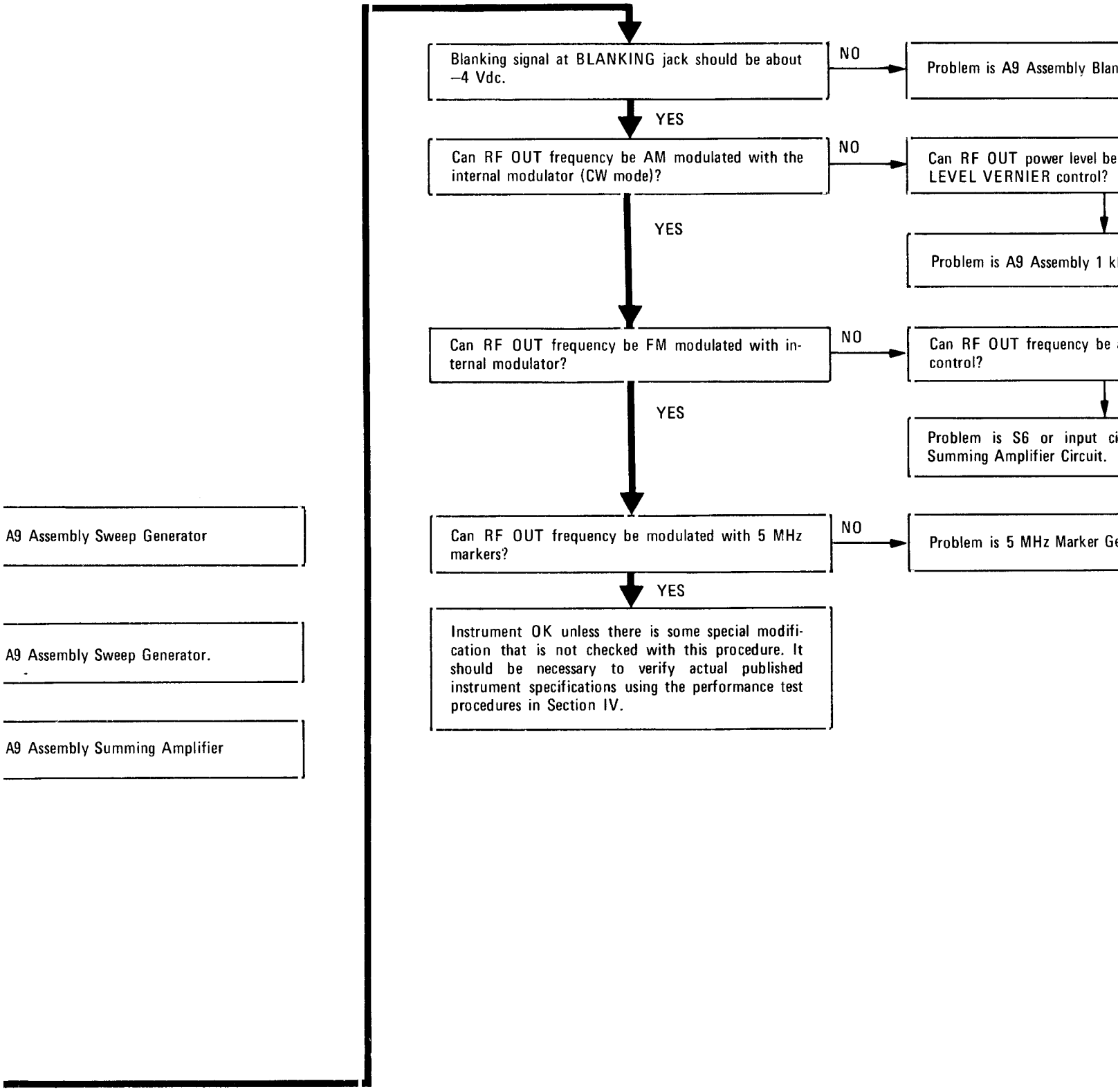


Figure 8-5. Troubleshooting

TROUBLESHOOTING TREE

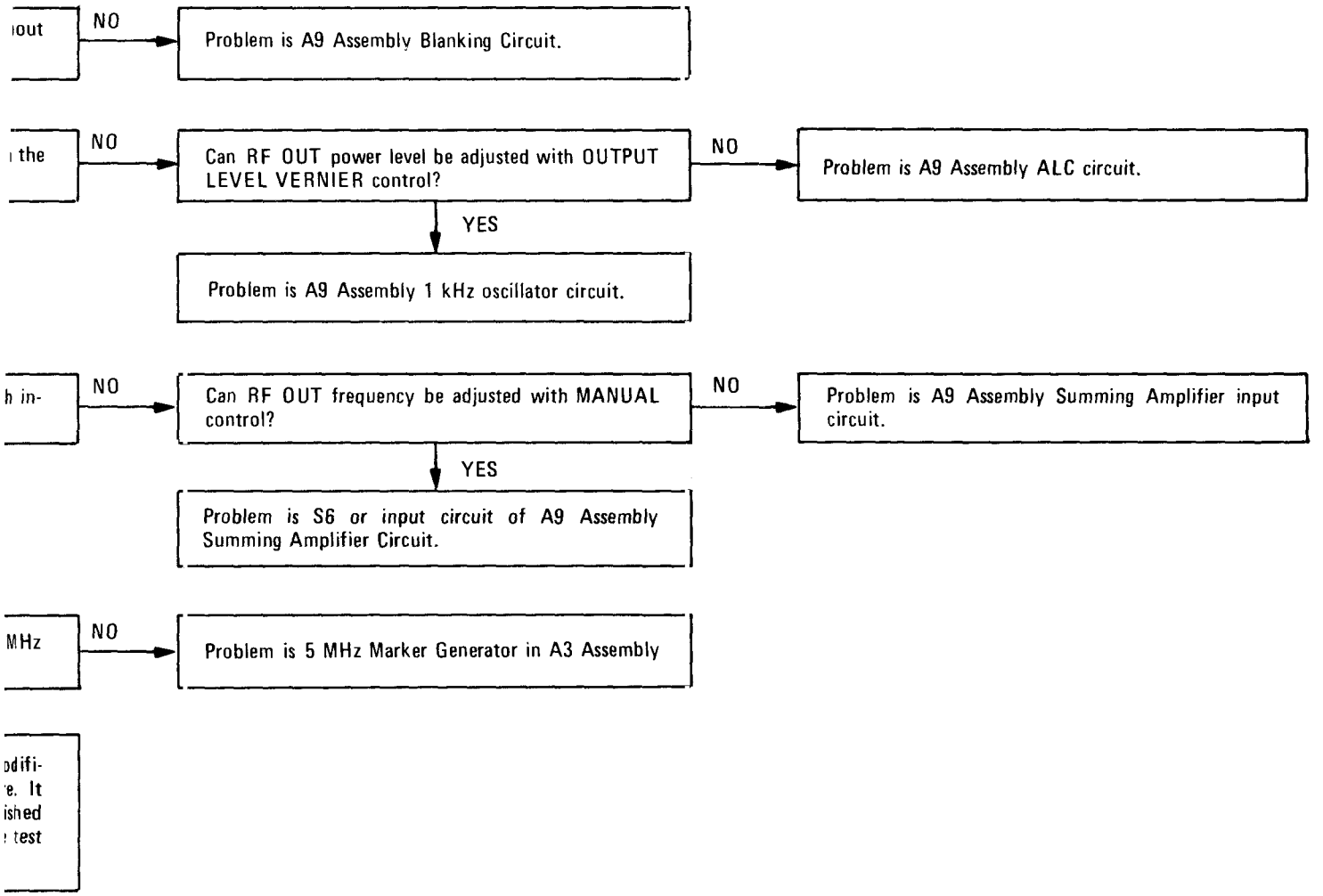
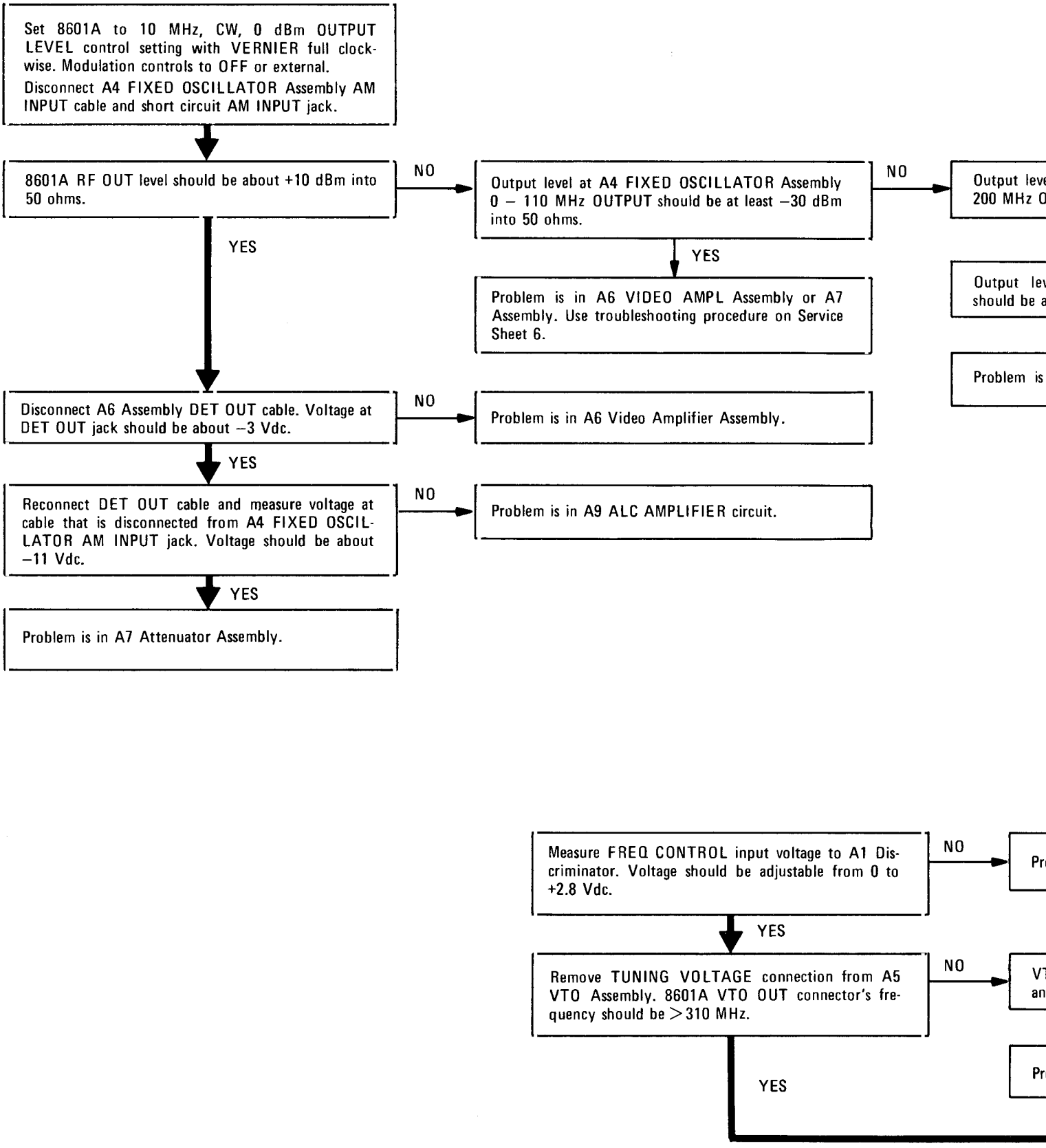
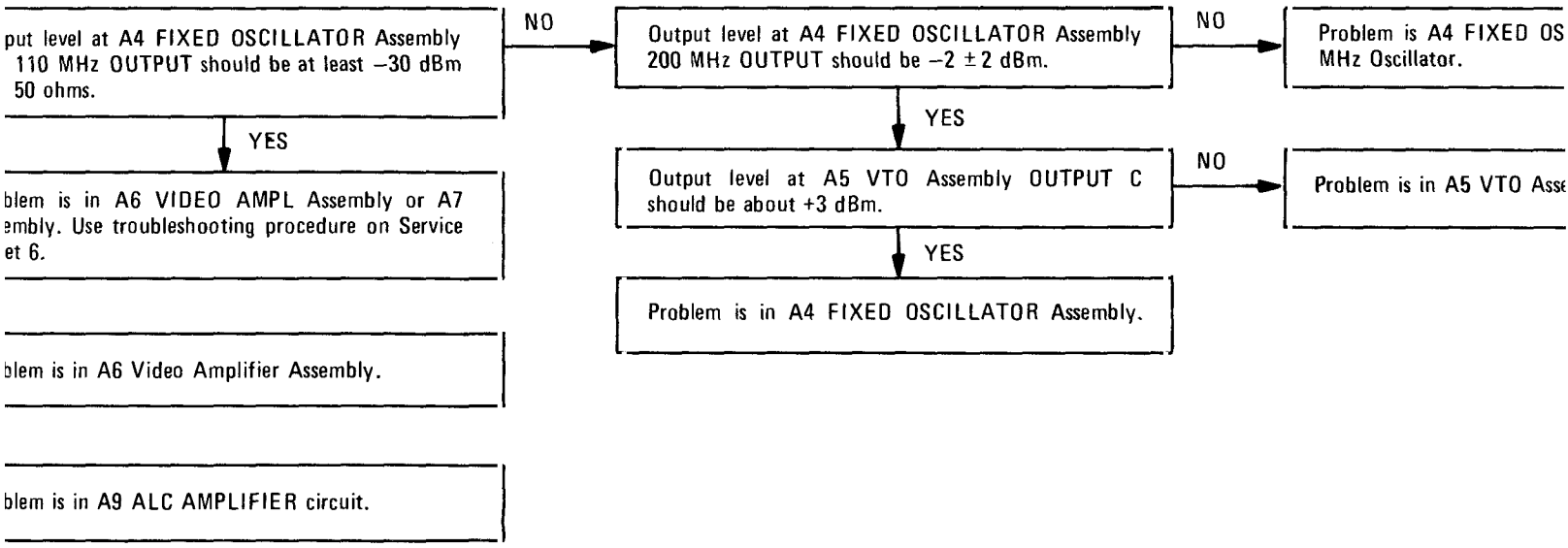


Figure 8-5. Troubleshooting Tree (1 of 2)

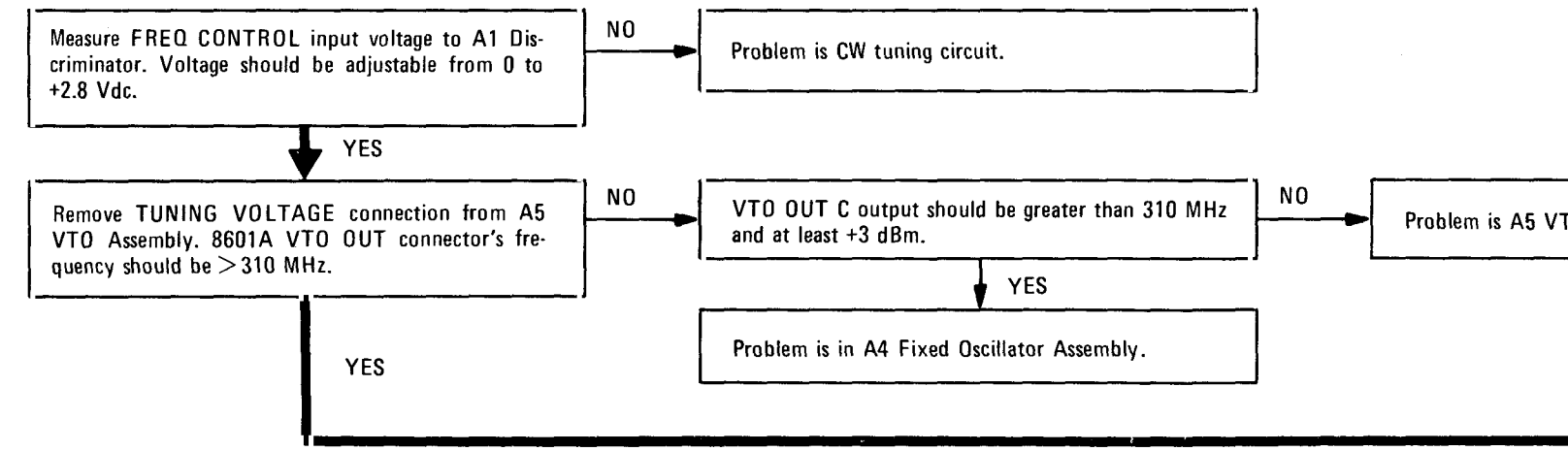


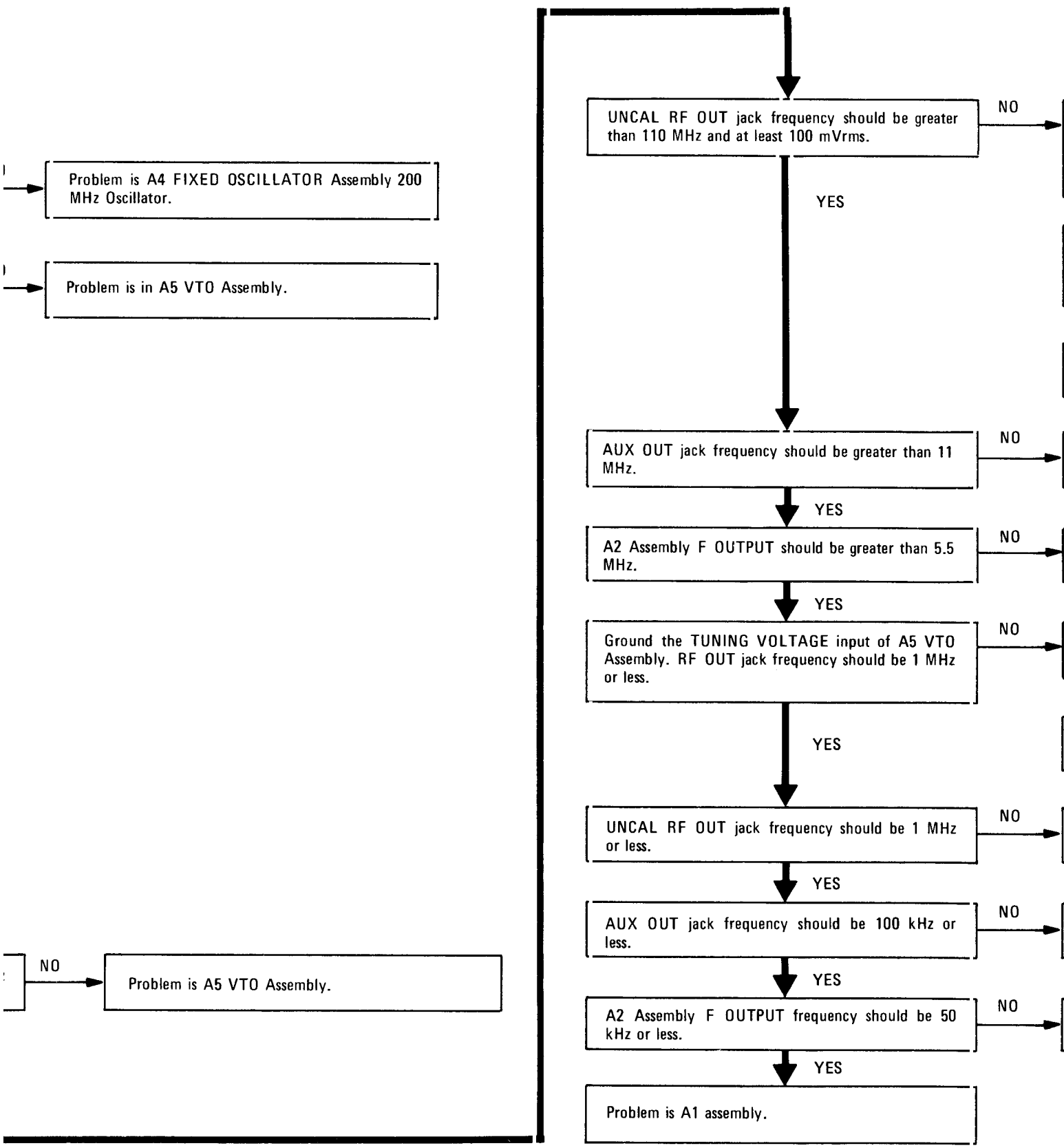
TROUBLESHOOTING
TREE

ALC LOOP TROUBLESHOOTING TREE



AFC LOOP TROUBLESHOOTING TREE




Problem is A4 FIXED OSCILLATOR Assembly 200 MHz Oscillator.
Problem is in A5 VTO Assembly.
NO
Problem is A5 VTO Assembly.
UNCAL RF OUT jack frequency should be greater than 110 MHz and at least 100 mVrms.
NO
YES
AUX OUT jack frequency should be greater than 11 MHz.
NO
YES
A2 Assembly F OUTPUT should be greater than 5.5 MHz.
NO
YES
Ground the TUNING VOLTAGE input of A5 VTO Assembly. RF OUT jack frequency should be 1 MHz or less.
NO
YES
UNCAL RF OUT jack frequency should be 1 MHz or less.
NO
YES
AUX OUT jack frequency should be 100 kHz or less.
NO
YES
A2 Assembly F OUTPUT frequency should be 50 kHz or less.
NO
YES
Problem is A1 assembly.

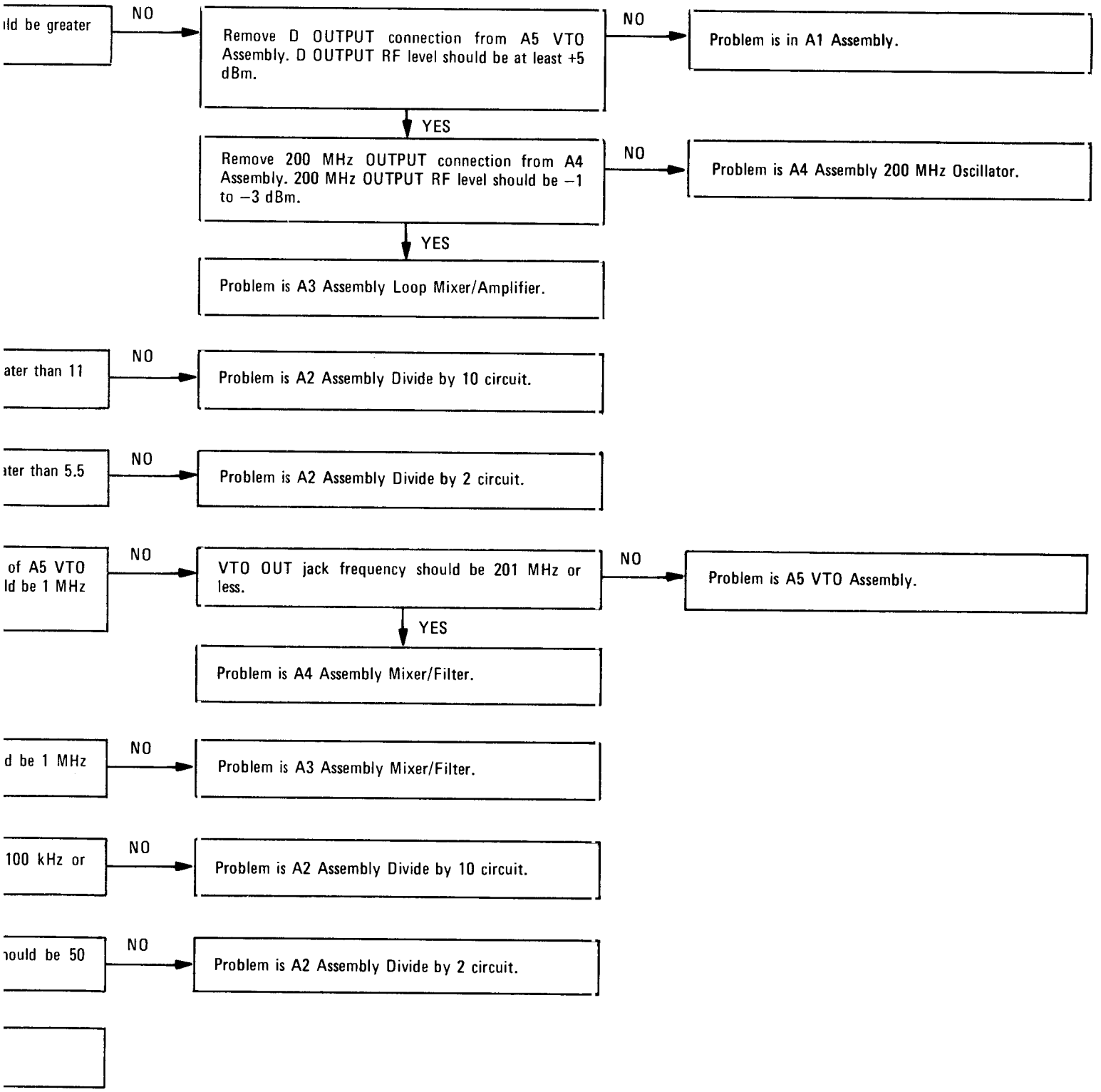


Figure 8-5. Troubleshooting Tree (2 of 2)

SERVICE SHEET 1

Discriminator Operation

The discriminator circuit is a frequency to voltage converter. The input frequency range is about 50 kHz to 5.5 MHz with a corresponding output voltage range of about 0 to +3 Vdc at test point 1. An input signal is amplified by Q11 and the positive peak of this amplified signal triggers one-shot multivibrator Q9/Q10. The one-shot multivibrator output is a positive pulse (pulse width determined by RF network C4/C5/C6/R7) superimposed upon a square wave signal. This positive pulse signal turns off Q8B causing current to flow in Q8A charging C9. After about 60 nsec, pulse width, the current switch returns to its stable state and charging current is removed from C9: C9 then discharges through R13. Thus, voltage developed by C9 and R13 is proportional to the one-shot multivibrator's output pulse width and repetition rate. The width is constant but the repetition rate is determined by discriminator input frequency.

Discriminator Troubleshooting

A common troubleshooting procedure is to inject a 2.5 MHz, 2.5 to 3 volt peak-peak, signal at the input A1J3 (F INPUT) and measure the DC voltage at Q8A collector. The Q8A collector voltage should be +1.2 to 1.3 volts dc.

DC Amplifier Operation

The output frequency of the 8601A must be tunable over a range of about 110 MHz. The discriminator circuit of the 8601A monitors actual output frequency and provides a proportional DC voltage. The DC amplifier circuit, a differential amplifier, compares this DC voltage to a tuning voltage input signal (A1J2) and provides an error (or difference) signal whenever the two voltages do not agree. This error signal is applied to a voltage tunable oscillator that changes the output frequency as necessary to eliminate the error signal. To ensure that this error signal never tunes the voltage tunable oscillator out of (below) its operating range, a search circuit is provided. Whenever the error signal exceeds +500 mV, the search circuit turns on and creates a large error signal causing the VTO frequency to change drastically. The frequency control loop then retunes itself. In high range (110 MHz range) with single frequency operation (CW or MANUAL) capacitor C12 reduces frequency control loop bandwidth and therefore residual FM.

DC Amplifier Troubleshooting

A common troubleshooting procedure is to replace discriminator input to Q5 with a DC power supply voltage of about +1240 millivolts. By setting 8601A controls to CW, 11 range, and 5.0 MHz frequency, the output at A1J1 should be between +750 and +850 millivolts.

NOTE

Output A1J1 should not be open-circuited, it should be connected to the VTO assembly.

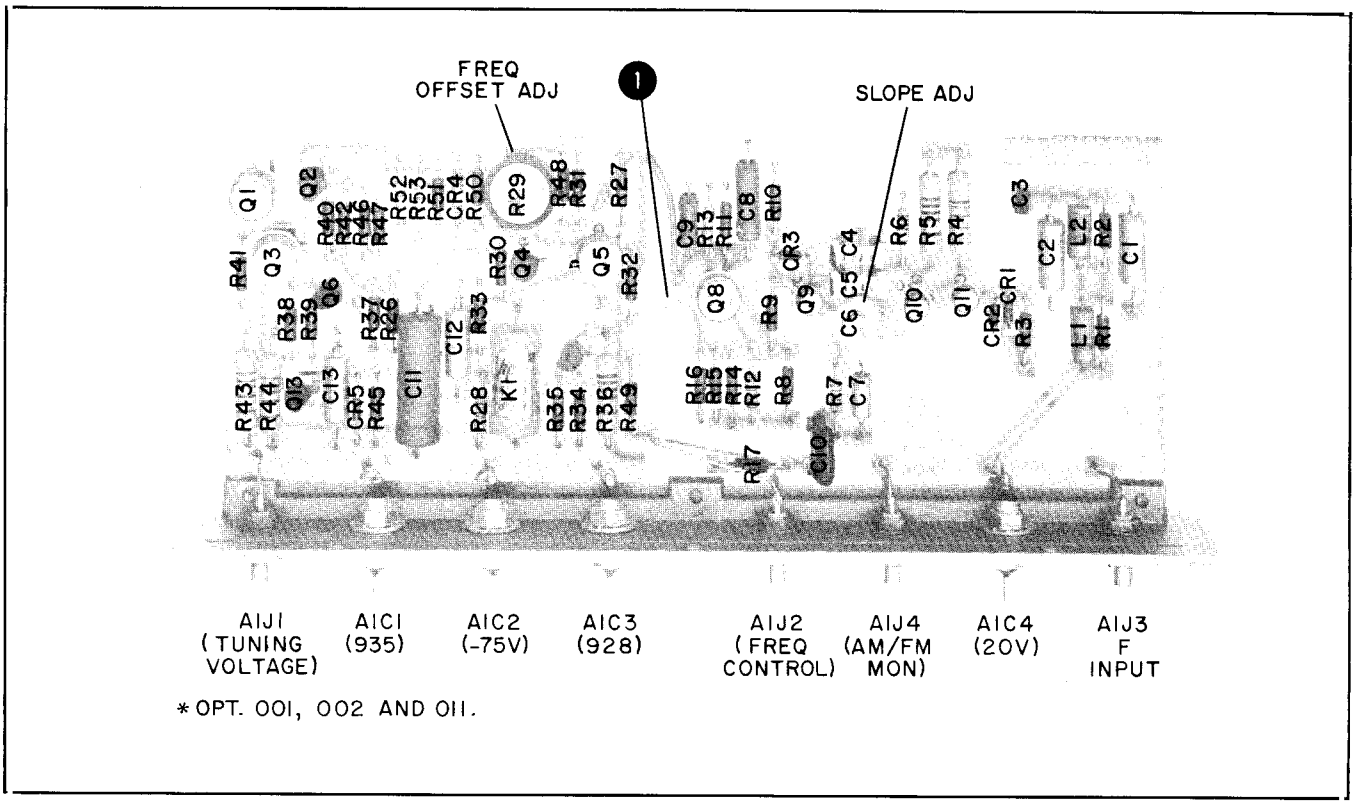
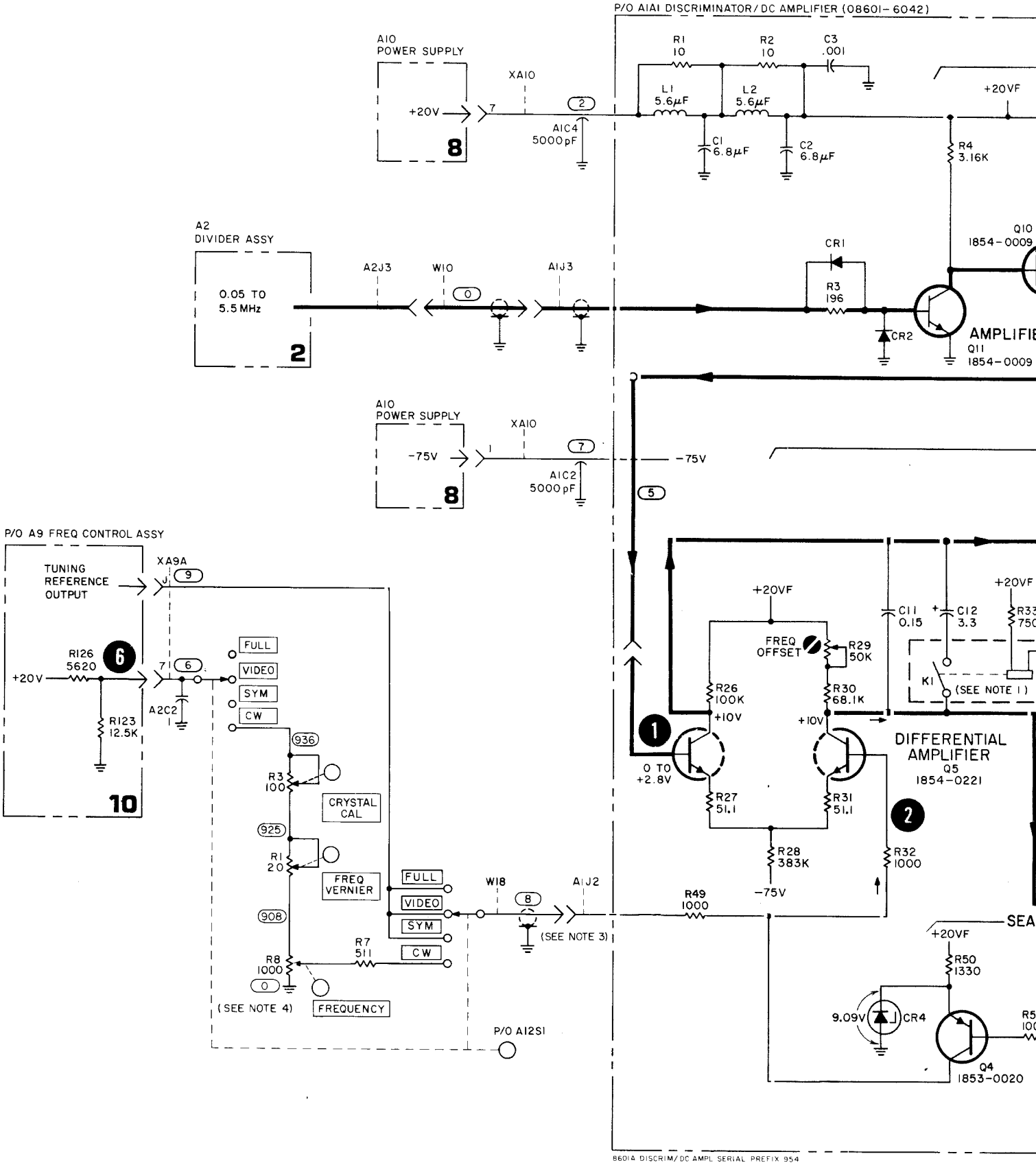


Figure 8-6. A1A1 Discriminator/DC Amplifier, Component Identification


P/O A1A1 DISCRIMINATOR/DC AMPLIFIER (08601-6042)
A10 POWER SUPPLY
+20V
8
XA10
7
2
A1C4 5000pF
R1 10
R2 10
C3 .001
L1 5.6µF
L2 5.6µF
C1 6.8µF
C2 6.8µF
+20VF
R4 3.16K
A2 DIVIDER ASSY
0.05 TO 5.5 MHz
2
A2J3
W10
0
A1J3
CR1
R3 196
CR2
Q10 1854-0009
AMPLIFIE
Q11 1854-0009
A10 POWER SUPPLY
-75V
8
XA10
7
1
A1C2 5000pF
-75V
5
P/O A9 FREQ CONTROL ASSY
TUNING REFERENCE OUTPUT
XA9A
J
9
R126 5620
6
+20V
7
6
A2C2 1
R123 12.5K
10
FULL
VIDEO
SYM
CW
936
R3 100
CRYSTAL CAL
925
R1 20
FREQ VERNIER
908
R8 1000
0
(SEE NOTE 4)
FREQUENCY
R7 511
FULL
VIDEO
SYM
CW
W18
8
A1J2
(SEE NOTE 3)
P/O A12S1
+20VF
FREQ OFFSET
R29 50K
R26 100K
R30 68.1K
+10V
+10V
1
0 TO +2.8V
R27 51.1
R31 51.1
2
R28 383K
R32 1000
-75V
R49 1000
C11 0.15
C12 3.3
K1
(SEE NOTE 1)
DIFFERENTIAL AMPLIFIER
Q5 1854-0221
+20VF
R50 1330
9.09V
CR4
Q4 1853-0020
SEA
8601A DISCRIM/DC AMPL SERIAL PREFIX 954

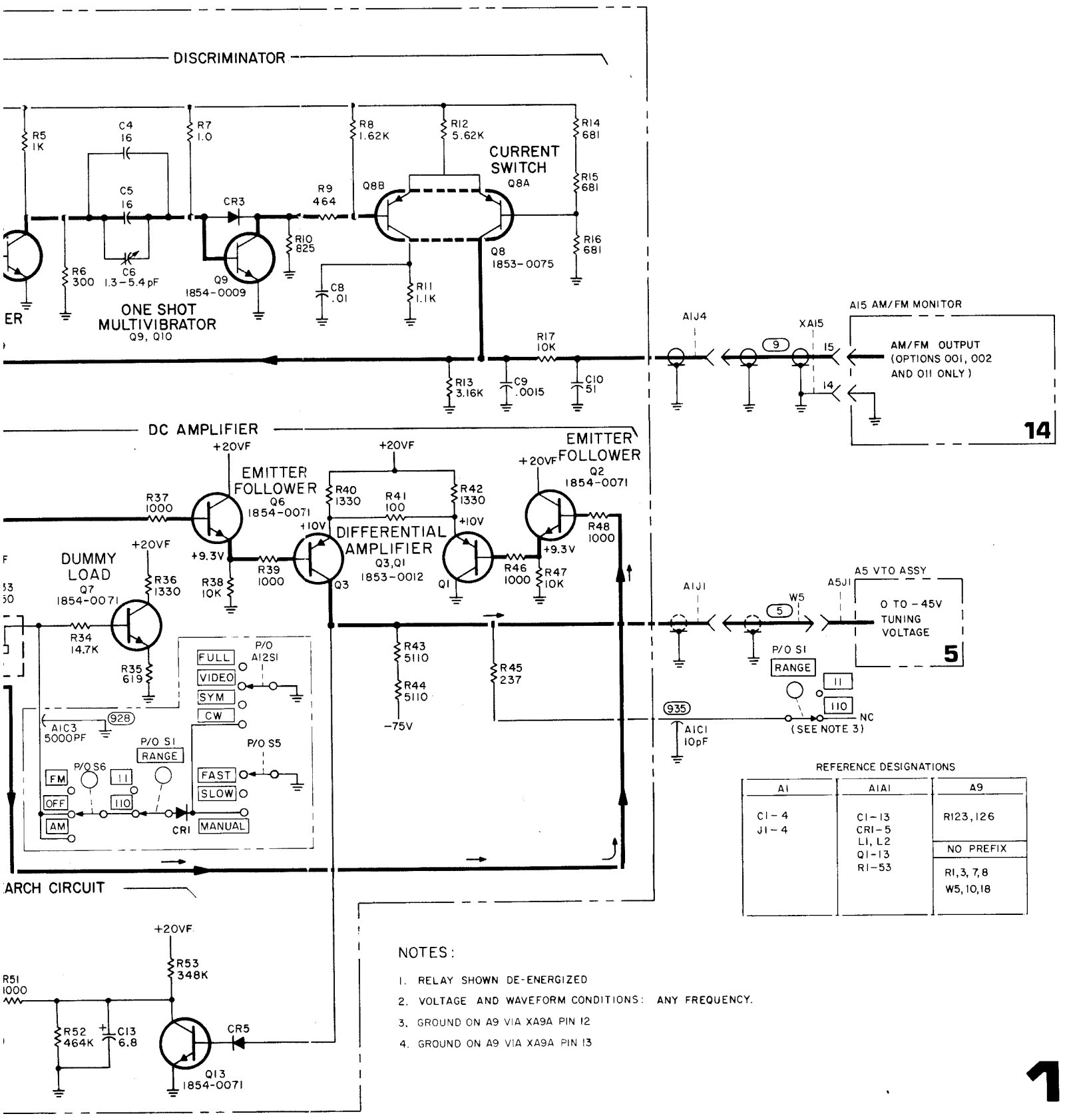


Figure 8-7. A1 Discriminator/DC Amplifier, Schematic Diagram

SERVICE SHEET 2

Operation

The 10:1 divider consists of a 2:1 divider (IC1) and a 5:1 divider (IC2/IC3/IC4). The 5:1 divider includes three two-to-one dividers connected in a ring counter configuration.

The input circuitry consists of two resistors (R1 and R2) and a coil (L5). The coil is used because the resistors have stray capacity that tends to shunt high frequency inputs (100 MHz or so) and cause the 10:1 divider input signal level to be too low. To eliminate this shunting, the coil (L5) was added.

NOTE

Adding this coil to older instruments can eliminate most high frequency-end divider problems.

Troubleshooting

To troubleshoot divider IC1, set 8601A to 110 RANGE and inject a low frequency signal (1 MHz or greater at a level of about 600 to 800 millivolts peak-peak) at A2J1. The output signal at IC1 (pin 2) should be frequency divided by two.

To troubleshoot dividers IC2, IC3 and IC4, remove IC3 and IC4 from circuit board and set 8601A to 110 RANGE. Inject low frequency signal through IC1 as above through A2J1 connector. The signal frequency at IC2 (pin 1) should be half the signal frequency at IC2 (pin 6). Remove IC2 and place IC3 in the IC2 socket, then repeat procedure. To troubleshoot IC4, repeat procedure.

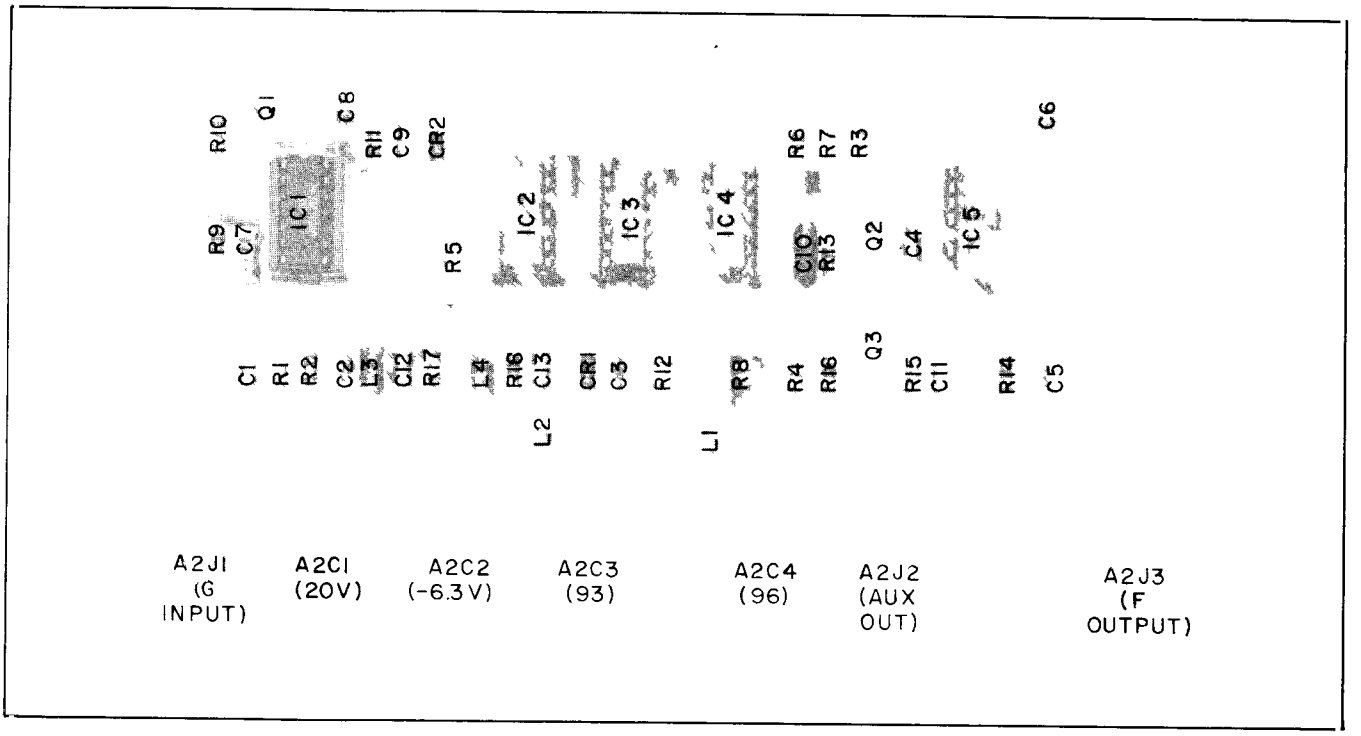


Figure 8-8. A2 Divider/Divider Bypass, Component Identification (Serial Prefixed 912- thru 945-)

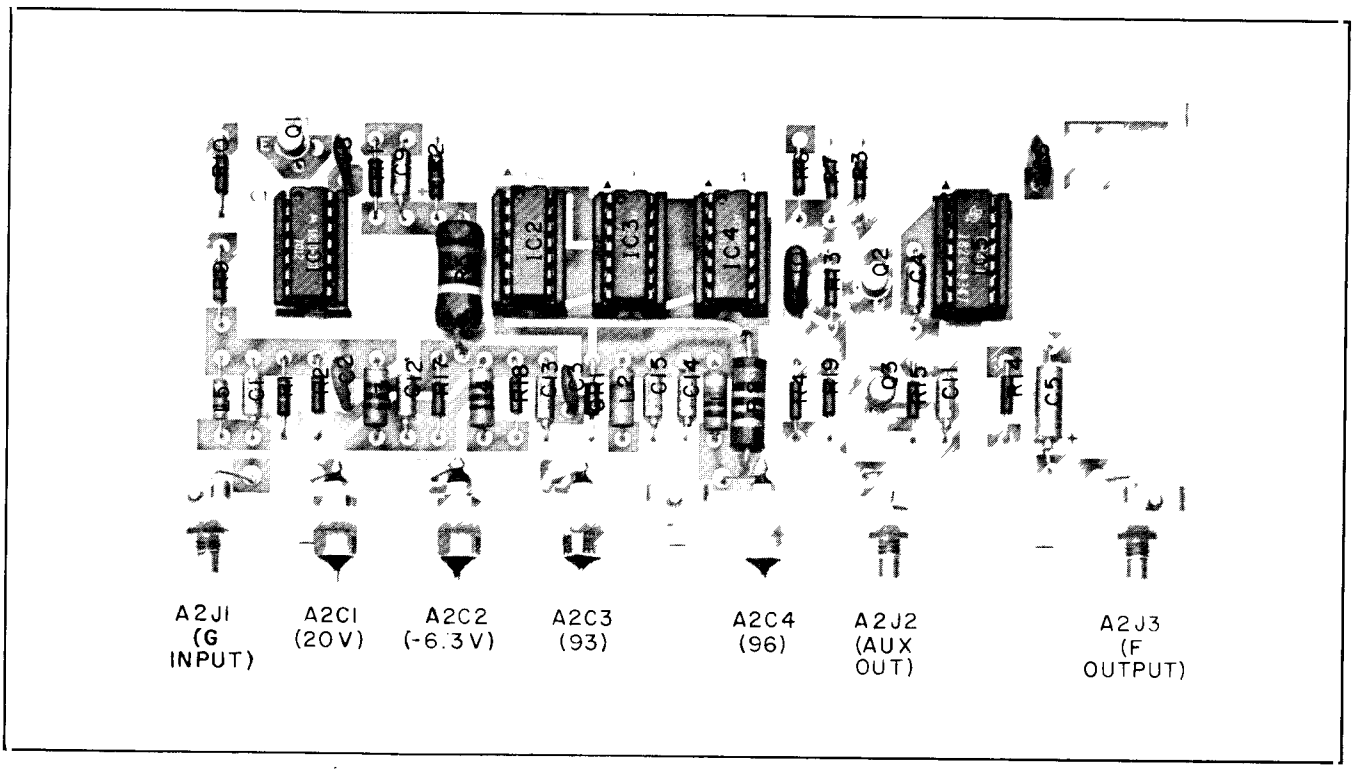
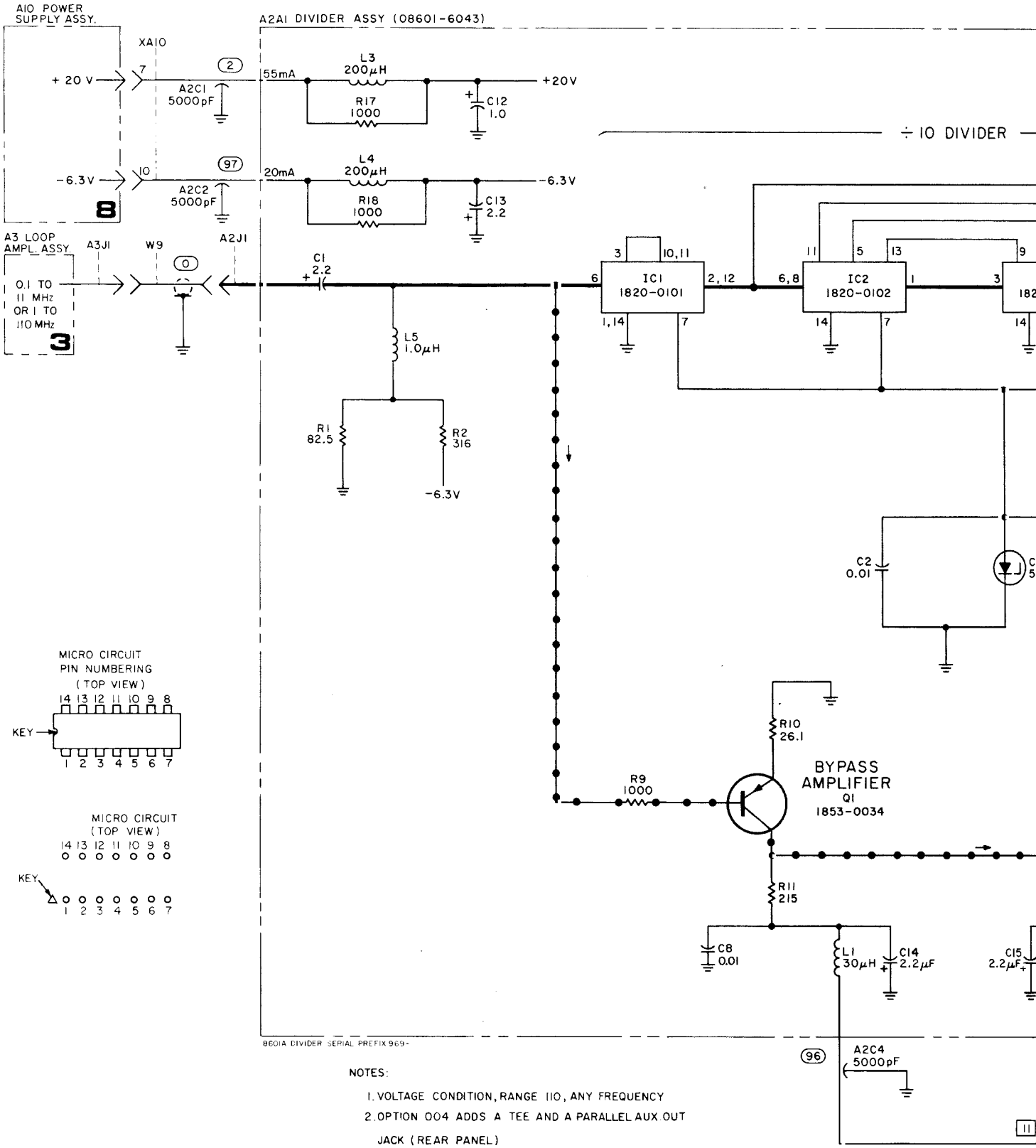
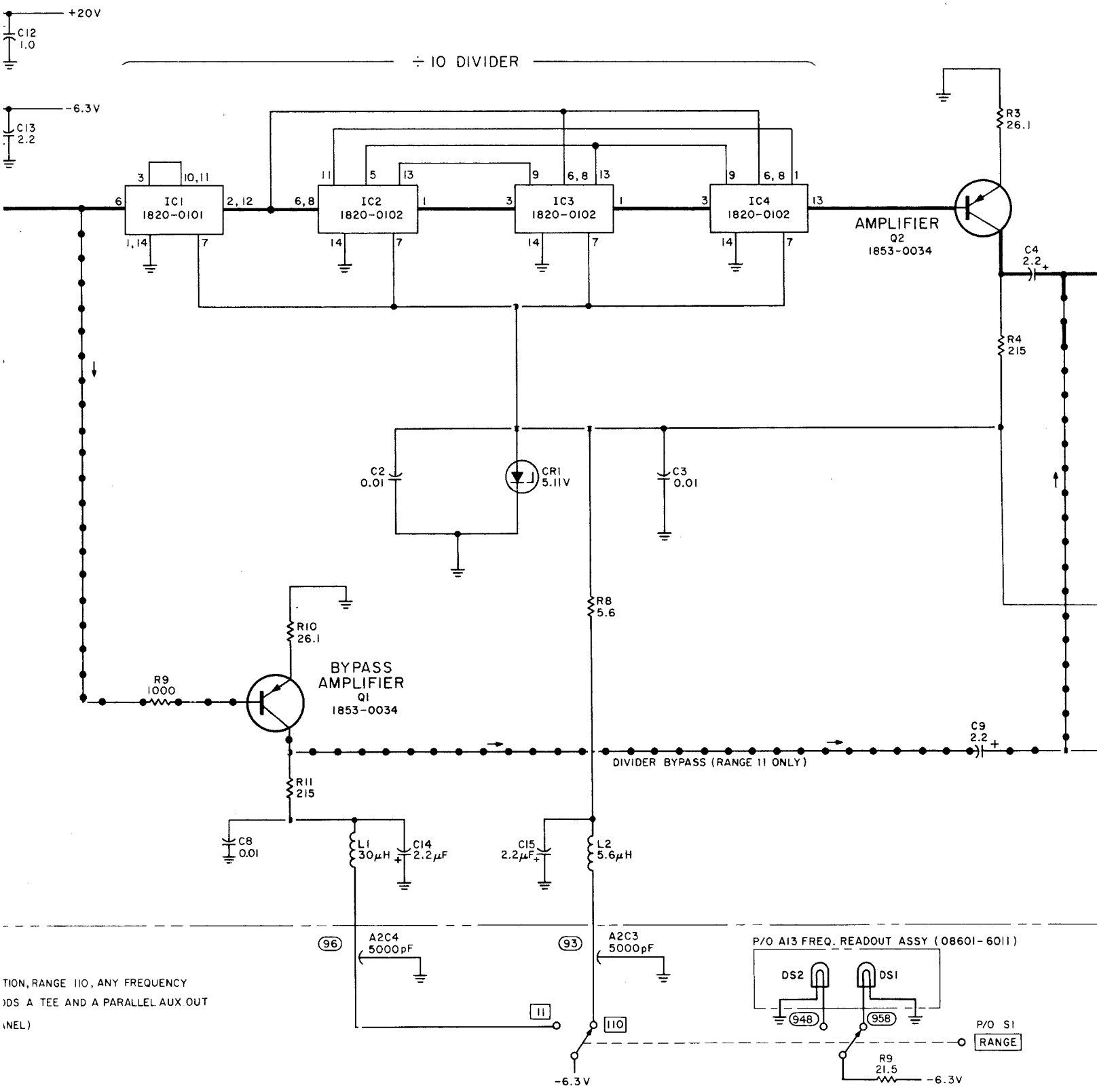


Figure 8-9. A2 Divider/Divider Bypass. Component Identification (Serial Prefixed 954- and Above)



NOTES:

1. VOLTAGE CONDITION, RANGE 110, ANY FREQUENCY
2. OPTION 004 ADDS A TEE AND A PARALLEL AUX OUT JACK (REAR PANEL)



TION, RANGE 110, ANY FREQUENCY
)DS A TEE AND A PARALLEL AUX OUT
ANEL)

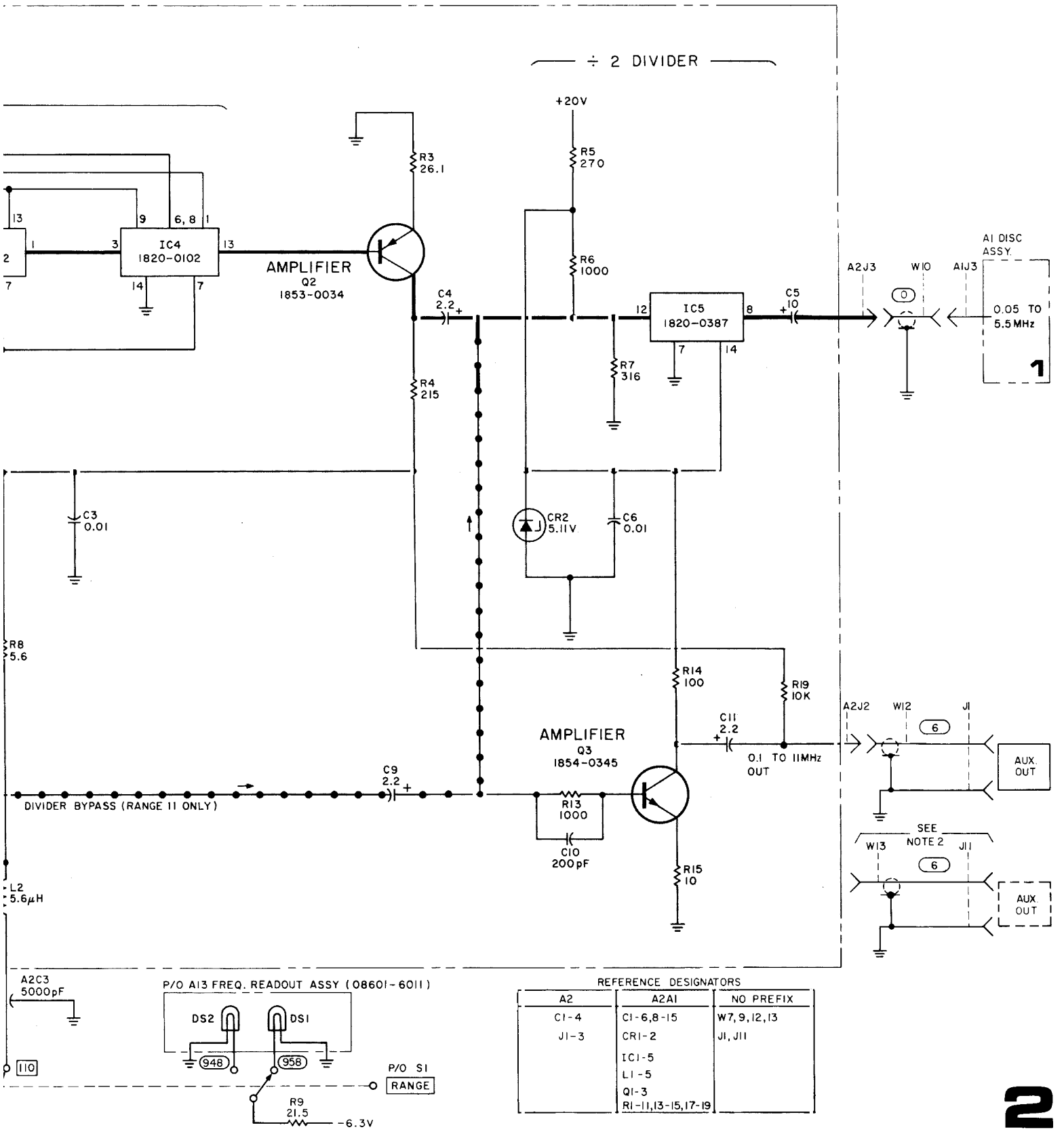


Figure 8-10. A2 Divider/Divider Bypass, Schematic Diagram

SERVICE SHEET 3

Loop Amplifier Operation

The loop amplifier is a high gain (about 30 dB) wide band (0.1 to 118 MHz) amplifier. The function of importance is that the output (A3J1) should be about 0 dBm across the entire operating frequency range. To increase the gain slightly, if necessary, resistors R2 and R3 may be selected to provide an output of +2 dBm or greater at a frequency of about 118 MHz.

Loop Amplifier Troubleshooting

The loop amplifier and the preamplifier (A6E1) are nearly identical units. Therefore, the loop amplifier can be tested by using the preamplifier unit in its place.

5 MHz Marker Generator/Active Filter Operation

The 5 MHz marker generator circuit consists of a 5 MHz oscillator and a hot carrier diode (CR2). The hot carrier diode generates harmonics of the 5 MHz signal applied to it. These harmonics mix with a sample of the RF signal applied to the diode (CR2). The mixed signal frequencies are applied to amplifier Q3, a field effect transistor with high input impedance, which acts as a buffer to prevent loading the mixer output. The active filter consists of resistors R20/R21/R22 and capacitors C24/C25. Also, high gain amplifier Q4 which provides feedback to increase filter roll off. The result is an output signal about 16 kHz wide at 5 MHz intervals across the band. Each of these 16 kHz wide signals has a notch signal at the center point corresponding to the 5 MHz point. This output signal is amplified by transistor Q5. The positive portion of the signal is shunted by CR3 while the negative portion is passed by CR4. The negative signal, with a positive going notch at center, is applied to the ALC amplifier causing a dip in output power on each side of the notch signal which corresponds to a multiple of 5 MHz.

NOTE

If the level of rf signal from Q2 (through R15 and C21) is too high, some marker signals may occur at 2.5 MHz intervals. To minimize or eliminate the undesired markers, the rf signal level can be decreased with R15 and C21. Increase C21 capacity for low rf problem, increase this resistance for wide band rf problem.

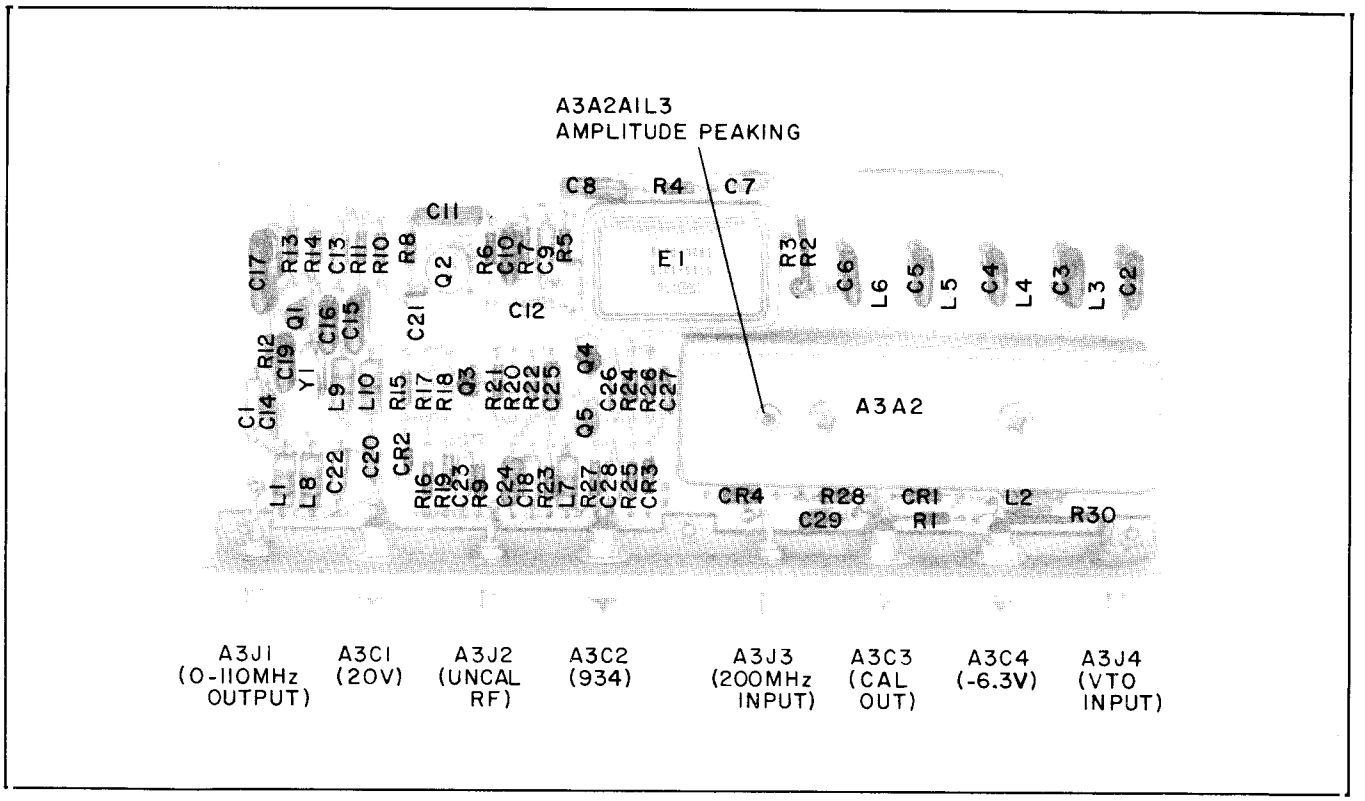


Figure 8-11. A3A1 Loop Amplifier/Crystal Calibrator, Component Identification

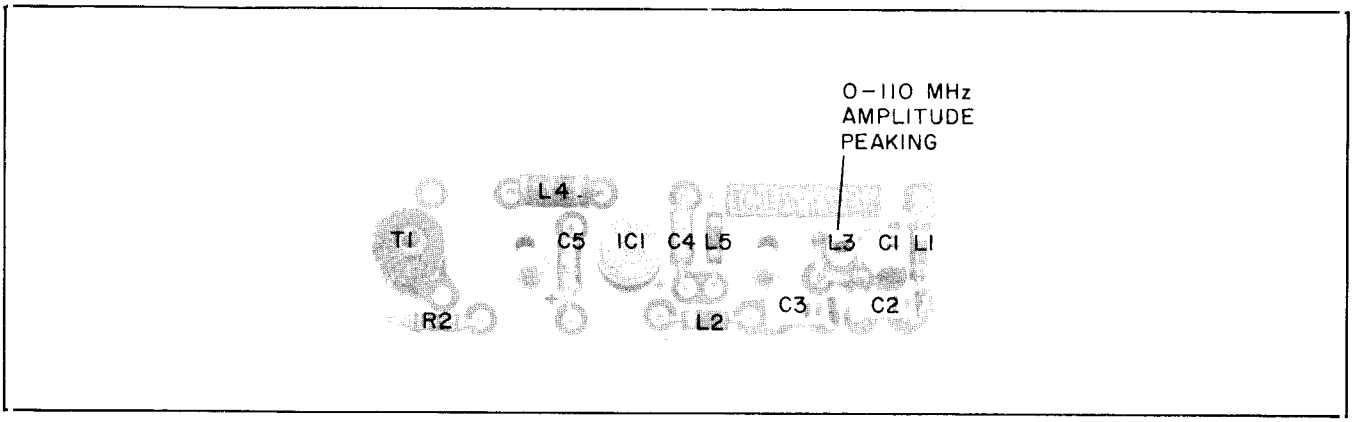
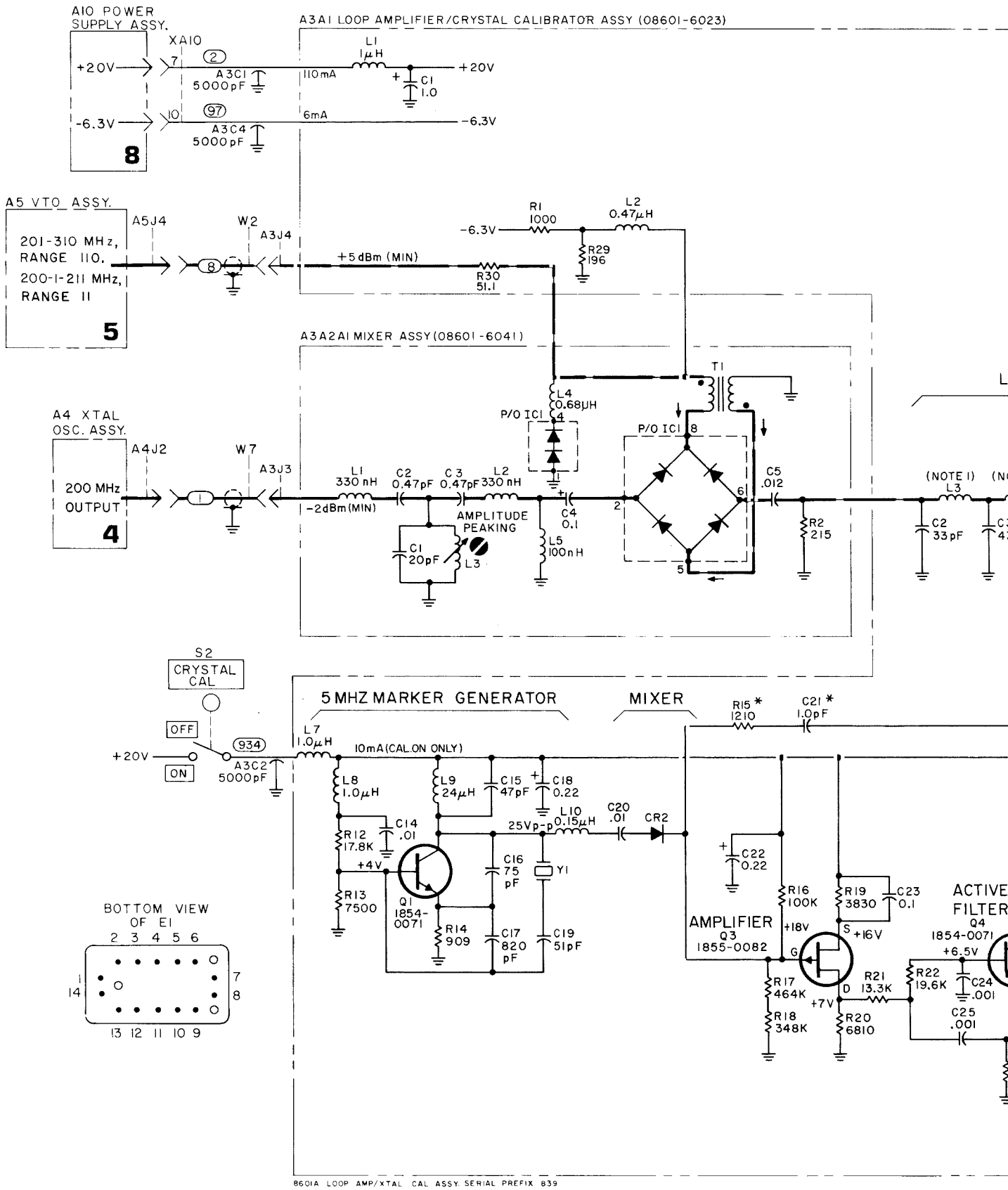
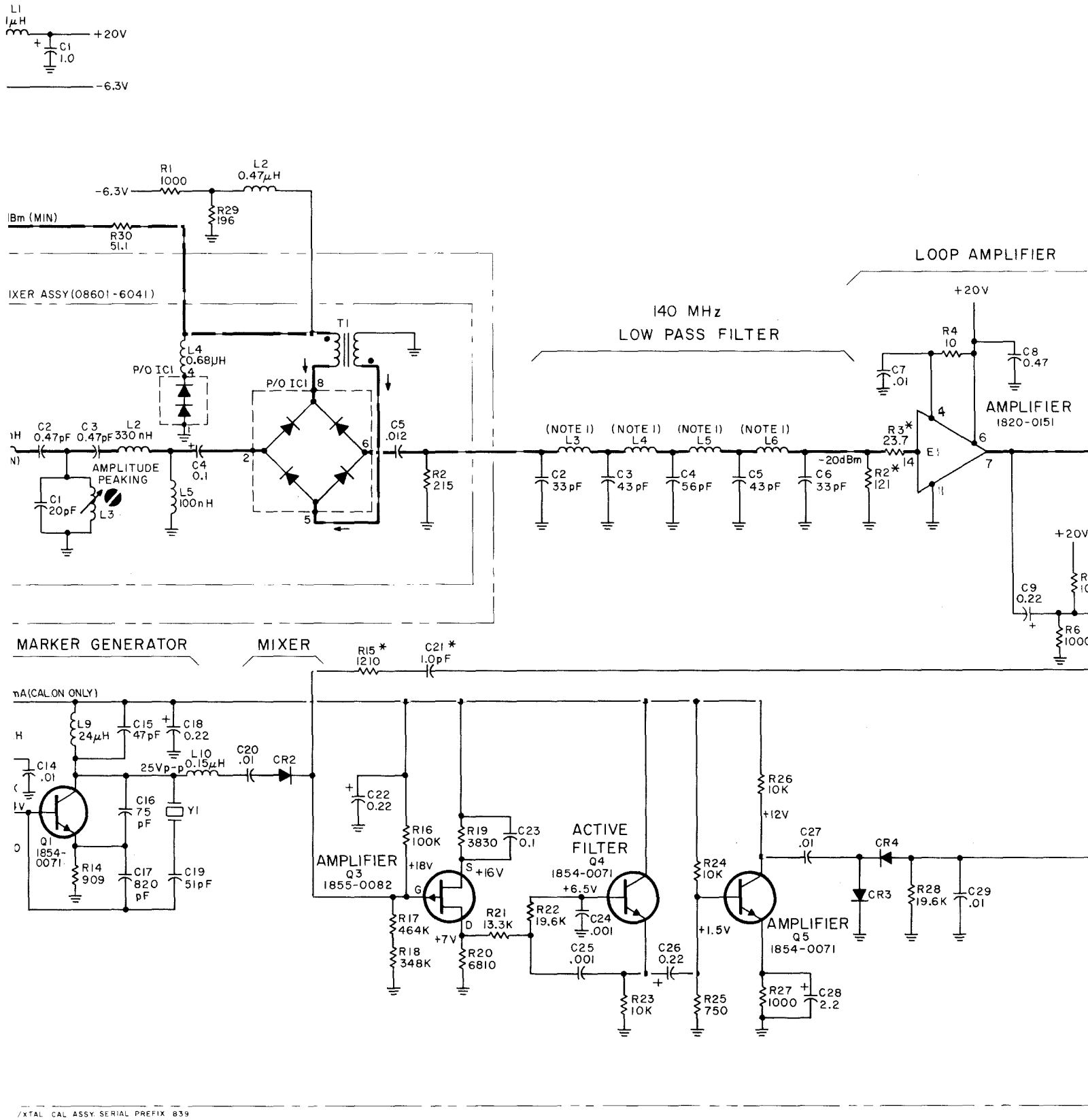


Figure 8-12. A3A1A1 Mixer, Component Identification


A10 POWER SUPPLY ASSY.
+20V
-6.3V
8
XA10
A3C1 5000pF
A3C4 5000pF
110mA
6mA
L1 1μH
C1 1.0
+20V
-6.3V
A3A1 LOOP AMPLIFIER/CRYSTAL CALIBRATOR ASSY (08601-6023)
A5 VTO ASSY.
201-310 MHz, RANGE 110.
200-1-211 MHz, RANGE 11
5
A5J4
W2
A3J4
+5dBm (MIN)
R30 51.1
R1 1000
L2 0.47μH
R29 196
A3A2A1 MIXER ASSY(08601-6041)
T1
L4 0.68μH
P/O IC1
A4 XTAL OSC. ASSY.
200 MHz OUTPUT
4
A4J2
W7
A3J3
-2dBm(MIN)
L1 330 nH
C2 0.47pF
C3 0.47pF
L2 330 nH
C4 0.1
C1 20pF
L3
AMPLITUDE PEAKING
L5 100nH
C5 .012
R2 215
(NOTE 1)
L3
C2 33pF
S2
CRYSTAL CAL
OFF
ON
+20V
934
A3C2 5000pF
5 MHZ MARKER GENERATOR
MIXER
L7 1.0μH
10mA(CAL ON ONLY)
L8 1.0μH
L9 24μH
C15 47pF
C18 0.22
C14 .01
R12 17.8K
+4V
R13 7500
Q1 1854-0071
R14 909
C16 75 pF
C17 820 pF
Y1
C19 51pF
L10 0.15μH
25Vp-p
C20 .01
CR2
R15* 1210
C21* 1.0pF
C22 0.22
AMPLIFIER
Q3 1855-0082
R16 100K
+18V
R19 3830
C23 0.1
+16V
R17 464K
R18 348K
+7V
R21 13.3K
R20 6810
ACTIVE FILTER
Q4 1854-0071
+6.5V
R22 19.6K
C24 .001
C25 .001
BOTTOM VIEW OF E1
2 3 4 5 6
1 14 7 8
13 12 11 10 9
8601A LOOP AMP/XTAL CAL ASSY. SERIAL PREFIX 839


L1
1μH
+20V
C1
1.0
-6.3V
R1
1000
L2
0.47μH
-6.3V
R29
196
dBm (MIN)
R30
51.1
IXER ASSY (08601-6041)
T1
L4
0.68μH
P/O IC1
P/O IC1
C2
0.47pF
C3
0.47pF
L2
330 nH
C4
0.1
AMPLITUDE
PEAKING
C1
20pF
L3
L5
100nH
C5
.012
R2
215
140 MHz
LOW PASS FILTER
(NOTE 1)
L3
(NOTE 1)
L4
(NOTE 1)
L5
(NOTE 1)
L6
C2
33pF
C3
43pF
C4
56pF
C5
43pF
C6
33pF
-20dBm
R2*
121
R3*
23.7
LOOP AMPLIFIER
+20V
R4
10
C7
.01
C8
0.47
AMPLIFIER
1820-0151
C9
0.22
+20V
R6
1000
MARKER GENERATOR
MIXER
R15*
1210
C21*
1.0pF
mA(CAL ON ONLY)
L9
24μH
C15
47pF
C18
0.22
C14
.01
L10
0.15μH
25Vp-p
C20
.01
CR2
C16
75
pF
Y1
Q1
1854-
0071
C17
820
pF
C19
51pF
R14
909
C22
0.22
AMPLIFIER
Q3
1855-0082
R16
100K
R19
3830
C23
0.1
+18V
+16V
R17
464K
R18
348K
+7V
R21
13.3K
R20
6810
ACTIVE
FILTER
Q4
1854-0071
+6.5V
R22
19.6K
C24
.001
C25
.001
C26
0.22
R23
10K
R24
10K
+1.5V
R25
750
R26
10K
+12V
C27
.01
CR4
CR3
R28
19.6K
C29
.01
AMPLIFIER
Q5
1854-0071
R27
1000
C28
2.2

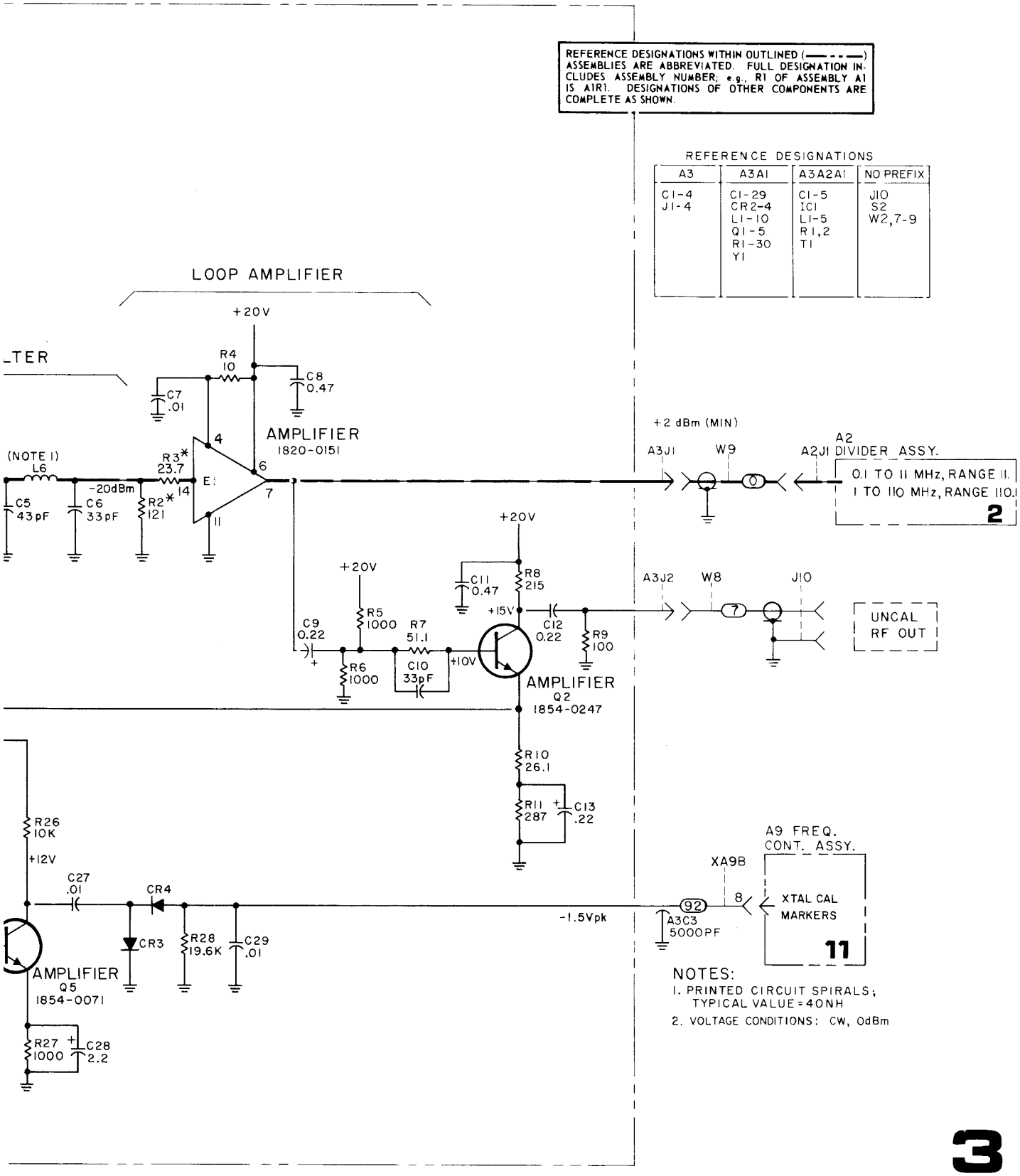


Figure 8-13. A3 Loop Amplifier/Crystal Calibrator, Mixer, Schematic Diagram

SERVICE SHEET 4

Operation

The 200 MHz crystal oscillator is a common base amplifier with positive feedback. The oscillation frequency is determined by resonant circuit C6/C7/L5/Y1: Isolation amplifier Q6 provides a 200 MHz output to the A3 assembly of the frequency control loop. Amplifiers Q1/Q3 provide a signal output to the main output amplifier, A6 assembly, through the mixer board. This main signal output level can be amplitude modulated and/or level controlled by the ALC loop control signal applied to Q5. The control signal, DC voltage with about a −4 to −5 volt range, controls the gain of amplifiers Q1/Q3 by controlling the current flow through Q5 (a −5 volt signal to Q5 will decrease the gain of amplifiers Q1/Q3 by about 35 dB).

NOTE

A −1.2 volt DC signal to Q5 should cause about a −40 dBm output from the low pass filter assembly; −4.4 volt DC signal should result in about a −50 dBm low pass filter assembly output.

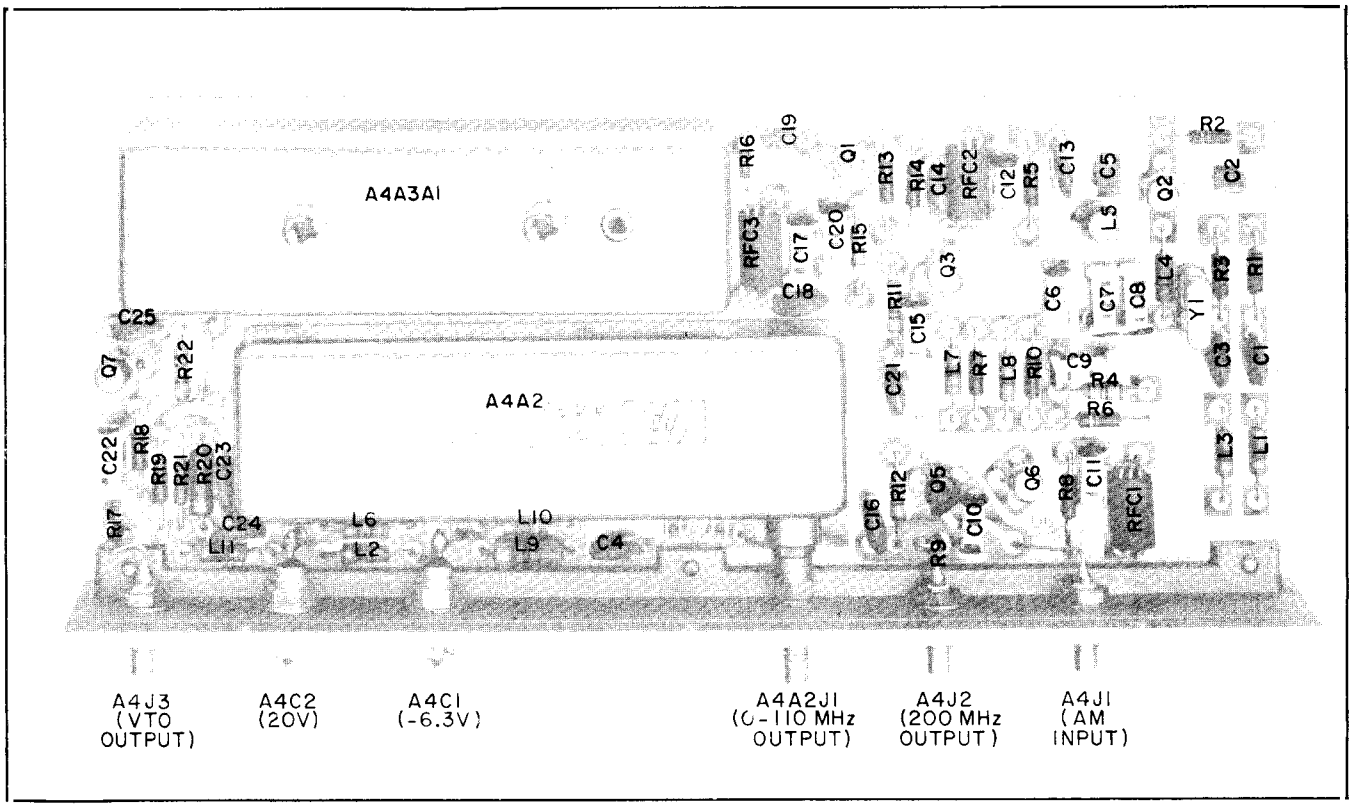


Figure 8-14. A4A1 Crystal Oscillator, Component Identification

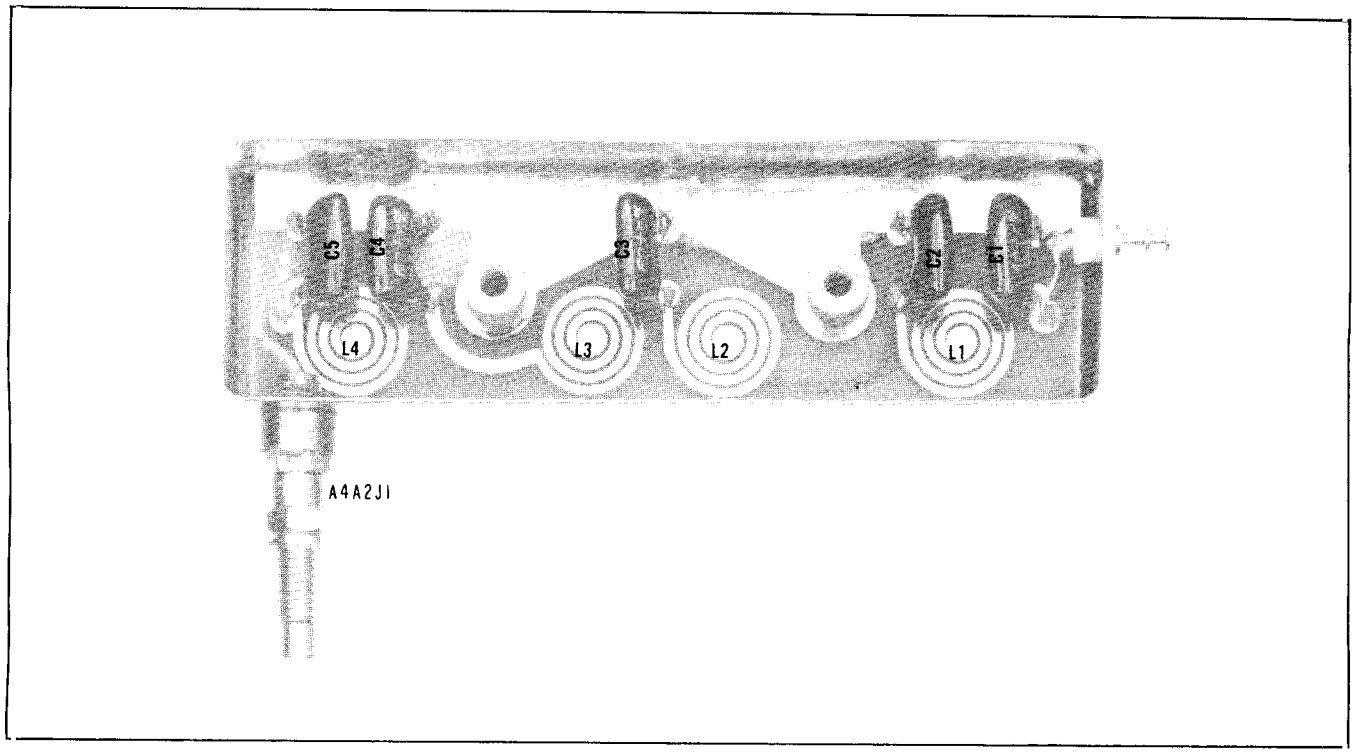


Figure 8-15. A4A2A1 Low Pass Filter, Component Identification

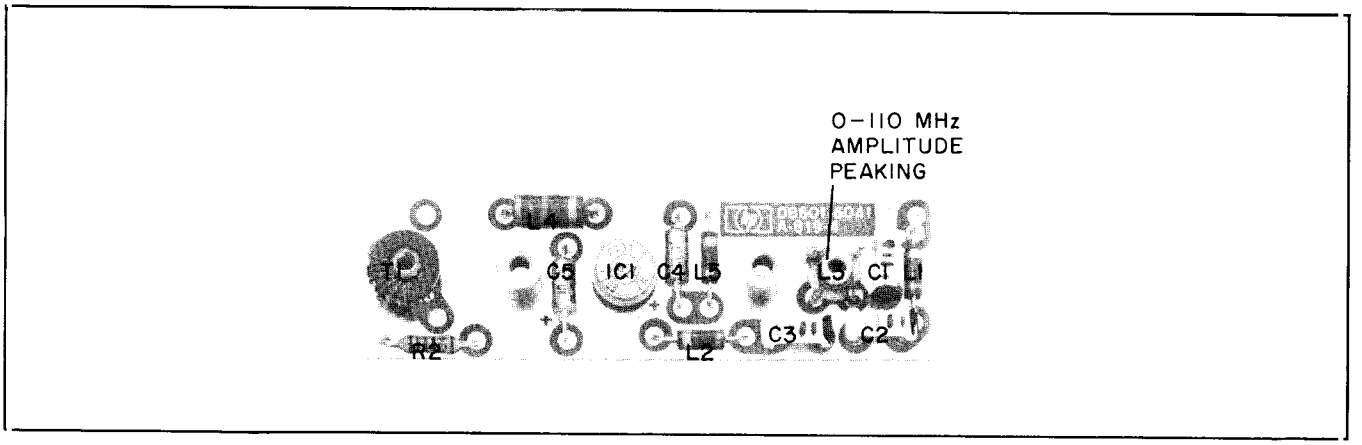
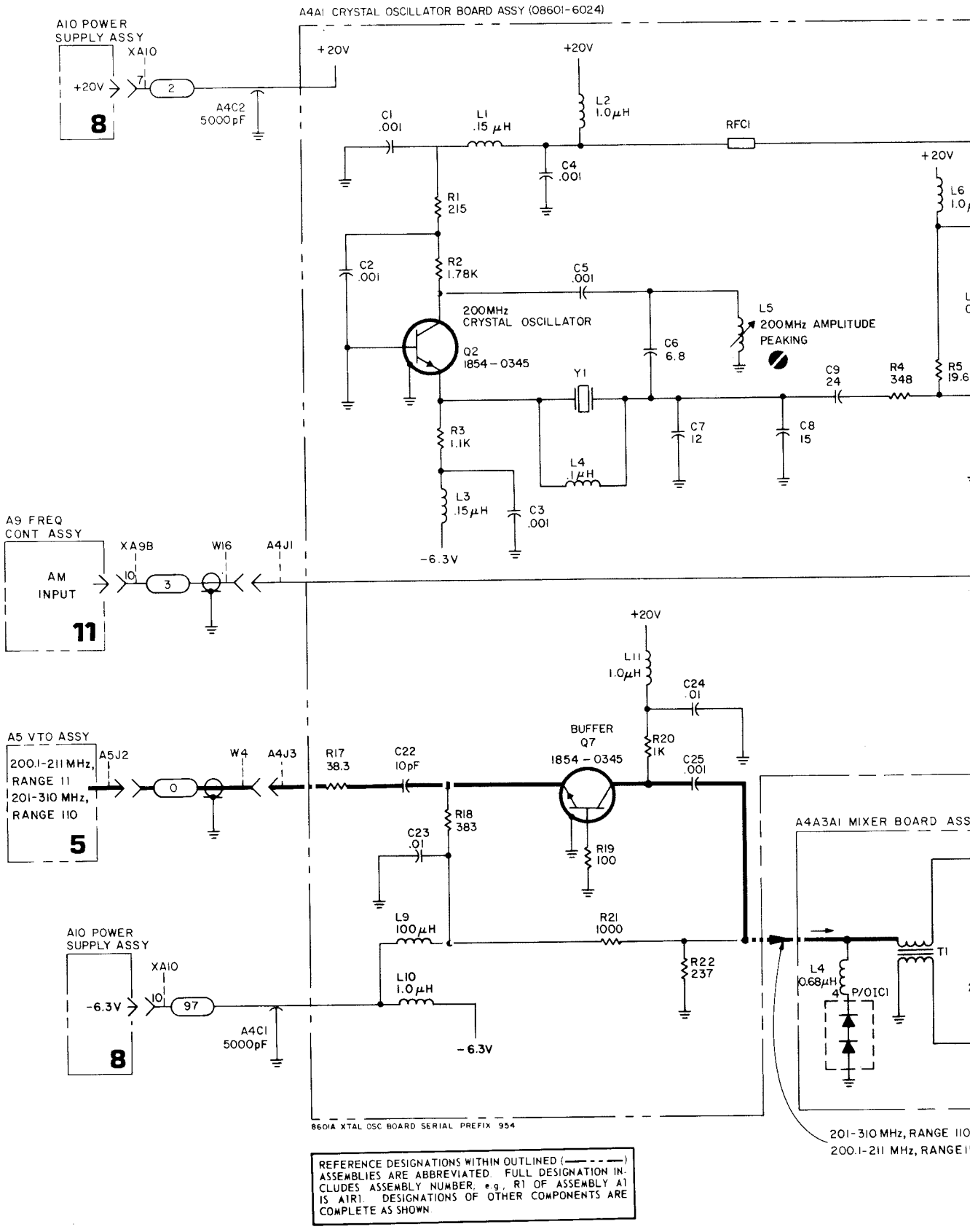
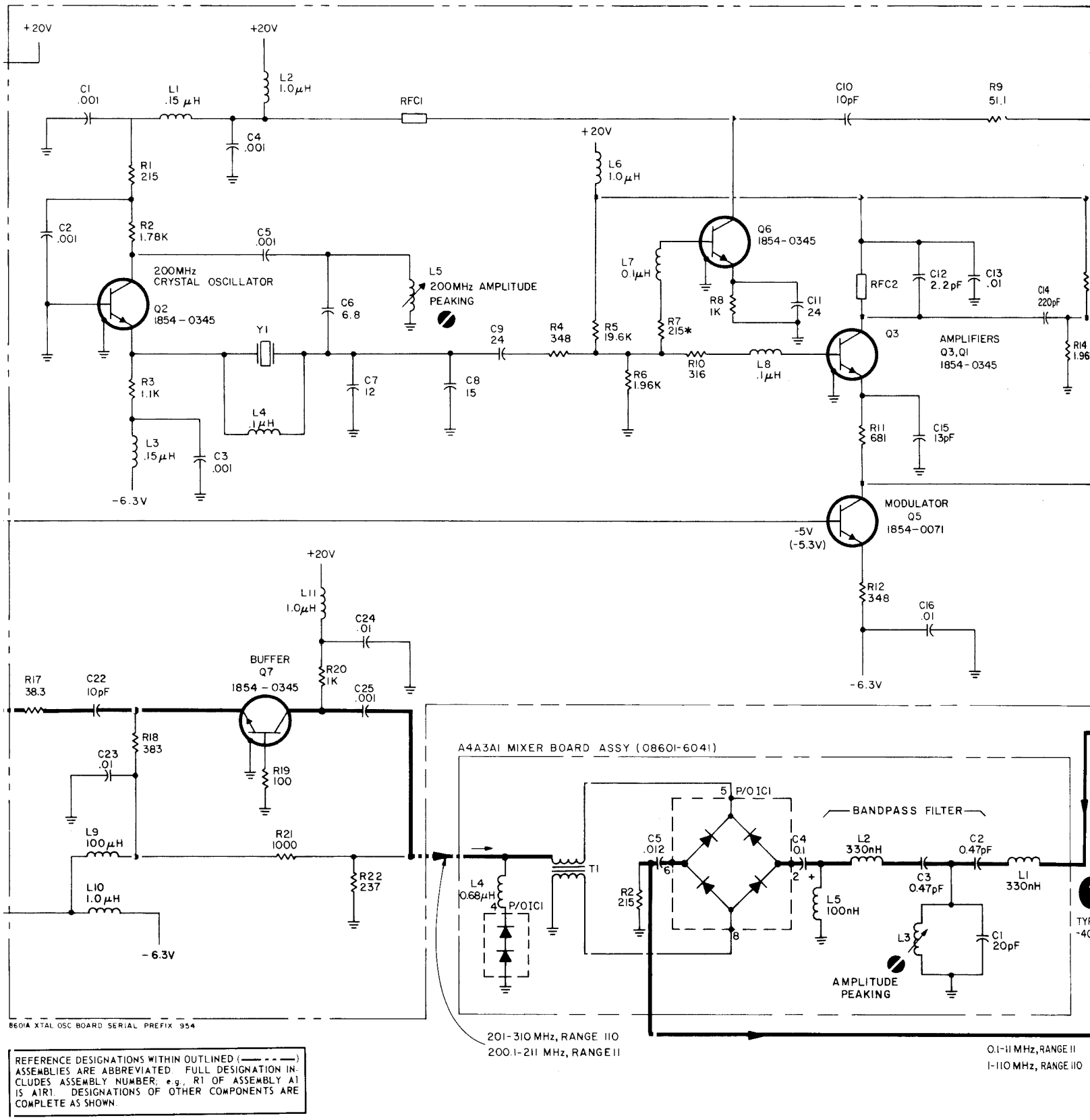


Figure 8-16. A4A3A1 Mixer, Component Identification



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.

A4A1 CRYSTAL OSCILLATOR BOARD ASSY (08601-6024)



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.

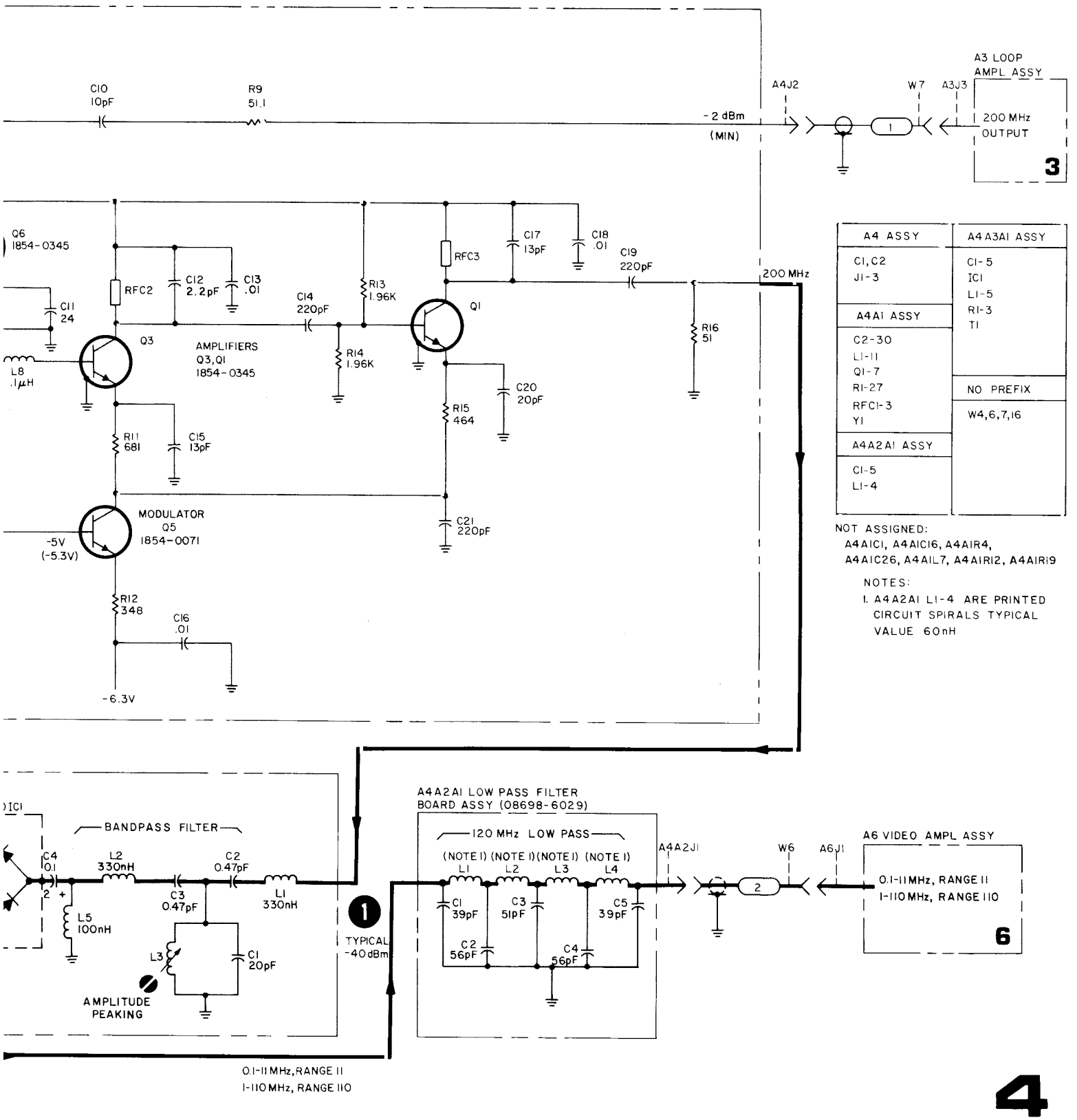


Figure 8-17. A4 Crystal Oscillator/Mixer, Low Pass Filter, Schematic Diagram

SERVICE SHEET 5

Shaping Network Operation

R1 — R8, CR1 — CR3 and Q9 form a shaping network that improves tuning linearity of the VTO.

Dummy Load Operation

Dummy load Q8 improves the +20V power supply regulation by ensuring that the same current is drawn when K1 if on or off. When K1 is on, Q8 is cut off by a ground on its base. When K1 is off, Q8 turns on and draws approximately the same current.

Voltage Tuned Oscillator Operation

L2 and L3 form the frequency determining network for the VTO. The network exhibits a 180 degree phase shift at the resonant frequency; Q7 and Q6 each provide 270 degrees of phase shift, thus providing the feedback to sustain oscillation. The tuning voltage input varies the capacitance of varactor CR5 and tunes the VTO from 200.1 to 211 MHz (RANGE 11) or from 201 to 310 MHz (RANGE 110).

Z-Match Circuit Operation

C7 and the emitter base junction of Q5 form a resonant circuit that develops the VTO output. The large amount of circulating current produces a strong output signal to amplifier Q4.

VTO Amplifier Operation

Amplifier Q3 and Q4 amplifies the VTO output. Q3 also provides a high output impedance for VTO output "C" (A5J2). Q1 and Q2 isolate the "C" and "D" VTO outputs. R34 and R35 attenuate the output of Q3 by approximately 6 dB. Q1 also provides a high output impedance for VTO OUTPUT "D" (A5J4).

Troubleshooting A5 VTO Assembly

1. A5 VTO assembly should be installed properly in 8601A.

2. Disconnect cable W5 from A5J2 (TUNING VOLTAGE INPUT) and cable W4 from A5J4 (VTO OUTPUT C). Frequency at A5J2 should be >310 MHz. If not, trouble is in shaping network or voltage tuned oscillator circuitry.

3. Connect subminiature 50 ohm termination to A5J1. Frequency at A5J2 should be <201 MHz. If not, trouble is in shaping network or voltage tuned oscillator circuitry.

4. Power output at A5J2 should be >+3 dBm. If not, trouble is in amplifier A5Q3/A5Q4.

5. Reconnect cable W4 to A5J2. Disconnect cable W2 from A5J4 (VTO OUTPUT D). Connect subminiature (SMC) tee (HP Part No. 1250-0838) to A5J4 and reconnect cable W2. Power output at A5J4 should be >+3 dBm. If not, trouble is in amplifier A5Q1/A5Q2 circuit.

6. Power output at 8601A rear panel VTO jack should be a minimum of —15 dBm. If not, trouble is in A5R33/A5C15.

7. A5 VTO assembly checks out ok.

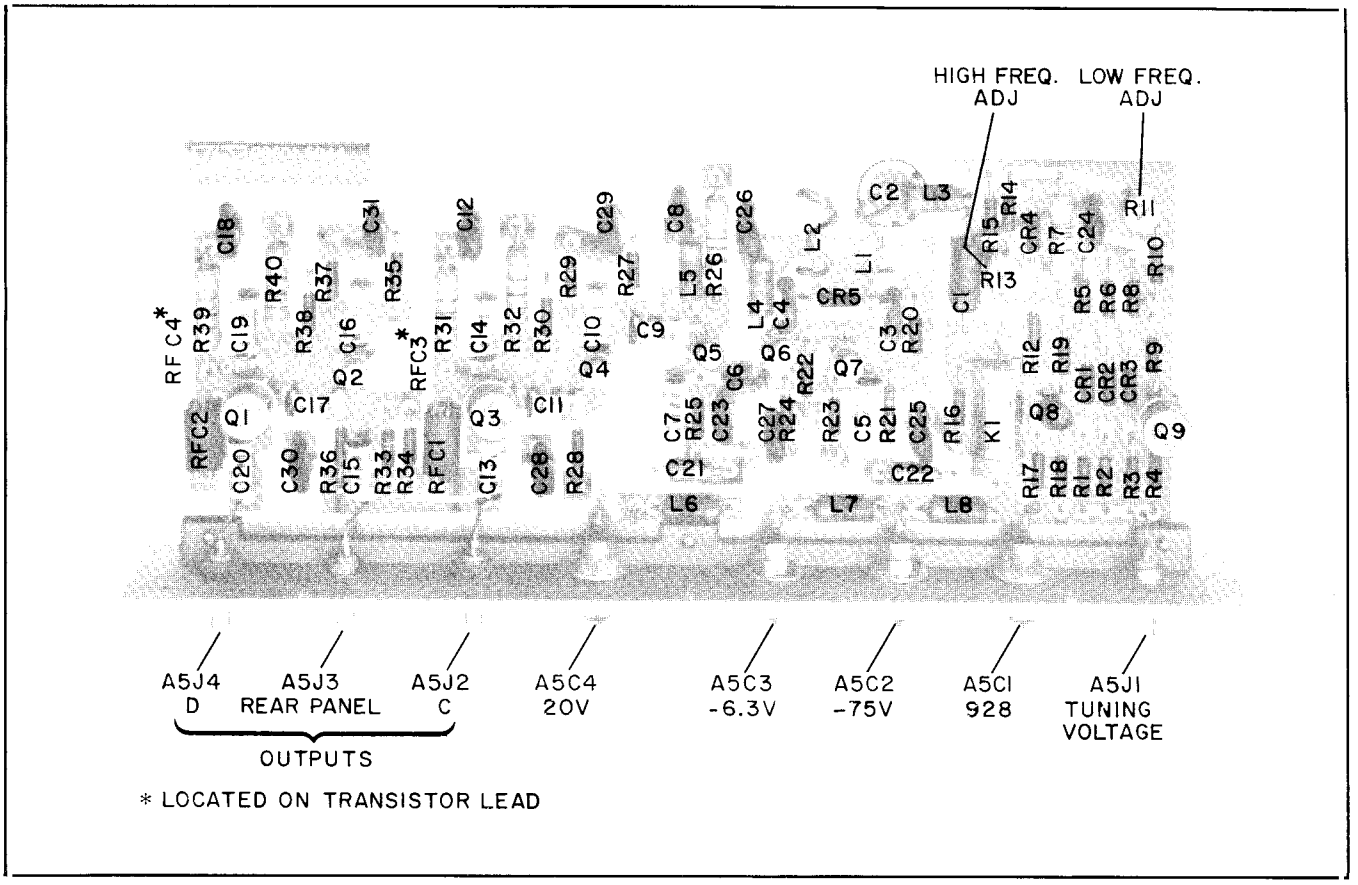
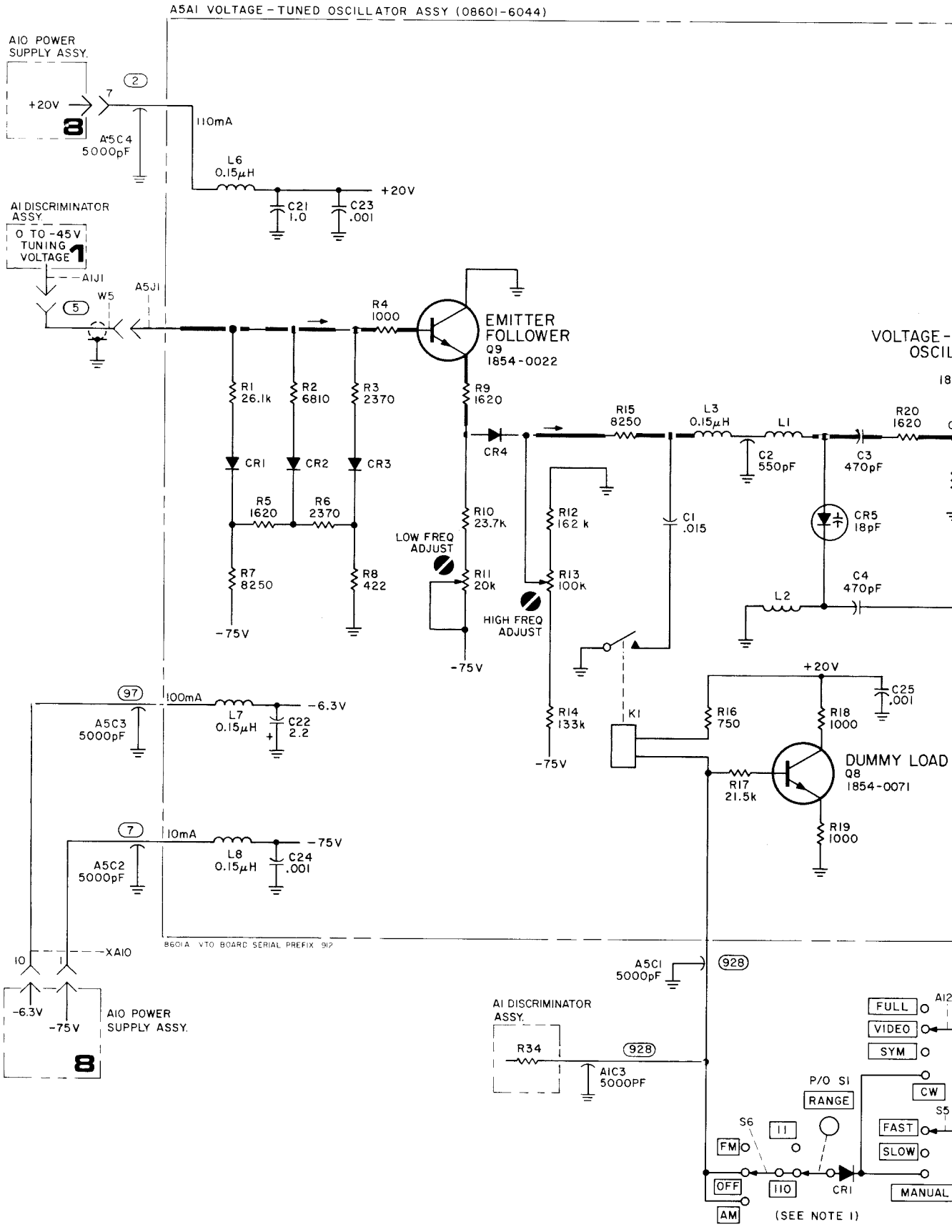
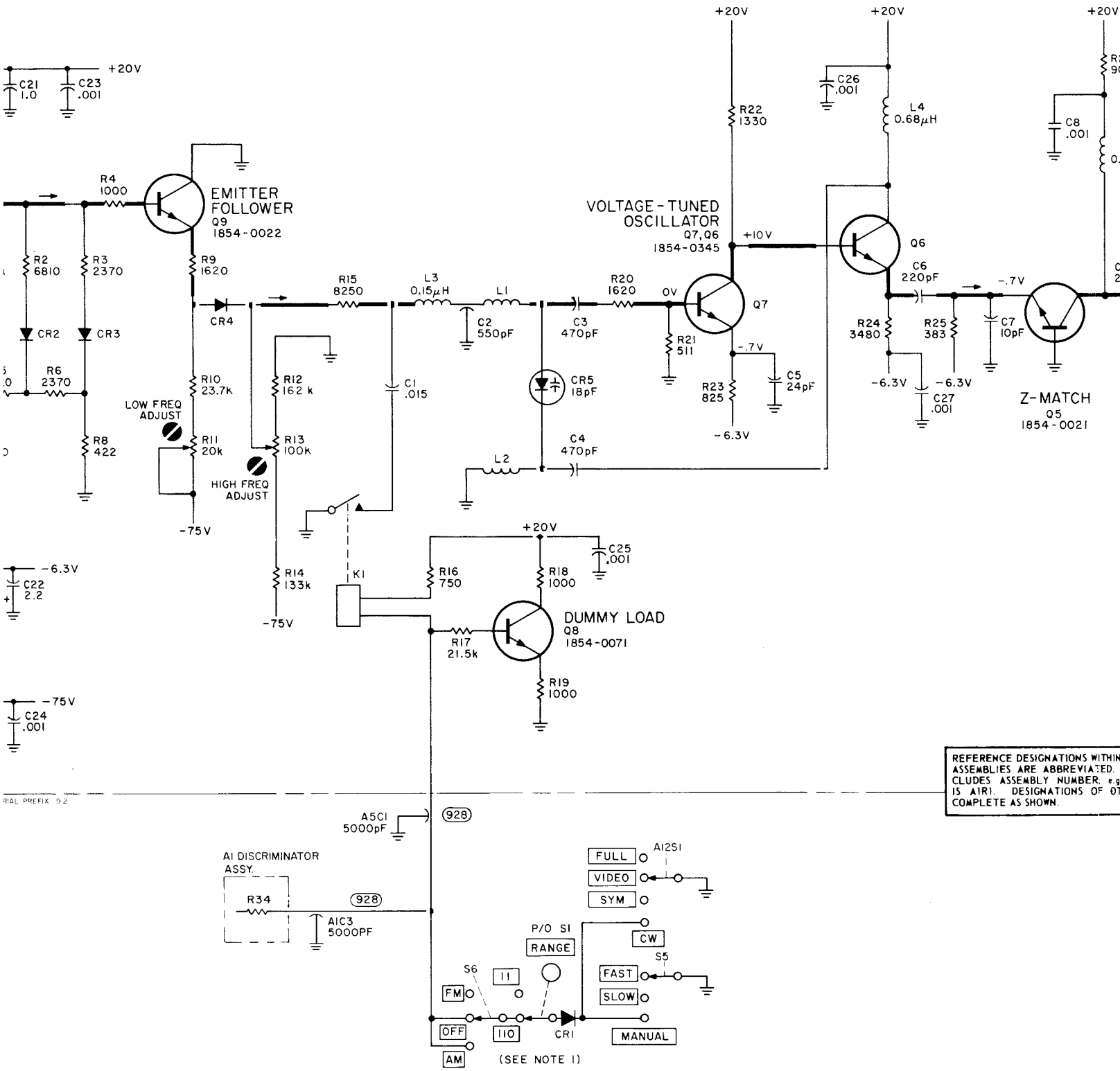
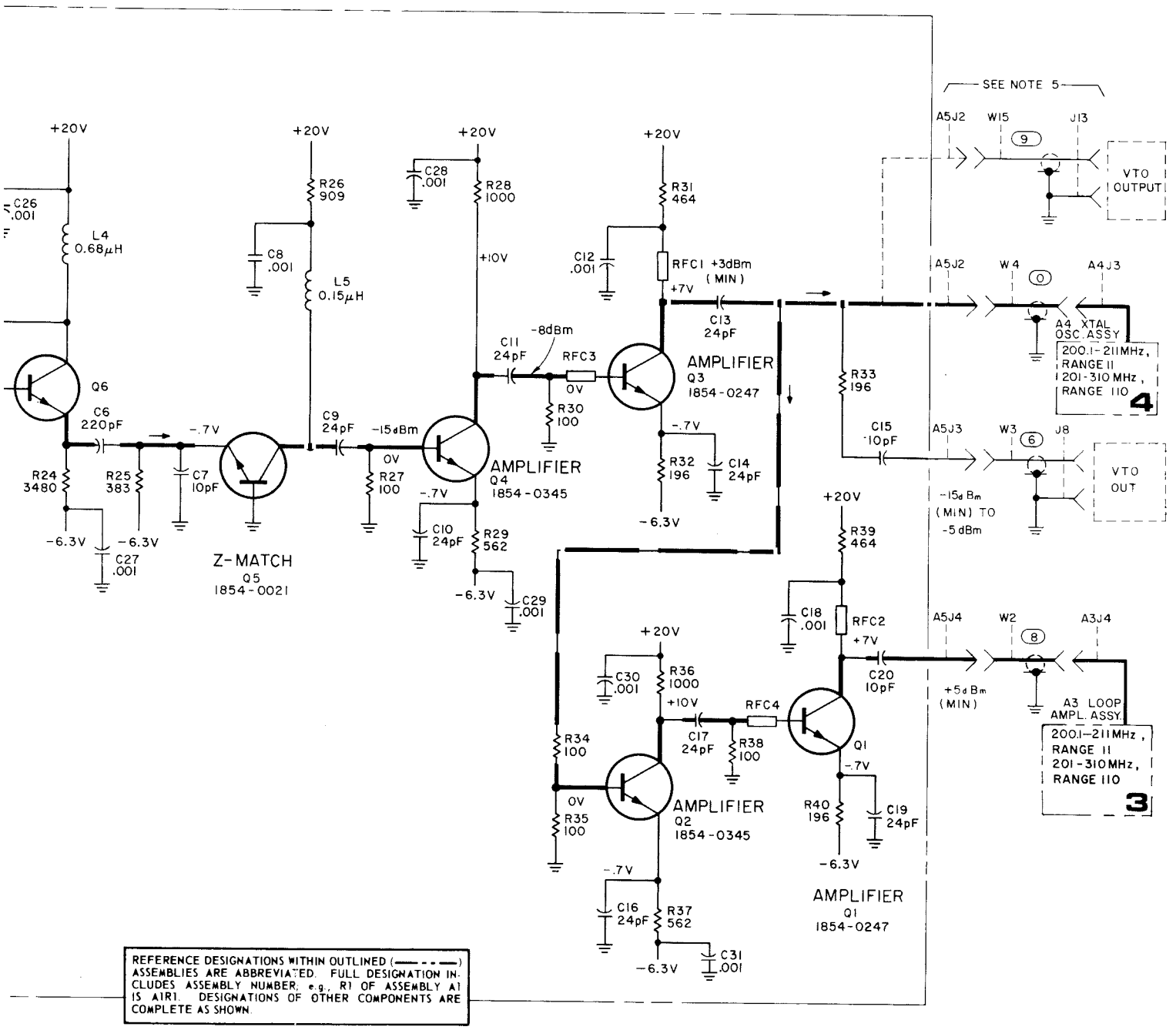


Figure 8-18. A5 VTO, Component Identification


A5A1 VOLTAGE-TUNED OSCILLATOR ASSY (08601-6044)
A10 POWER SUPPLY ASSY.
+20V
8
2
7
110mA
A5C4 5000pF
L6 0.15μH
C21 1.0
C23 .001
+20V
A1 DISCRIMINATOR ASSY.
0 TO -45V TUNING VOLTAGE
1
A1J1
W5
5
A5J1
R4 1000
EMITTER FOLLOWER Q9 1854-0022
R1 26.1k
R2 6810
R3 2370
R9 1620
CR1
CR2
CR3
CR4
R5 1620
R6 2370
R7 8250
R8 422
-75V
R10 23.7k
LOW FREQ ADJUST
R11 20k
HIGH FREQ ADJUST
-75V
R12 162 k
R13 100k
R14 133k
-75V
R15 8250
L3 0.15μH
L1
C2 550pF
C3 470pF
R20 1620
C1 .015
CR5 18pF
C4 470pF
L2
K1
+20V
C25 .001
R16 750
R18 1000
R17 21.5k
DUMMY LOAD Q8 1854-0071
R19 1000
97
100mA
A5C3 5000pF
L7 0.15μH
C22 2.2
-6.3V
7
10mA
A5C2 5000pF
L8 0.15μH
C24 .001
-75V
8601A VTO BOARD SERIAL PREFIX 912
10
1
XA10
-6.3V
-75V
A10 POWER SUPPLY ASSY.
8
A5C1 5000pF
928
A1 DISCRIMINATOR ASSY.
R34
928
A1C3 5000PF
FULL
VIDEO
SYM
A12
P/O S1
RANGE
CW
S6
11
FM
FAST
SLOW
S5
OFF
110
CR1
MANUAL
AM
(SEE NOTE 1)


+20V
C21 1.0
C23 .001
R4 1000
EMITTER FOLLOWER Q9 1854-0022
R2 6810
R3 2370
R9 1620
CR2
CR3
R6 2370
R8 422
R10 23.7k
LOW FREQ ADJUST
R11 20k
R12 162 k
R13 100k
HIGH FREQ ADJUST
-75V
CR4
R15 8250
L3 0.15μH
L1
C2 550pF
C1 .015
C3 470pF
CR5 18pF
C4 470pF
L2
R20 1620
0V
R21 511
VOLTAGE-TUNED OSCILLATOR Q7,Q6 1854-0345
+10V
Q7
R22 1330
-.7V
R23 825
C5 24pF
-6.3V
C26 .001
L4 0.68μH
Q6
C6 220pF
R24 3480
R25 383
C7 10pF
C27 .001
Z-MATCH Q5 1854-0021
C8 .001
-6.3V
C22 2.2
-75V
C24 .001
K1
R14 133k
+20V
C25 .001
R16 750
R18 1000
DUMMY LOAD Q8 1854-0071
R17 21.5k
R19 1000
REFERENCE DESIGNATIONS WITHIN ASSEMBLIES ARE ABBREVIATED. CLUDES ASSEMBLY NUMBER, e.g IS A1R1. DESIGNATIONS OF 01 COMPLETE AS SHOWN.
RIAL PREFIX 9:2
A5C1 5000pF
928
A1 DISCRIMINATOR ASSY.
R34
A1C3 5000PF
A12S1
FULL
VIDEO
SYM
P/O S1
RANGE
CW
S5
FAST
SLOW
MANUAL
S6
11
FM
OFF
110
AM
CR1
(SEE NOTE 1)



REFERENCE DESIGNATIONS WITHIN OUTLINED (— - - —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

NOTES:

1. SWITCH CONNECTIONS SHOWN ARE INTENDED FOR CIRCUIT ANALYSIS ONLY AND DO NOT INDICATE INSTRUMENT WIRING. SWITCH WIRING DIAGRAM IS SHOWN IN FIGURE 7-39.
2. * = FACTORY SELECTED PART; TYPICAL VALUE GIVEN.
3. RELAY K1 SHOWN DE-ENERGIZED.
4. VOLTAGE CONDITIONS: CW, ANY FREQUENCY.
5. OPTION 007 ONLY.

REFERENCE DESIGNATIONS

A5	A5A1	NO PREFIX
C1 - 4	C1 - 32	J8,13
J1 - 4	CR1 - 5	S1,5,6
	K1	W2-5,15
	L1 - 8	
	Q1 - 9	
	R1 - 40	
	RFC1 - 4	

5

Figure 8-19. A5 VTO, Schematic Diagram

SERVICE SHEET 6

Operation

The video amplifier assembly is a broad band (0.1 to 120 MHz) amplifier with a gain of approximately 52 dB. The maximum RF output level is about +21 dBm into 50 ohms. For output levels of greater than about +13 dBm the biasing of the output amplifier (E2) must be increased to minimize distortion components. However, noticeable distortion will almost always be present at some RF output frequencies with output levels above about +16 dBm. In addition to providing required power amplification, the video amplifier assembly is part of the ALC loop which monitors output power for leveling purposes. The ALC loop monitor is a detector which is included in the output amplifier, E2.

Troubleshooting

Turn on 8601A and set OUTPUT LEVEL control to +20 dBm position. Check that +20 and −6.3V power supply voltages are being supplied to the A6 video amplifier assembly (the −6.3 volts is only supplied to the video amplifier assembly when the OUTPUT LEVEL control is set to +20 dBm).

Connect RF source to video amplifier RF IN connector (set for any frequency between 0.1 and 100 MHz) and remove top cover from video amplifier assembly.

1. Set 8601A OUTPUT LEVEL control to +10 dBm position. Set RF source level to −40 dBm. At 8601A RF output, level should be at least +10 dBm. Detector output should be about −1.7 volts DC at A6J2.

2. Set 8601A OUTPUT LEVEL control to +20 dBm position. Set RF source level to −30 dBm. At 8601A RF OUTPUT, level should be at least +20 dBm. Detector output should be about −3.3 volts DC.

NOTE

If output is incorrect, substitute the loop amplifier for the preamplifier, A6A1E1, and repeat the test. If output is ok, A6A1E1 is probably bad. If output is not ok A6A1E2 is probably bad.

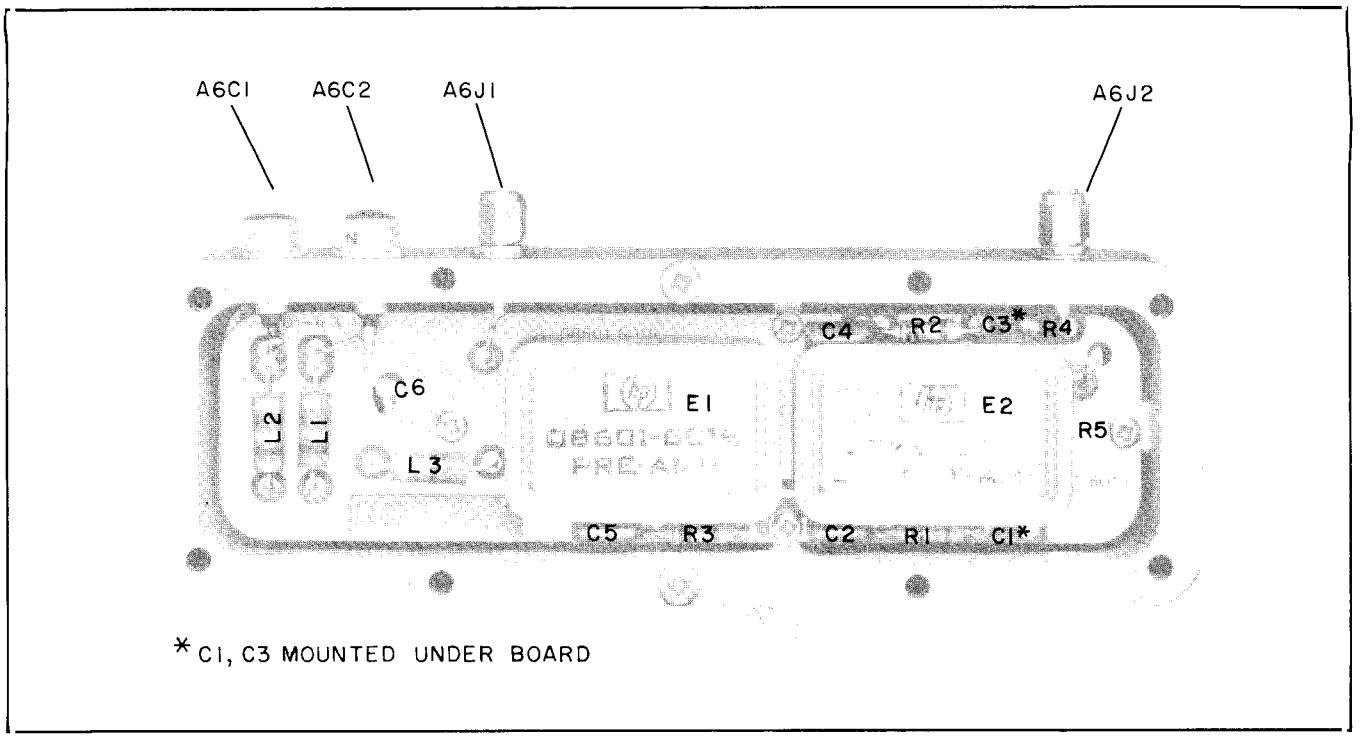


Figure 8-20. A6 Video Amplifier, Component Identification (Serial Prefixed 828- and Below)

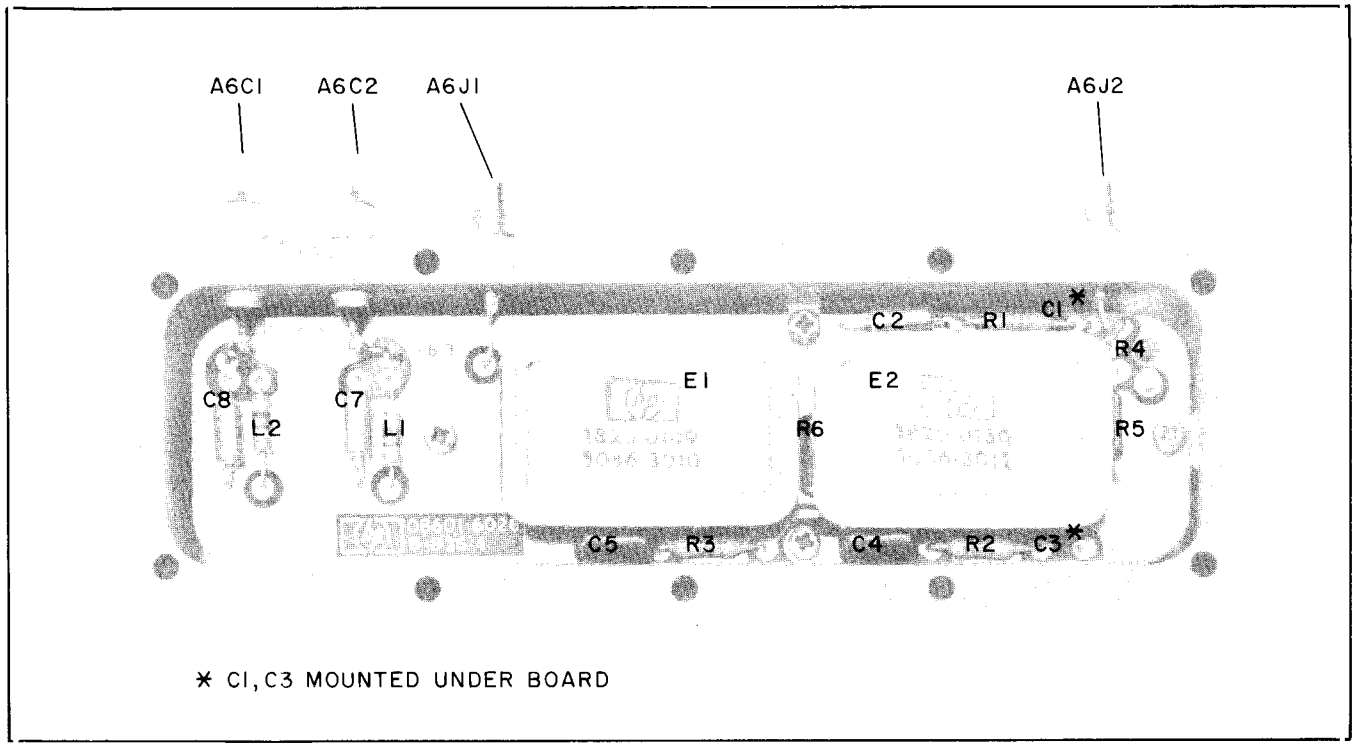
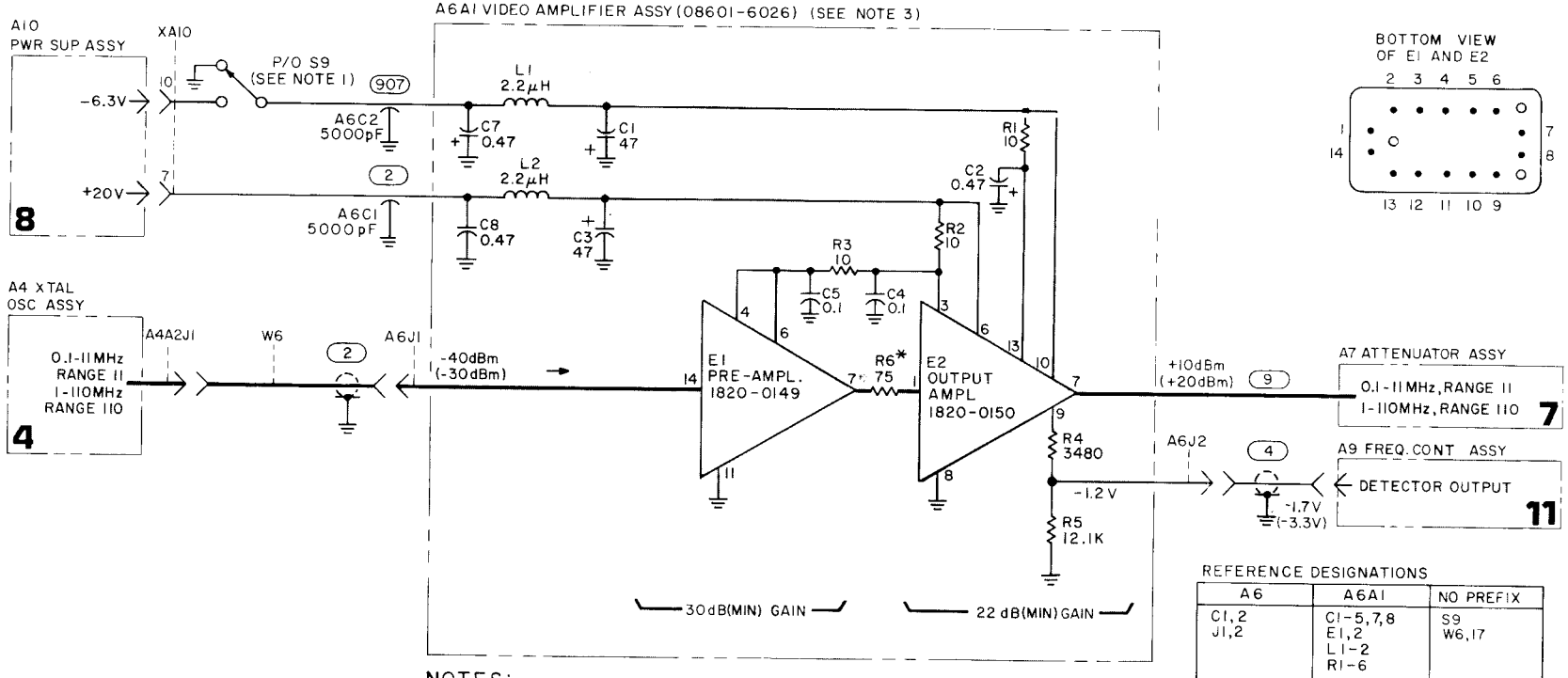


Figure 8-21. A6 Video Amplifier, Component Identification (Serial Prefixed 838- and Above)



NOTES:

1. SWITCH S9 SHOWN DEACTIVATED; SWITCH IS ACTIVATED BY OUTPUT LEVEL CONTROL IN +20 DBM POSITION ONLY.

2. | INPUT AT A6J1 | OUTPUT AT A6J2 |
   |---|---|
   | -40 dBm | +10 dBm |
   | -30 dBm | +20 dBm |

3. HP PART NUMBER 08601-6026 DOES NOT INCLUDE AMPLIFIERS E1 OR E2.

REFERENCE DESIGNATIONS

A6	A6A1	NO PREFIX
C1,2 J1,2	C1-5,7,8 E1,2 L1-2 R1-6	S9 W6,17

NOT ASSIGNED
A6A1C6

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.

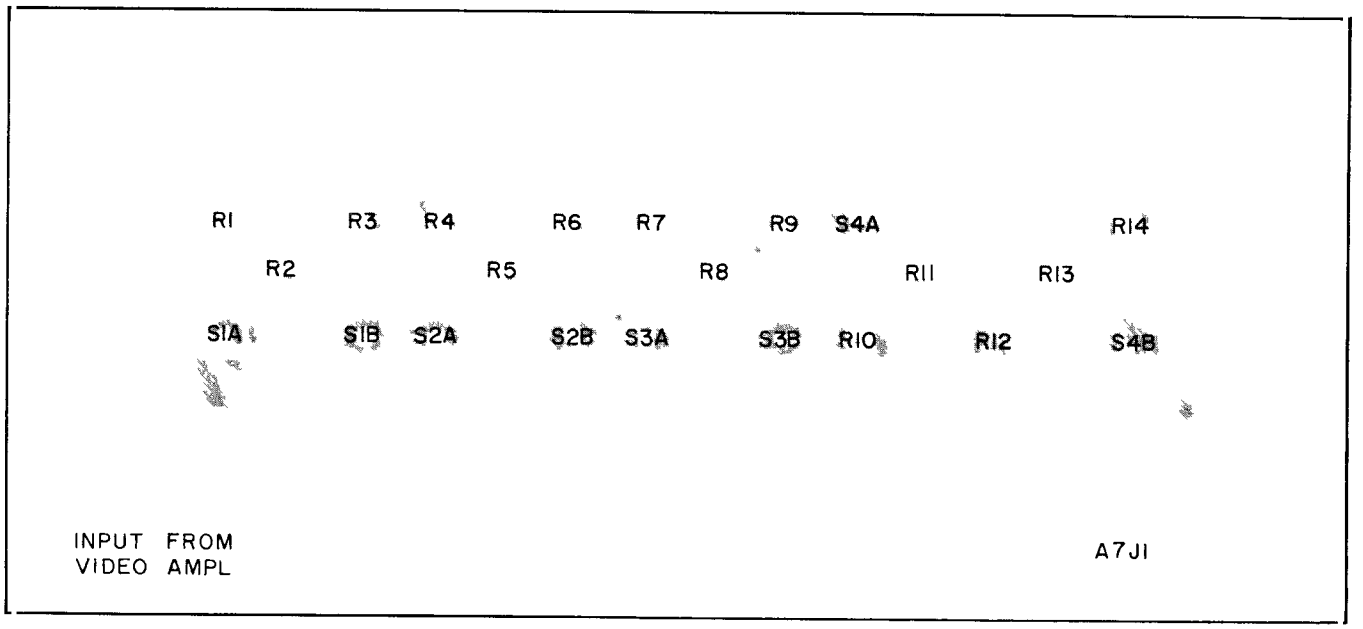
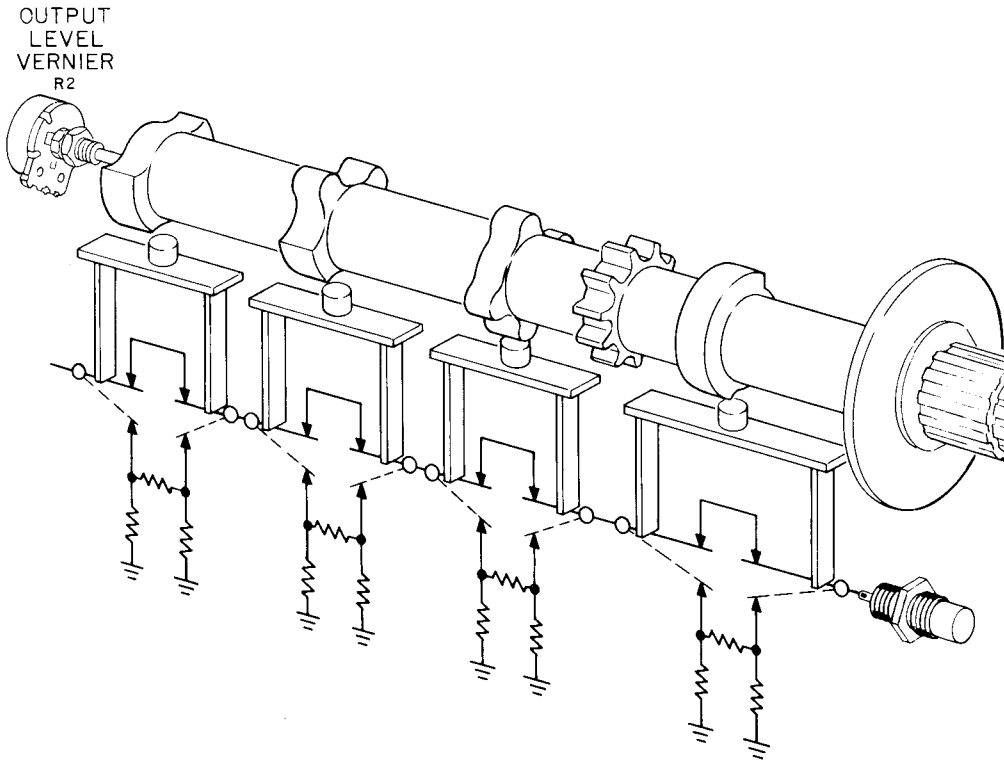
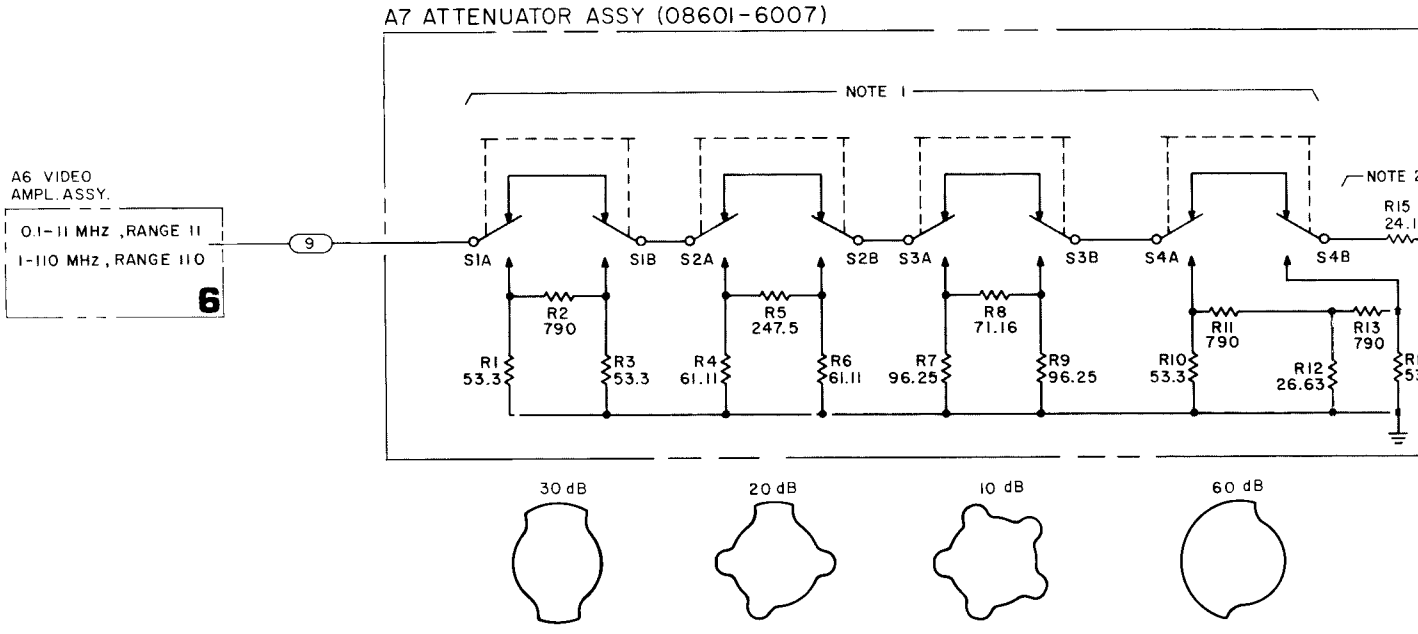


Figure 8-23. A7 Attenuator, Component Identification





CAM PROFILES

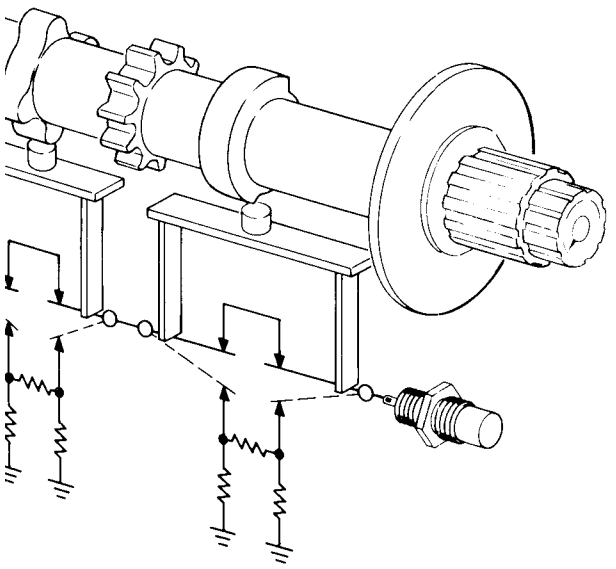
NOTE

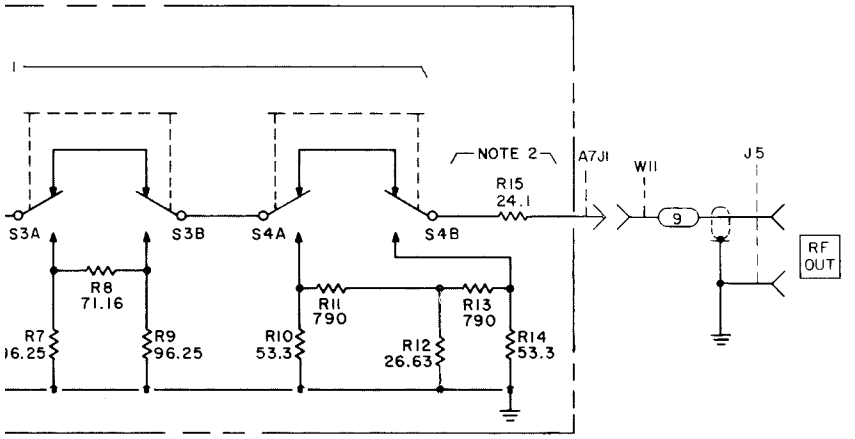
1. MICROSWITCH SHOWN IN NORMAL (UNOPERATED) CONDITION

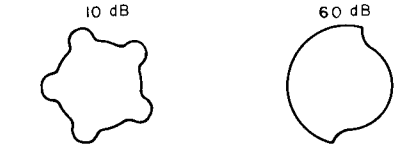
2. RESISTOR A7R15 INSTALLED FOR OPTIONS 008,009 AND 010 ONLY.

REFERENCE

A7
J1
R1-14
S1-8







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.

)FILES

REFERENCE DESIGNATIONS

A7	NO PREFIX
J1	J5
R1-14	R2
S1-8	W11

7

Figure 8-24. A7 Attenuator, Schematic Diagram

SERVICE SHEET 8

Operation

The power supply assembly includes a 26.3 volt supply and a 75 volt supply. The 26.3 volt supply output is basically a floating supply which is used as a +20 volt and a −6.3 volt regulated supply. The +20 volt is the regulated supply current output while the −6.3 volt is the regulated supply current return. In order to hold these two outputs (+20 and −6.3 volts) constant with respect to a common ground reference, a second supply is included (Q1/Q5) simply to place a constant ground reference between the two voltages (+20 and −6.3). The −75 volt supply consists of a series regulator, current source, and driver (reference amplifier). Both of these supplies operate in the same general manner: The series regulator is an electronically controlled series attenuator which controls the amount of current flowing through the supply. The supply voltage results from this current flowing through a resistor divider stick. Power supply current is supplied through the emitter collector junction of the current source. The amount of current supplied is controlled by a reference amplifier (or reference amplifier driver combination) which sets series regulator base bias.

The maximum ripple on the +20 and −6.3 volt supply leads should not exceed 2 millivolts peak-to-peak (5 millivolts peak-to-peak for the −75 volt supply).

NOTE

For instruments serial numbered 912-00580 and below, failure of transistors A10Q6 and A10Q7 could be a problem. To eliminate this problem, diode A10CR14 was added.

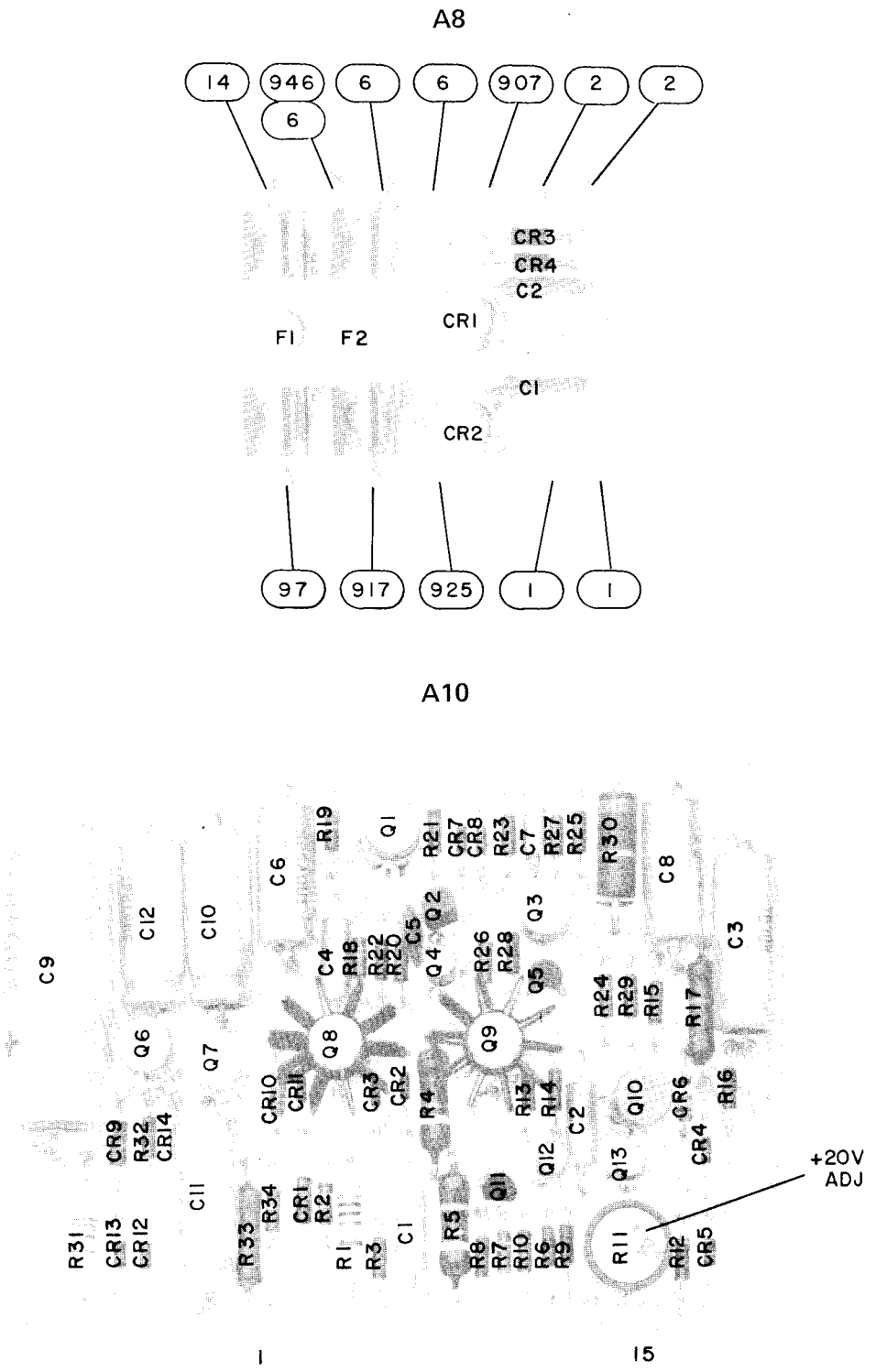
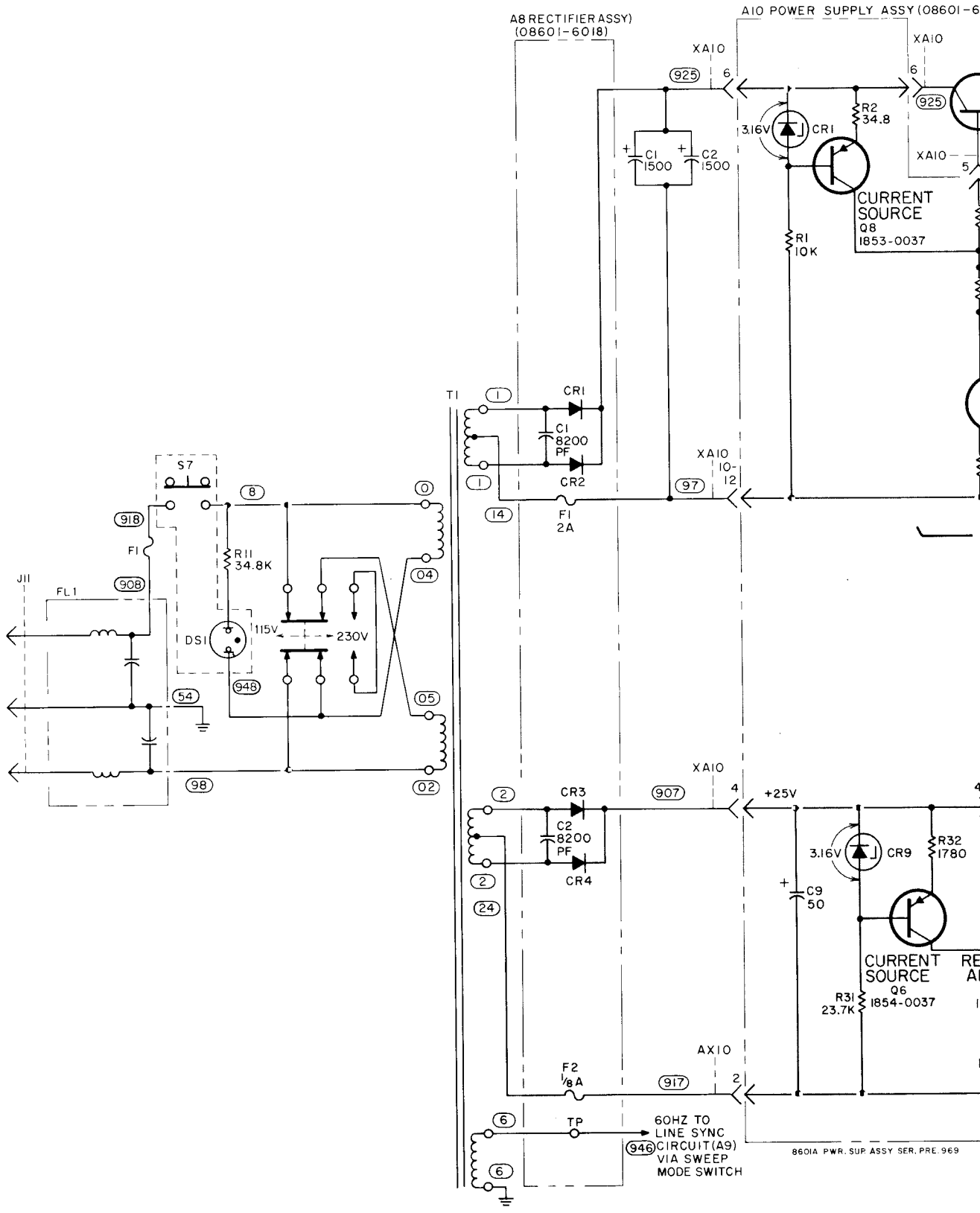
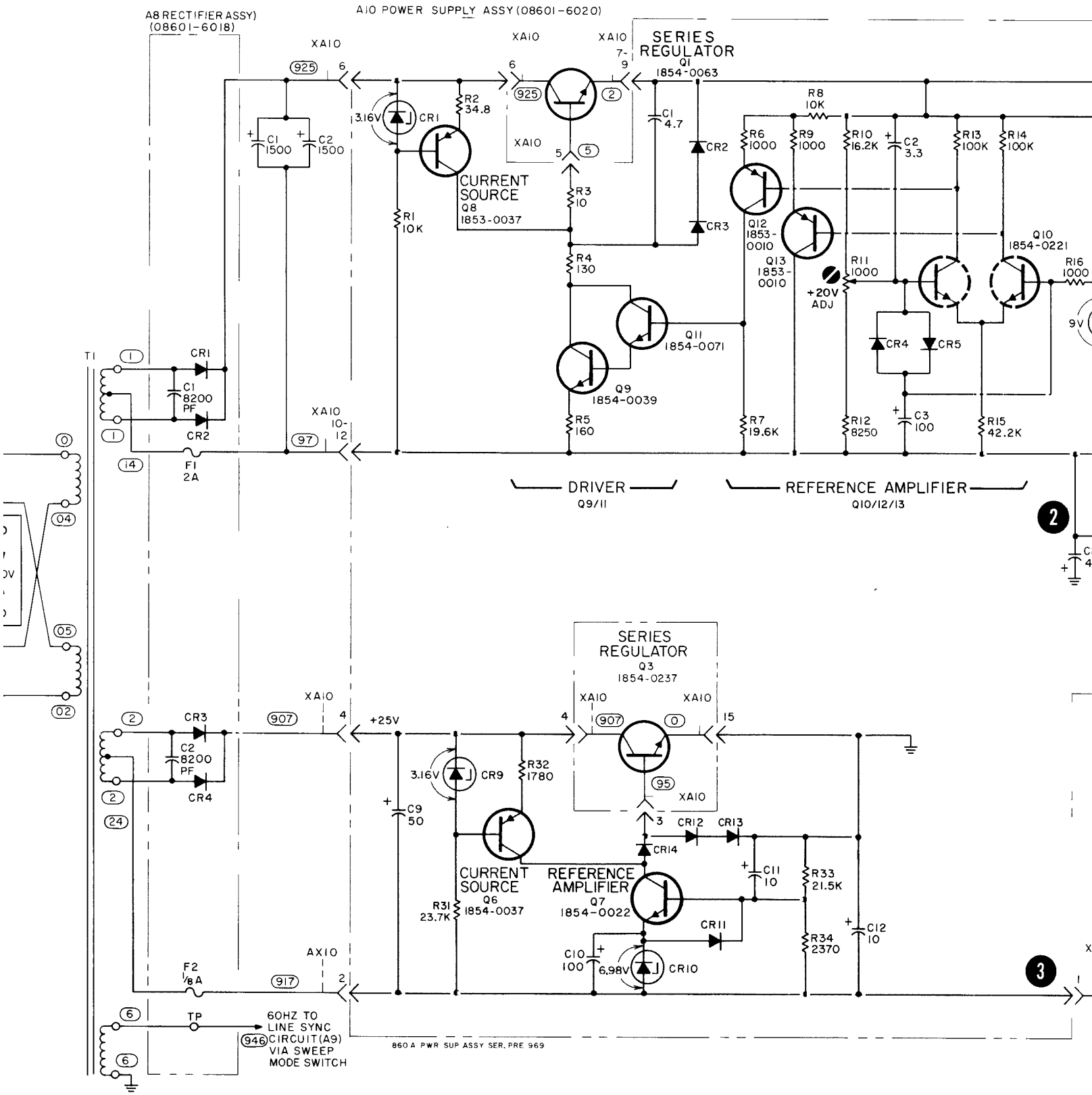
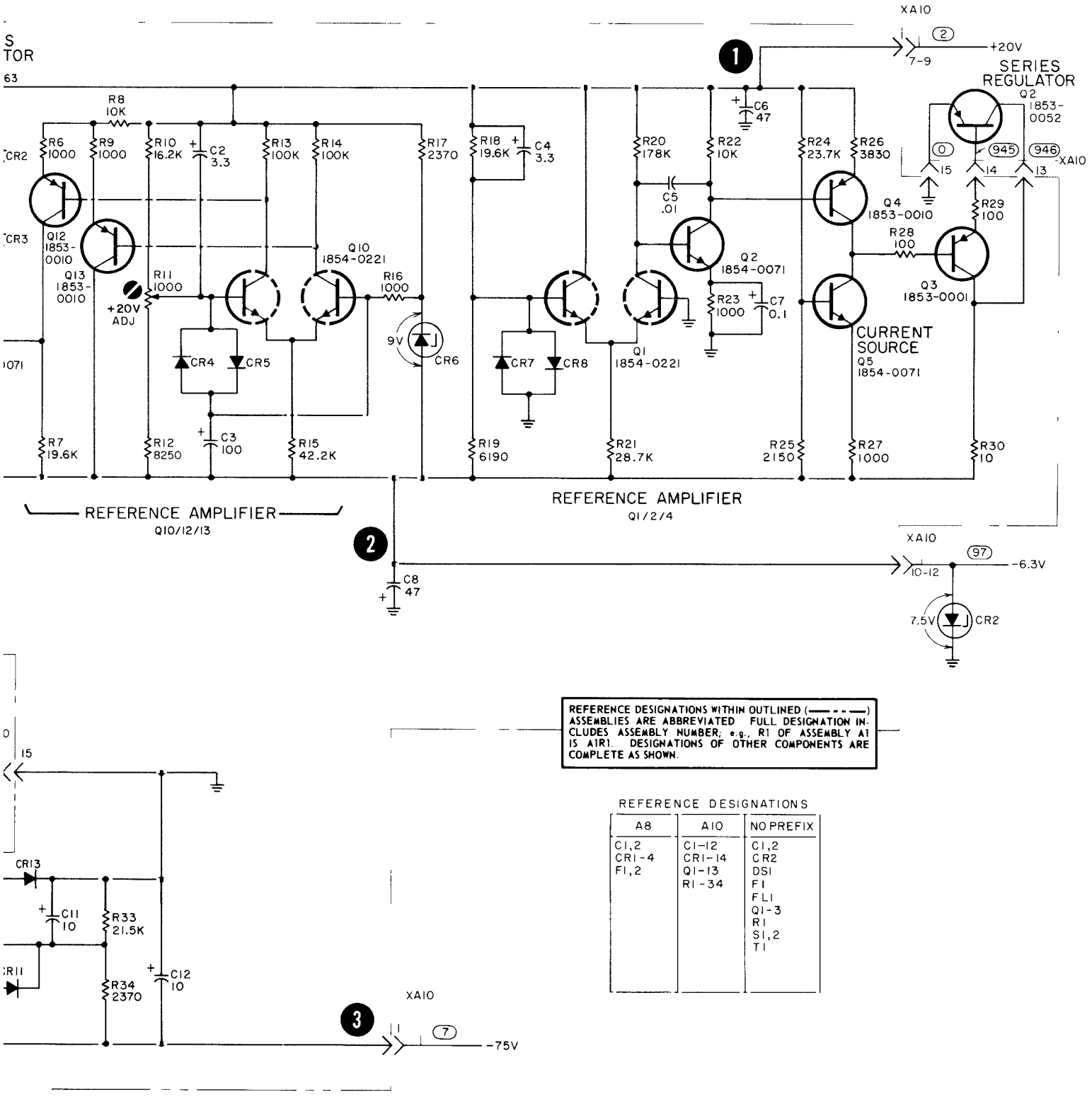


Figure 8-25. A8 Rectifier, A10 Power Supply, Component Identification


A8 RECTIFIER ASSY (08601-6018)
A10 POWER SUPPLY ASSY (08601-6
XA10
925
6
R2 34.8
3.16V
CR1
C1 1500
C2 1500
CURRENT SOURCE Q8 1853-0037
R1 10K
XA10 5
T1
1
CR1
C1 8200 PF
CR2
XA10 10-12
97
14
F1 2A
S7
8
0
918
F1
R11 34.8K
J11
FL1
908
04
DS1
115V
230V
948
54
05
98
02
2
CR3
907
XA10 4
+25V
C2 8200 PF
CR4
24
3.16V
CR9
R32 1780
C9 50
CURRENT SOURCE Q6 1854-0037
R31 23.7K
AX10
F2 1/8A
917
2
6
TP
60HZ TO LINE SYNC CIRCUIT (A9) VIA SWEEP MODE SWITCH
946
8601A PWR. SUP. ASSY SER. PRE. 969


A8 RECTIFIER ASSY (08601-6018)
A10 POWER SUPPLY ASSY (08601-6020)
SERIES REGULATOR
Q1 1854-0063
CURRENT SOURCE
Q8 1853-0037
DRIVER
Q9/11
REFERENCE AMPLIFIER
Q10/12/13
SERIES REGULATOR
Q3 1854-0237
CURRENT SOURCE
Q6 1854-0037
REFERENCE AMPLIFIER
Q7 1854-0022
+20V ADJ
60HZ TO LINE SYNC CIRCUIT (A9) VIA SWEEP MODE SWITCH
860A PWR SUP ASSY SER. PRE 969



REFERENCE DESIGNATIONS WITHIN OUTLINED (— - - —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

REFERENCE DESIGNATIONS

A8	A10	NO PREFIX
C1,2	C1-12	C1,2
CR1-4	CR1-14	CR2
F1,2	Q1-13	DS1
	R1-34	F1
		FL1
		Q1-3
		R1
		S1,2
		T1

8

Figure 8-26. A8 Rectifier, A10 Power Supply, Schematic Diagram

SERVICE SHEET 9

Auto Sweep Generator Operation

Automatic swept frequency operation is started by applying bias voltage to Q37 emitter. Q37 conducts causing capacitor C1 to charge towards +1.2 to +1.5 volts (in SLOW mode C2 parallels C1 producing a slower charging ramp). Current to Q37 is controlled by R4, providing a 10:1 sweep speed adjustment. This ramp voltage, charging signal, is applied through Q28 and the sweep output circuit to cause the output frequency (8601A RF OUT) to increase. When the ramp voltage, at positive side of C1, reaches +1.2 to +1.5V, ramp sensor Q36 turns on suddenly, producing a negative step-voltage output. This negative step-voltage, differentiated by C9 and R53, is applied to Q35 causing Q34/Q35 to switch to unstable state (Q34 on/Q35 off). The low impedance path, CR17/Q34/R182, discharges C1 causing sweep signal to retrace. The on time of Q34 is determined by C11 charge time (in SLOW mode C12 parallels C11 increasing Q34 on-time long enough for C1/C2 combination to discharge).

Blanking Operation

Q30 is normally off, Q31 on. Q14 turns on when ramp signal reaches +600 mV. Q14 turn on triggers negative output from Schmitt trigger Q30/Q31 output. When retrace is completed, the positive going Q34 output returns Schmitt trigger to normal state. The output of Schmitt trigger Q30/Q31 is a negative pulse concurrent with sweep retrace. Zener diode CR3 offsets the output, causing a −5 volt blanking pulse.

Manual Trigger Operation

Q26 and Q27 are connected in a four-layer diode (SCR) configuration. In the TRIGGER mode, Q26 and Q27 are connected across the main ramp capacitor. Q26 and Q27 are normally on, disabling the ramp generator, and Q25 is off. C14 is charged negative on the left side, to positive on the right. When the TRIG button is depressed to begin the sweep, C14's negative charge is applied to Q26's emitter, turning Q26 and Q27 off. The ramp generator bypass is removed and the sweep begins. With Q26 and Q27 off, Q25 is turned on and C14 charges positive on the left side to negative on the right. If the TRIG button is depressed a second time, C14's positive charge is applied to Q26's emitter, turning Q26 and Q27 back on. The ramp generator is bypassed and the sweep retraces. If the TRIG button is not used to stop the sweep, normal retrace will occur and the multivibrator's negative step output turns Q26 and Q27 back on. The next sweep will not begin until the TRIG is depressed.

Time Delay Operation

Time Delay circuit Q32/Q33 operates exactly like the main ramp generator and sensor. When the collector of Q32 is 1.0 to 1.2V, Q33 turns on. The negative step output of Q33 is applied to the emitter of main ramp sensor Q36, causing Q36 to turn on suddenly, if ramp capacitor C1 is charged. This action only occurs at initial turn on, allowing voltages to stabilize before normal sweep operation begins. The time delay is about seven seconds.

Sweep Output Operation

The sweep output is about 0 to +7V for any sweep. Output impedance is less than 10K. Δ SYM adjust, R71, adjusts sweep signal symmetry; SYM SWEEP CAL adjust, R76, adjusts the sweep signal amplitude. VIDEO SWEEP STOP adjust, R24, adjusts upper video sweep frequency to match output frequency in CW mode. SYM Fc MAX adjust, R117, adjusts symmetrical sweep center frequency to equal output frequency in CW mode. DWELL TIME adjust, R20, adjusts for equal dead-time at beginning and end of sweep ramp (sweep ramp clipping is caused by saturation or cutoff of Q19/Q20 circuit).

Sweep Inhibit Operation

Q42 is normally off. Applying ground signal to sweep inhibit input stops sweep signal. Capacitor, C1, holds charge for up to about 20 milliseconds so the sweep output voltage and the output 8601A frequency is temporarily held constant. If ground input is removed, C1 will continue to charge and sweep will continue normally. If ground input is held long enough sweep operation will continue very slowly (about one complete sweep would be expected every ten seconds).

Troubleshooting

To troubleshoot sweep generator circuitry, first test sweep output circuitry by operating 8601A in MANUAL/FULL/FREE mode and checking sweep outputs using MANUAL control. Then set 8601A for a sweep FAST mode and measure sweep outputs and blanking signal to isolate problem.

NOTE

Always measure power supply voltages to ensure they are correct, before troubleshooting other circuitry.

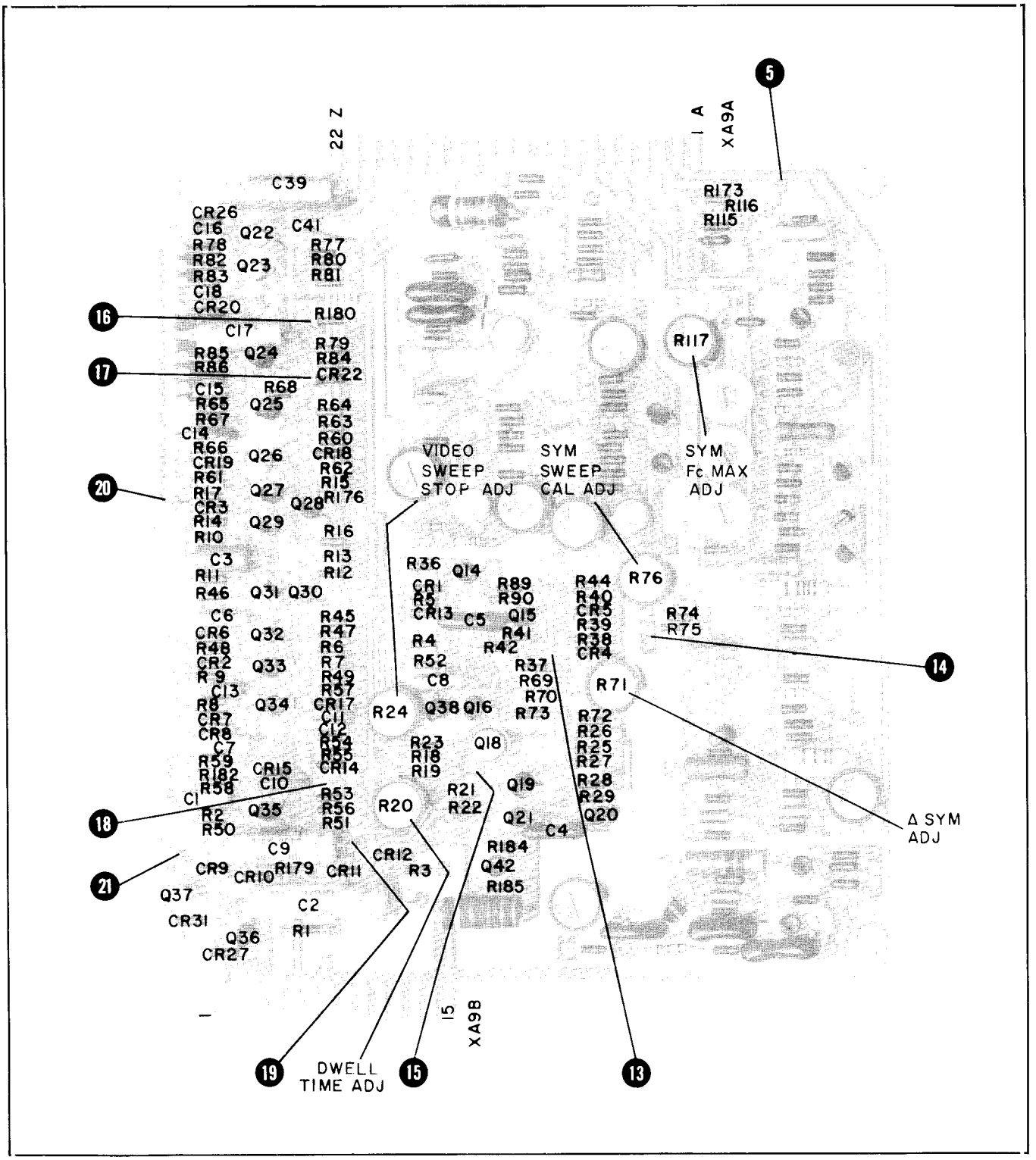
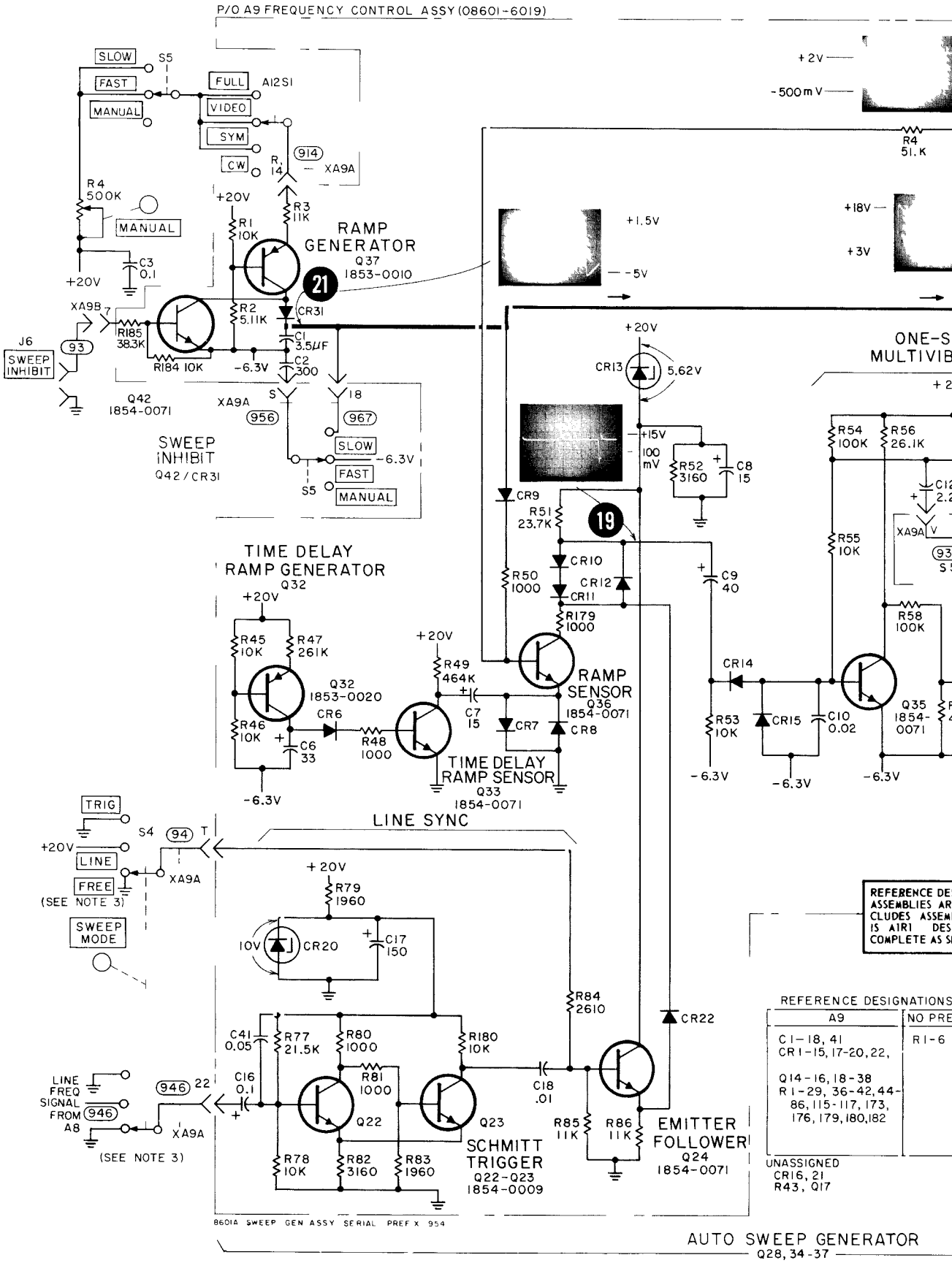
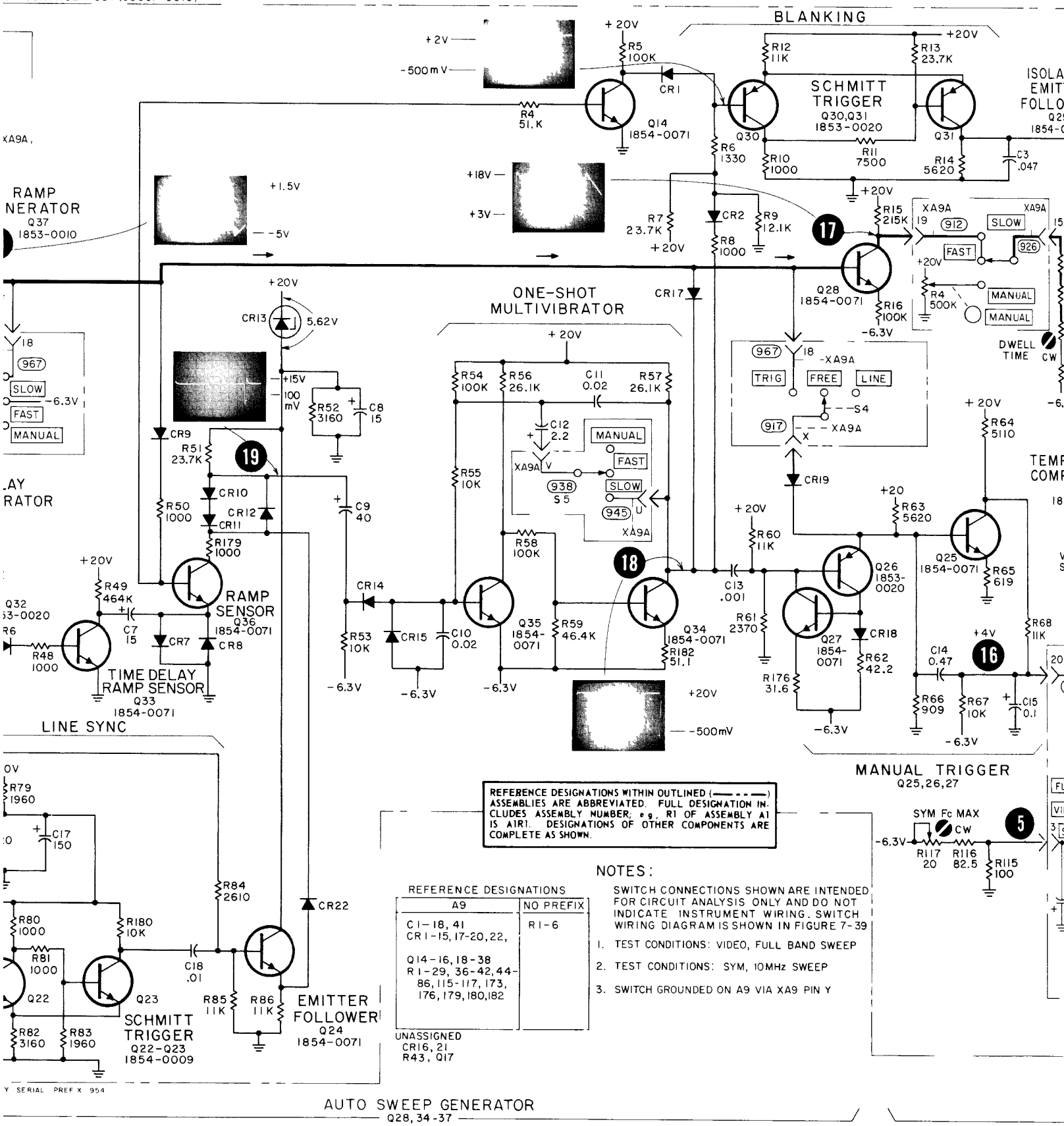


Figure 8-27. P/O A9 Assembly, Sweep Generator, Component Identification


P/O A9 FREQUENCY CONTROL ASSY (08601-6019)
SLOW
FAST
MANUAL
S5
FULL
VIDEO
SYM
CW
A12S1
914
XA9A
R4 500K
MANUAL
+20V
C3 0.1
R1 10K
R3 11K
RAMP GENERATOR
Q37 1853-0010
21
CR31
R2 5.11K
C1 3.5µF
C2 300
R184 10K
-6.3V
XA9B
R185 38.3K
J6
SWEEP INHIBIT
93
Q42 1854-0071
XA9A
956
967
SLOW
FAST
MANUAL
-6.3V
SWEEP INHIBIT
Q42/CR31
+2V
-500mV
R4 51.K
+1.5V
-5V
+18V
+3V
+20V
CR13
5.62V
+15V
100 mV
R52 3160
C8 15
CR9
R51 23.7K
19
CR10
CR12
CR11
R50 1000
R179 1000
C9 40
R54 100K
R56 26.1K
R55 10K
R58 100K
TIME DELAY RAMP GENERATOR
Q32
+20V
R45 10K
R47 261K
Q32 1853-0020
R46 10K
CR6
C6 33
R48 1000
-6.3V
+20V
R49 464K
C7 15
CR7
CR8
RAMP SENSOR
Q36 1854-0071
TIME DELAY RAMP SENSOR
Q33 1854-0071
CR14
R53 10K
CR15
C10 0.02
Q35 1854-0071
-6.3V
-6.3V
-6.3V
LINE SYNC
TRIG
S4
94
T
+20V
LINE
FREE
(SEE NOTE 3)
XA9A
SWEEP MODE
+20V
R79 1960
10V
CR20
C17 150
R84 2610
CR22
C41 0.05
R77 21.5K
R80 1000
R180 10K
R81 1000
C16 0.1
C18 .01
LINE FREQ SIGNAL FROM A8
946
22
946
XA9A
(SEE NOTE 3)
Q22
Q23
SCHMITT TRIGGER
Q22-Q23
1854-0009
R85 11K
R86 11K
EMITTER FOLLOWER
Q24
1854-0071
R78 10K
R82 3160
R83 1960
REFERENCE DESIGNATIONS
A9
C1-18, 41
CR1-15, 17-20, 22,
Q14-16, 18-38
R1-29, 36-42, 44-86, 115-117, 173, 176, 179, 180, 182
NO PRE
R1-6
UNASSIGNED
CR16, 21
R43, Q17
8601A SWEEP GEN ASSY SERIAL PREF X 954
AUTO SWEEP GENERATOR
Q28, 34-37

CY CONTROL ASSY (08601-6019)



REFERENCE DESIGNATIONS WITHIN OUTLINED (— - - —) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER; e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

NOTES:

SWITCH CONNECTIONS SHOWN ARE INTENDED FOR CIRCUIT ANALYSIS ONLY AND DO NOT INDICATE INSTRUMENT WIRING. SWITCH WIRING DIAGRAM IS SHOWN IN FIGURE 7-39

1. TEST CONDITIONS: VIDEO, FULL BAND SWEEP
2. TEST CONDITIONS: SYM, 10MHz SWEEP
3. SWITCH GROUNDED ON A9 VIA XA9 PIN Y

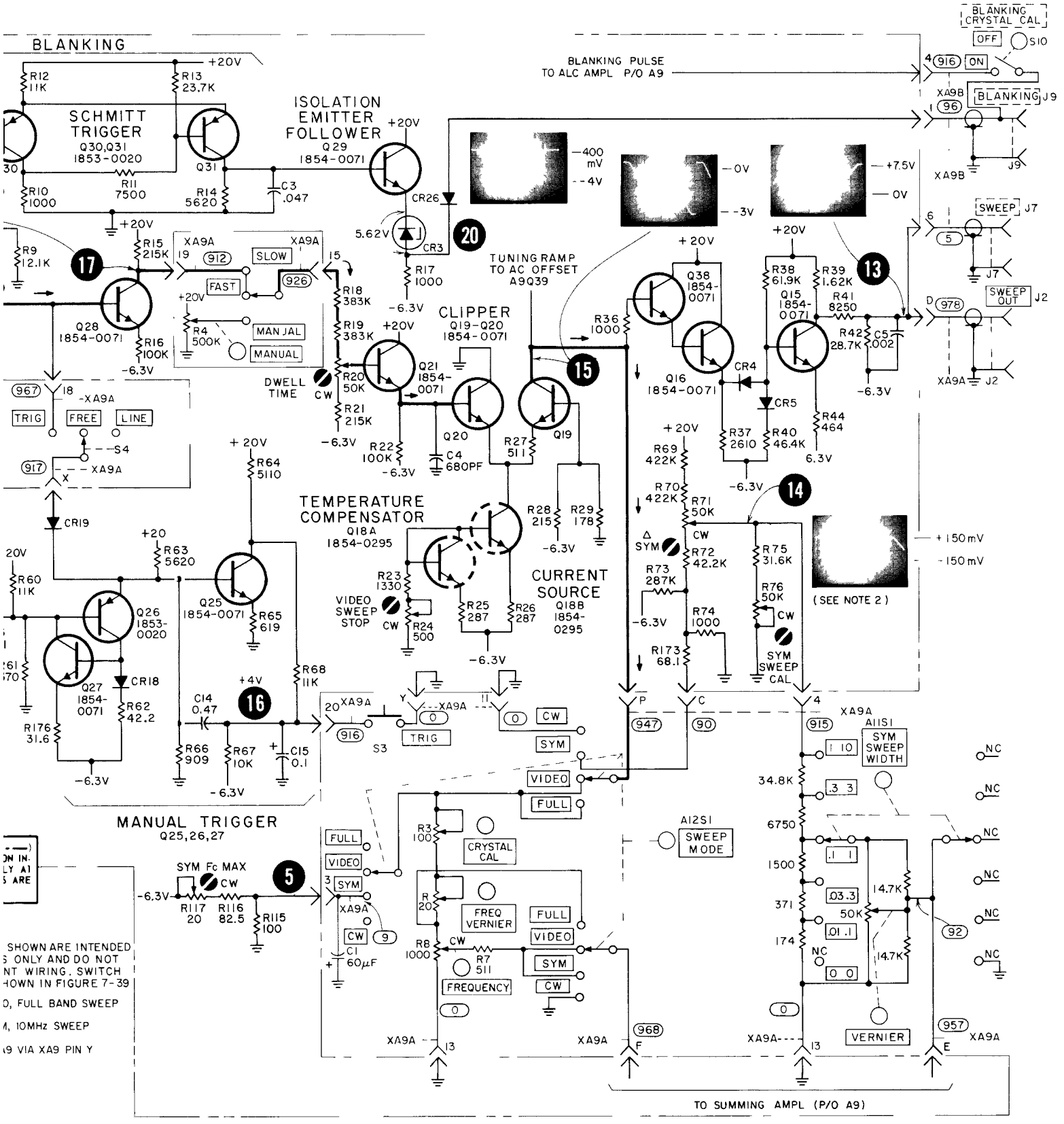
REFERENCE DESIGNATIONS

A9	NO PREFIX
C1-18, 41 CR1-15, 17-20, 22, Q14-16, 18-38 R1-29, 36-42, 44-86, 115-117, 173, 176, 179, 180, 182	R1-6

UNASSIGNED
CR16, 21
R43, Q17

Y SERIAL PREF X 954

AUTO SWEEP GENERATOR
Q28, 34-37



SWEEP OUTPUT
Q15,16,18,21,38

Figure 8-28. P/O A9 Assembly, Sweep Generator, Schematic Diagram

SERVICE SHEET 10

Operation

The summing amplifier, E1, is a high gain, low frequency amplifier. The high gain characteristic, with feedback network R99/C19, make it a very sensitive unity gain amplifier whose input can be held at virtual ground permitting multiple inputs without cross coupling. Diodes CR23 and CR24 limit the input voltage range. The summing amplifier, E1, is used to combine the swept frequency inputs required for frequency modulation and/or swept frequency operation. The adjustments, provided in the summing amplifier assembly, are provided to eliminate frequency tuning differences between SWEEP and CW mode operation (R120 and R34) or frequency drift due to ambient temperature changes (R88 and R95).

Troubleshooting

To troubleshoot the summing amplifier circuitry, first isolate trouble to the amplifier, E1 itself, or the other circuitry as follows:

1. Lift one lead of each of the following resistors: R93, R97, R109 and R114.

2. Set 8601A SWEEP/CW switch to SYM (this should place a ground on one lead of resistor R92).

3. Measure voltage at A9TP9 and record.

4. Vary SYM Fc MIN, A9R120, from end to end. The voltage at A9TP9 should vary from about +25 to −25 millivolts dc (this voltage is usually slightly more positive than negative). If voltage variation is correct, summing amplifier, E1, circuitry is operating properly and trouble is elsewhere in the circuit.

5. Re-adjust SYM Fc MIN, A9R120, for voltage level measured in step 3.

Free copy VK5ZLR

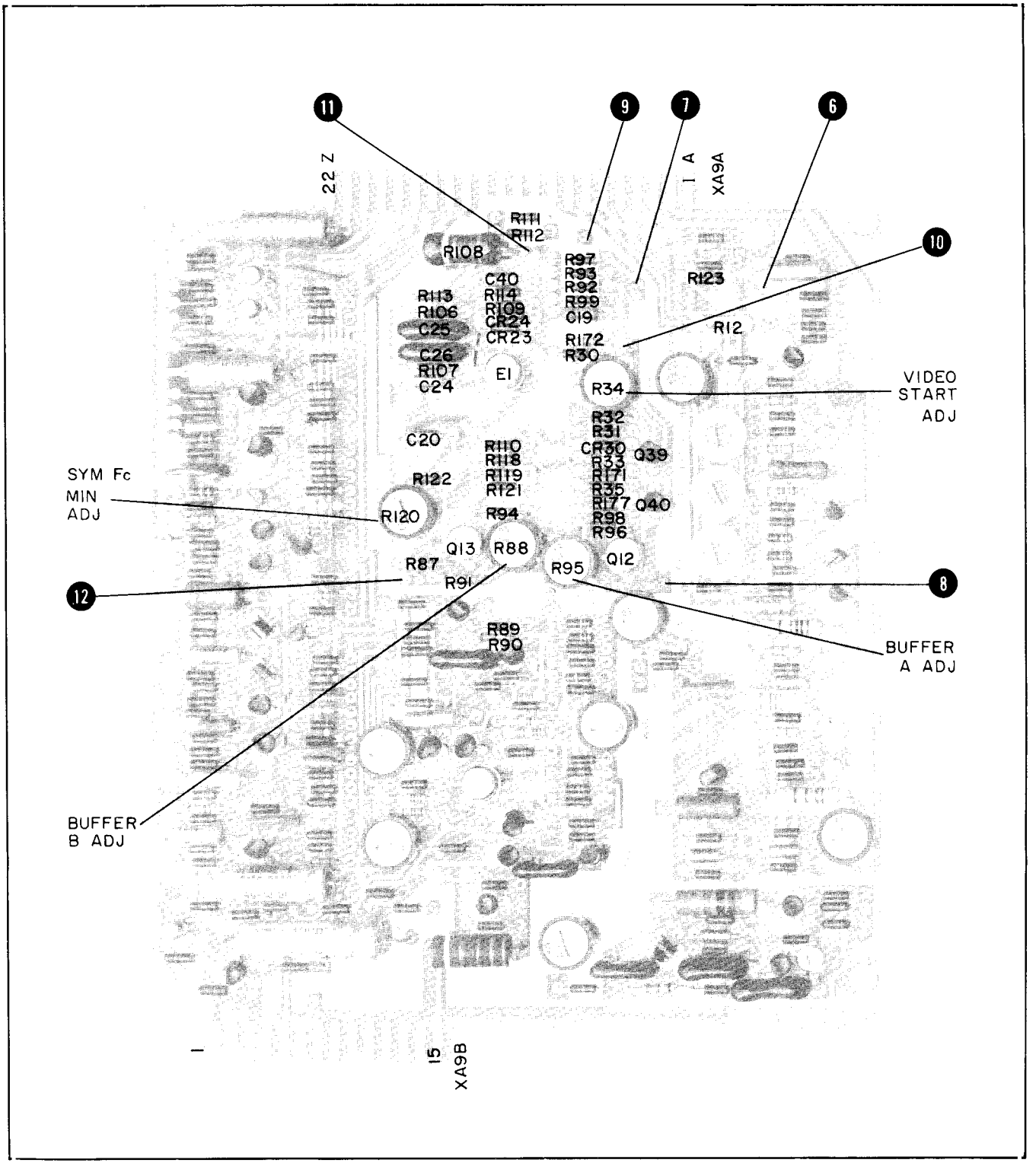
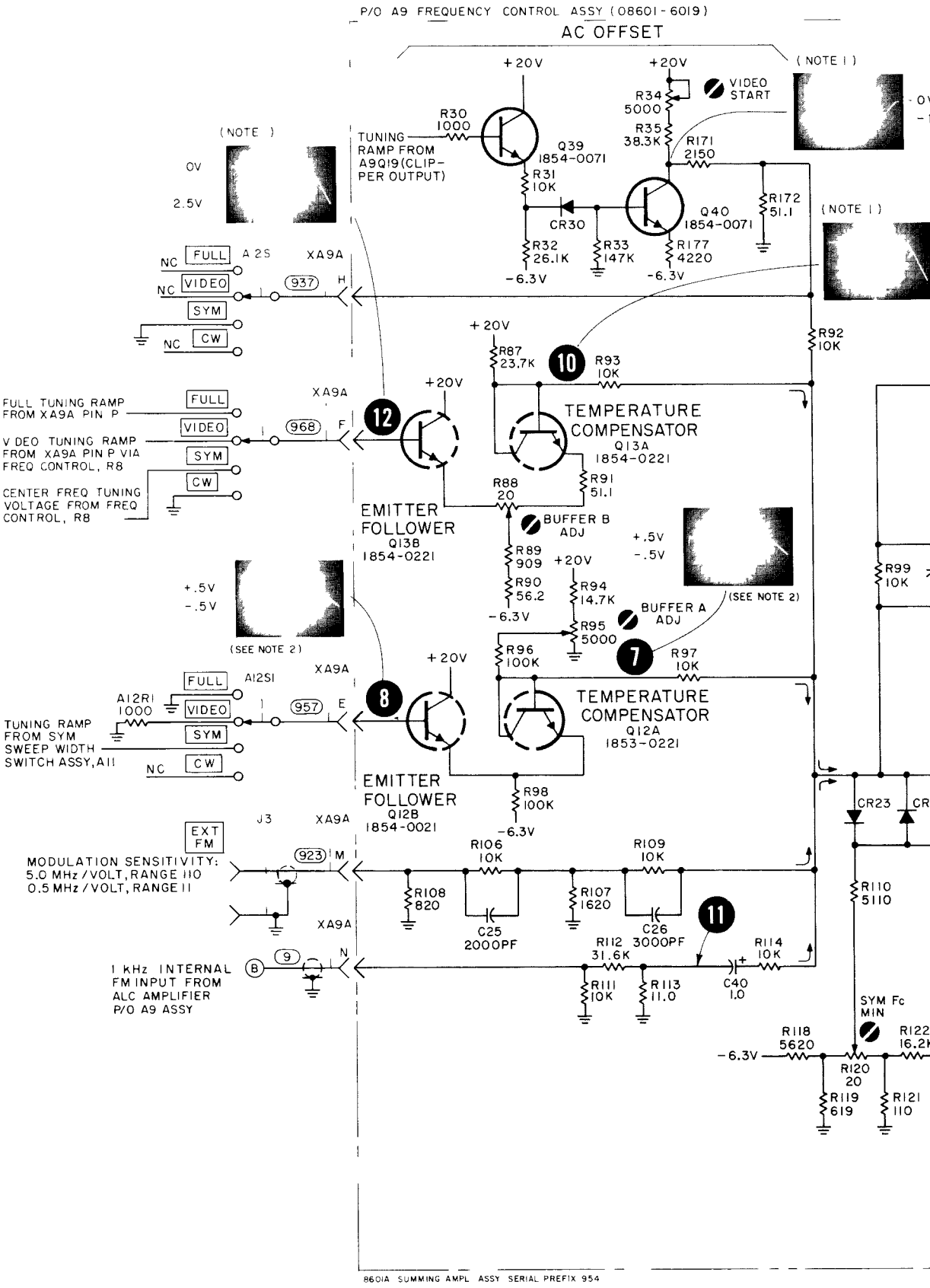
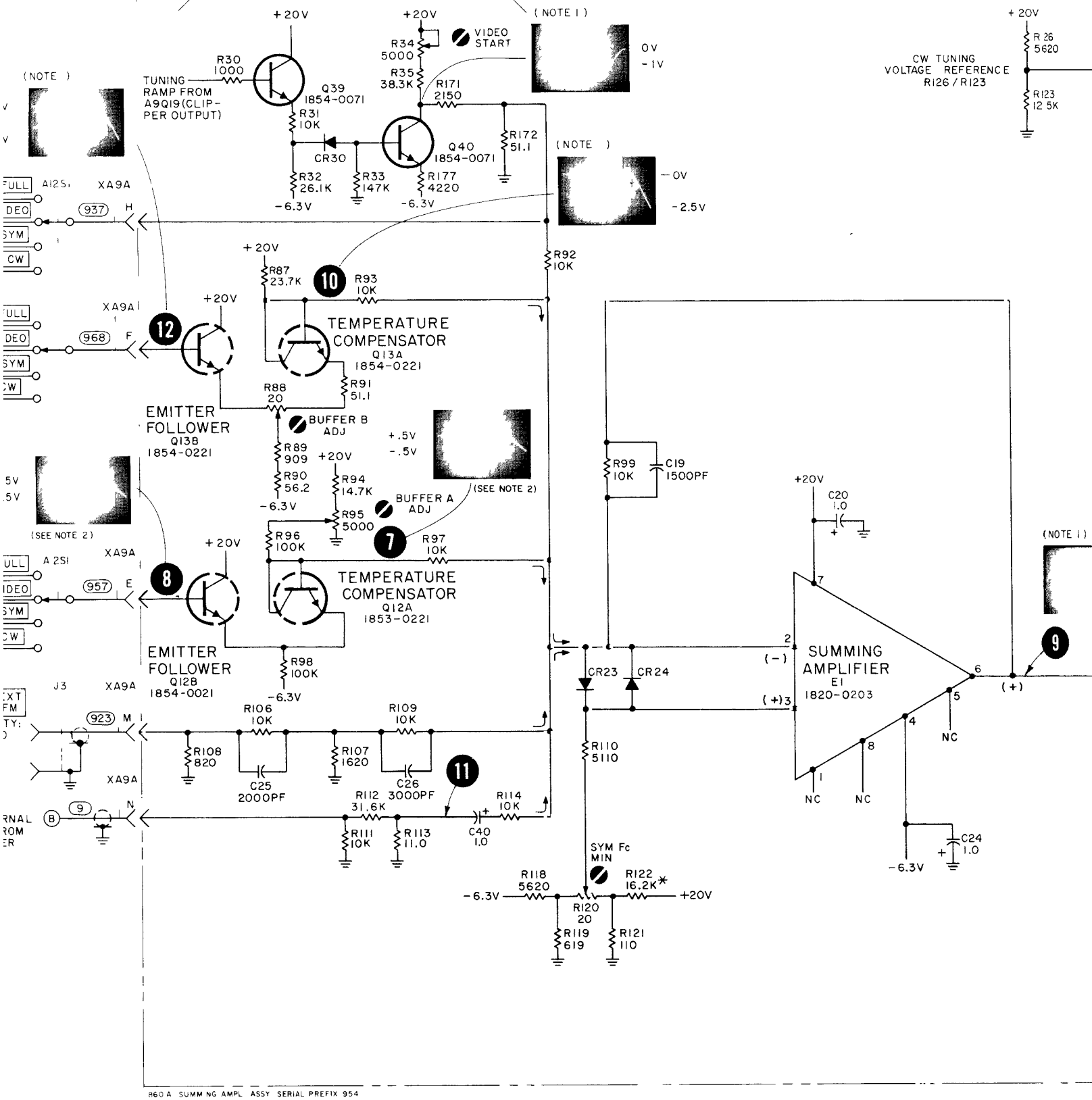


Figure 8-29. P/O A9 Assembly Summing Amplifier, Component Identification

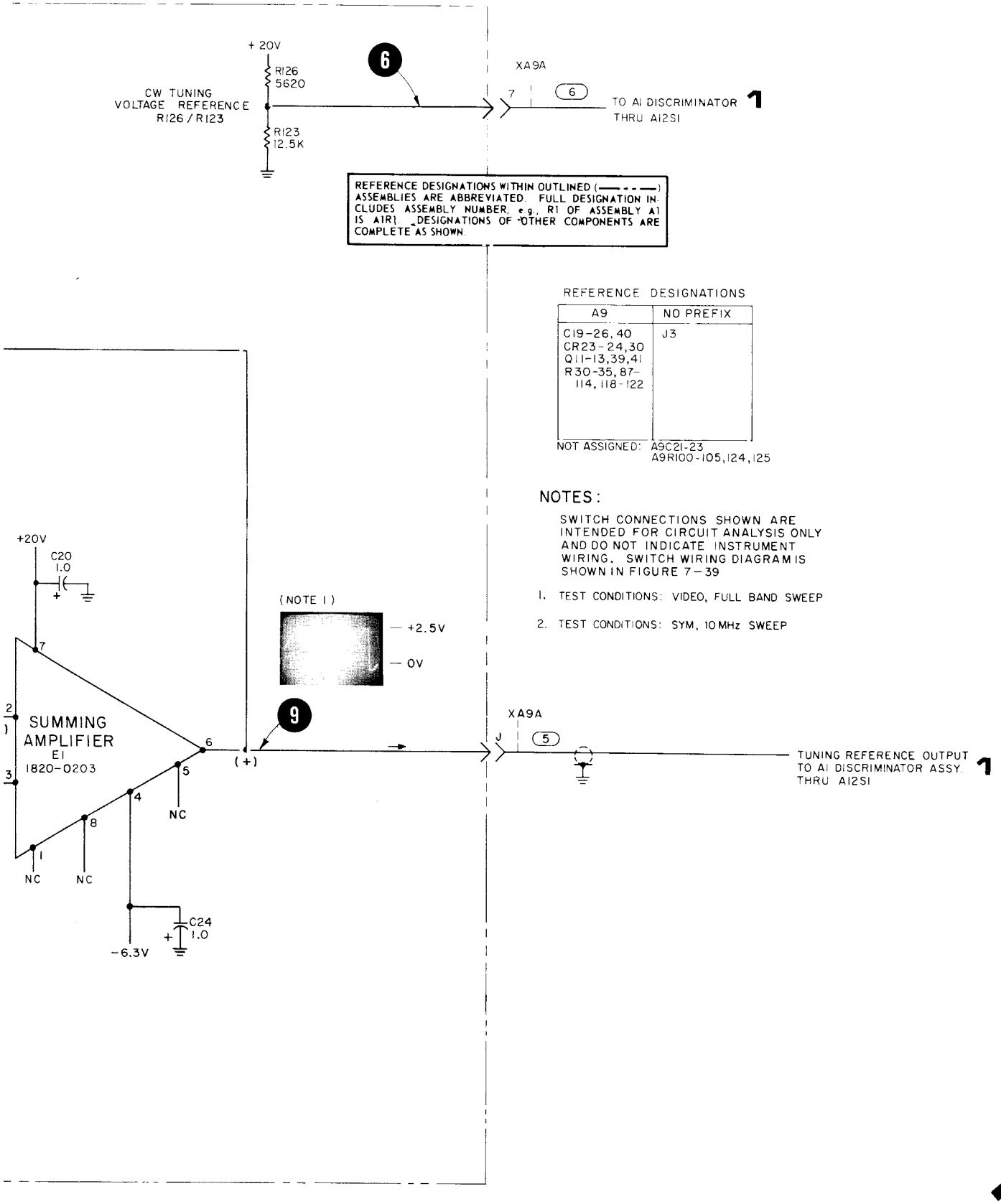

P/O A9 FREQUENCY CONTROL ASSY (08601-6019)
AC OFFSET
+20V
+20V
(NOTE 1)
VIDEO START
R34 5000
R35 38.3K
R171 2150
R30 1000
TUNING RAMP FROM A9Q19(CLIPPER OUTPUT)
Q39 1854-0071
R31 10K
CR30
Q40 1854-0071
R172 51.1
R32 26.1K
R33 147K
R177 4220
-6.3V
-6.3V
(NOTE 1)
(NOTE 1)
0V
2.5V
NC FULL A2S
NC VIDEO
SYM
NC CW
XA9A
937 H
+20V
R87 23.7K
10
R93 10K
R92 10K
FULL TUNING RAMP FROM XA9A PIN P
V DEO TUNING RAMP FROM XA9A PIN P VIA FREQ CONTROL, R8
CENTER FREQ TUNING VOLTAGE FROM FREQ CONTROL, R8
FULL
VIDEO
SYM
CW
XA9A
968 F
12
+20V
TEMPERATURE COMPENSATOR Q13A 1854-0221
R91 51.1
R88 20
EMITTER FOLLOWER Q13B 1854-0221
BUFFER B ADJ
+.5V
-.5V
(SEE NOTE 2)
R89 909
R90 56.2
-6.3V
+20V
R94 14.7K
BUFFER A ADJ
R95 5000
R96 100K
7
R97 10K
R99 10K
+.5V
-.5V
(SEE NOTE 2)
FULL
A12R1 1000
VIDEO
SYM
NC CW
A12S1
TUNING RAMP FROM SYM SWEEP WIDTH SWITCH ASSY, A11
XA9A
957 E
8
+20V
TEMPERATURE COMPENSATOR Q12A 1853-0221
EMITTER FOLLOWER Q12B 1854-0021
R98 100K
-6.3V
CR23
CR
EXT FM
J3
XA9A
923 M
MODULATION SENSITIVITY:
5.0 MHz/VOLT, RANGE HO
0.5 MHz/VOLT, RANGE I1
R106 10K
R109 10K
R108 820
R107 1620
C25 2000PF
C26
R110 5110
XA9A
1 kHz INTERNAL FM INPUT FROM ALC AMPLIFIER P/O A9 ASSY
B 9 N
R112 31.6K
3000PF
11
R114 10K
R111 10K
R113 11.0
C40 1.0
SYM Fc MIN
R118 5620
-6.3V
R120 20
R119 619
R121 110
R122 16.2K
8601A SUMMING AMPL ASSY SERIAL PREFIX 954

P/O A9 FREQUENCY CONTROL ASSY (08601-6019)

AC OFFSET



860A SUMMING AMPL ASSY SERIAL PREFIX 954



10

Figure 8-30. P/O A9 Assembly, Summing Amplifier, Schematic Diagram

SERVICE SHEET 11

ALC Amplifier Operation

Input differential amplifier Q1 compares the detected RF signal with the reference level voltage established by the OUTPUT LEVEL vernier control R2. Any difference between the inputs generates an error signal that is applied to output differential amplifier Q2 and Q3. This error signal is further amplified by amplifier Q4 and applied to the Fixed Oscillator's modulator to adjust the output power level.

ALC Amplifier Troubleshooting

A quick check of the ALC amplifier can be made by varying the OUTPUT LEVEL controls and noting the output power varies.

1 kHz Oscillator Operation

Q8, Q9 and Q10 form a 1 kHz phase-shift oscillator for internal AM and FM. FREQ adjust R160 varies the resistance of the RF phase shift network, thus varying oscillator frequency.

1 kHz Oscillator Troubleshooting

A quick check of the 1 kHz oscillator can be made by setting the 8601A for internal AM and noting that output frequency is amplitude modulated.

AM Driver Operation

Driver Q7 applies the internal 1 kHz phase-modulation signal to the ALC reference input and % MOD ADJ R162 controls the modulation amplitude. Driver Q5 applies the 5 MHz markers and blanking signals to the ALC reference input. The blanking signal shuts off RF power during sweep retrace. C36 provides additional filtering in CW operation to improve marker resolution.

AM Driver Troubleshooting

A quick check of driver Q7 can be made by setting the 8601A for internal AM and noting that the frequency output is amplitude modulated at a 1 kHz rate. A quick check of driver Q5 can be made by setting the BLANKING switch to on, during automatic sweep, and noting that the RF OUTPUT is blanked during retrace.

Peak Detector Operation

Emitter Follower Q6 is normally on and provides a low impedance path for CR25 and C27. Meter M1 indicates C27's charge as dBm and volts rms into 50 ohms.

Peak Detector Troubleshooting

A quick check of the peak detector can be made by varying the OUTPUT LEVEL vernier control and noting that the meter indication varies.

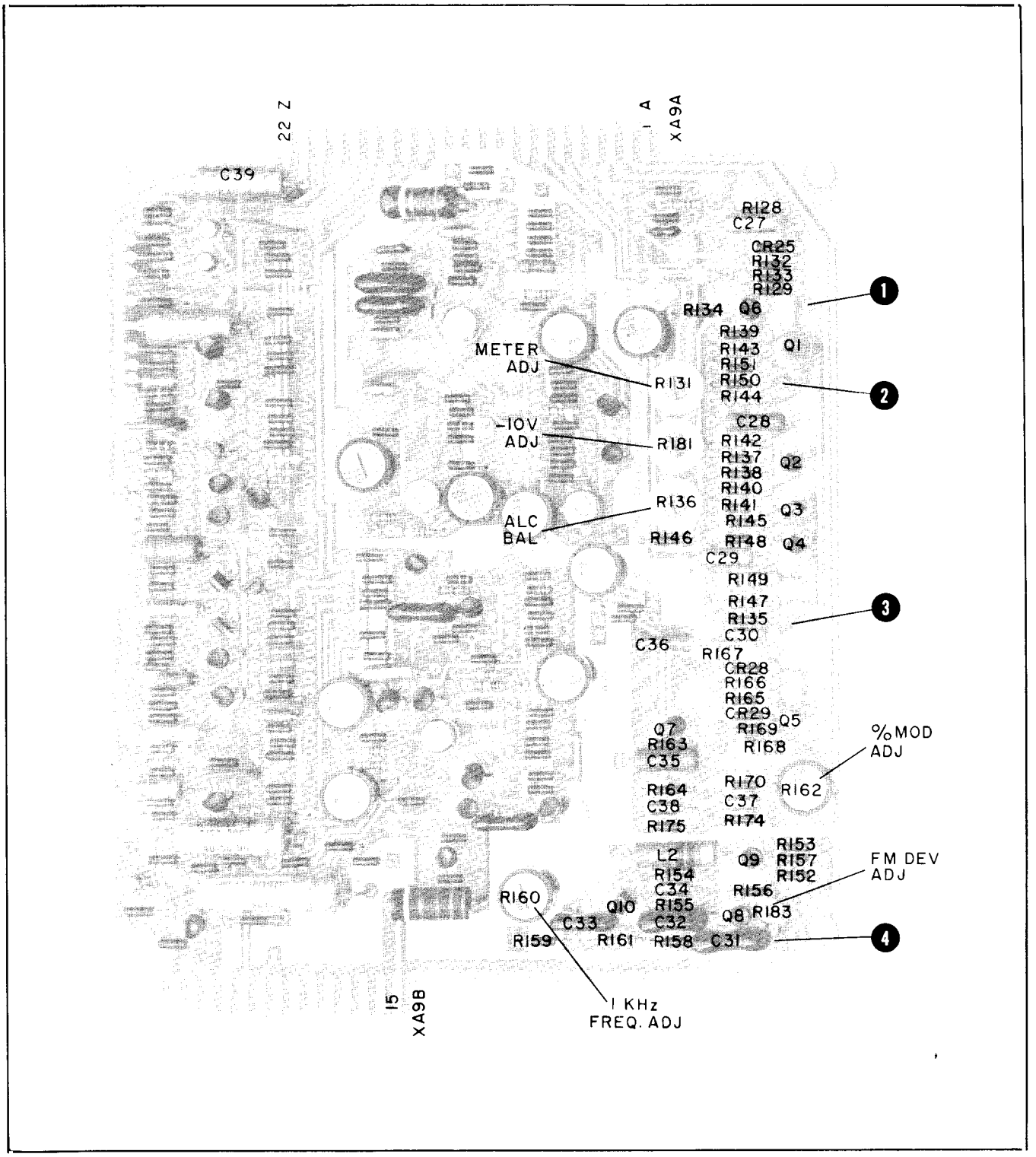
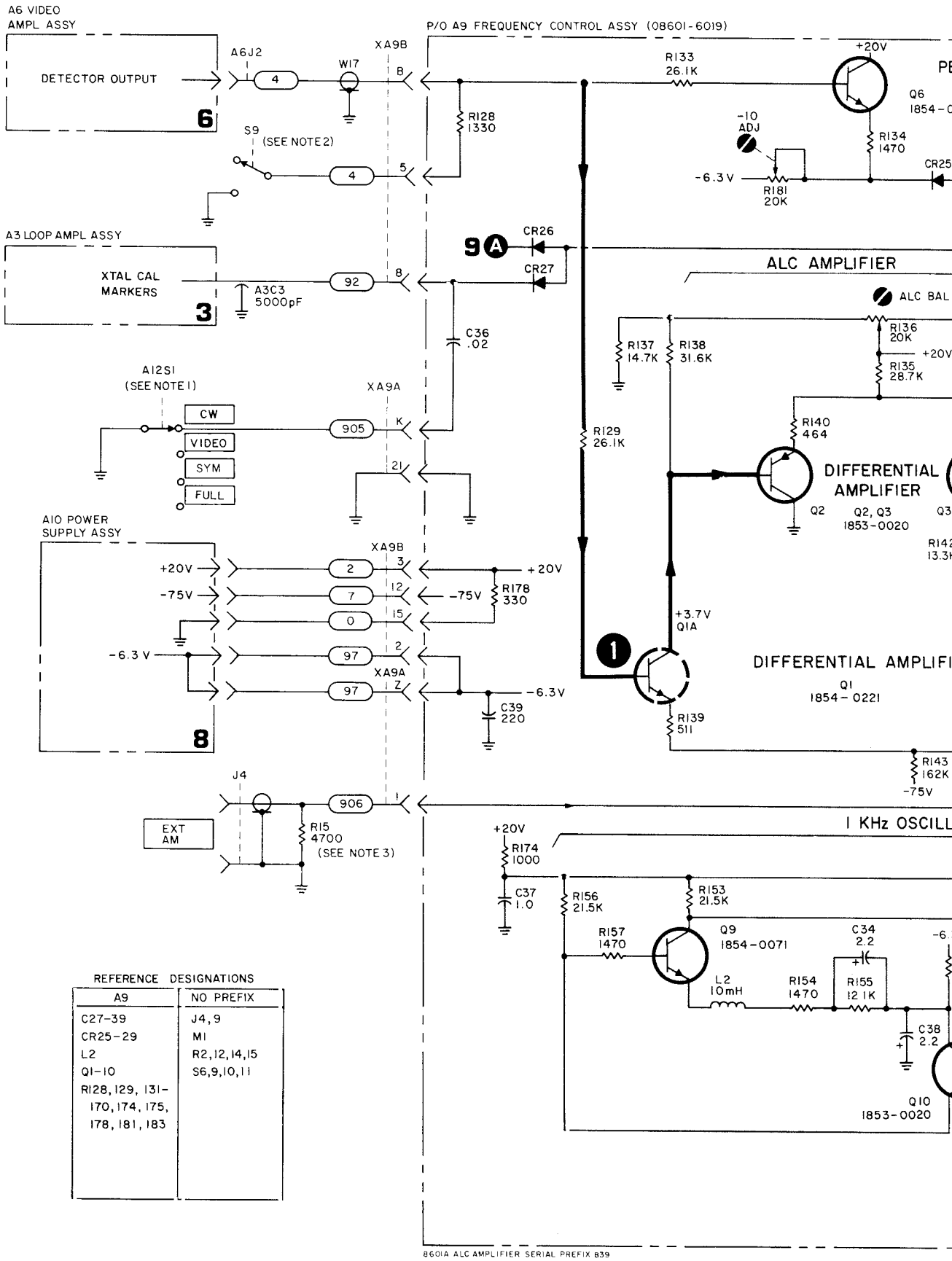
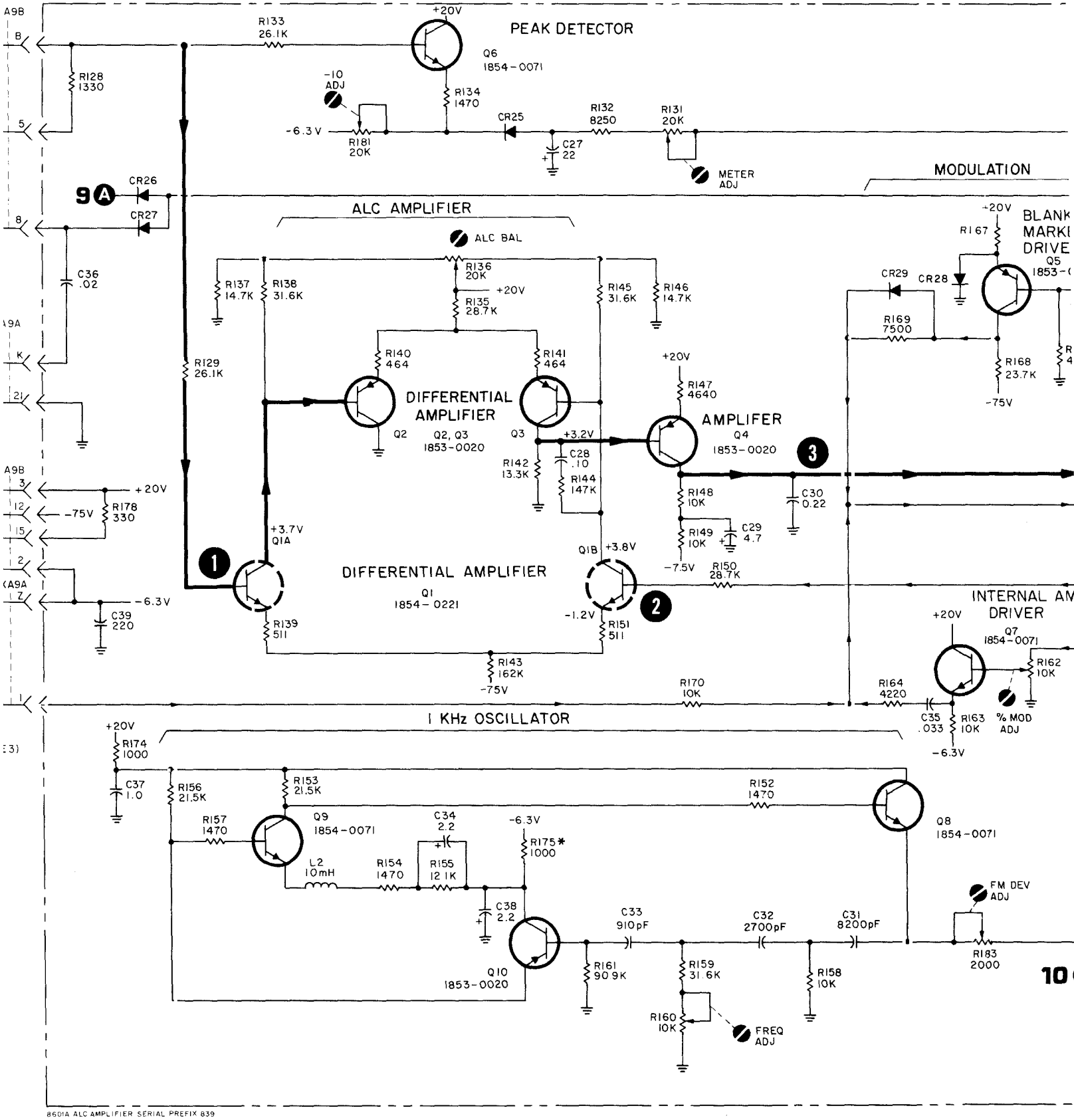


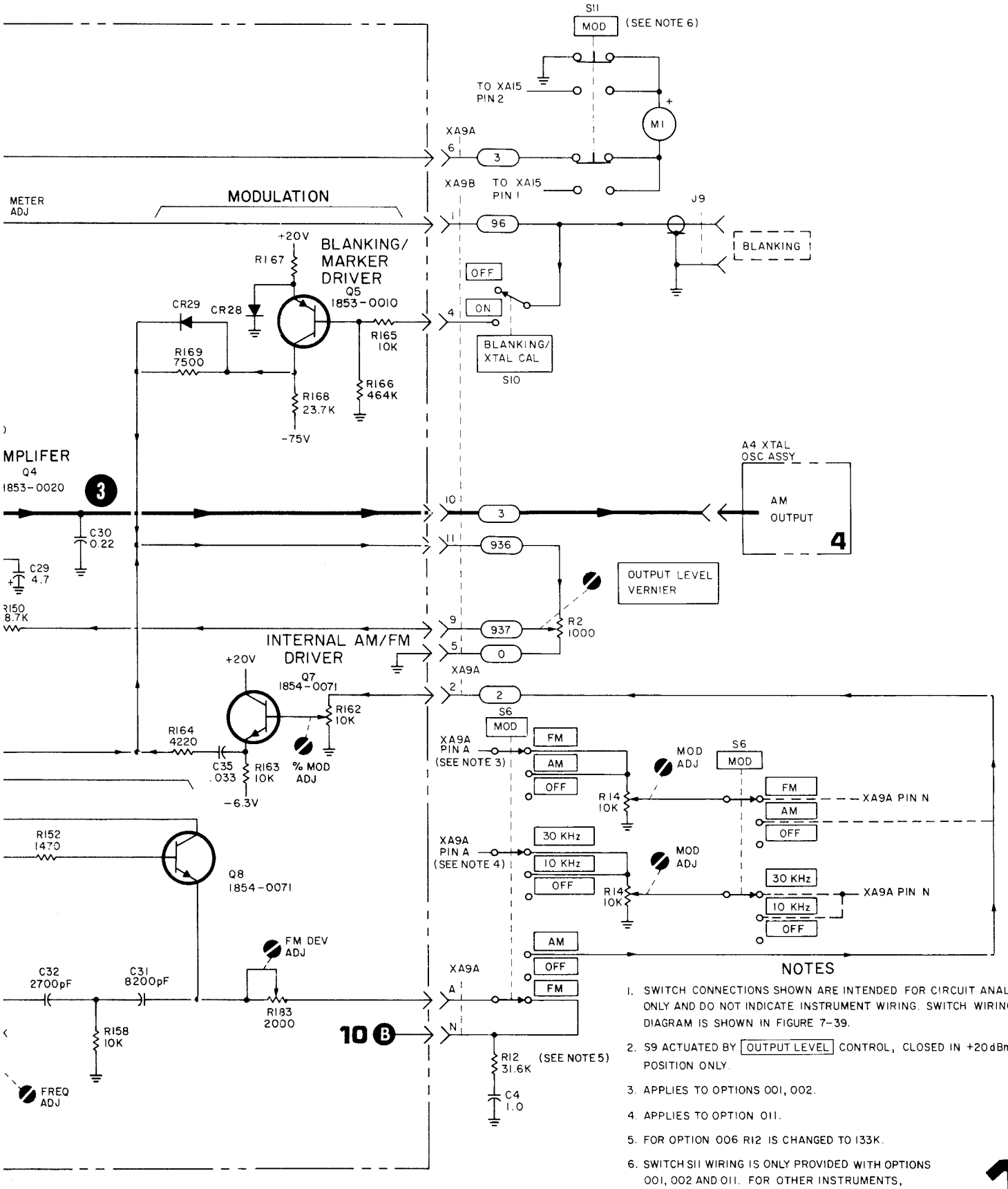
Figure 8-31. P/O A9 Assembly, ALC Amplifier, Component Identification


A6 VIDEO AMPL ASSY
DETECTOR OUTPUT
6
A6J2
4
W17
XA9B
B
P/O A9 FREQUENCY CONTROL ASSY (08601-6019)
R133 26.1K
+20V
Q6 1854-0
-10 ADJ
R134 1470
-6.3V
R181 20K
CR25
S9 (SEE NOTE 2)
4
5
R128 1330
A3 LOOP AMPL ASSY
XTAL CAL MARKERS
3
A3C3 5000pF
92
8
9A
CR26
CR27
ALC AMPLIFIER
ALC BAL
R136 20K
+20V
R137 14.7K
R138 31.6K
R135 28.7K
C36 .02
A12S1 (SEE NOTE 1)
CW
VIDEO
SYM
FULL
905
XA9A
K
21
R129 26.1K
R140 464
DIFFERENTIAL AMPLIFIER
Q2
Q2, Q3 1853-0020
Q3
R142 13.3K
A10 POWER SUPPLY ASSY
8
+20V
-75V
-6.3V
2
7
0
97
97
XA9B
3
12
15
2
Z
+20V
-75V
R178 330
-6.3V
C39 220
+3.7V Q1A
1
DIFFERENTIAL AMPLIFI
Q1 1854-0221
R139 511
R143 162K
-75V
J4
EXT AM
906
1
R15 4700 (SEE NOTE 3)
1 KHz OSCILL
+20V
R174 1000
C37 1.0
R156 21.5K
R153 21.5K
R157 1470
Q9 1854-0071
C34 2.2
L2 10mH
R154 1470
R155 12.1K
C38 2.2
Q10 1853-0020
REFERENCE DESIGNATIONS
A9
C27-39
CR25-29
L2
Q1-10
R128, 129, 131-170, 174, 175, 178, 181, 183
NO PREFIX
J4, 9
M1
R2, 12, 14, 15
S6, 9, 10, 11
8601A ALC AMPLIFIER SERIAL PREFIX 839

P/O A9 FREQUENCY CONTROL ASSY (08601-6019)



8601A ALC AMPLIFIER SERIAL PREFIX 839



NOTES

1. SWITCH CONNECTIONS SHOWN ARE INTENDED FOR CIRCUIT ANALYSIS ONLY AND DO NOT INDICATE INSTRUMENT WIRING. SWITCH WIRING DIAGRAM IS SHOWN IN FIGURE 7-39.
2. S9 ACTUATED BY OUTPUT LEVEL CONTROL, CLOSED IN +20dBm POSITION ONLY.
3. APPLIES TO OPTIONS 001, 002.
4. APPLIES TO OPTION 011.
5. FOR OPTION 006 R12 IS CHANGED TO 133K.
6. SWITCH S11 WIRING IS ONLY PROVIDED WITH OPTIONS 001, 002 AND 011. FOR OTHER INSTRUMENTS, SWITCH S11 IS REPLACED WITH SHORT CIRCUIT.

11

Figure 8-32. P/O A9 Assembly, ALC Circuit, Schematic Diagram

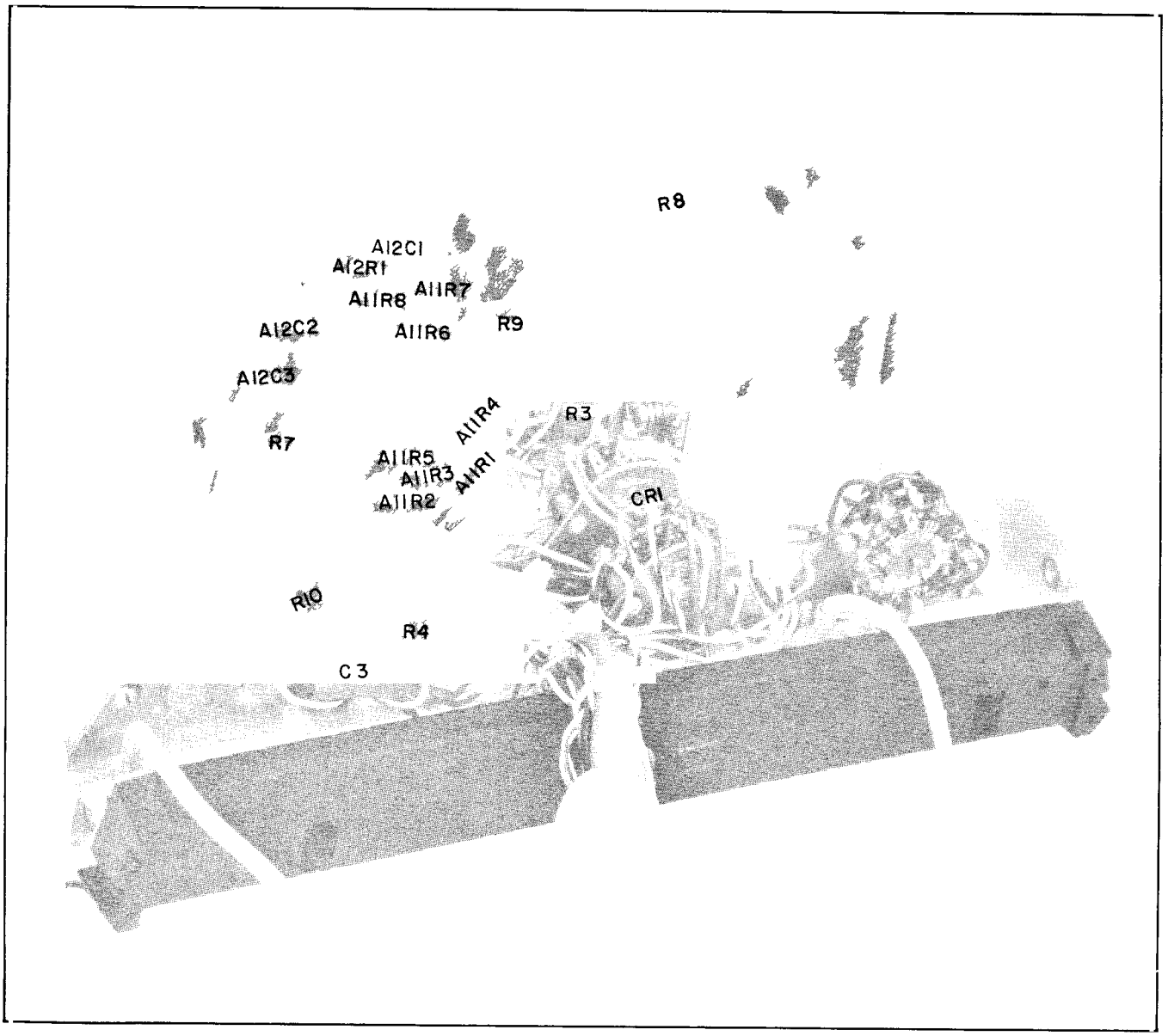
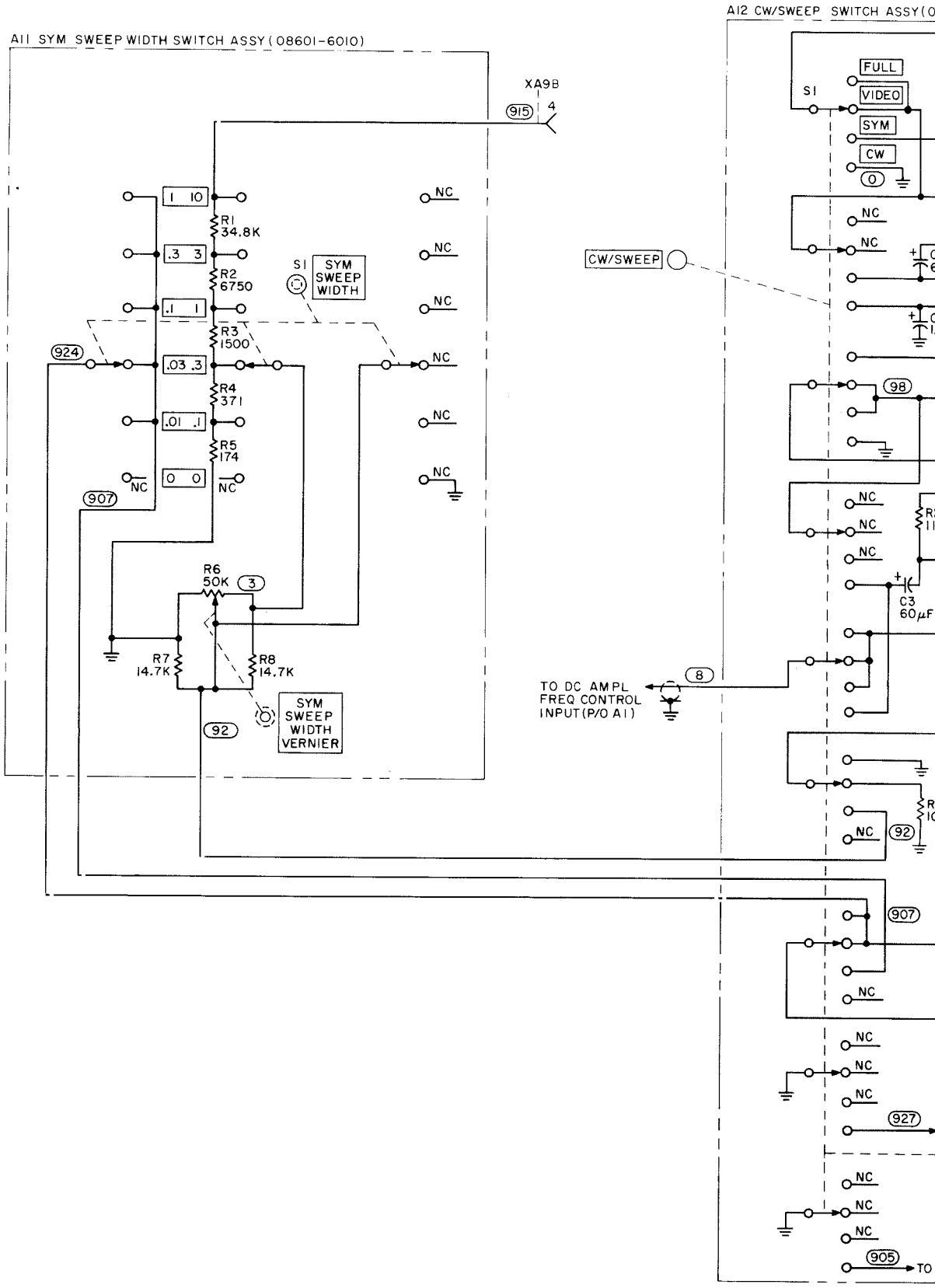
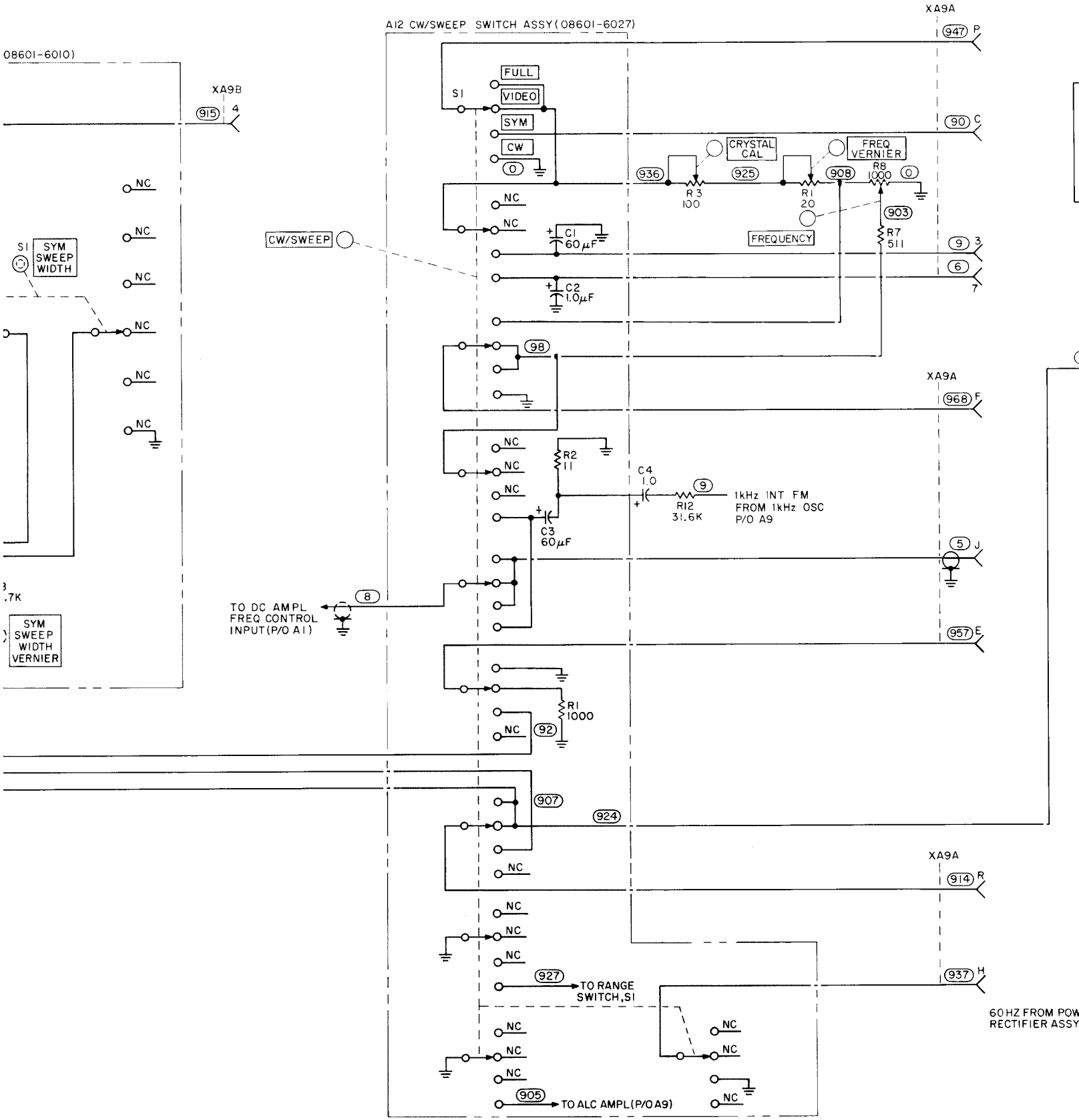


Figure 8-33. Front Panel Wiring, Component Identification


A11 SYM SWEEP WIDTH SWITCH ASSY (08601-6010)
A12 CW/SWEEP SWITCH ASSY(0
XA9B
915
4
1 10
R1
34.8K
.3 3
R2
6750
.1 1
R3
1500
924
.03 .3
R4
371
.01 .1
R5
174
0 0
NC
907
S1
SYM
SWEEP
WIDTH
R6
50K
3
R7
14.7K
R8
14.7K
92
SYM
SWEEP
WIDTH
VERNIER
CW/SWEEP
TO DC AMPL
FREQ CONTROL
INPUT(P/O A1)
8
FULL
VIDEO
SYM
CW
0
98
C3
60μF
927
905
TO


A12 CW/SWEEP SWITCH ASSY(08601-6027)
08601-6010)
XA9A
XA9B
947 P
915 4
90 C
FULL
VIDEO
SYM
CW
0
S1
CRYSTAL CAL
FREQ VERNIER
936
925
908
R8 1000
R3 100
R1 20
FREQUENCY
903
R7 511
NC
CW/SWEEP
C1 60μF
C2 1.0μF
9 3
6 7
98
968 F
R2 11
C4 1.0
9
R12 31.6K
1kHz INT FM FROM 1kHz OSC P/O A9
C3 60μF
5 J
TO DC AMPL FREQ CONTROL INPUT(P/O A1)
8
957 E
R1 1000
92
907
924
914 R
927
TO RANGE SWITCH,S1
937 H
60 HZ FROM POW RECTIFIER ASSY
905
TO ALC AMPL(P/O A9)
SYM SWEEP WIDTH
SYM SWEEP WIDTH VERNIER

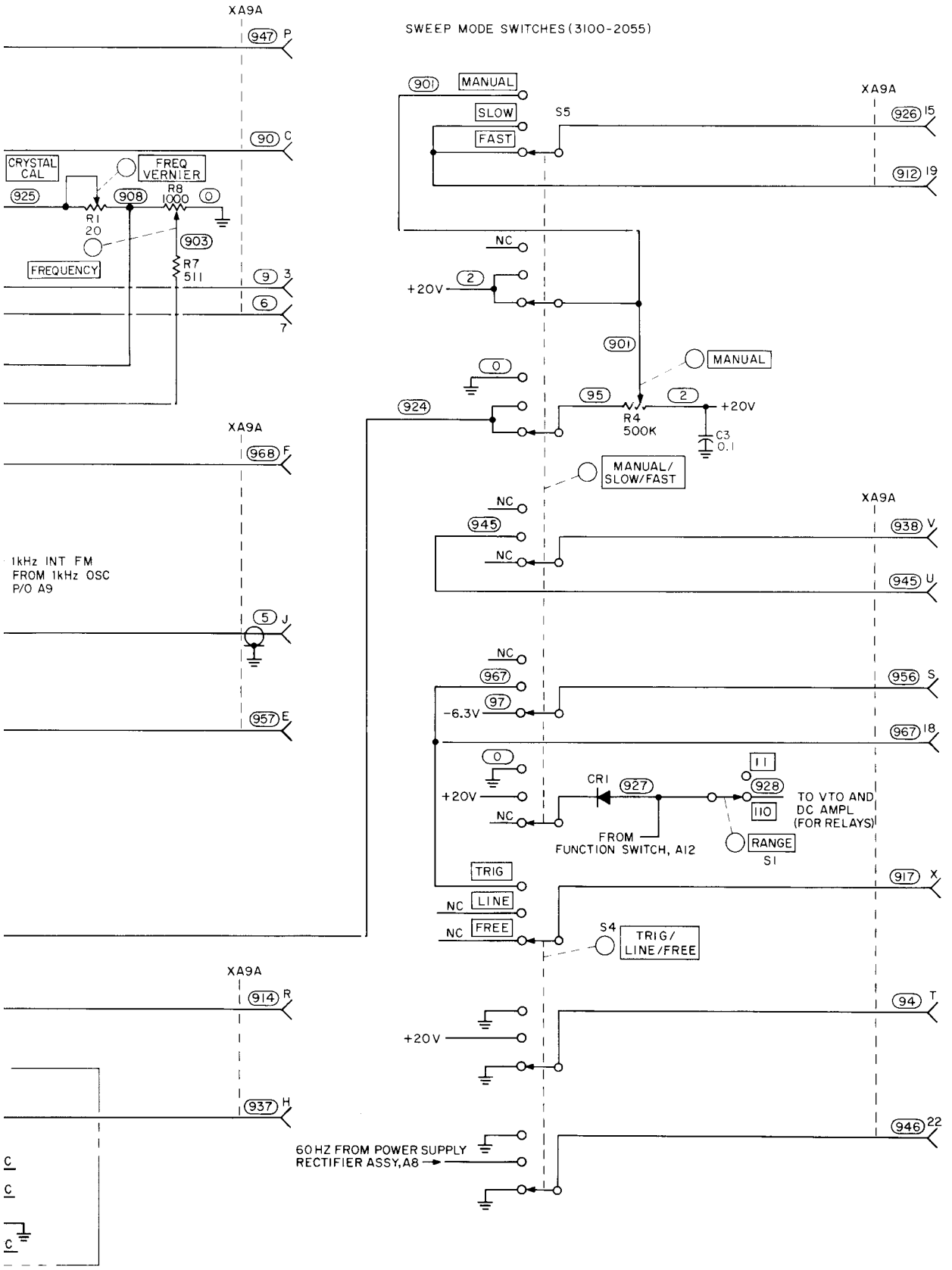


Figure 8-34. S5/A11/A12 Front Panel Switching, Schematic Diagram

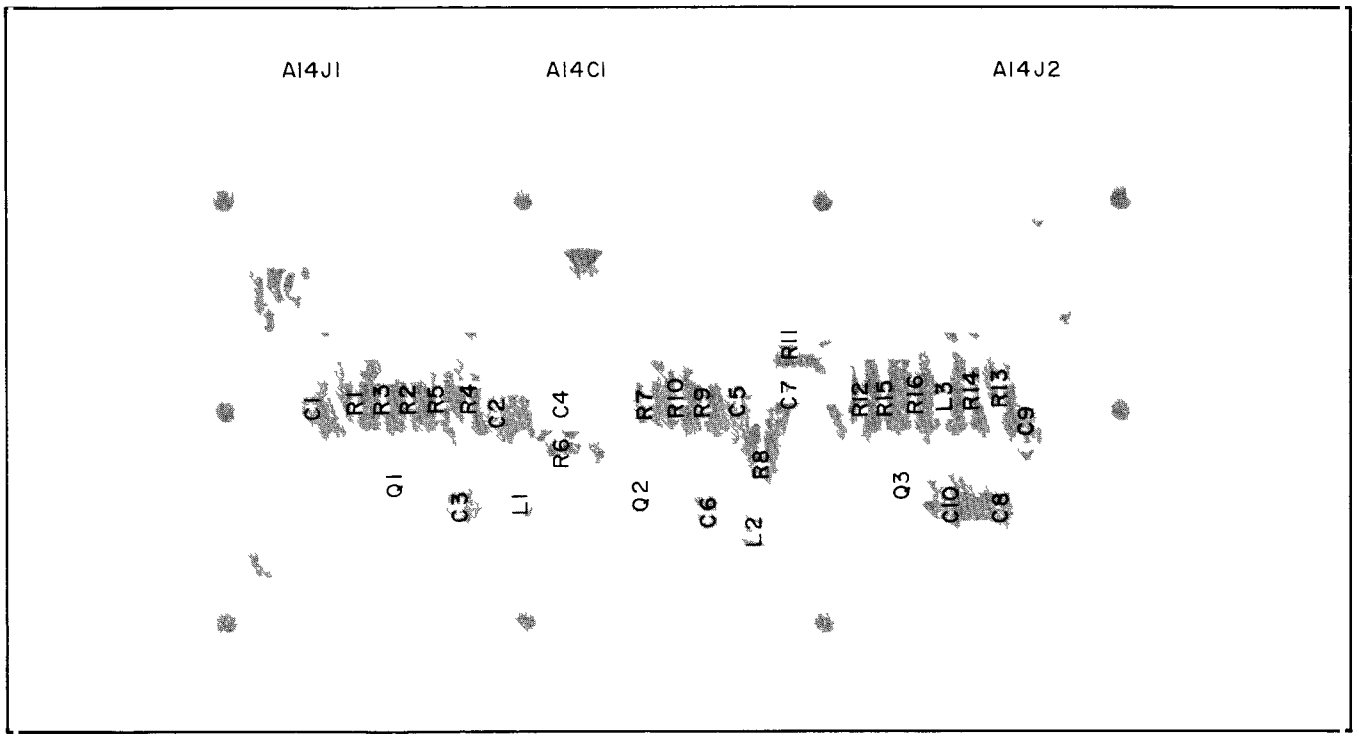


Figure 8-35. A14 Broadband Amplifier, Component Identification

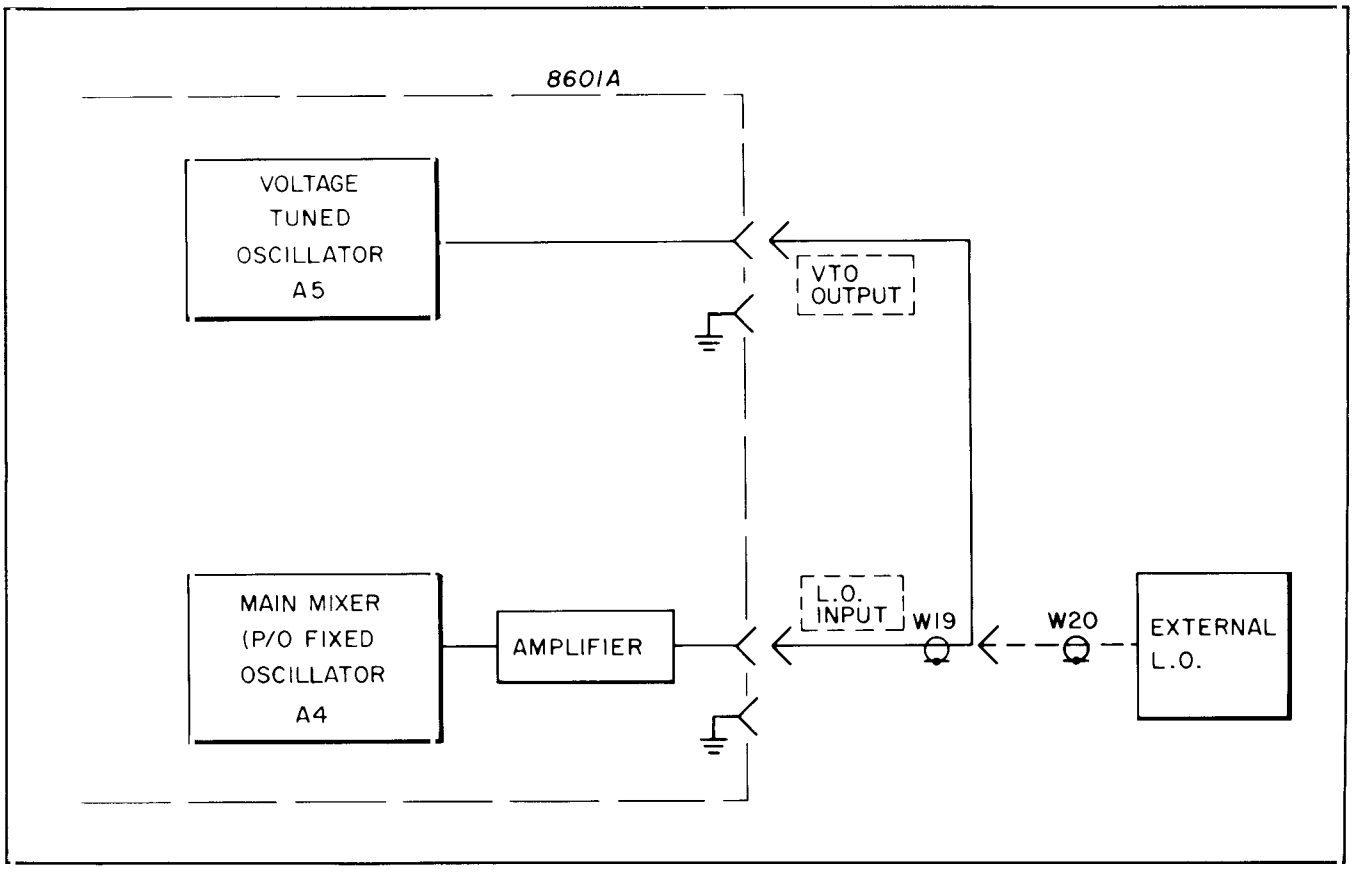
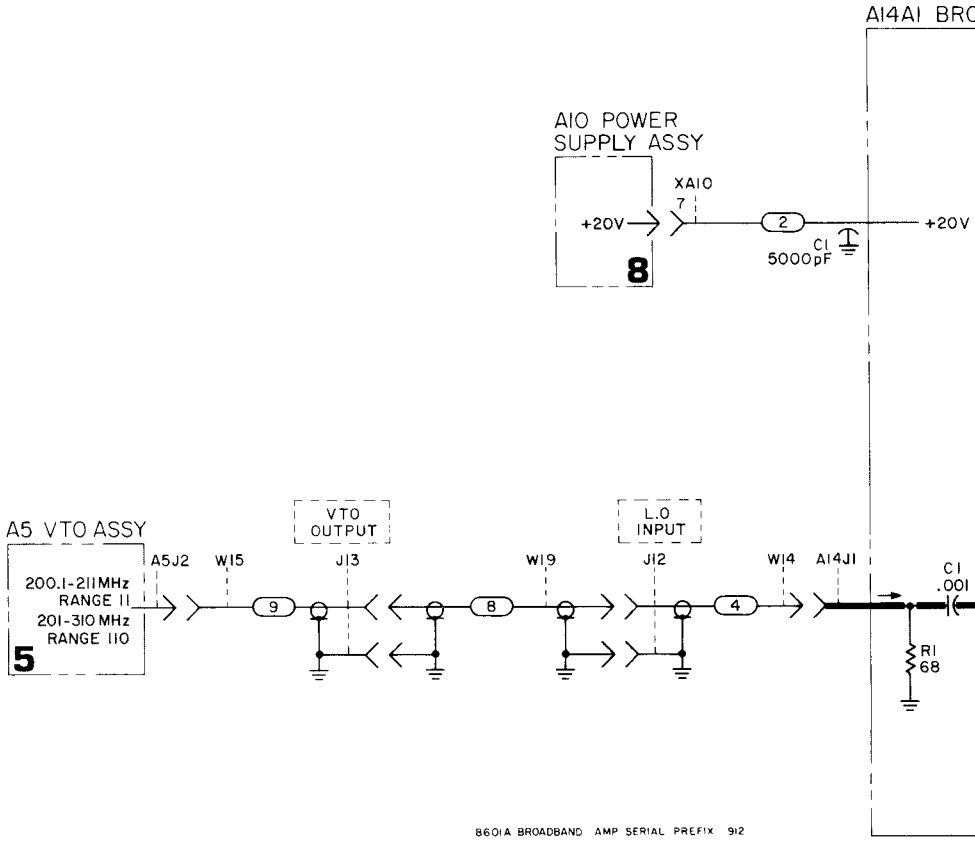
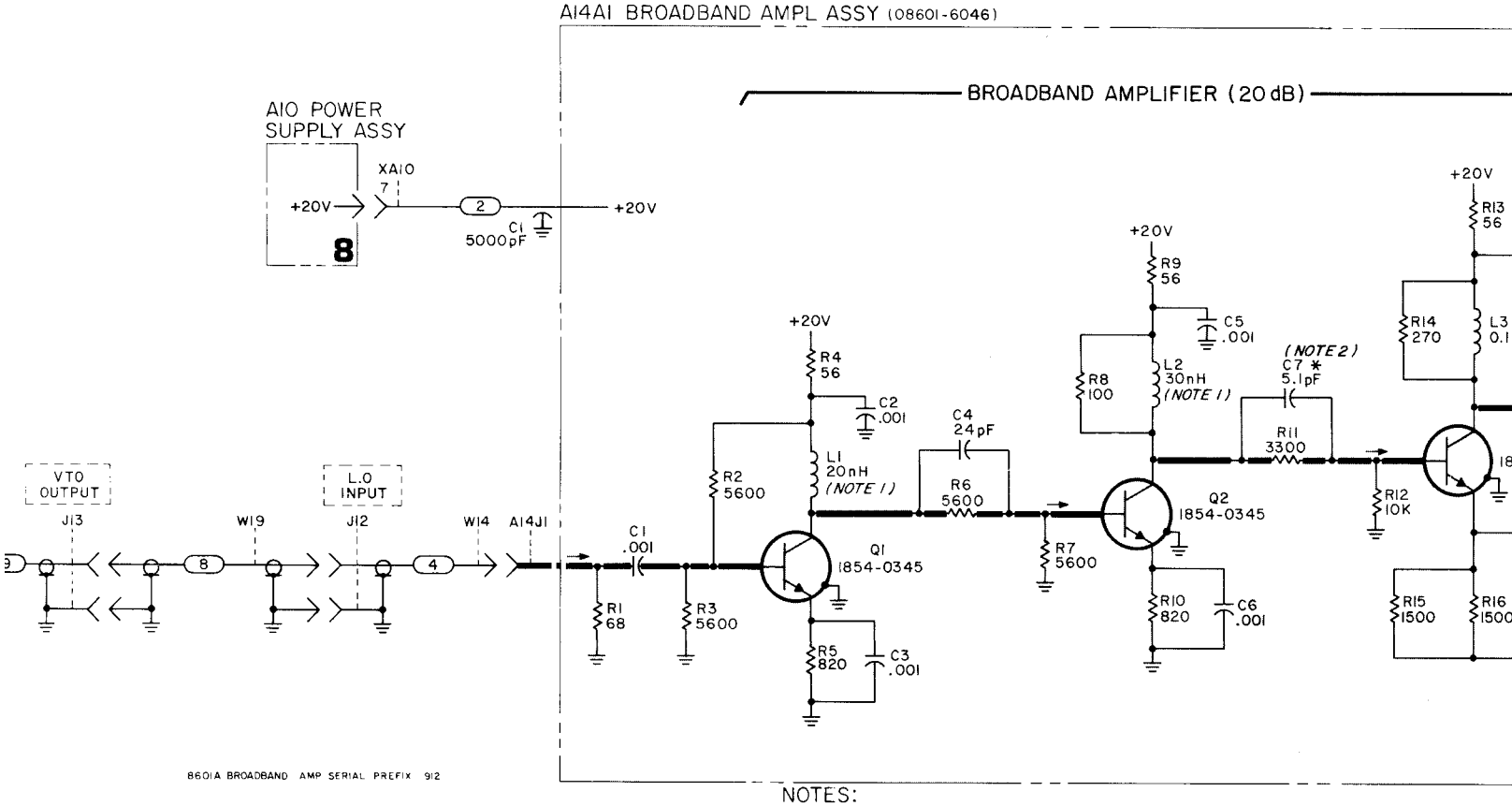


Figure 8-36. Block Diagram, 8601A Option 007

SERVICE SHEET 13



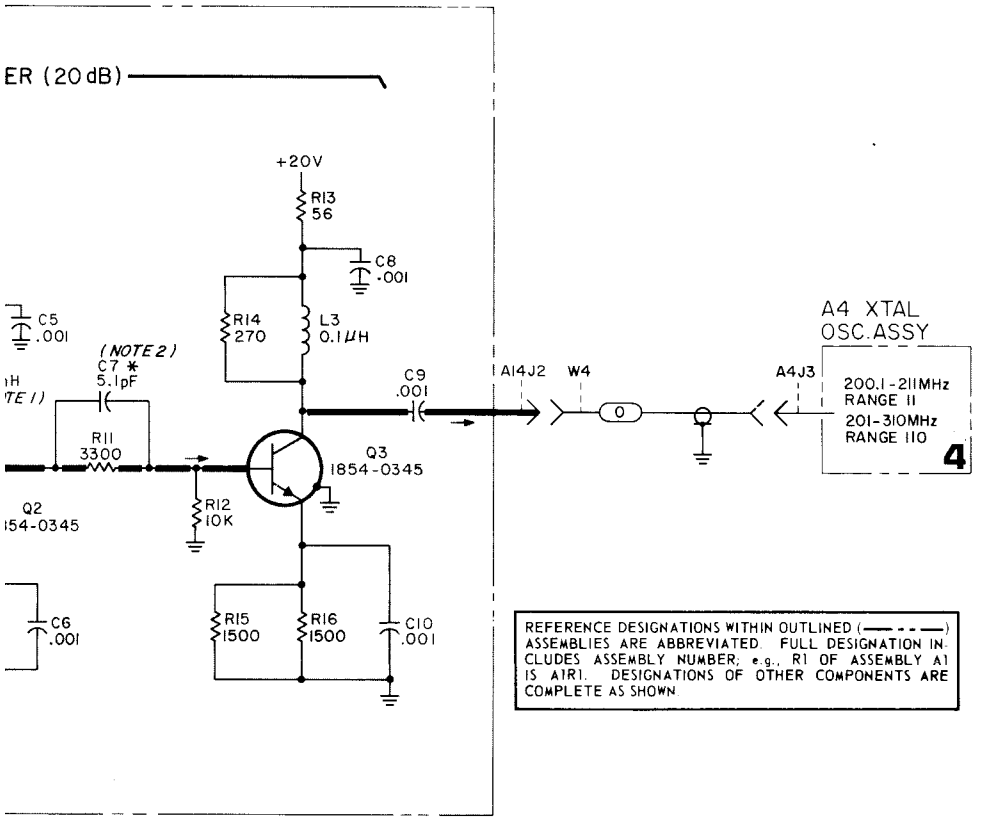
8601A BROADBAND AMP SERIAL PREFIX 912



8601A BROADBAND AMP SERIAL PREFIX 912

NOTES:

1. PRINTED CIRCUIT SPIRALS, P/O BOARD ASSY
2. * = FACTORY SELECTED PART;
   TYPICAL VALUE GIVEN
   C7 IS SELECTED FOR SPURIOUS RESPONSES
   ≥ 40 dB BELOW CARRIER WITH OUTPUT LEVEL
   SET AT +10 dBm AND VERNIER SET FOR −10 dBm
   METER READING



REFERENCE DESIGNATIONS

A14 ASSY	A14A1
C1 J1, 2	C1-10 L1-3 Q1-3 R1-16

13

Figure 8-37. A14 Broadband Amplifier, Schematic Diagram (Option 007 Only)

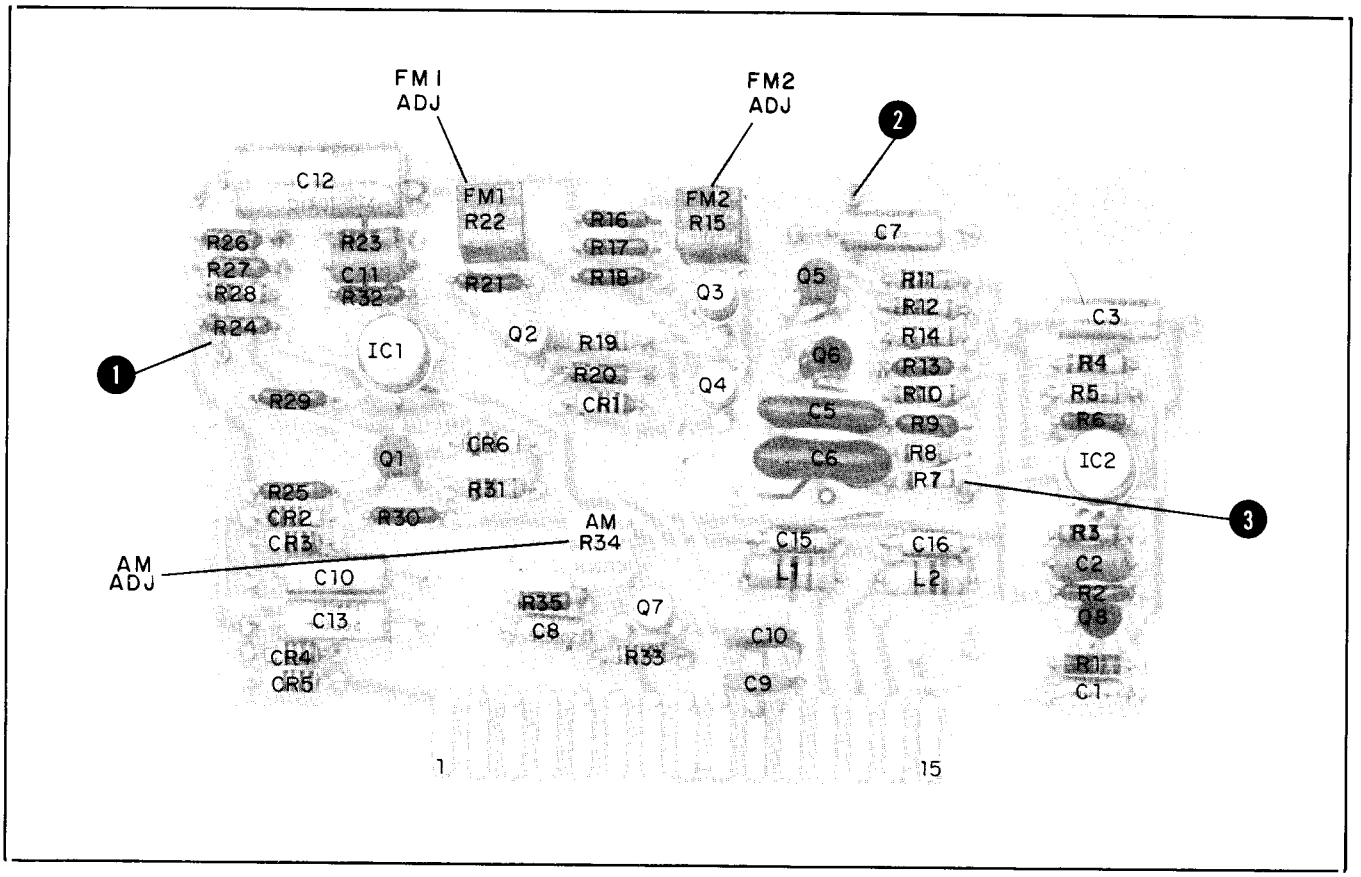
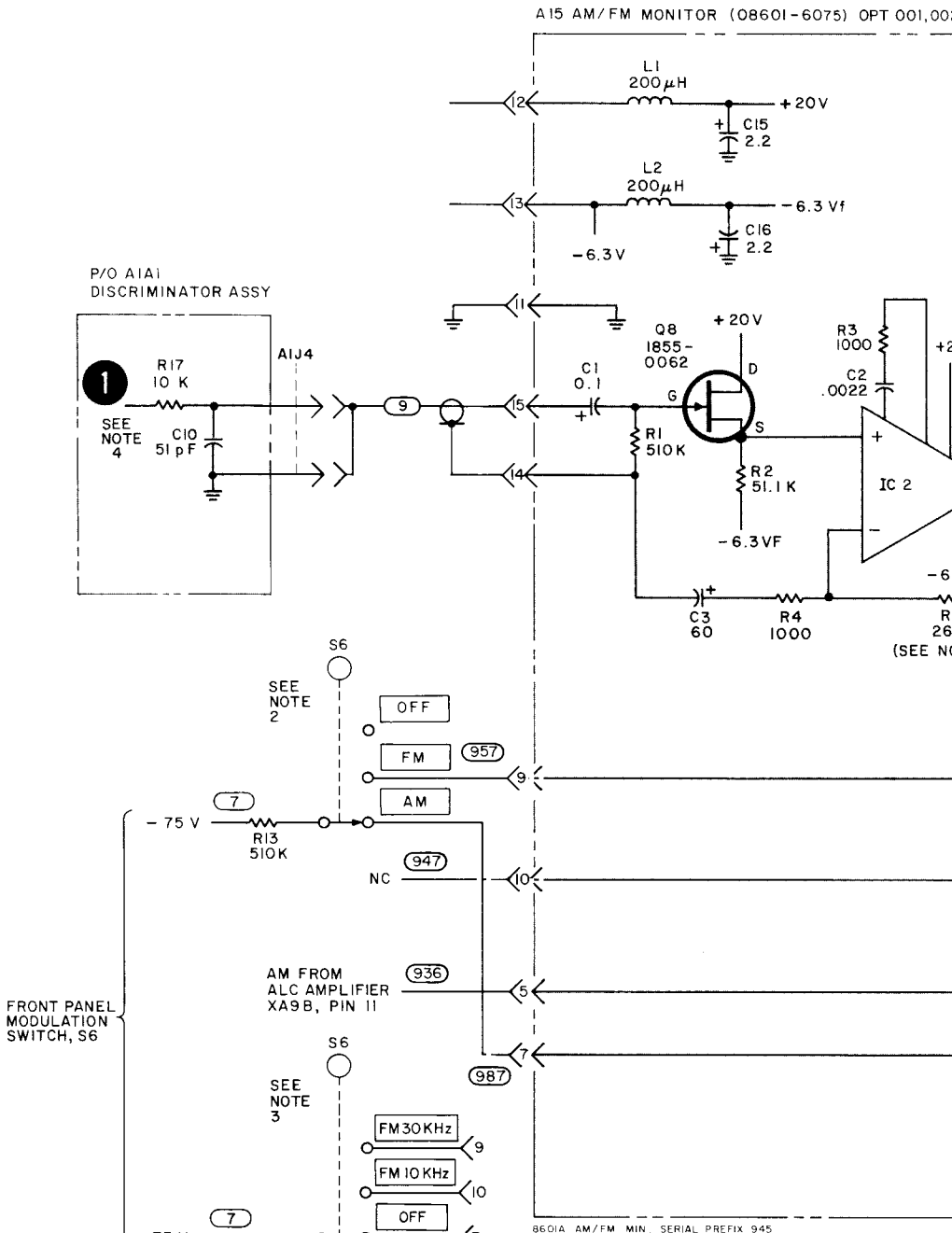
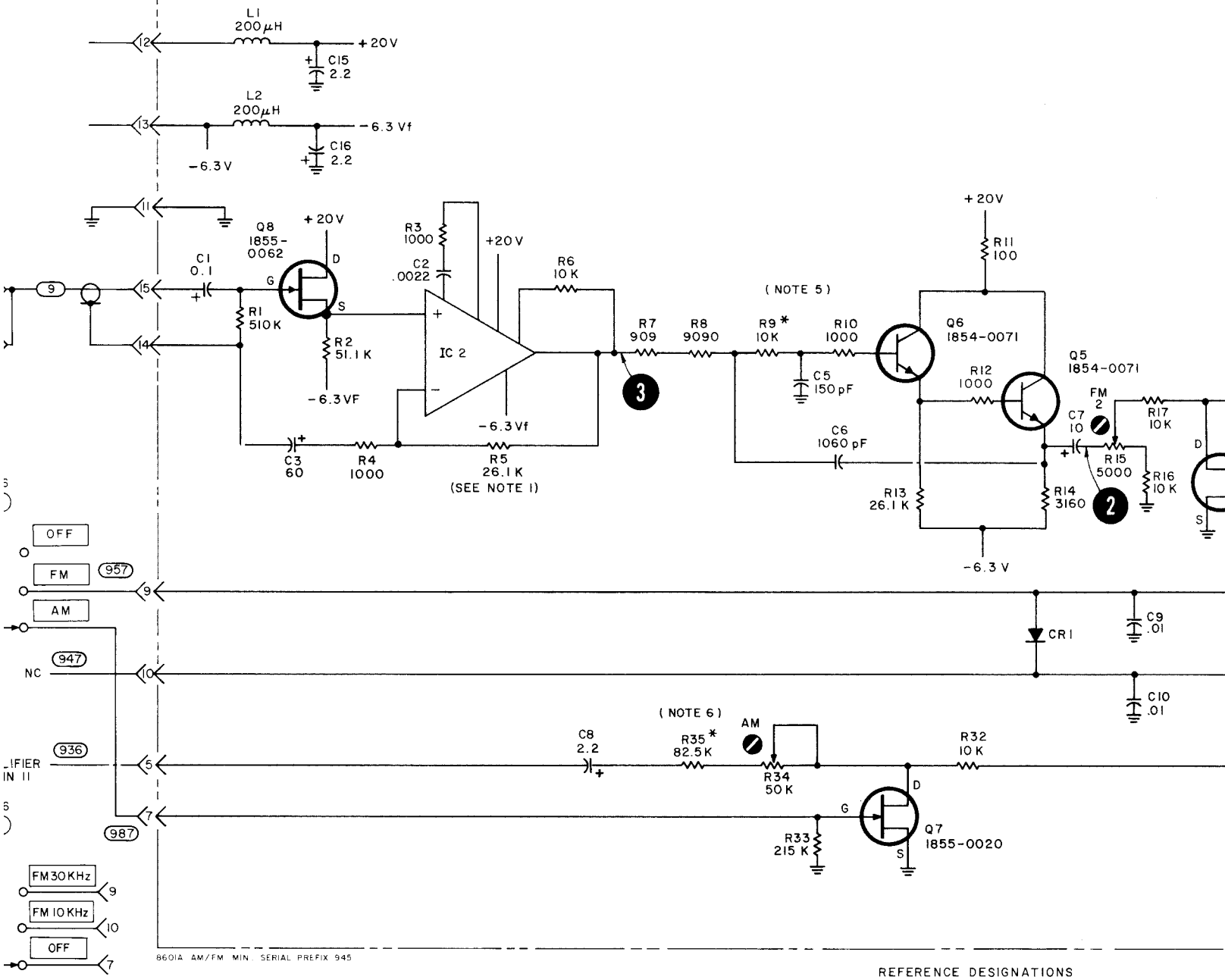


Figure 8-38. A15 AM/FM Monitor, Component Identification


A15 AM/FM MONITOR (08601-6075) OPT 001,00
L1
200μH
+20V
C15
2.2
L2
200μH
-6.3 Vf
C16
2.2
-6.3V
P/O A1A1
DISCRIMINATOR ASSY
1
R17
10 K
SEE
NOTE
4
C10
51 pF
A1J4
9
11
15
14
Q8
1855-
0062
+20V
D
G
S
C1
0.1
R1
510K
R2
51.1 K
-6.3VF
R3
1000
C2
.0022
IC 2
C3
60
R4
1000
(SEE NO
S6
SEE
NOTE
2
OFF
FM
957
AM
7
-75 V
R13
510K
947
NC
10
AM FROM
ALC AMPLIFIER
XA9B, PIN 11
936
5
FRONT PANEL
MODULATION
SWITCH, S6
S6
SEE
NOTE
3
987
7
FM30KHz
FM10KHz
OFF
9
10
7
-75 V
R13
510K
8601A AM/FM MIN. SERIAL PREFIX 945

A15 AM/FM MONITOR (08601-6075) OPT 001,002,011



8601A AM/FM MIN. SERIAL PREFIX 945

REFERENCE DESIGNATIONS

A15	A1A1
C1-C16 CR1-CR16 IC1, IC2 L1, L2 Q1-Q8 R1-R35	C10 R17 CHASSIS R13 S6

NOTES

1. R5
2. S6
3. S6
4. ADD
5. *
MO
6. * =

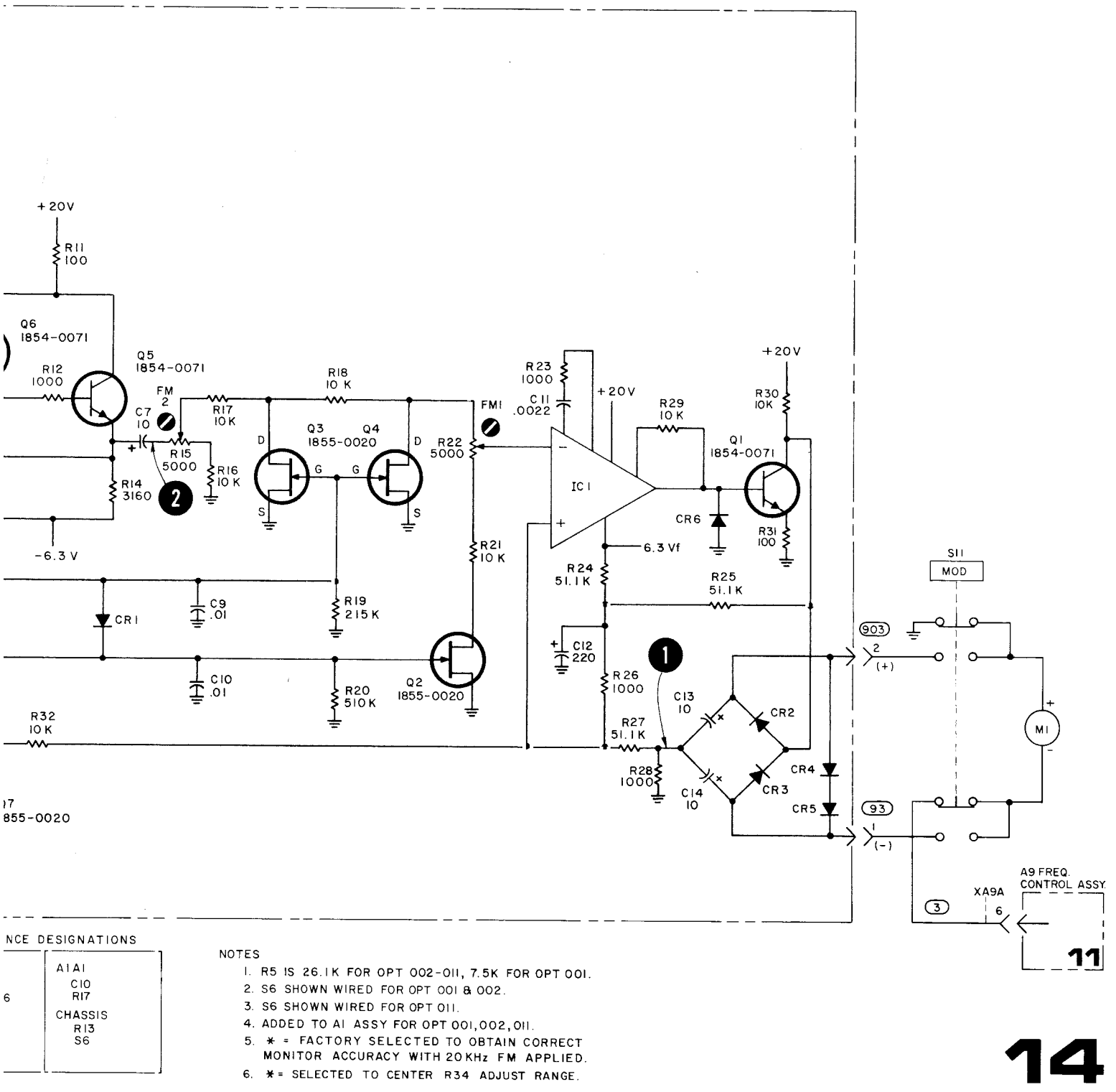


Figure 8-39. A15 AM/FM Monitor, Schematic Diagram (Options 001, 002 and 011 Only)

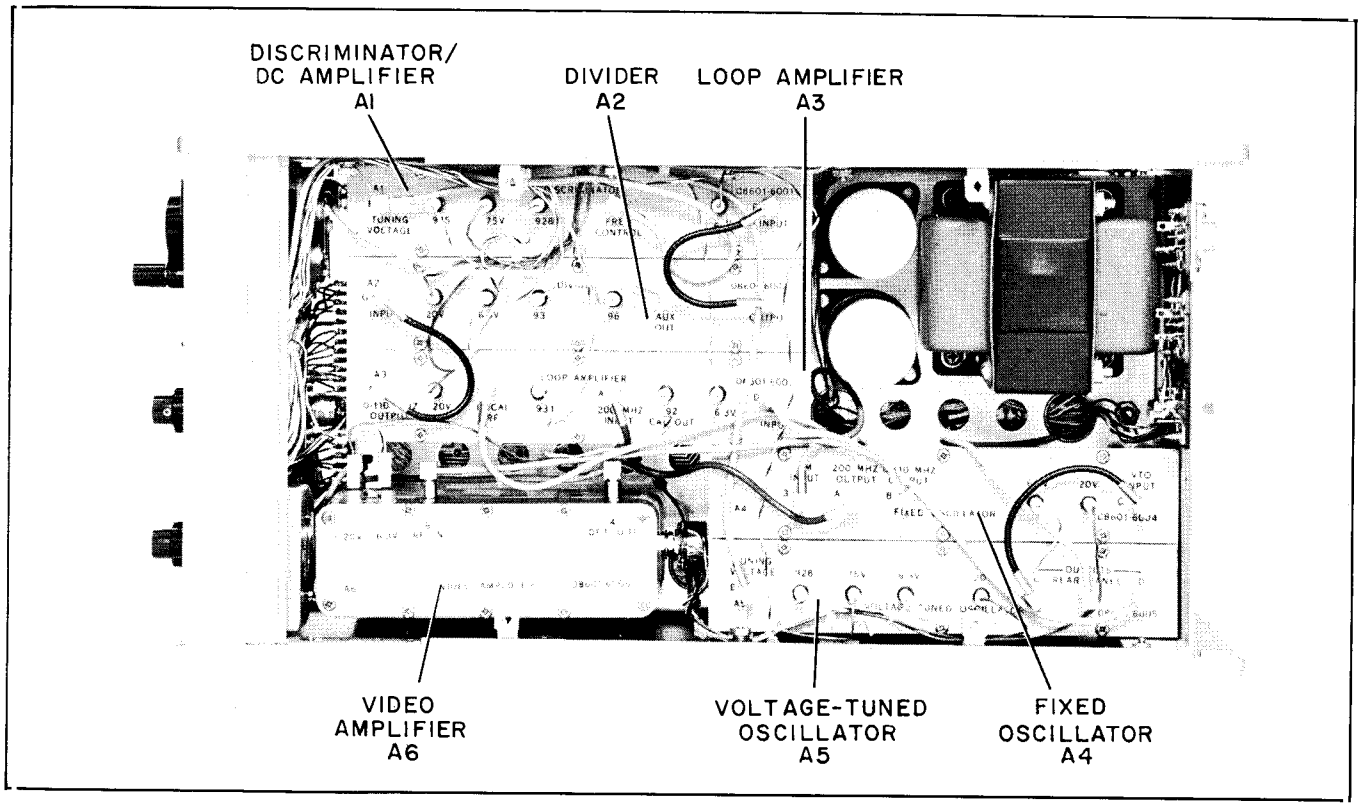


Figure 8-40. 8601A Top View

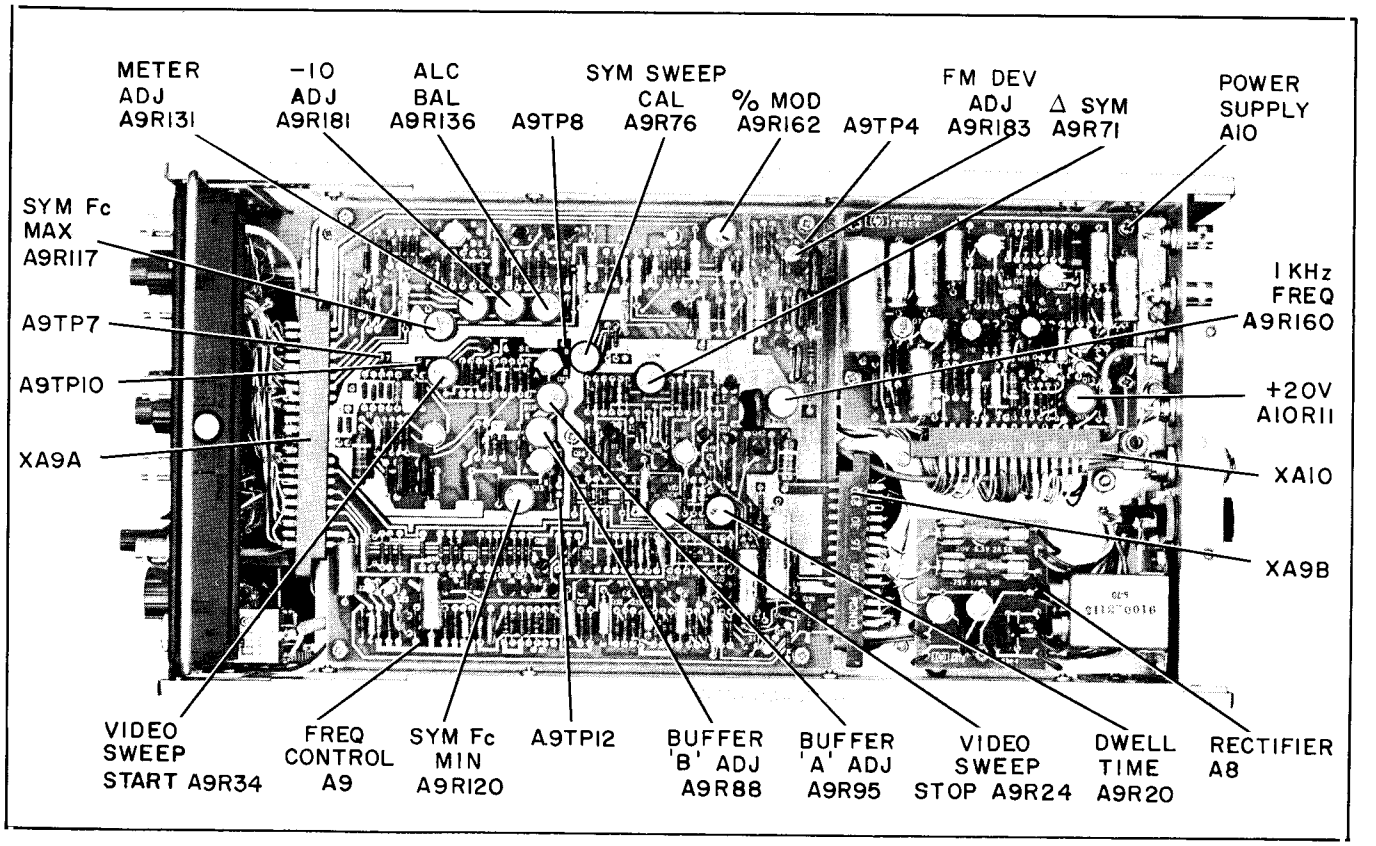


Figure 8-41. 8601A Bottom View

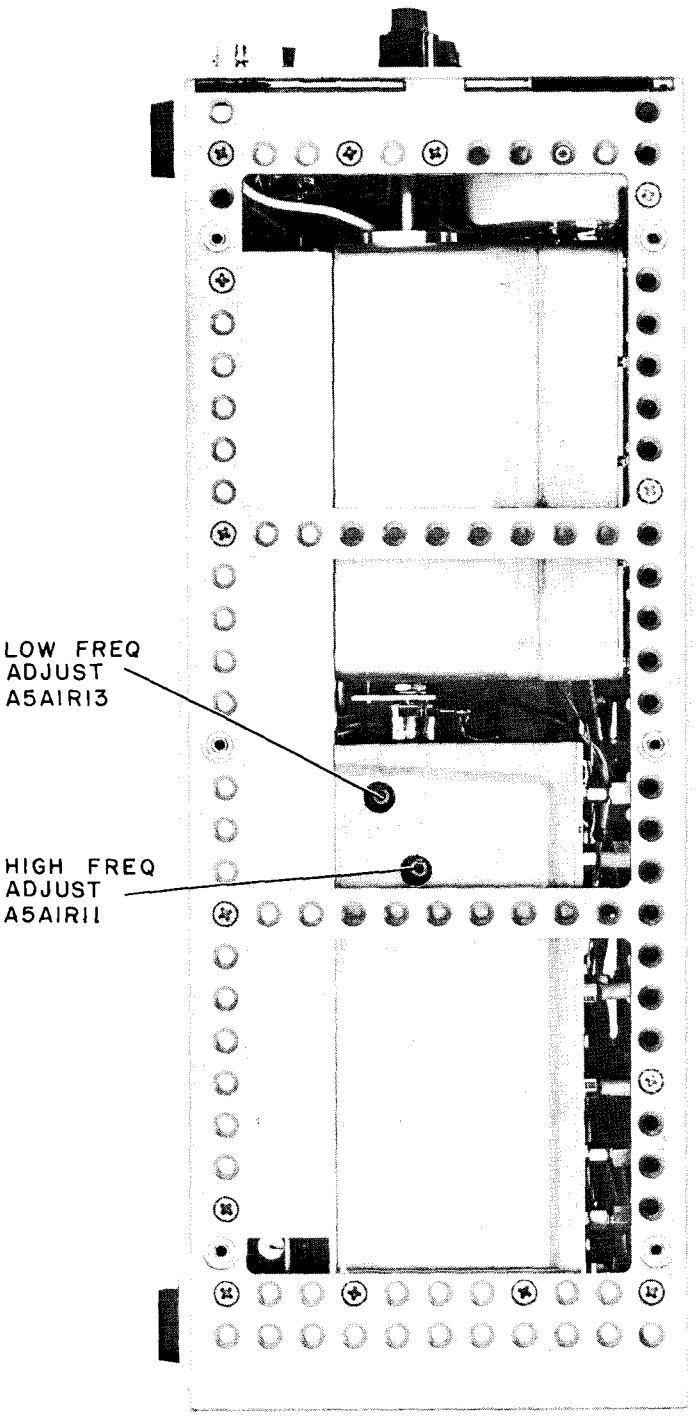


Figure 8-42. 8601A Right Side Adjustments

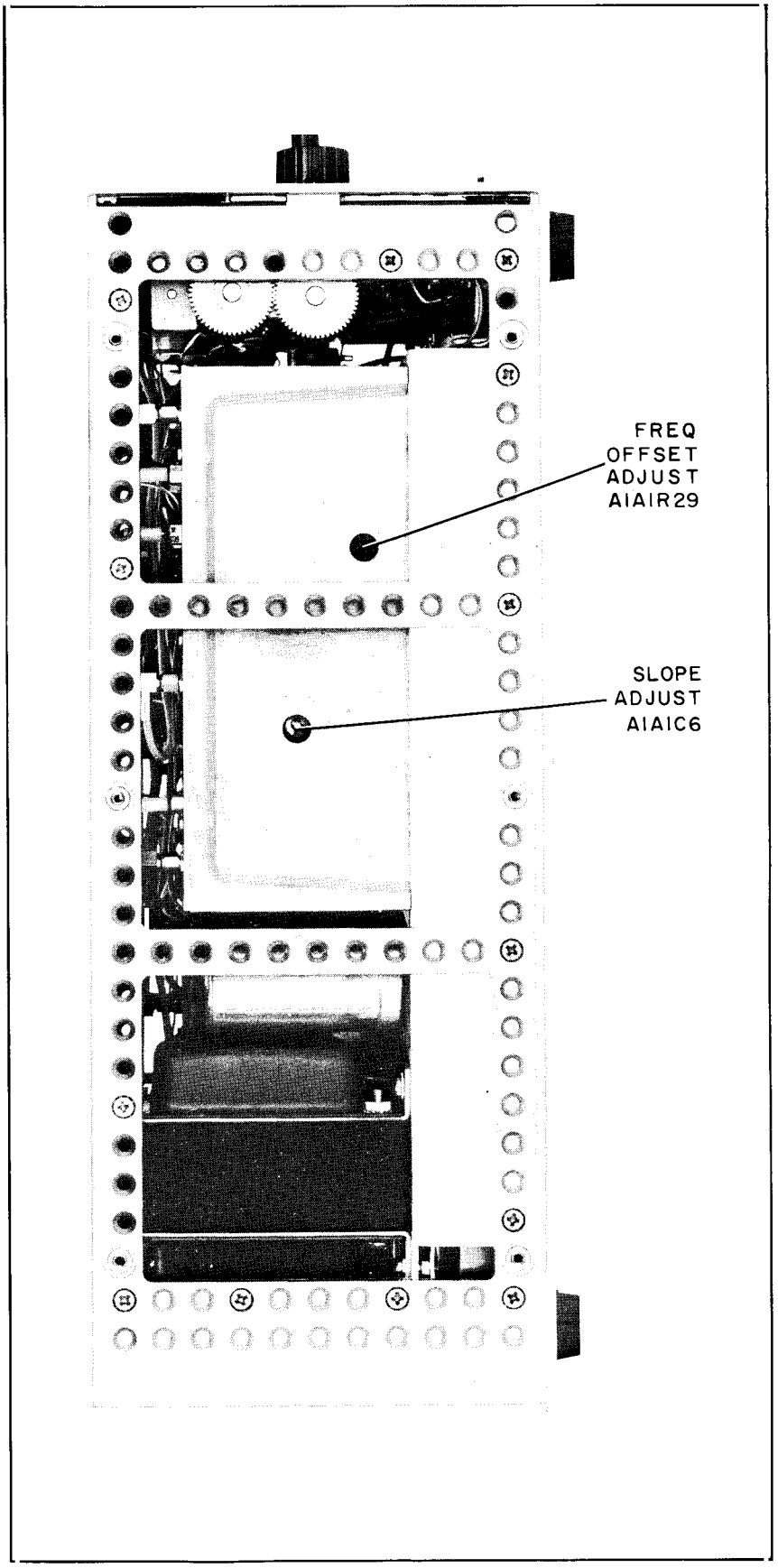


Figure 8-43. 8601A Left Side Adjustments

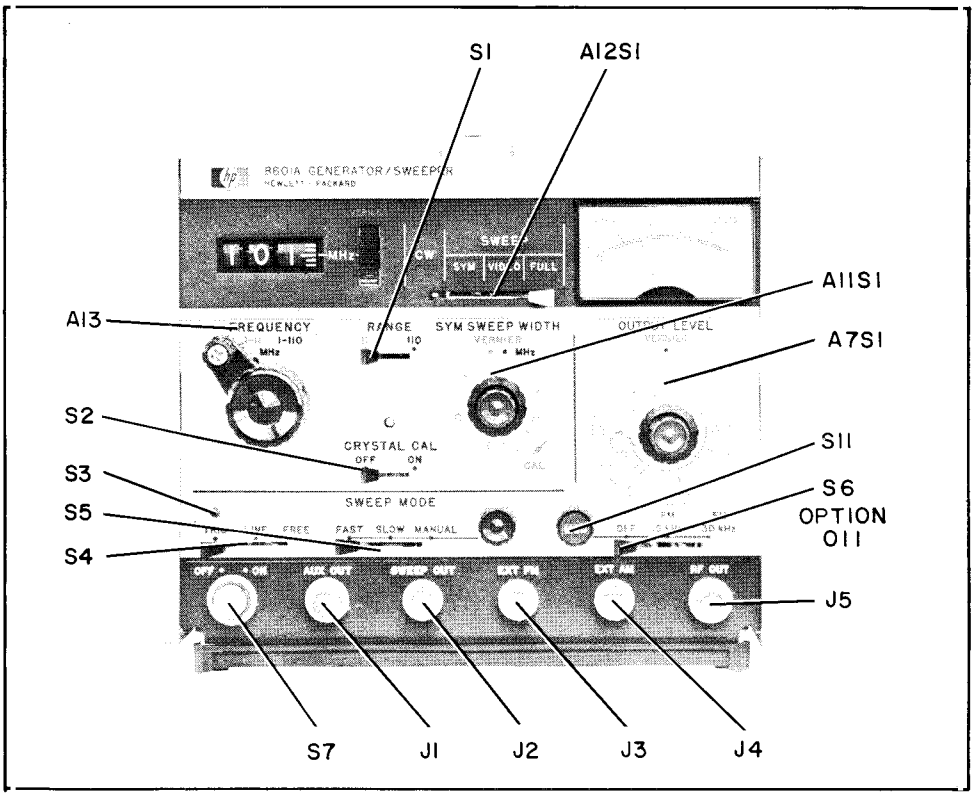


Figure 8-44. 8601A Front Panel, Assembly Location

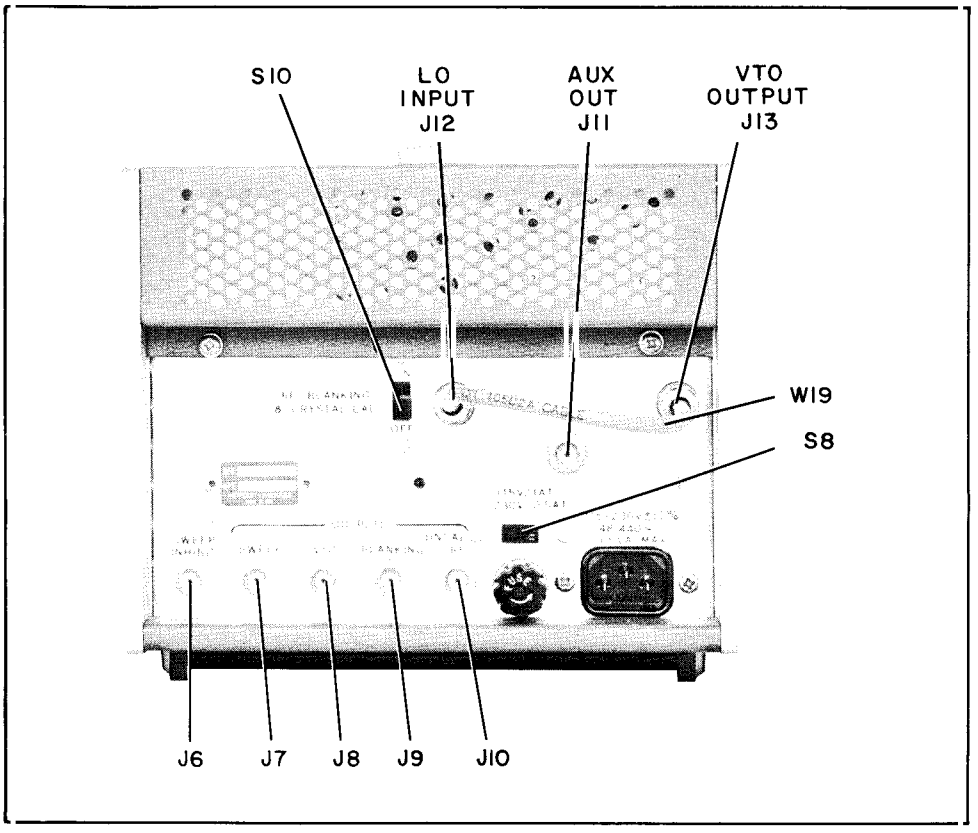


Figure 8-45. 8601A Rear Panel, Assembly Location

HP Part No. 08601-90017

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