

# HEWLETT-PACKARD

## GENERATOR/SWEEPER 8601A

### FOR REFERENCE PURPOSES ONLY

#### 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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Manual Part No. 08601-90017  
Microfiche Part No. 08601-90018

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HEWLETT  PACKARD

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# MANUAL CHANGES

## MANUAL IDENTIFICATION

Model Number: 8601A  
Date Printed: June, 1971  
Part Number: 08601-90017

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

To use this supplement:

Make all ERRATA corrections

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

| Serial Prefix or Number       | Make Manual Changes | Serial Prefix or Number         | Make Manual Changes |
|-------------------------------|---------------------|---------------------------------|---------------------|
| 0969A02216 thru<br>0969A02355 | 1                   | 1144A03056 thru<br>1144A03300   | 1 thru 7            |
| 0969A02356 thru<br>0969A02565 | 1,2                 | 1144A03301 thru<br>1144A03545   | 1 thru 8            |
| 1144A02566 thru<br>1144A02810 | 1,2,3               | 1144A03546 thru<br>1144A04245   | 1 thru 9            |
| 1144A02811 thru<br>1144A02845 | 1 thru 4            | 1144A04246 thru<br>1144A04630   | 1 thru 10           |
| 1144A02846 thru<br>1144A02985 | 1 thru 5            | 1512A04631 thru<br>1512A04735   | 1 thru 11           |
| 1144A02986 thru<br>1144A03055 | 1 thru 6            | 1512A04736 thru<br>1512A04910   | 1 thru 12           |
|                               |                     | 1512A04911 thru<br>1512A05155   | 1 thru 13           |
|                               |                     | 1512A05156 thru<br>1512A prefix | 1 thru 14           |
|                               |                     | 1612A                           | 1 thru 15           |

► NEW ITEM

## ERRATA

Page 1-1, Paragraph 1-11:

Change the second sentence to read "FM deviation is variable from 0 to 100 kHz for Option 001."

Page 1-2, Table 1-1, under OUTPUT CHARACTERISTICS:

Change Level for options 008, 009, and 010 to read "+18 to -112 dBm."

Change Accuracy to read "±1 dB accuracy for any output level from +13 dBm to -110 dBm."

Change Flatness to read "±0.25 dB over full range, ±0.1 dB over any 10 MHz portion (+10 dBm step or below)."

Change Video to read "Sweep extends from low end of range to frequency dial setting. Start frequency accuracy is ±1% of stop frequency, or ±10 kHz low range, ±100 kHz high range, whichever is greater."

Page 1-3, Table 1-1, under AUXILIARY OUTPUTS, Rear Panel:

Change Uncalibrated RF output to -12 dBm minimum, unmodulated.

Page 1-3, Table 1-2 (1 of 3):

Add the following:

## NOTE

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

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10 Pages

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## ERRATA (Cont'd)

| Instrument Type    | Measurement Requirements                                                                 | Suggested Model | Use |
|--------------------|------------------------------------------------------------------------------------------|-----------------|-----|
| Electronic Counter | Frequency Range: dc to 50 MHz<br>Sensitivity: 100 mV<br>Gate Time: 1 $\mu$ S (Time Base) | HP 5245L        | P   |

Page 3-8, Figure 3-4, under step 2:

Change FULL to read "sweeps full band 0.1 to 11 MHz on range 11, 1 to 110 MHz on range 110."

Page 4-2, Paragraph 4-8:

Add this note following step 9 of paragraph 4-8:

## NOTE

Frequency measured at 8601A AUX OUT jack will be one-tenth the actual frequency output.

Table 1. Matrix to Select Frequency Control Board Components for 8601A Options

| COMPONENT | STANDARD<br>08601-6019<br>CIRCUIT<br>BOARD | CHANGE FROM COMPONENT IN STANDARD COLUMN TO COMPONENT<br>IN OPTION COLUMN BELOW |                           |                            |                          |                    |                            |                            |
|-----------|--------------------------------------------|---------------------------------------------------------------------------------|---------------------------|----------------------------|--------------------------|--------------------|----------------------------|----------------------------|
|           |                                            | OPT 001                                                                         | OPT 002                   | OPT 003                    | OPT 005                  | OPT 006            | OPT 011                    | OPT 012                    |
| R-107     | 1.62 K<br>0757-0428                        |                                                                                 |                           | 24.6 $\Omega$<br>0698-4087 |                          |                    | 23.7 $\Omega$<br>0698-8431 | 23.6 $\Omega$<br>0698-4087 |
| R-112     | 31.6 K<br>0698-3180                        |                                                                                 |                           |                            |                          | 100 K<br>0757-0465 |                            |                            |
| R-113     | 11.0 $\Omega$<br>0757-0378                 | 14.7 $\Omega$<br>0698-3428                                                      | 5.6 $\Omega$<br>0683-0565 |                            |                          |                    | 5.6 $\Omega$<br>0683-0565  | 14.7 $\Omega$<br>0698-3428 |
| R-159     | 31.6 K<br>0698-3160                        |                                                                                 |                           |                            | 28.7 K<br>0698-3449      |                    |                            |                            |
| R-162     | 10 K Pot<br>2100-1776                      | 50 K Pot<br>2100-0969                                                           | 50 K Pot<br>2100-0969     |                            |                          |                    |                            | 50 K Pot<br>2100-0969      |
| R-163     | 10 K<br>0757-0442                          |                                                                                 |                           |                            | 5.11 K<br>0757-0438      |                    |                            |                            |
| C-31      | 8200 pf<br>0140-0184                       |                                                                                 |                           |                            | 17,000 pf<br>0140-0166   |                    |                            |                            |
| C-32      | 2700 pf<br>0160-2228                       |                                                                                 |                           |                            | 8200 pf<br>0140-0184     |                    |                            |                            |
| C-33      | 910 pf<br>0160-2217                        |                                                                                 |                           |                            | 2700 pf<br>0160-2228     |                    |                            |                            |
| C-35      | .033 $\mu$ f<br>0160-0163                  |                                                                                 |                           |                            | .1 $\mu$ f<br>0160-0163  |                    |                            |                            |
| C-37      | 1 $\mu$ f<br>0180-0291                     |                                                                                 |                           |                            | 2.2 $\mu$ f<br>0180-0197 |                    |                            |                            |
| C-38      | 2.2 $\mu$ f<br>0180-0197                   |                                                                                 |                           |                            | 10 $\mu$ f<br>0180-0374  |                    |                            |                            |
| L-2       | 10 mH<br>9140-0131                         |                                                                                 |                           |                            | 24 mH<br>9100-2867       |                    |                            |                            |

**ERRATA (Cont'd)**

Page 4-4, Paragraph 4-9:

Add this note following step 9 of Paragraph 4-9:

**NOTE**

Frequency measured at 8601A AUX OUT jack will be one-tenth the actual frequency output.

Page 4-5, Paragraph 4-9:

Change the limits of steps 15 and 16 to  $\pm 0.21$  MHz.Change the limits of step 18 to  $\pm 0.07$  MHz.Change the limits of step 20 to  $\pm 0.03$  MHz.Change the limits of step 24 to  $\pm 0.021$  MHz.

Add the following after step 25.

**NOTE**

The following procedure is an alternate method for testing the sweep characteristics using a standard electronic counter.

26. Connect electronic counter to 8601A AUX OUT connector.

27. Set 8601A controls as follows:

|                               |                      |
|-------------------------------|----------------------|
| RANGE .....                   | 110                  |
| FREQUENCY .....               | 5.000 $\pm$ .002 MHz |
| SWEEP .....                   | SYM                  |
| SYM SWEEP WIDTH .....         | 10 MHz               |
| SYM SWEEP WIDTH VERNIER ..... | Counterclockwise     |
| SWEEP MODE .....              | MANUAL               |

28. Turn SYM SWEEP WIDTH VERNIER to CAL. Rotate SYM SWEEP WIDTH manually to sweep upper and lower frequencies of each calibrated sweep width position.

**SYM SWEEP WIDTH Accuracy Test**

| Calibrated SWEEP WIDTH Position | Counter Indication                  | Test Limits     |
|---------------------------------|-------------------------------------|-----------------|
| 10 MHz                          | Upper 105 MHz<br>Lower 95 MHz       | $\pm 0.21$ MHz  |
| 3 MHz                           | Upper 101.5 MHz<br>Lower 98.5 MHz   | $\pm 0.07$ MHz  |
| 1 MHz                           | Upper 100.5 MHz<br>Lower 99.5 MHz   | $\pm 0.03$ MHz  |
| .3 MHz                          | Upper 100.15 MHz<br>Lower 99.85 MHz | $\pm 0.016$ MHz |
| .1 MHz                          | Upper 100.05 MHz<br>Lower 99.95 MHz | $\pm 0.012$ MHz |

## ERRATA (Cont'd)

29. Set 8601A RANGE to 11 and SYM SWEEP WIDTH to 1 MHz (blue number on dial).
30. Turn SYM SWEEP WIDTH VERNIER to CAL. Rotate SYM SWEEP WIDTH manually to sweep upper and lower frequencies of each calibrated sweep width position.

## SYM SWEEP WIDTH Accuracy Test

| Calibrated SWEEP WIDTH Position | Counter Indication                  | Test Limits     |
|---------------------------------|-------------------------------------|-----------------|
| 1 MHz                           | Upper 10.5 MHz<br>Lower 9.5 MHz     | $\pm 0.021$ MHz |
| .3 MHz                          | Upper 10.15 MHz<br>Lower 9.85 MHz   | $\pm 0.061$ MHz |
| .1 MHz                          | Upper 10.5 MHz<br>Lower 9.95 MHz    | $\pm 0.021$ MHz |
| .03 MHz                         | Upper 10.015 MHz<br>Lower 9.985 MHz | $\pm 0.007$ MHz |
| .01 MHz                         | Upper 10.005 MHz<br>Lower 9.995 MHz | $\pm 0.003$ MHz |

Page 4-9, Paragraph 4-11:

Change step 8 to read "With front panel MOD pushbutton depressed, the 8601A OUTPUT LEVEL METER should indicate  $30 \pm 3$  divisions ( $30 \pm 3\%$ ) on the 0-3 scale."

Page 4-12, Paragraph 4-12:

Change step 13 to read "Set 8601A RANGE to 11, FREQUENCY to 10 MHz, and repeat steps 11 and 12."

Page 4-18, Paragraph 4-15:

Add this note following step 7 of paragraph 4-15:

## NOTE

A correction factor of 10 dB is added because the reference (R1) set in step 4 is not the actual carrier level. The reference is 10 dB down because of the square-law response of the RF Detector and the response of the RMS Voltmeter to a square wave signal.

Page 4-23, Table 4-1, entry 4-8. FREQUENCY COVERAGE/ACCURACY:

Add this note following step 7:

## NOTE

Frequency measured at 8601A AUX OUT jack in Range 110 will be one-tenth the actual frequency output.

Page 4-24, Table 4-1, entry 4-9. SWEEP CHARACTERISTICS (cont'd):

Change the limits of step 20 (a) to 100.53 MHz and 100.47 MHz.

Change the limits of step 20 (b) to 99.53 MHz and 99.47 MHz.

Change the limits of step 21 (d) to 99.962 MHz and 99.938 MHz.

Change the limits of step 24 (a) to 10.521 MHz and 10.479 MHz.

Change the limits of step 24 (b) to 9.521 MHz and 9.479 MHz.

**ERRATA (Cont'd)****Page 4-24, Table 4-1, entry 4-9. SWEEP CHARACTERISTICS (Cont'd)**

Change the lower limit of step 25 (b) to 9.843 MHz.

Change the limits of step 25 (e) to 10.017 MHz and 10.013 MHz.

**Page 5-8, Figure 5-1:**

Photo on left should be titled "UNLEVELED" and photo on right should be titled "LEVELED."

**Page 5-8, Figure 5-2:**

Photo on left should be titled "INCORRECT" and photo on right should be titled "CORRECT".

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

Add a footnote (1) after reference designators A1A1R5 through A1A1R10, and A1A1R12.

Add footnote (1) at bottom of page: 1. Special Temperature Coefficient of 25 PPM/C°.

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

Add to description of A3 and A3A1: Does not include A3A1E1.

Change A3A1E1 to HP Part No. 5086-7010.

Add to description of A3A1E1:

**NOTE**

HP Part No. 5086-7111 may be used as direct replacement for HP Part No. 5086-7010. (On A3A1 Assembly only.)

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

Change A5A1RF3 and A5A1RF4 to HP Part No. 9170-0847 (Recommended replacement).

Add to description of A6 and A6A1: Does not include A6A1E1 and A6A1E2.

Change A6A1E1 to HP Part No. 5086-7010.

Change A6A1E2 to HP Part No. 5086-7112.

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

Delete all optional A6 Frequency Control & Leveling Board Assemblies as follows:

HP Part Number 08601-6061 Option 001

HP Part Number 08601-6064 Option 002

HP Part Number 08601-6069 Option 003

HP Part Number 08601-6070 Option 005

HP Part Number 08601-6068 Option 006

HP Part Number 08601-6077 Option 011

**NOTE**

To obtain an A9 Frequency Control and Leveling Board for any of the above options, order the standard A9 Frequency Control and Leveling Board Assembly, HP Part Number 08601-6019 and a Service Kit HP Part Number 08601-60112. Table 1 shows the component changes needed for converting the standard A9 board to each option.

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

Add A9CR30, HP Part No. 1901-0033, DIODE: SILICON 100 MA 180WV.

**Page 6-13, Table 6-2:**

Add A9R107 HP Part Number 0698-3431 R:FXD MET FLM 23.7 OHM 1% 1/8 W (OPT 011 ONLY).

Change A9R113 HP Part Number 0698-3428 to (OPT 001 AND 012 ONLY).

**Page 6-14, Table 6-2:**

Change A9R162 HP Part Number 2100-0969 to (OPT 001, 002, AND 012 ONLY).

**ERRATA (Cont'd)****Page 8-9, Figure 8-7:**

Change the value of resistor A1A1R7 to 10 K Ohms.

Add a 0.01  $\mu$ F capacitor A1A1C7 to the DISCRIMINATOR circuit. Connect one end to +20 VF and the other end to ground.

**Page 8-13, Figure 8-12:**

Change the title to read A3A2A1 Mixer Component Identification.

**Page 8-13, Figure 8-13:**

Change HP Part No. of amplifier E1 on A3A1 assembly to 5086-7010 or 5086-7111.

**Page 8-15, Figure 8-17:**

Change the values of the following capacitors to picofarads; A4A1C6, A4A1C7, A4A1C8, A4A1C9, and A4A1C11.

Change the value of resistor A4A1R5 to 1.96K Ohms.

**Page 8-16, SERVICE SHEET 5:**

Change A5J2 to A5J1 and change A5J4 to A5J2 in step 2 under Troubleshooting A5 VTO Assembly.

Change "> +3 dBm" to "> +5 dBm" in step 5 under Troubleshooting A5 VTO Assembly.

Change step 6 under Troubleshooting A5 VTO Assembly to read as follows: Power output at 8601A rear panel VTO jack should be between -5 dBm and -15 dBm. Power variation should be less than 4 dB. If not, trouble is in A5R33/A5C15.

**Page 8-19, Figure 8-22:**

Change HP Part No. of preamplifier E1 on A6A1 Assembly to 5086-7010.

Change HP Part No. of output amplifier E2 on A6A1 Assembly to 5086-7112.

**Page 8-29, Figure 8-32:**

Change the value of resistor A9R167 to 3.16K ohms.

Change the value of capacitor A9C28 to 0.01  $\mu$ F.

**CHANGE 1****Page 6-11, Table 6-2:**

Change A9E1 to HP Part Number 1826-0013. Description remains the same.

**Page 8-27, Figure 8-30:**

Change A9E1 to HP Part Number 1826-0013.

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

Change capacitor A9C11 to HP Part Number 0170-0083: C:FXD MY .022 UF 20% 50 VDCW  
(Recommended replacement for instruments with serial number 954-01131 and above.)

**Page 8-25, Figure 8-28:**

Change value of capacitor A9C11 to 0.022  $\mu$ F.

**CHANGE 3****Table 6-2:**

Add the following note to define the 8601A color scheme:

**NOTE**

This change implements a different color scheme for the standard instrument. Colors prior to this change are now available as options. Refer to listing below.

8601A STANDARD - Indicates color scheme for the 8601A beginning with this change. (Includes MINT GRAY/ OLIVE BLACK front panel.)

8601A Option X95 - Indicates color scheme for the 8601A Models prior to this change. (Includes LIGHT GRAY/BLACK front panel.)

**CHANGE 3 (Cont'd)**

Page 6-21, Table 6-2, under Miscellaneous:

Add the following 8601A parts or description changes:

|               |                                                                         |
|---------------|-------------------------------------------------------------------------|
| 08601-0002    | FRONT PANEL (LIGHT GRAY/BLACK) (8601A, 8601A OPT 003-010)               |
| # 08601-00043 | FRONT PANEL (MINT GRAY/OLIVE BLACK)(STANDARD)(8601A, 8601A OPT 003-010) |
| 08601-0015    | FRONT PANEL (LIGHT GRAY/BLACK)(8601A OPT 001, 002)                      |
| # 07601-00046 | FRONT PANEL (MINT GRAY/OLIVE BLACK)(STANDARD)(8601A OPT 001, 002)       |
| 08601-0025    | FRONT PANEL (LIGHT GRAY/BLACK)(8601A OPT 011)                           |
| # 08601-00045 | FRONT PANEL (MINT GRAY/OLIVE BLACK)(STANDARD) (8601A OPT 011)           |
| 4040-0328     | BEZEL:BLACK METER                                                       |
| # 4040-0905   | BEZEL:OLIVE BLACK METER (STANDARD)                                      |

# Denotes standard color for 8601A part beginning with this change.

Page 6-22, Table 6-2:

Add the following 8601A parts or description changes:

|               |                                            |
|---------------|--------------------------------------------|
| 08601-006     | TOP COVER (BLUE GRAY)                      |
| # 08601-00044 | TOP COVER (OLIVE GRAY)(STANDARD)           |
| 5000-0704     | SIDE COVER 6 X 16 (BLUE GRAY)              |
| # 5000-8567   | SIDE COVER 6 X 16 (OLIVE GRAY)(STANDARD)   |
| 5000-0136     | BOTTOM COVER 7 X 16 (BLUE GRAY)            |
| # 5000-8535   | BOTTOM COVER 7 X 16 (OLIVE GRAY)(STANDARD) |
| 08601-2004    | PANEL READOUT (BLACK)                      |
| # 08601-20089 | PANEL READOUT (OLIVE BLACK)                |
| 08601-2011    | METER TRIM: TOP (BLACK)                    |
| # 08601-20091 | METER TRIM: TOP (MINT GRAY)(STANDARD)      |

# Denotes standard color for 8601A part beginning with this change.

**CHANGE 4**

Page 6-7, Table 6-2, Replaceable Parts:

Change A4A1R7 to HP Part No. 0757-0403, R:FXD MET FLM 121 OHM 1% 1/8W (FACTORY SELECTED PART).

Page 8-15, Figure 8-17:

Change the value of A4A1R7 to 121\*.

**CHANGE 5**

Page 6-12, Table 6-2, Replaceable Parts:

Change A9R3 to HP Part No. 0757-0442, R:FXD MET FLM 10K 1% 1/8W (Recommended replacement).

Page 8-25, Figure 8-28:

Change the value of A9R3 to 10K.

**CHANGE 6**

Page 5-1, Table 5-1, Factory Selected Components:

Add the following:

|         |                                                           |   |
|---------|-----------------------------------------------------------|---|
| A5A1R12 | Selected to obtain sufficient oscillator frequency range. | 5 |
|---------|-----------------------------------------------------------|---|

**CHANGE 6 (Cont'd)**

Page 6-8, Table 6-2, Replaceable Parts:

Change A5A1Q1 and A5A1Q3 to HP Part No. 1854-0580. (Recommended replacements.)

Page 6-9, Table 6-2, Replaceable Parts:

Change A5A1R12 to HP Part No. 0698-3455, R:FXD 261K 1% 1/8W. Factory selected part.

Page 8-17, Figure 8-19:

Change A5A1Q1 and A5A1Q3 to HP Part No. 1854-0580.

Change R12 on A5A1 assembly to R12\* 261K.

**CHANGE 7**

Page 6-14, Table 6-2, Replaceable Parts:

Change A9R144 to HP Part No. 0757-0462, R:FXD 75K 1% 1/8W. (Recommended replacement.)

Page 8-29, Figure 8-32:

Change the value of R144 on A9 assembly to 75K.

**CHANGE 8**

Page 5-1, Table 5-1, Factory Selected Components:

Add the following:

|       |                                                         |    |
|-------|---------------------------------------------------------|----|
| A11R7 | Selected to compensate for tolerance variation in A11R6 | 12 |
|-------|---------------------------------------------------------|----|

Page 6-16, Table 6-2, Replaceable Parts:

Change A11R7 to HP Part No. 0698-4307, R: FXD MET FLM 14.3K OHM 1% (FACTORY SELECTED).

**NOTE**

A11R7 must be one of three values: 14.3K OHM (HP Part No. 0698-4307), 14.7K OHM (HP Part No. 0698-3156), or 15K OHM (HP Part No. 0757-0446). Typically, if the measured value of A11R6 is less than 48K, A11R7 should be 15K; if value of A11R6 is between 48K and 52K, A11R7 should be 14.7K; if A11R6 is greater than 52K, A11R7 should be 14.3K.

Page 8-31, Figure 8-34:

Change R7 on A11 SYM SWEEP WIDTH SWITCH ASSY to R7\* 14.3K.

**CHANGE 9**

Page 6-6, Table 6-2:

Change A3A1R14 to HP Part No. 0757-0424 R: FXD MET FLM 1.1 K OHM 1% 1/8 W (FACTORY SELECTED).

**NOTE**

The value is selected to eliminate noise on the swept carrier when the CRYSTAL CAL switch R2 is ON. Value should be  $\geq 909$  ohms and  $\geq 1210$  ohms. Nominal value is 1100 ohms.

Page 6-21, Table 6-2, Rear Panel Miscellaneous:

Add HP Part No. 0360-0042 LUG: GROUNDING.

Add HP Part No. 2360-0195 SCREW: POZI-DRIVER.

Add HP Part No. 2420-0001 NUT: HEX.

Add HP Part No. 2190-0007 WASHER: LOCK.

Add HP Part No. 08601-00050 NAMEPLATE: 400 Hz MOD (Option 005).

Page 8-13, Figure 8-13:

Change A3A1R14 to 1100 FACTORY SELECTED.

**CHANGE 10**

Page 6-14, Table 6-2:

Change A9R120 to HP Part No. 2100-3409 R: VAR CERMET 20 OHM 10%.

**CHANGE 11**

Page 1-2, Table 1-1, Stability in CW:

Change first two lines of Specification to read as follows:

(50 ppm + 100 Hz)/10 min. low range after two hours warm up. (Typically (15 ppm + 100 Hz)/10 min. after 3 1/2 hours warm up.)

(50 ppm + 1 kHz)/10 min. high range after two hours warm up. (Typically (15 ppm + 1 kHz)/10 min. after 3 1/2 hours warm up.)

**CHANGE 12**

Page 6-10, Table 6-2:

Change A7MP1 to HP Part Number 08601-00052 DIAL-KNOB ASSY: ATTENUATOR

Page 6-16, Table 6-2:

Change A11S1 to HP Part Number 08601-00053 DIAL-KNOB ASSY: SYM. SWEEP WIDTH.

**CHANGE 13**

Page 6-15, Table 6-2:

Change A10R32 to HP Part No. 0757-0417 R:FXD 562 OHM 1% 1/8W.

**NOTE**

Resistor value changed to ensure sufficient current to drive series regulator under all beta conditions.

Page 8-23, Figure 8-26:

Change R32 resistance to 562.

**►CHANGE 14**

Page 6-16, Table 6-2:

Add second A12 entry as follows. "A12, 08601-6066, SWITCH ASSY: FUNCTION (OPTION 001)."

Add third A12 entry as follows. "A12, 08601-6067, SWITCH ASSY: FUNCTION (OPTIONS 002 AND 011)."

Add second A12C1 entry as follows. "A12C1, 0180-0116, C:FXD ELECT 6.8 UF 35VDC (OPTIONS 001, 002, AND 011)."

Page 8-31, Figure 8-34, SERVICE SHEET 12:

Change A12 Assembly title to read: "A12 CW/SWEEP SWITCH ASSY (08601-6027) (SEE NOTE 1)."

Add above A12C1: "(SEE NOTE 2)."

Add below schematic: "NOTES: 1. HP Part Number for Option 001 is 08601-6066, HP Part Number for Options 002 and 011 is 08601-6067. 2. A12C1 is 6.8UF 35V for Options 001, 002, and 011."

**CHANGE 15**

Page 6-11, Table 6-2:

Change A9E1 HP Part Number to 1826-0261.

Page 8-27, Figure 8-30:

Change A9E1 Part Number to 1826-0261.

**CHANGE 15 (Cont'd)**

**NOTE**

The 1826-0261 is a high reliability replacement for the 1826-0013.

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Figure 1-1. Model 8601A Generator/Sweeper

## 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 fre-

quency 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  $\mu$ Vrms) 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 recorders; 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  $\pm 5\%$ , high range, and 10 kHz/volt  $\pm 5\%$ , 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.                                                                                                                                                                                     | Residual AM: AM noise modulation index (rms, 10 kHz bandwidth) is <-50 dB. (Typically -60 dB at 25°C.)                                                                                                                                       |  |
| Accuracy (in CW, stop frequency of VIDEO sweep, and center frequency of SYMMETRICAL sweep):<br>Low range, ±1% of frequency ±10 kHz.<br>High range, ±1% of frequency ±100 kHz.                                                                   | Incidental AM: Incidental AM modulation index is <-55 dB with 75 kHz deviation.                                                                                                                                                              |  |
| Settability: Vernier settability, ±0.01%; range, ±0.1%; coarse settability using frequency control is 5 kHz, low range; 50 kHz, high range.                                                                                                     | OUTPUT CHARACTERISTICS                                                                                                                                                                                                                       |  |
| Linearity: ±0.5% of sweep width.                                                                                                                                                                                                                | 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). |  |
| Stability in CW:<br>100 ppm +1 kHz/10 min. high range after one hour warm up.<br>100 ppm +100 Hz/10 min. low range after one hour warm up.<br>300 ppm +3 kHz/°C, high range.<br>300 ppm +300 Hz/°C, low range.<br>10 ppm/V line voltage change. | Accuracy: ±1 dB accuracy for any output level from +13 dBm to -100 dBm.                                                                                                                                                                      |  |
| 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.                       | Flatness: ±0.25 dB over full range, ±0.1 dB over any 10 MHz portion.                                                                                                                                                                         |  |
| Residual FM: Noise in a 10 kHz bandwidth including line related components. (Dominant component of RESIDUAL FM is noise.)                                                                                                                       | Impedance: 50Ω, SWR <1.2 on 0 dBm step and below.                                                                                                                                                                                            |  |
| CW: <50 Hz rms, low range; <500 Hz rms, high range.                                                                                                                                                                                             | RF Leakage: Low leakage permits receiver sensitivity measurements down to 1 microvolt.                                                                                                                                                       |  |
| SYM 0, Sweep: Less than 100 Hz rms, low range; <1 kHz rms, high range.                                                                                                                                                                          | SWEEP CHARACTERISTICS                                                                                                                                                                                                                        |  |
| Incidental FM with 30% AM:<br>CW: negligible.<br>SYM 0, Sweep: <100 Hz peak, low range; <1 kHz peak, high range.                                                                                                                                | 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)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Sweep Width Accuracy:</b> <math>\pm 2\%</math> of sweep width and <math>\pm 1</math> kHz on low range; <math>\pm 2\%</math> of sweep width and <math>\pm 10</math> kHz on high range.</p> <p><b>Sweep Speeds:</b> Fast, typically 3 to 60 sweeps per second, variable. Slow, typically 3 to 60 seconds per sweep, variable. Manual, continuous tuning over preset limits.</p> <p><b>Trigger Modes:</b> Manual trigger with reset, line-synchronized, or free running.</p> <p><b>AMPLITUDE MODULATION</b></p> <p><b>Internal AM:</b><br/>30% <math>\pm 5\%</math> at 1 kHz, less than 3% distortion. Typically <math>&lt; 1\%</math> distortion for output readings on upper half of meter scale.</p> <p style="text-align: center;">Note</p> <p>For Option 005, rate is 400 Hz.</p> <p><b>External AM:</b> 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).</p> <p><b>FREQUENCY MODULATION</b></p> <p><b>Internal FM:</b> Low range: 7.5 kHz <math>\pm 5\%</math> peak deviation, 1 kHz rate; high range: 75 kHz <math>\pm 5\%</math> peak deviation, 1 kHz rate; less than 3% distortion. Typically <math>&lt; 1\%</math>.</p> <p style="text-align: center;">Note</p> <p>For Option 005, internal rate is changed to 400 Hz.</p> | <p><b>External FM:</b> Sensitivity: 0.5 MHz per volt <math>\pm 5\%</math>, low range; 5 MHz per volt <math>\pm 5\%</math>, high range; negative polarity.</p> <p>Deviations to the band edges are possible for rates to 100 Hz; voltage to frequency linearity is <math>\pm 0.5\%</math>, allowing remote frequency programming. FM rates to 10 kHz are obtainable with less linearity and accuracy.</p> <p><b>CRYSTAL CALIBRATOR</b></p> <p>Internal 5 MHz crystal allows single frequency calibration to <math>\pm 0.01\%</math> at any multiple of 5 MHz.</p> <p><b>AUXILIARY OUTPUTS</b></p> <p><b>Front Panel:</b> Sweep Output: approximately 0 to +7 volts. Auxiliary Output: always 0.1 – 11 MHz for low frequency counter monitoring.</p> <p><b>Rear Panel:</b> Sweep inhibit; stops sweep when grounded. Uncalibrated RF output: <math>-5</math> dBm minimum, unmodulated. VTO output: 200.1 – 310 MHz, output level <math>-25</math> dBm minimum. Blanking: <math>-4</math> volt pulse concurrent with RF blanking.</p> <p><b>GENERAL</b></p> <p><b>Power:</b> 115 or 230V, <math>\pm 10\%</math>, 50 – 400 Hz, <math>\pm 10\%</math>; approximately 50 watts.</p> <p><b>Weight:</b> Net, 21 lbs (9.5 kg).</p> <p><b>Dimensions:</b> 7-25/32 in. wide, 6-3/32 in. high, 16-3/8 in. deep (190 x 155 x 416 mm).</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

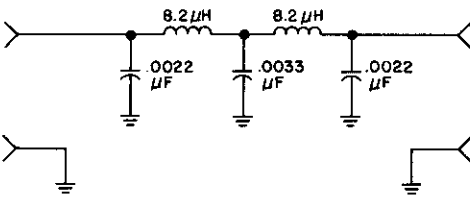
Table 1-2. Recommended Test Equipment (1 of 3)

| Instrument Type          | Measurement Requirements                                                                                                                                     | Suggested Model   | Use (Note 1) |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------|
| Counter/Marker Generator | Frequency Range: 0.1 – 12 MHz<br>Accuracy: 0.1% of frequency<br>Input Impedance: 500K ohms                                                                   | HP 8600A          | P, A, T      |
| Digital Voltmeter        | Voltage Range: 0 – 75 VDC to +25 V<br>Accuracy: $\pm 0.16\%$ of voltage<br>Input Impedance: $> 100$ K ohms                                                   | HP 3439A/3443A    | P, A         |
| RF Detector              | Frequency Range: 0.1 – 110 MHz<br>Frequency Response: $< \pm 0.1$ dB over any 10 MHz range<br>Output Polarity: Negative<br>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<br>(Note 1) |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------|
| Frequency Meter<br>and FM Discrimi-<br>nator | Input Frequency Range: 10 MHz<br>Bandwidth: 3 Hz to 2 MHz<br>Discriminator Output:<br>Linearity: $\pm 0.5\%$<br>Residual FM Noise: All components<br>43.3 dB below full scale output level<br>Output Range: Adjustable from 100<br>kHz/volt to 10 MHz volt<br>Output Filtering: (see Note 4) | HP 5210A and 2 MHz<br>low-pass filter (Note 3) | P, A            |
| Oscilloscope                                 | Bandwidth: DC to 20 MHz<br>Vertical Sensitivity: 5 mV/div to 1<br>volt/div<br>Input Impedance: 100K ohms<br>External and internal horizontal sweep<br>capability                                                                                                                             | HP 180A/1803A/1820A                            | P, A, T         |
| 110 MHz Spectrum<br>Analyzer                 | Frequency Range: 1 kHz — 110 MHz<br>Input Measurement Range: -50 to +10<br>dBm in 50 ohms<br>Amplitude Calibration:<br>1. 10 dB/div<br>2. Accuracy: $\pm 1$ dB                                                                                                                               | HP 140T/8552/8553                              | P, A, T         |
| 400 MHz Spectrum<br>Analyzer                 | Frequency Range: 10 MHz — 400 MHz<br>Input Measurement Range: -50 to +20<br>dBm<br>Amplitude Calibration:<br>1. 10 dB/div<br>2. Accuracy: $\pm 1$ dB                                                                                                                                         | HP 140T/8552/8555                              | P, A, T         |
| 1 kHz Amplifier                              | Frequency Range: 1 kHz<br>Amplification: $>10$ dB in 50 ohms                                                                                                                                                                                                                                 | HP 461A or 466A                                | P               |
| DC Power Supply                              | DC Range: 0.05 to +10.9 VDC<br>Output Impedance: $<0.5$ ohms                                                                                                                                                                                                                                 | HP 6215A                                       | P, A            |
| Signal Generator                             | Frequency Range: 0.2 to 110 MHz<br>Output Level: -10 dBm into 50 ohms<br>Residual FM:<br>1. $<50$ Hz up to 110 MHz<br>2. $<20$ Hz up to 11 MHz                                                                                                                                               | HP 606A and 608C                               | P               |
| Audio Oscillator                             | Frequency Range: 100 Hz to 10 kHz<br>Output Level: 10 volts into 600 ohms                                                                                                                                                                                                                    | HP 200CD                                       | P, A            |
| 50 Ohm Termination<br>(Note 5)               | Frequency Range: 0.1 to 110 MHz<br>Impedance: 50 ohms $\pm 5\%$<br>Connector: BNC plug                                                                                                                                                                                                       | HP Part No. 1250-0207                          | P, A            |
| RMS Voltmeter                                | Frequency Range: DC to 80 kHz<br>Input Range: 7 mV to 1 Vrms<br>Input Impedance: $>100K$ ohms                                                                                                                                                                                                | HP 3400A                                       | P, A            |
| 50 Ohm Termination<br>(Note 5)               | Frequency Range: 0.1 to 110 MHz<br>Impedance: 50 ohms $\pm 5\%$<br>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<br>75 ohm to 50 Ohm Transition Connector:<br>BNC plug/BNC jack                                                                                               | Texscan Corporation,<br>Model ZM-57 (Note 6)                                                                                                                                                                                                                    | P, A         |
| Adapters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |              |
| 1. BNC Tee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1. BNC plug and two BNC jacks<br>Impedance: 50 ohms                                                                                                                                          | HP Part No. 1250-0781                                                                                                                                                                                                                                           | P            |
| 2. Subminiature-to-BNC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2. BNC jack to SMC plug<br>Impedance: 50 ohms                                                                                                                                                | HP Part No. 1250-0832                                                                                                                                                                                                                                           | A            |
| Balanced Mixer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Frequency Range: 6 to 60 MHz<br>Inputs: -10 dBm to +10 dBm                                                                                                                                   | HP 10514A or 10534A                                                                                                                                                                                                                                             | P, A         |
| 2 MHz low pass filter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  <p>Cutoff Frequency: 2 MHz<br/>Insertion Loss:<br/>Above 2 MHz: &gt;6 dB<br/>Above 10 MHz: &gt;40 dB</p> | <p>Suggested Part Types:</p> <p>8.2 <math>\mu</math>H <math>\pm 10\%</math> (HP Part No. 9140-0105)<br/> 0.0033 <math>\mu</math>F <math>\pm 10\%</math> (HP Part No. 0160-0155)<br/> 0.0022 <math>\mu</math>F <math>\pm 10\%</math> (HP Part No. 0160-0154)</p> |              |
| <p style="text-align: center;">Notes</p> <ol style="list-style-type: none"> <li>1. P = Performance tests; A = Adjustment procedures; T = Troubleshooting.</li> <li>2. For 8601A Options 008, 009 and 010: the HP-8471A, Option 005, is required.</li> <li>3. 2 MHz low pass filter construction is shown at end of table.</li> <li>4. 10 kHz and 100 kHz filtering of output signal is required for some tests. The HP Model 10531A Filter Kit is recommended.</li> <li>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.)</li> <li>6. Texscan Corporation, 2446 North Shadeland Avenue, Indianapolis, Indiana, 46219.</li> </ol> |                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |              |

## 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  $\pm 10\%$ , 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  $55^{\circ}\text{C}$  ( $131^{\circ}\text{F}$ ). 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  $\pm 5\%$  peak deviation on range 11, and 75 kHz  $\pm 5\%$  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%

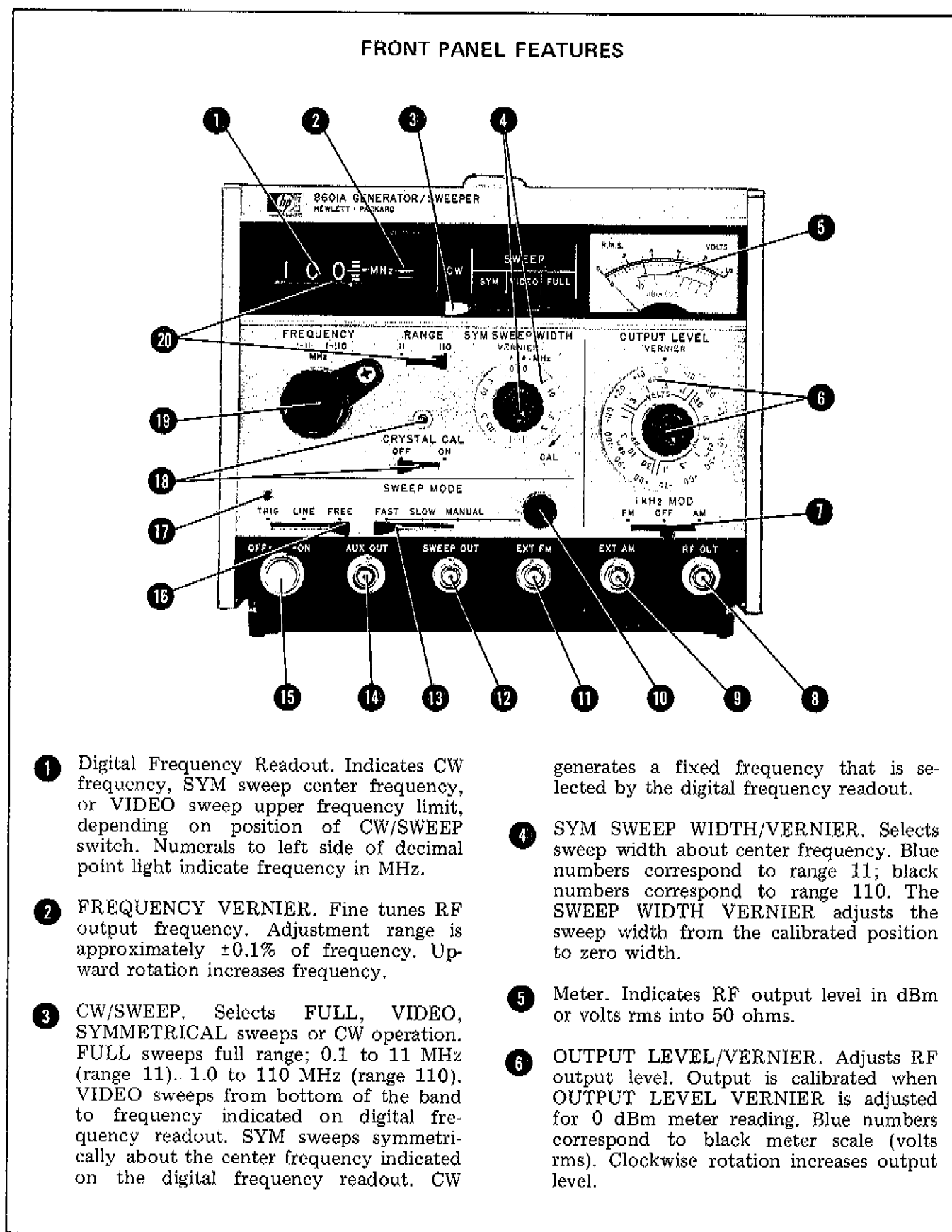


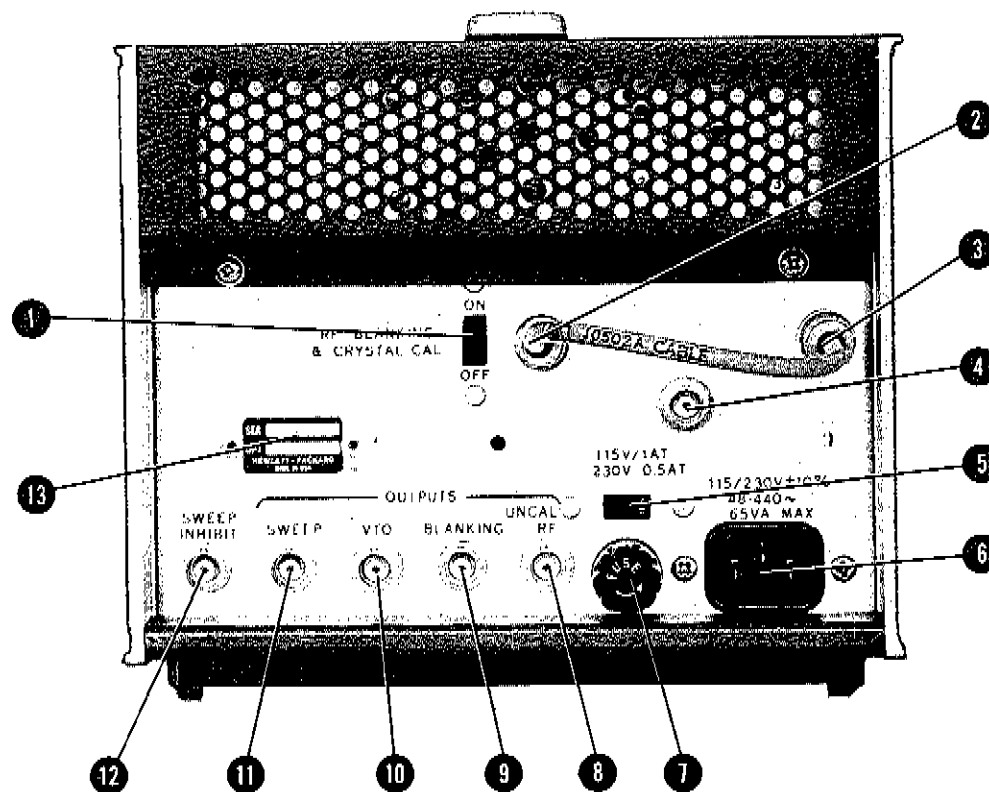
Figure 3-1. Front Panel Controls, Connectors and Indicators (1 of 2)

## 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 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.) 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)*

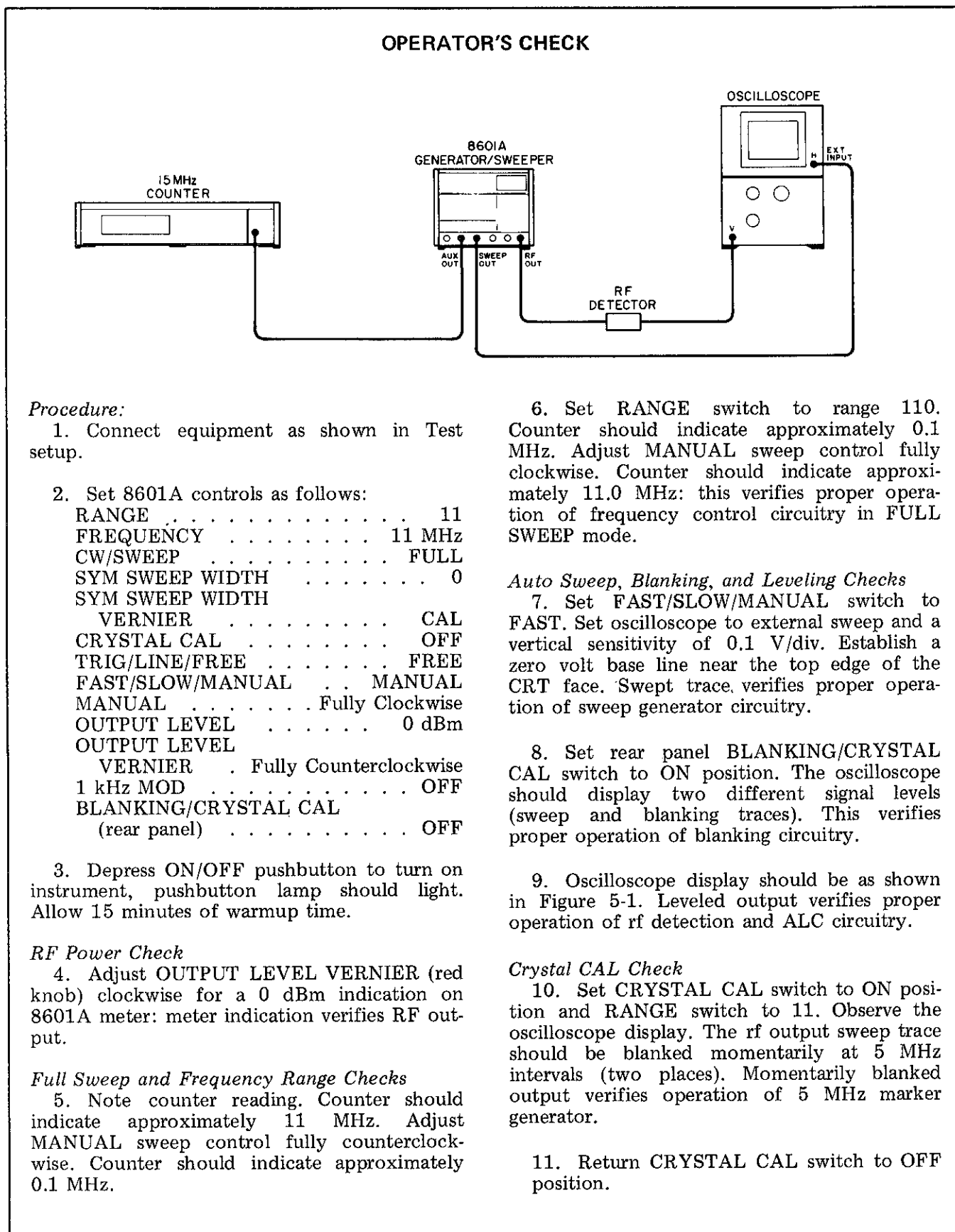


Figure 3-3. Operator's Check (1 of 2)

**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  $5.0 \pm 0.1$  MHz.

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

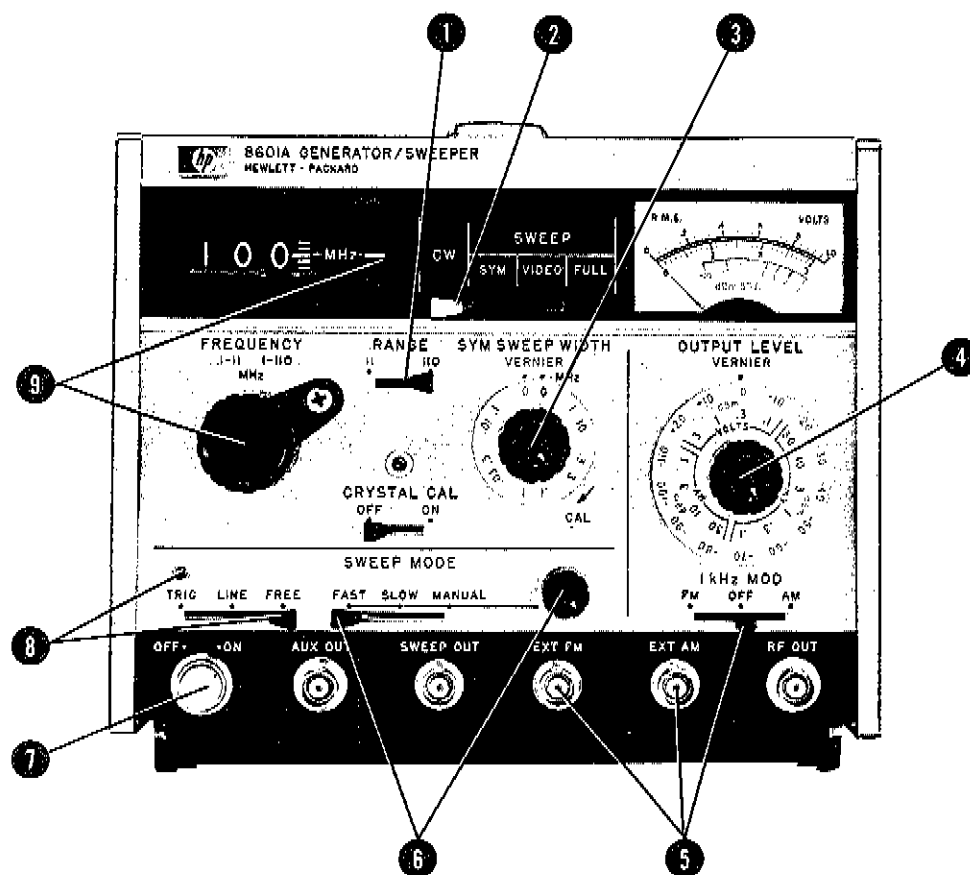
18. Adjust MANUAL control from fully counterclockwise position to fully clockwise position. Counter should indicate a total frequency change of approximately 1 MHz. This verifies proper operation of frequency control circuitry in SYM SWEEP mode.

*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)



**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:

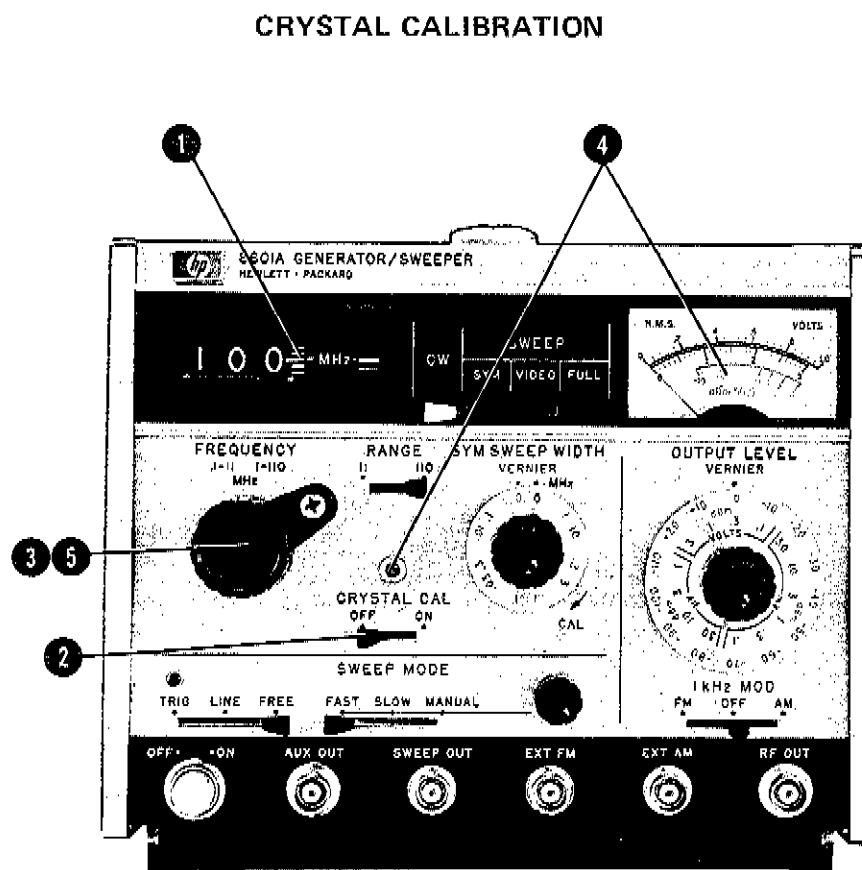
TRIG: Sweep is started by depressing trigger button. Retrace occurs automatically or sweep may be terminated manually by depressing trigger button a second time.

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  $\pm 0.1\%$  of frequency

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



- 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.

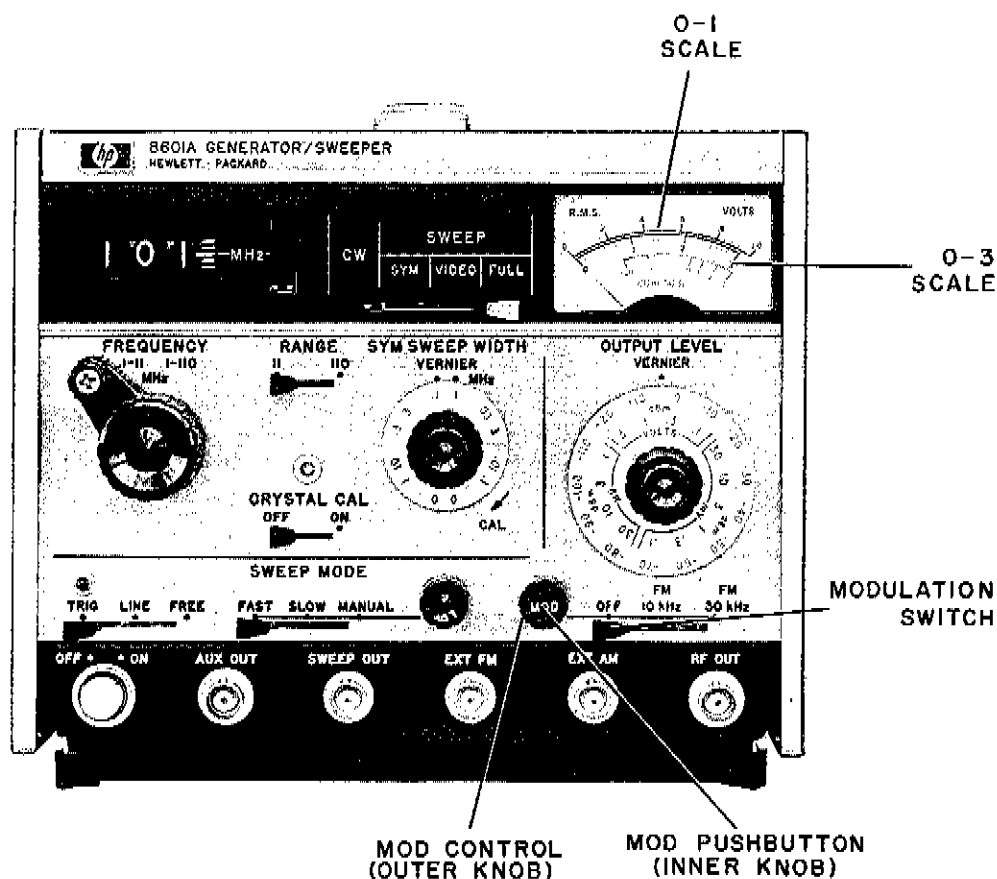
- 5** Switch CRYSTAL CAL to OFF. The digital frequency readout is calibrated to  $\pm 0.01\%$ .

#### 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,

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

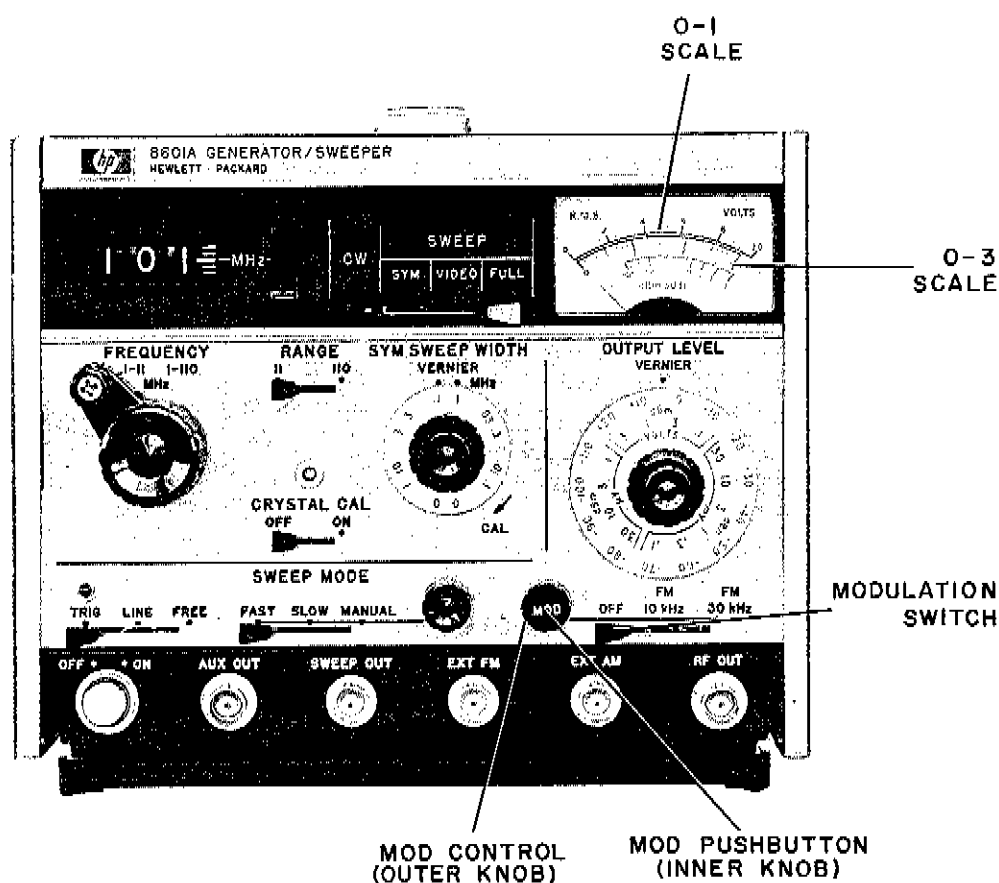
Depress the MOD pushbutton and apply an external AM signal to the front panel EXT AM jack. The amount of external am applied can be read directly on the 0 - 3 (0 - 30%) scale of the 8601A meter.

- ### 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)

$\pm 5\%$  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.

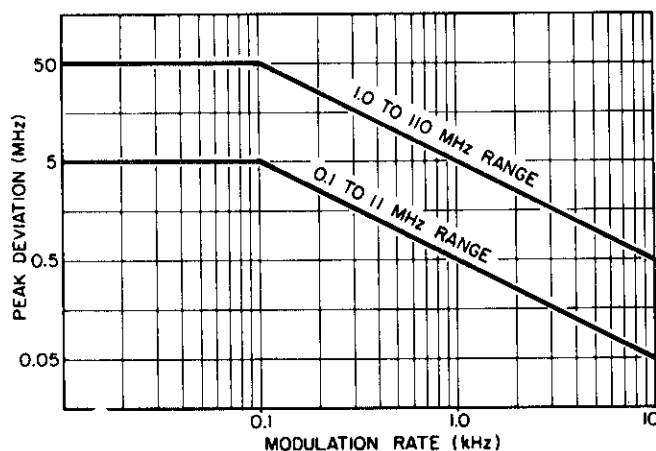


Figure 3-8. Maximum Peak Deviation versus Modulation Rate

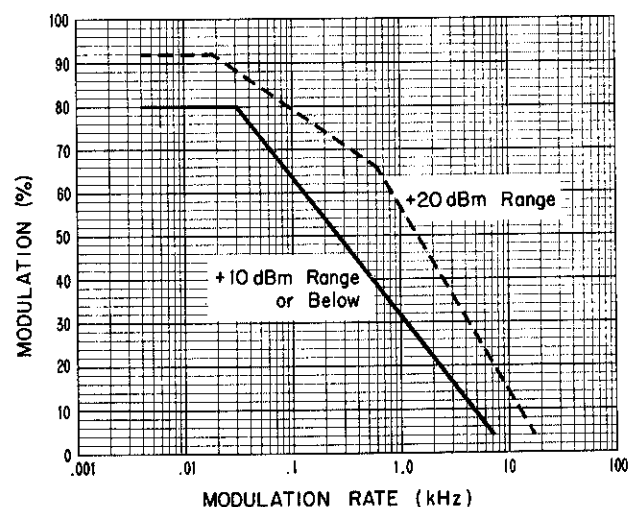


Figure 3-9. Maximum Percent Modulation versus Modulation Rate

## 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*,  $\pm 1\%$  of frequency  $\pm 10$  kHz

*High Range*,  $\pm 1\%$  of frequency  $\pm 100$  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        |
| SYM SWEEP WIDTH VERNIER . . . . . | CAL      | on output meter                |              |
|                                   |          | 1 kHz MOD . . . . .            | OFF (or EXT) |

3. Counter should indicate 0.1 MHz  $\pm 11$  kHz.

4. Adjust 8601A FREQUENCY control to 5 MHz.

5. Counter should indicate 5 MHz  $\pm 60$  kHz.

6. Adjust FREQUENCY control to 11 MHz.

7. Counter should indicate 11 MHz  $\pm 120$  kHz.

8. Set 8601A RANGE switch to 110.

9. Adjust FREQUENCY control to 1 MHz.

10. Counter reading should be 0.1 MHz  $\pm 11$  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  $\pm$ 110 kHz.

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

12. Adjust FREQUENCY control to 110 MHz: the counter reading should be 11 MHz  $\pm$ 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  $\pm$ 1% of stop frequency,  $\pm$ 100 kHz, high range;  $\pm$ 1% of stop frequency,  $\pm$ 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:*  $\pm$ 2% of sweep width  $\pm$ 1 kHz on low range;  $\pm$ 2% of sweep width  $\pm$ 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.

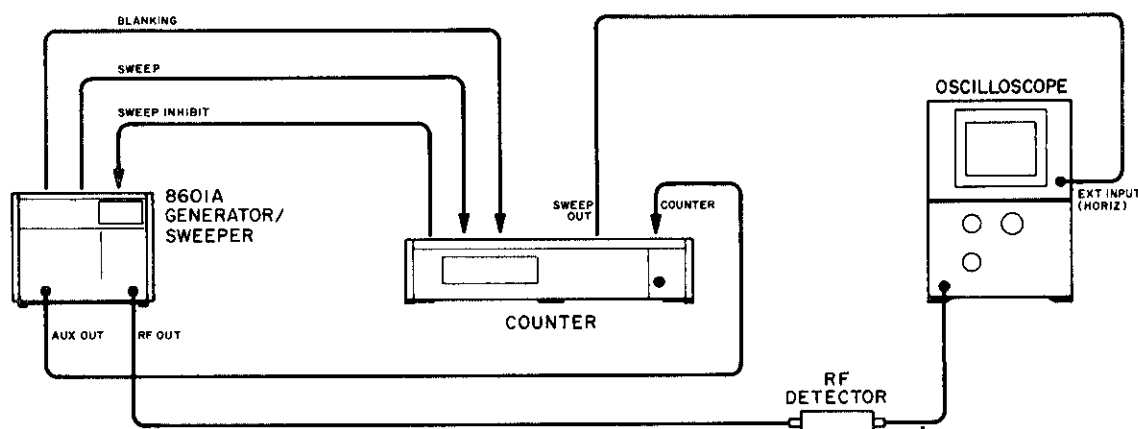


Figure 4-1. Sweep Characteristics Test Setup

## 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  $0.1 \pm 0.11$  MHz. The highest frequency should be  $10 \pm 0.11$  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  $1 \pm 1.1$  MHz. The highest frequency should be  $100 \pm 1.1$  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**

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**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  $105 \pm 0.2$  MHz.
16. Position a selected marker to lowest frequency point on display. Counter indication should be  $95 \pm 0.2$  MHz.
17. Adjust 8601A SYM SWEEP WIDTH control to 3 MHz.
18. Repeat steps 15 and 16. Highest frequency should be  $101.5 \pm 0.06$  MHz and lowest frequency should be  $98.5 \pm 0.06$  MHz.
19. Adjust 8601A SYM SWEEP WIDTH control to 1 MHz.
20. The highest frequency should be  $100.5 \pm 0.02$  MHz and lowest frequency should be  $99.5 \pm 0.02$  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  $\pm 2\%$  of sweep width  $\pm 10$  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  $10.5 \pm 0.02$  MHz. Lowest frequency should be  $9.5 \pm 0.02$  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  $\pm 2\%$  of symmetrical sweep width  $\pm 1$  kHz.

---

**4-10. Linearity***Specification:*

*Linearity:*  $\pm 0.5\%$  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.

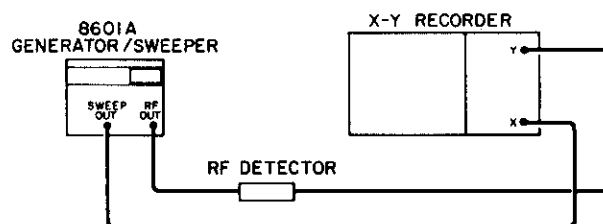


Figure 4-2. Alternate Linearity Test Setup

## 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  $\pm 1$  mm (1 mm = 0.5% linearity).

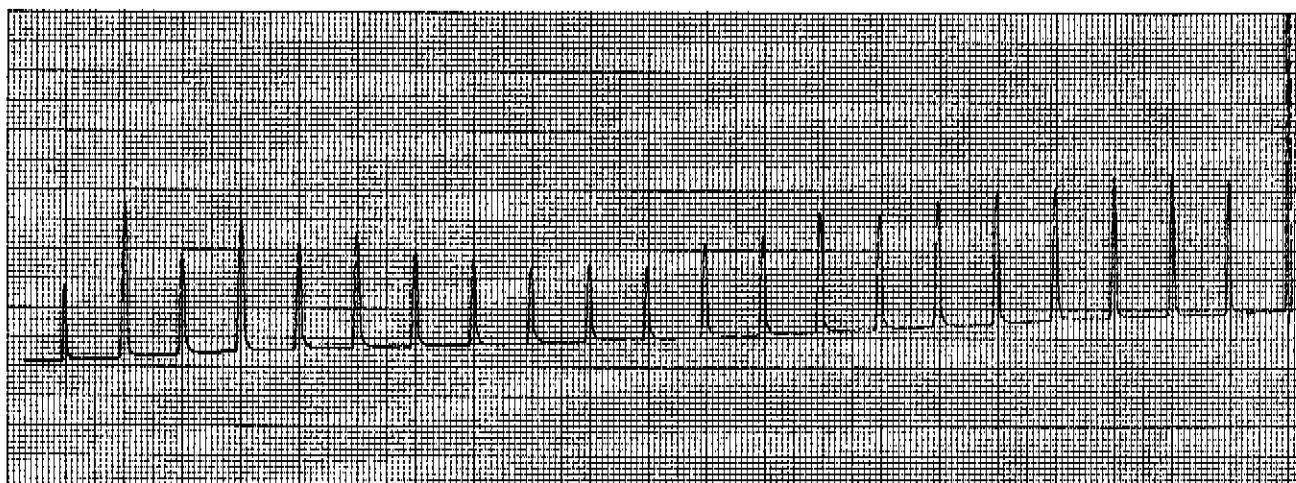


Figure 4-3. Recorder Trace of Linearity

### 4-11. Amplitude Modulation

#### Specification:

*Standard Instrument and Options 003, 004 and 006 — 010*

*Internal AM:* 30%  $\pm 5\%$  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  $\pm 3\%$  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      |
| RANGE . . . . . 11             | EXT AM)                    |

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.

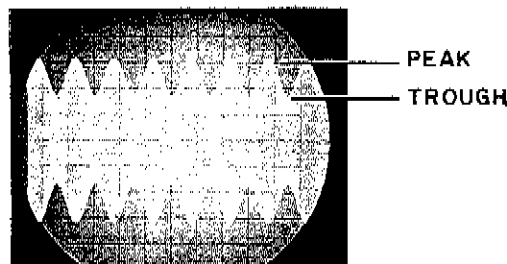


Figure 4-4. Typical Amplitude Modulated Carrier Waveform

#### *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 counter-clockwise 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.

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**PERFORMANCE TESTS**

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**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  $30 \pm 3$  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  $1.5 \pm 0.25$  cm ( $30 \pm 5\%$ ).

---

**4-12. External FM***Specifications:**Standard Instrument (and Options 004 — 010)*

*External FM:* Sensitivity; 5 MHz per volt  $\pm 5\%$ , high range; 0.5 MHz per volt  $\pm 5\%$  low range; negative polarity.

Deviations to the band edges are possible for rates from DC to 100 Hz; voltages to frequency linearity are  $\pm 0.5\%$ , 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  $\pm 5$  kHz for 50 Hz to 10 kHz FM rates;  $\pm 10$  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  $\pm 1.5$  kHz for 50 Hz to 10 kHz rates;  $\pm 3$  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,  $\pm 0.6$  kHz for 50 Hz to 10 kHz rates;  $\pm 1.0$  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.

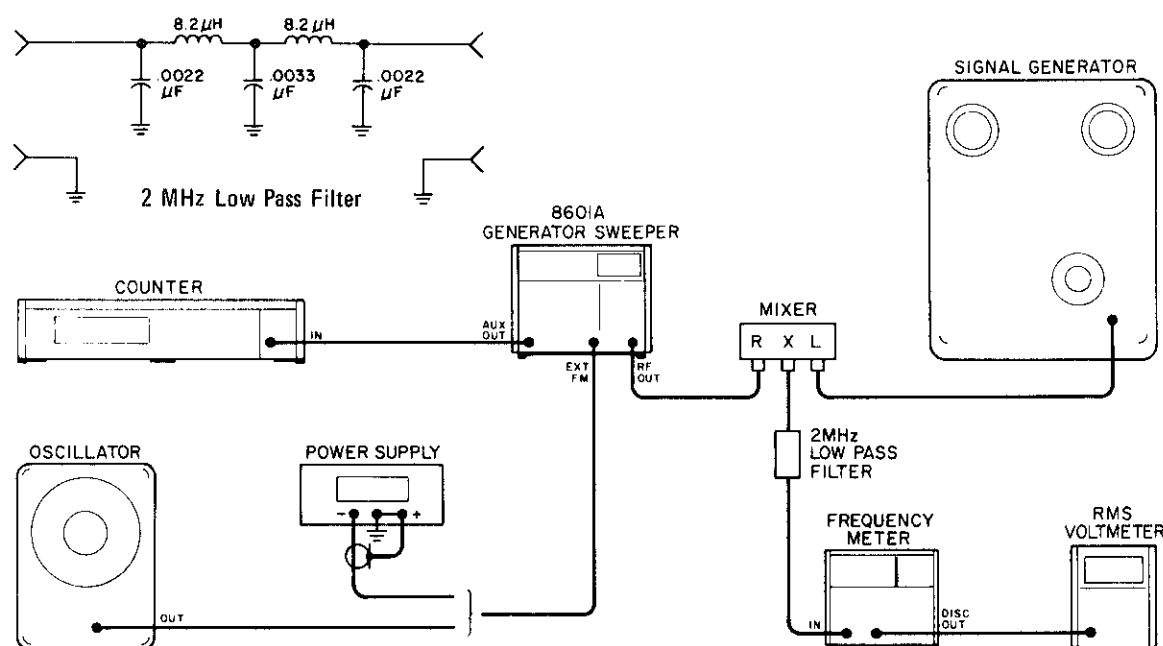


Figure 4-5. External FM Test Setup

*Equipment:*

|                          |                           |
|--------------------------|---------------------------|
| Counter/Marker Generator | HP 8600A                  |
| DC Power Supply          | HP 6215A                  |
| Audio Oscillator         | HP 200CD                  |
| RMS Voltmeter            | HP 3400A                  |
| Frequency Meter          | HP 5210A                  |
| Balanced Mixer           | HP 10514A<br>or HP 10534A |

|                          |                        |
|--------------------------|------------------------|
| Signal Generator         | HP 606A<br>and HP 608C |
| 2 MHz Low Pass<br>Filter | (See Table 1-2)        |
| Digital Voltmeter        | HP 3439A/<br>3443A     |

## 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: | CW/SWEEP . . . . . SYM         |
| SWEEP MODE . . . . . FAST         | SYM SWEEP WIDTH . . . . . 0    |
| RANGE . . . . . 110               | OUTPUT LEVEL . . . . . +10 dBm |
| FREQUENCY . . . . . 60 MHz        | 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.

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**PERFORMANCE TESTS**

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**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  $100 \pm 5$  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  $30 \pm 1.5$  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  $10 \pm 0.6$  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  $\pm 5\%$  deviation, high range.

1 kHz rate; 7.5 kHz  $\pm 5\%$  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  $\pm 5$  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  $\pm 1.5$  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  $\pm 5\%$  on high range and 2.25 kHz  $\pm 5\%$  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  $\pm 0.6$  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             |   |
| CW/SWEEP  | SYM     |                 | (or FM 30 kHz) |   |

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  $\pm 5\%$ .
    - b. For Option 006 instrument: 15.9 mVrms  $\pm 5\%$ .

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PERFORMANCE TESTS

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**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  $100 \pm 5$  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  $30 \pm 1.5$  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  $10 \pm 0.6$  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  $\pm 5\%$ .

b. For Option 006 instruments: 15.9 mVrms  $\pm 5\%$ .

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.

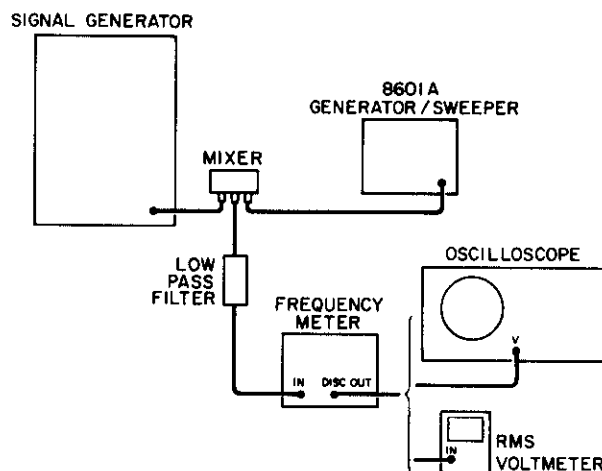


Figure 4-6. Residual and Incidental FM Test Setup

#### 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      |

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**PERFORMANCE TESTS**

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**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.

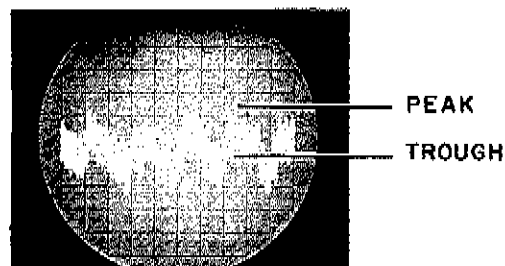


Figure 4-7. Typical Incidental FM Waveform

## 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.

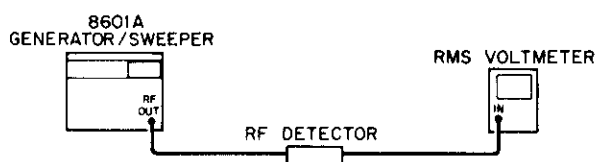


Figure 4-8. Residual AM Test Setup

#### 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:  $(R2 - R1) \text{ dB} + (10 \text{ dB})$ .
8. Residual AM (step 7 answer) is  $>50 \text{ dB}$  below R1 reading.

### 4-16. Incidental AM

#### Specification:

*Incidental AM:* Modulation index is less than  $-55 \text{ dB}$  with  $75 \text{ kHz}$  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).

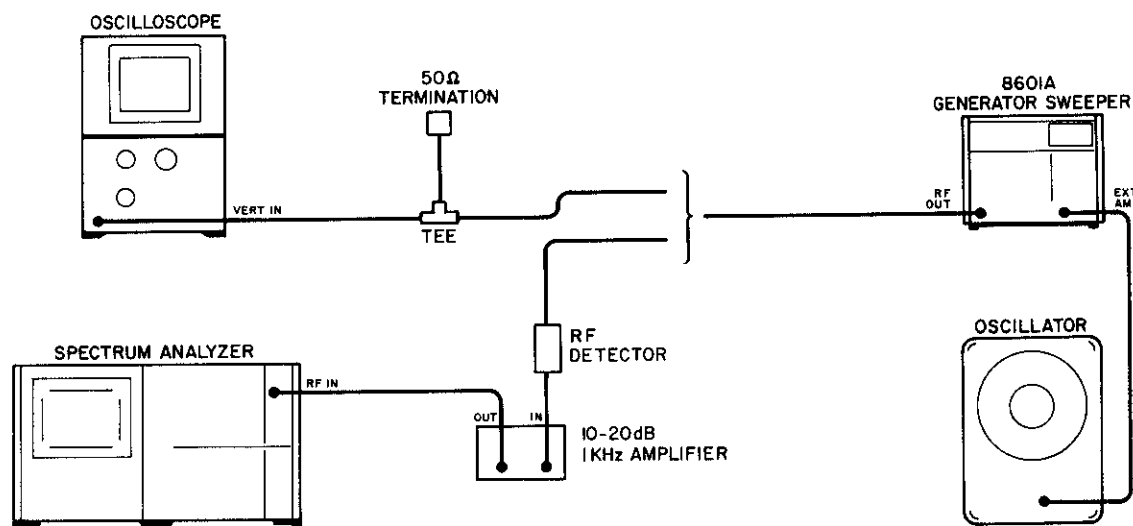


Figure 4-9. Incidental AM Test Setup

#### Equipment:

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

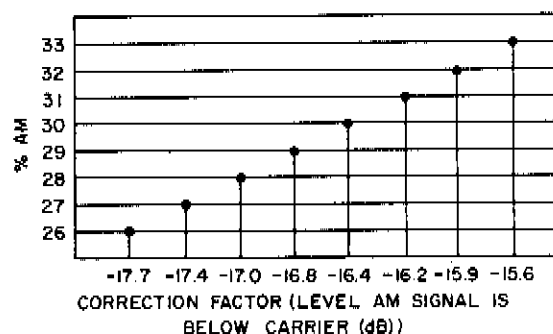


Figure 4-10. Correction Factor Chart

*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.

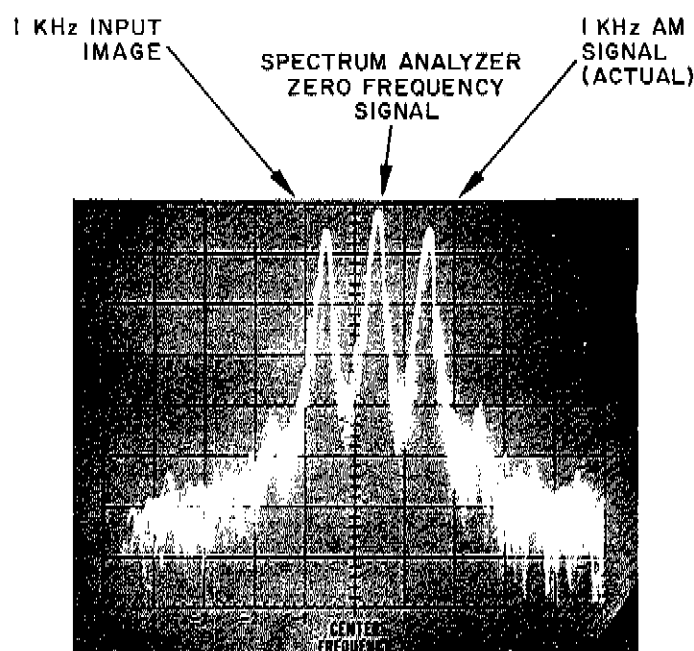


Figure 4-11. Spectrum Analyzer Display

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

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### 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:  $\pm 1$  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 ( $\pm 0.5$  dB).

#### Procedure Using 110 MHz Spectrum Analyzer:

1. Set 8601A controls as follows:

|                                |                                       |
|--------------------------------|---------------------------------------|
| RANGE . . . . . 110 MHz        | OUTPUT LEVEL                          |
| FREQUENCY . . . . . 10 MHz     | VERNIER . . . . . Fully counterclock- |
| CW/SWEEP . . . . . CW          | wise                                  |
| OUTPUT LEVEL . . . . . +20 dBm | CRYSTAL CAL . . . . . OFF             |
|                                | 1 kHz MOD . . . . . OFF               |

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  $\pm 1.5$  dB for all  $50$  ohm output 8601A instruments.
- b.  $-2$  dBm  $\pm 1.5$  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 between 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<br>Generator Sweeper<br>Serial Number _____ |                | Test Performed by: _____<br>Date: _____ |                |
|-------------------------------------------------------------------------|----------------|-----------------------------------------|----------------|
|                                                                         | Upper<br>Limit | Measured<br>Value                       | Lower<br>Limit |
| <b>4-8. Frequency Coverage/Accuracy</b>                                 |                |                                         |                |
| <i>Range 11</i>                                                         |                |                                         |                |
| 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     |
| <i>Range 110</i>                                                        |                |                                         |                |
| 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     |
| <b>4-9. Sweep Characteristics</b>                                       |                |                                         |                |
| <i>Full Sweep (Range 110)</i>                                           |                |                                         |                |
| 5. High end frequency                                                   | 120 MHz        | _____                                   | 110 MHz        |
| 6. Low end frequency                                                    | 3.0 MHz        | _____                                   | 0.98 MHz       |
| <i>Full Sweep (Range 11)</i>                                            |                |                                         |                |
| 7. a. High end frequency                                                | 12 MHz         | _____                                   | 11 MHz         |
| b. Low end frequency                                                    | 0.3 MHz        | _____                                   | 0.1 MHz        |
| <i>Video Sweep (Range 11)</i>                                           |                |                                         |                |
| 9. a. Low end frequency                                                 | 0.21 MHz       | _____                                   | 0.0 MHz        |
| b. High end frequency                                                   | 10.11 MHz      | _____                                   | 9.89 MHz       |
| <i>Video Sweep (Range 110)</i>                                          |                |                                         |                |
| 11. a. Low end frequency                                                | 2.1 MHz        | _____                                   | 0.0 MHz        |
| b. High end frequency                                                   | 101.1 MHz      | _____                                   | 98.9 MHz       |
| <i>Sym Sweep (Range 110)</i>                                            |                |                                         |                |
| <i>10 MHz Sweep Width</i>                                               |                |                                         |                |
| 15. High frequency end                                                  | 105.21 MHz     | _____                                   | 104.79 MHz     |
| 16. Low frequency end                                                   | 95.21 MHz      | _____                                   | 94.79 MHz      |
| <i>3 MHz Sweep Width</i>                                                |                |                                         |                |
| 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<br>Limit | Measured<br>Value | Lower<br>Limit |
|-------------------------------------------------------|----------------|-------------------|----------------|
| <b>4-9. Sweep Characteristics (cont)</b>              |                |                   |                |
| <i>1 MHz Sweep Width</i>                              |                |                   |                |
| 20. a. High frequency end                             | 100.52 MHz     | _____             | 100.48 MHz     |
| b. Low frequency end                                  | 99.52 MHz      | _____             | 99.48 MHz      |
| <i>0.3 MHz Sweep Width</i>                            |                |                   |                |
| 21. a. High frequency end                             | 100.166 MHz    | _____             | 100.134 MHz    |
| b. Low frequency end                                  | 99.866 MHz     | _____             | 99.834 MHz     |
| <i>0.1 MHz Sweep Width</i>                            |                |                   |                |
| 21. c. High frequency end                             | 100.062 MHz    | _____             | 100.038 MHz    |
| d. Low frequency end                                  | 99.912 MHz     | _____             | 99.888 MHz     |
| <i>SYM Sweep (Range 11)</i>                           |                |                   |                |
| <i>1 MHz Sweep Width</i>                              |                |                   |                |
| 24. a. High end frequency                             | 10.52 MHz      | _____             | 10.48 MHz      |
| b. Low end frequency                                  | 9.52 MHz       | _____             | 9.48 MHz       |
| <i>0.3 MHz Sweep Width</i>                            |                |                   |                |
| 25. a. High end frequency                             | 10.157 MHz     | _____             | 10.143 MHz     |
| b. Low end frequency                                  | 9.857 MHz      | _____             | 9.834 MHz      |
| <i>0.1 MHz Sweep Width</i>                            |                |                   |                |
| 25. c. High end frequency                             | 10.053 MHz     | _____             | 10.047 MHz     |
| d. Low end frequency                                  | 9.953 MHz      | _____             | 9.947 MHz      |
| <i>0.03 MHz Sweep Width</i>                           |                |                   |                |
| 25. e. High end frequency                             | 10.032 MHz     | _____             | 10.028 MHz     |
| f. Low end frequency                                  | 9.987 MHz      | _____             | 9.983 MHz      |
| <i>0.01 MHz Sweep Width</i>                           |                |                   |                |
| 25. g. High end frequency                             | 10.006 MHz     | _____             | 10.004 MHz     |
| h. Low end frequency                                  | 9.996 MHz      | _____             | 9.994 MHz      |
| <b>4-10. Linearity</b>                                |                |                   |                |
| 15. Refer to initial recorder trace of 5 MHz markers. |                |                   |                |
| <b>4-11. Amplitude Modulation</b>                     |                |                   |                |
| 8. AM Monitor                                         | 33%            | _____             | 27%            |
| 10. Internal AM                                       | 35%            | _____             | 25%            |

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

|                                             | Upper<br>Limit | Measured<br>Value | Lower<br>Limit |
|---------------------------------------------|----------------|-------------------|----------------|
| <b>4-12. External FM</b>                    |                |                   |                |
| 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     |
| <b>4-13. Internal FM</b>                    |                |                   |                |
| 6. Internal FM (Range 110)                  | 55.65 mVrms    | _____             | 50.35 mVrms    |
| 11. Internal FM (Range 11)                  | 55.65 mVrms    | _____             | 50.35 mVrms    |
| <b>4-14. Residual and Incidental FM</b>     |                |                   |                |
| <i>CW Mode</i>                              |                |                   |                |
| 10. Residual FM (Range 110)                 | 5 mVrms        | _____             |                |
| 12. Residual FM (Range 11)                  | 0.5 mVrms      | _____             |                |
| <i>SYM Mode (0 Sweep)</i>                   |                |                   |                |
| 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           | _____             |                |
| <b>4-15. Residual AM</b>                    |                |                   |                |
| 7. Residual AM                              |                | _____             | -50 dB         |
| <b>4-16. Incidental AM</b>                  |                |                   |                |
| 13. Incidental AM                           |                | _____             | -55 dB         |
| <b>4-17. Output Level</b>                   |                |                   |                |
| 4. Meter Output Level                       | +1.5 dB        | _____             | -1.5 dB        |
| <b>4-18. Harmonics and Spurious Signals</b> |                |                   |                |
| 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 $\pm$ 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 $\geq$ 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                 | $\Delta$ 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.       |

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**ADJUSTMENTS**

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**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  $\pm$  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.

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**ADJUSTMENTS**

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**5-8. Crystal Oscillator Adjustment (Cont)**

6. Adjust 200 MHz amplitude peaking ADJ A4A1L5 for  $-2 \text{ dBm} \pm 2 \text{ dB}$ .

**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  $-30 \text{ dBm}$ ).

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  $11.9 \pm 0.1 \text{ MHz}$  ( $119 \pm 1 \text{ MHz}$  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  $100 \pm 10 \text{ kHz}$  ( $1 \pm 0.1 \text{ MHz}$  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

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### 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  $\pm 0.12$  MHz (110 MHz  $\pm 1.2$  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  $\pm 11$  kHz (1 MHz  $\pm 110$  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  $\pm 0.12$  MHz.
  9. Set FREQUENCY control to 0.1 MHz.
  10. Re-adjust A1A1R29 (if necessary) for 100 kHz counter reading  $\pm 11$  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 |

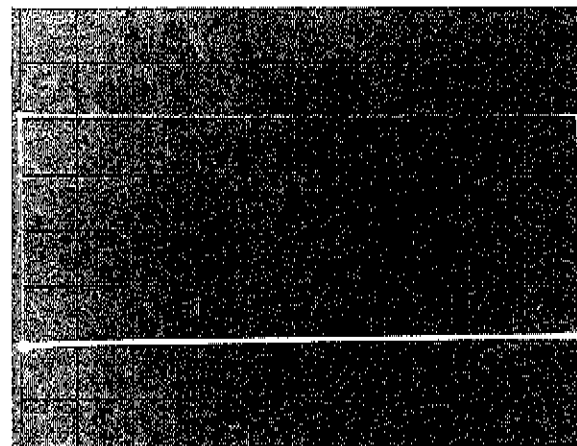
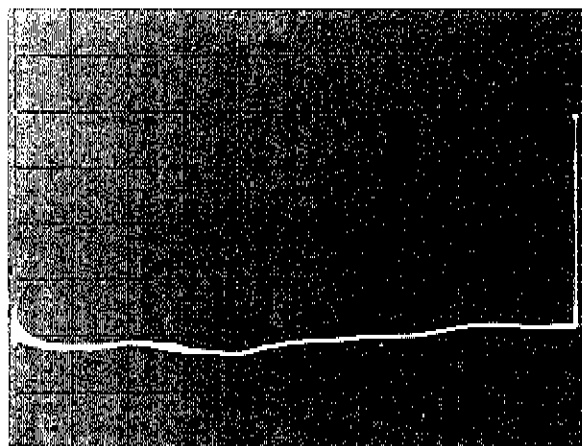
3. If necessary, slowly turn OUTPUT LEVEL VERNIER counterclockwise until power output is leveled across the band as shown in Figure 5-1.

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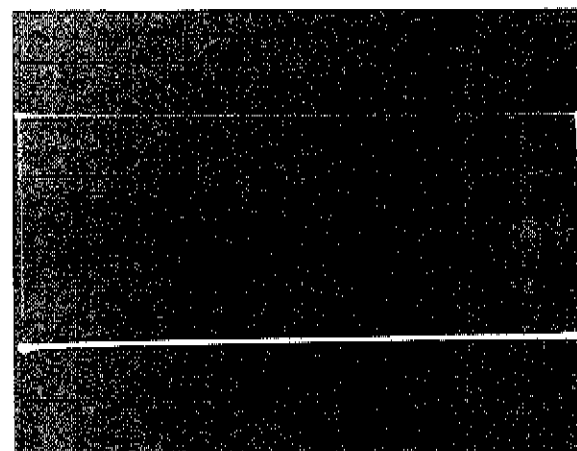
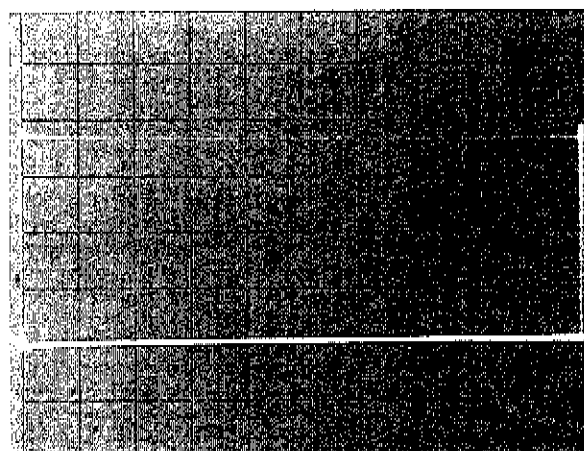
ADJUSTMENTS

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*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.

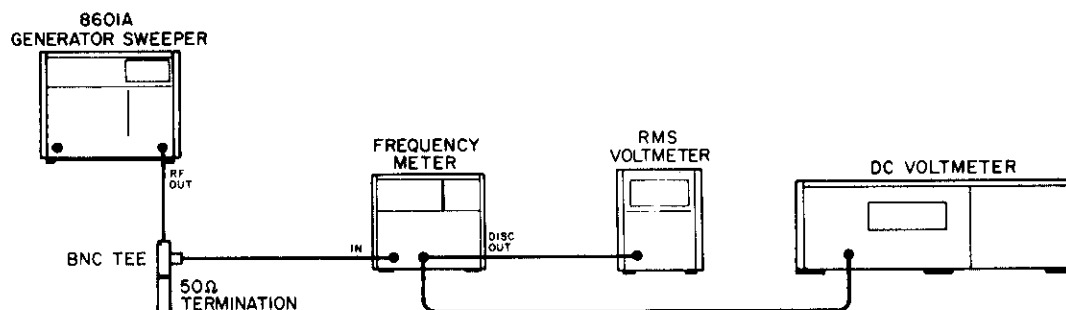


Figure 5-3. Internal FM Adjustment Setup

## 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     |
| SYM SWEEP WIDTH . . . . .  | 0      |                        | FM 30 kHz) |
| 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                 | RANGE . . . . .     | 110    |
| CW/SWEEP . . . . . CW | 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.

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ADJUSTMENTS

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**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  $0 \pm 1$  mV reading.
  10. Connect the dc digital voltmeter to test point A9TP10.
  11. Adjust buffer B ADJUST A9R88 for  $0 \pm 0.5$  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              | SWEEP MODE . . . . .     | FAST |
| CW/SWEEP . . . . . | TRIG/LINE/FREE . . . . . | FREE |
| FULL               |                          |      |

|                                |                         |          |
|--------------------------------|-------------------------|----------|
| Oscilloscope                   | HORIZONTAL              |          |
| VERTICAL SENSITIVITY . . . . . | TIME/DIVISION . . . . . | 5 ms/div |
| 1 V/cm                         |                         |          |

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

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### 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:

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

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.
-

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**ADJUSTMENTS**

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**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,  |
| B  | = motor                   | FL | = Filter          | Q  | = transistor         |    | neon bulb,      |
| BT | = battery                 | J  | = jack            | R  | = resistor           |    | photocell, etc. |
| C  | = capacitor               | K  | = relay           | RT | = thermistor         | VR | = voltage       |
| CP | = coupler                 | L  | = inductor        | S  | = switch             |    | regulator       |
| 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         |
| AMPL  | = amplifier                   | HEX     | = hexagonal                | NPO    | = negative positive zero (zero temperature coefficient) | RWV     | = reverse working voltage  |
| BFO   | = beat frequency oscillator   | HR      | = hour(s)                  |        |                                                         | S-B     | = slow-blow                |
|       |                               | HZ      | = Hertz                    | NPN    | = negative-positive-negative                            | SCR     | = screw                    |
| BE CU | = beryllium copper            | IF      | = intermediate freq        |        |                                                         | SE      | = selenium                 |
| BH    | = binder head                 | IMPG    | = impregnated              | NRFR   | = not recommended for field replacement                 | SECT    | = section(s)               |
| BP    | = bandpass                    | INCD    | = incandescent             |        |                                                         | SEMICON | = semiconductor            |
| BRS   | = brass                       | INCL    | = include(s)               | NSR    | = not separately replaceable                            | SI      | = silicon                  |
| BWO   | = backward wave oscillator    | INS     | = insulation(ed)           |        |                                                         | SIL     | = silver                   |
|       |                               | INT     | = internal                 |        |                                                         | SL      | = slide                    |
| CCW   | = counterclockwise            |         |                            | OBD    | = order by description                                  | SPG     | = spring                   |
| CER   | = ceramic                     | K       | = kilo = 1000              | OH     | = oval head                                             | SPL     | = special                  |
| CMO   | = cabinet mount only          |         |                            | OX     | = oxide                                                 | SST     | = Stainless steel          |
| COEF  | = coefficient                 | LH      | = left hand                |        |                                                         | SR      | = split ring               |
| COM   | = common                      | LIN     | = linear taper             | P      | = peak                                                  | STL     | = steel                    |
| COMP  | = composition                 | LK WASH | = lock washer              | PC     | = printed circuit                                       |         |                            |
| COMPL | = complete                    | LOG     | = logarithmic taper        | PF     | = picofarads = 10 <sup>-12</sup> farads                 | TA      | = tantalum                 |
| CONN  | = connector                   | LPF     | = low pass filter          |        |                                                         | TD      | = time delay               |
| CP    | = cadmium plate               |         |                            | PH BRZ | = phosphor bronze                                       | TGL     | = toggle                   |
| CRT   | = cathode-ray tube            |         |                            | PHL    | = Phillips                                              | THD     | = thread                   |
| CW    | = clockwise                   |         |                            | PIV    | = peak inverse voltage                                  | TI      | = titanium                 |
|       |                               | M       | = milli = 10 <sup>-3</sup> |        |                                                         | TOL     | = tolerance                |
| DEPC  | = deposited carbon            | MEG     | = meg = 10 <sup>6</sup>    | PNP    | = positive-negative-positive                            | TRIM    | = trimmer                  |
| DR    | = drive                       | MET FLM | = metal film               |        |                                                         | TWT     | = traveling wave tube      |
|       |                               | MET OX  | = metallic oxide           |        |                                                         |         |                            |
| ELECT | = electrolytic                | MFR     | = manufacturer             | P/O    | = part of                                               |         |                            |
| ENCAP | = encapsulated                | MHz     | = mega Hertz               | POLY   | = polystyrene                                           | μ       | = micro = 10 <sup>-6</sup> |
| EXT   | = external                    | MINAT   | = miniature                | PORC   | = porcelain                                             |         |                            |
|       |                               | MOM     | = momentary                | POS    | = position(s)                                           | VAR     | = variable                 |
| F     | = farads                      | MOS     | = metalized substrate      | POT    | = potentiometer                                         | VDCW    | = dc working volts         |
| FH    | = flat head                   | MTG     | = mounting                 | PP     | = peak-to-peak                                          |         |                            |
| FIL H | = Fillister head              | MY      | = "mylar"                  | PT     | = point                                                 | W/      | = with                     |
| FXD   | = fixed                       |         |                            | PWV    | = peak working voltage                                  | W       | = watts                    |
|       |                               | N       | = nano (10 <sup>-9</sup> ) |        |                                                         | WIV     | = working inverse voltage  |
| G     | = giga (10 <sup>9</sup> )     | N/C     | = normally closed          | RECT   | = rectifier                                             | WW      | = wirewound                |
| GE    | = germanium                   | NE      | = neon                     | RF     | = radio frequency                                       | W/O     | = without                  |
| GL    | = glass                       | NI PL   | = nickel plate             | RH     | = round head or right hand                              |         |                            |
| 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, A1A1 ASSY & COVER        |          |                    |
| A1                    | 08601-6051     | 1   | DISCRIMINATOR ASSY (OPT 001, 002, 011 ONLY) | 28480    | 08601-6051         |
| A1                    |                |     | (INCL C1-C4, J1-J4, 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    | 81048X102M         |
| A1A1C4                | 0160-2262      | 2   | C:FXD CER 16 PF 5% 500VDCW                  | 72982    | 301-000 C060 160J  |
| A1A1C5                | 0160-2262      |     | C:FXD CER 16 PF 5% 500VDCW                  | 72982    | 301-000 C060 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    | RDH15E510J1C       |
| 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 180MV                  | 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      | 49  | R:FXD MET FLM 51.1 OHM 1% 1/8W        | 28480    | 0757-0394            |
| A1A1R32               | 0757-0280      |     | R:FXD MET FLM 1K OHM 1% 1/8W          | 28480    | 0757-0280            |
| A1A1R33               | 0757-0420      |     | R:FXD MET FLM 750 OHM 1% 1/8W         | 28480    | 0757-0420            |
| A1A1R34               | 0698-3156      |     | R:FXD MET FLM 14.7K OHM 1% 1/8W       | 28480    | 0698-3156            |
| A1A1R35               | 0757-0418      |     | 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      |     | 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      |     | 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      |     | 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      | 4   | R:FXD MET FLM 1K OHM 1% 1/8W          | 28480    | 0757-0280            |
| A1A1R52               | 0698-3260      |     | R:FXD MET FLM 464K OHM 1% 1/8W        | 28480    | 0698-3260            |
| A1A1R53               | 0698-3458      |     | R:FXD MET FLM 348K OHM 1% 1/8W        | 28480    | 0698-3458            |
| A2                    | 08601-6071     |     | 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     |     | 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     |     | 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      |     | C:FXD MICA 200 PF 5%                  | 72136    | RD15F201J3C          |
| 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   |
| A2A1C16               | 1902-0579      | 1   | DIODE BREAKDOWN: 5.11V                | 28480    | 1902-0579            |
| A2A1C17               | 1902-0041      |     | DIODE: BREAKDOWN 5.11V 5%             | 04713    | S210939-98           |
| A2A1C18               | 1820-0101      |     | INTEGRATED CIRCUIT: DIFFERENTIAL AMPL | 04713    | MC1034P              |
| A2A1C19               | 1820-0102      |     | INTEGRATED CIRCUIT: J-K FLIP FLOP     | 04713    | MC1013P              |
| A2A1C20               | 1820-0102      |     | INTEGRATED CIRCUIT: J-K FLIP FLOP     | 04713    | MC1013P              |
| A2A1C21               | 1820-0387      | 1   | INTEGRATED CIRCUIT                    | 28480    | 1820-0387            |
| A2A1C22               | 9100-1624      |     | COIL/CHOKE 30 UH 5%                   | 82142    | 15-4465-1J           |
| A2A1C23               | 9100-1618      |     | COIL: MOLDED CHOKE 5.60 UH            | 28480    | 9100-1618            |
| A2A1C24               | 9140-0237      |     | COIL: FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2A1C25               | 9140-0237      |     | COIL: FXD 200 UH 5%                   | 28480    | 9140-0237            |
| A2A1C26               | 9140-0158      | 5   | COIL: FXD RF 1 UH 10%                 | 99800    | 1025-20              |
| A2A1C27               | 1853-0034      |     | TSTR: SI PNP (SELECTED FROM 2N3251)   | 28480    | 1853-0034            |
| A2A1C28               | 1853-0034      |     | TSTR: SI PNP (SELECTED FROM 2N3251)   | 28480    | 1853-0034            |
| A2A1C29               | 1854-0345      |     | TSTR: SI NPN                          | 80131    | 2N5179               |
| A2A1C30               |                |     |                                       |          |                      |
| A2A1R1                | 0757-0399      | 2   | R:FXD MET FLM 82.5 OHM 1% 1/8W        | 28480    | 0757-0399            |
| A2A1R2                | 0698-3444      |     | R:FXD MET FLM 316 OHM 1% 1/8W         | 28480    | 0698-3444            |
| A2A1R3                | 0698-3432      |     | R:FXD MET FLM 26.1 OHM 1% 1/8W        | 28480    | 0698-3432            |
| A2A1R4                | 0698-3441      |     | R:FXD MET FLM 215 OHM 1% 1/8W         | 28480    | 0698-3441            |
| A2A1R5                | 0698-3629      |     | R:FXD MET QX 270 OHM 5% 2W            | 28480    | 0698-3629            |
| A2A1R6                | 0757-0280      | 1   | 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      |     | 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            |

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      |
|-----------------------|----------------|-----|-------------------------------------------|----------|----------------------|
| 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    | 1500105X9035A2-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    | RD15E430J3C          |
| A3A1C4                | 0140-0191      | 3   | C:FXD MICA 56 PF 5% 300VDCW               | 19701    | RD15E560J 300V       |
| A3A1C5                | 0160-2200      |     | C:FXD MICA 43 PF 5%                       | 72136    | RD15E430J3C          |
| 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    | RD15E510J1C          |
| 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-COKO-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    | 1500104X9035A2-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                     |          |                      |

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      |
|-----------------------|----------------|-----|----------------------------------------|----------|----------------------|
| 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-COGU-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    | 1500104X9035A2-DYS   |
| A3A2A1C5              | 0160-0301      | 2   | C:FXD MY 0.012 UF 10% 200VDCW          | 56289    | 192P12392-PTS        |
| A3A2A1C1              | 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    | C067B102E1027S26-CDH |
| A4A1C2                | 0160-2327      |     | C:FXD CER 1000 PF 20% 100VDCW          | 96733    | 81048X102M           |
| 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    | 81048X102M           |
| A4A1C6                | 0160-2253      | 1   | C:FXD CER 6.8 PF 500VDCW               | 72982    | 301-NP0-6.8 PF       |
| A4A1C7                | 0160-2259      | 1   | C:FXD CER 12 PF 5% 500VDCW             | 72982    | 301-000-COG0-120J    |
| A4A1C8                | 0160-2261      | 1   | C:FXD CER 15 PF 5% 500VDCW             | 72982    | 301-NP0-15 PF        |
| A4A1C9                | 0160-2266      |     | C:FXD CER 24 PF 5% 500VDCW             | 72982    | 301-000-COG0-240J    |
| A4A1C10               | 0160-2257      | 5   | C:FXD CER 10 PF 5% 500VDCW             | 72982    | 301-000-CDH0-100J    |
| A4A1C11               | 0160-2266      |     | C:FXD CER 24 PF 5% 500VDCW             | 72982    | 301-000-COG0-240J    |
| A4A1C12               | 0160-2241      | 1   | C:FXD CER 2.2 PF 500VDCW               | 72982    | 301-000-COJD-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-COG0 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 8               |
| 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 8               |
| 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    | C0678102E102LS26-CDH |
| A4A1L1                | 9100-2249      | 2   | COIL/CHUKE 0.15 UH 10%                 | 28480    | 9100-2249            |
| A4A1L2                | 9140-0158      |     | COIL:FXD RF 1 UH 10%                   | 99800    | 1025-20              |
| A4A1L3                | 9100-2249      |     | COIL/CHUKE 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/CHUKE 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            |
| A4A1R8                |                |     | 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 39.3 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:CHUKE                             | 02114    | VK200-10/48          |
| A4A1RFC2              | 9100-1788      |     | COIL:CHUKE                             | 02114    | VK200-10/48          |
| A4A1RFC3              | 9100-1788      |     | COIL:CHUKE                             | 02114    | VK200-10/48          |
| A4A1V1                | 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 GLOW PASS FILTER BD ASSY           | 28480    | 08698-6009           |
| A4A2A1C1              | 0140-0190      | 2   | C:FXD MICA 39 PF 5%                    | 72136    | RD15E390J3C          |
| A4A2A1C2              | 0140-0191      |     | C:FXD MICA 56 PF 5% 300VDCW            | 19701    | RD15E560J 300V       |
| A4A2A1C3              | 0160-2201      |     | C:FXD MICA 51 PF 5%                    | 72136    | RD15E510J1C          |
| A4A2A1C4              | 0140-0191      |     | C:FXD MICA 56 PF 5% 300VDCW            | 19701    | RD15E560J 300V       |
| A4A2A1C5              | 0140-0190      |     | C:FXD MICA 39 PF 5%                    | 72136    | RD15E390J3C          |
| 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   |

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      |
|-----------------------|----------------|-----|------------------------------------|----------|----------------------|
| A4A3A1C5              | 0160-0301      |     | C:FXD MY 0.012 UF 10% 200VDCW      | 56289    | 192P12392-PTS        |
| A4A3A1C1              | 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 |
| A5A1C31               | 1901-0033      |     | DIODE:SILICON 100MA 180WV          | 07263    | FD3369               |
| A5A1C32               | 1901-0033      |     | DIODE:SILICON 100MA 180WV          | 07263    | FD3369               |
| A5A1C33               | 1901-0033      |     | DIODE:SILICON 100MA 180WV          | 07263    | FD3369               |
| A5A1C34               | 1901-0033      |     | DIODE:SILICON 100MA 180WV          | 07263    | FD3369               |
| A5A1C35               | 0122-0274      |     | 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(CW)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      |     | 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    | 517843             |
| 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    | VK200-10/48        |
| A5A1RFC2              | 9100-1788      |     | COIL:CHOKE                               | 02114    | VK200-10/48        |
| A5A1RFC3              | 9170-0016      | 2   | BEAD:MAGNETIC SHIELDING                  | 02114    | 56-590-65/38       |
| A5A1RFC4              | 9170-0016      |     | BEAD:MAGNETIC SHIELDING                  | 02114    | 56-590-65/38       |
| A6                    | 08601-6006     | 1   | AMPLIFIER ASSY:VIDEO                     | 28480    | 08601-6006         |
| A6                    |                |     | INCL CI-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    | 1500476X9035S2-DYS |
| A6A1C2                | 0180-0376      | 3   | C:FXD ELECT 0.47 UF 10% 35VDCW           | 56289    | 1500476X9035A2-DYS |
| A6A1C3                | 0180-0097      |     | C:FXD TANT. 47 UF 10% 35VDCW             | 56289    | 1500476X9035S2-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    | 1500476X9035A2-DYS |
| A6A1C8                | 0180-0376      |     | C:FXD ELECT 0.47 UF 10% 35VDCW           | 56289    | 1500476X9035A2-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          |
| A7                    | 08601-6007     | 1   | FACTORY SELECTED PART<br>ATTENUATOR ASSY | 28480    | 08601-6007         |

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      |
|-----------------------|----------------|-----|-----------------------------------------------------------|----------|----------------------|
| A7                    | 08601-6057     | 1   | ATTENUATOR ASSY<br>(OPT 008, 009, 010 ONLY)               | 28480    | 08601-6057           |
| 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<br>(OPT 008, 009, 010 ONLY)     | 01121    | CB 2405              |
| 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                    | 08401-6018     | 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<br>(OPT 001 ONLY) | 28480    | 08601-6061           |
| A9                    | 08601-6064     | 1   | BOARD ASSY:FREQUENCY CONTROL & LEVELING<br>(OPT 002 ONLY) | 28480    | 08601-6064           |
| A9                    | 08601-6069     | 1   | BOARD ASSY:FREQUENCY CONTROL & LEVELING<br>(OPT 003 ONLY) | 28480    | 08601-6069           |
| A9                    | 08601-6070     | 1   | BOARD ASSY:FREQUENCY CONTROL & LEVELING<br>(OPT 005 ONLY) | 28480    | 08601-6070           |
| A9                    | 08601-6068     | 1   | BOARD ASSY:FREQUENCY CONTROL & LEVELING<br>(OPT 006 ONLY) | 28480    | 08601-6068           |
| A9                    | 08601-6077     | 1   | BOARD ASSY:FREQUENCY CONTROL & LEVELING<br>(OPT 011 ONLY) | 28480    | 08601-6077           |
| 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    | 109D30TX0030W2-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    | 5C1187S-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   |

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    |
|-----------------------|----------------|-----|--------------------------------------------------|----------|--------------------|
| A9C30                 | 0180-1735      | 2   | C:FXD ELECT 0.22 UF 10% 35VDCW                   | 28480    | 0180-1735          |
| A9C31                 | 0140-0184      |     | C:FXD MICA 8200 PF 1% 100VDCW                    | 28480    | 0140-0184          |
| A9C31                 | 0140-0166      | 1   | C:FXD MICA 17,000PF 2% 300VDCW<br>(OPT 005 ONLY) | 28480    | 0140-0166          |
| A9C32                 | 0160-2228      | 2   | C:FXD MICA 2700 PF 5%                            | 28480    | 0160-2228          |
| A9C32                 | 0140-0184      | 1   | C:FXD MICA 8200 PF 1% 100VDCW<br>(OPT 005 ONLY)  | 28480    | 0140-0184          |
| A9C33                 | 0160-2217      |     | 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      | 1   | C:FXD ELECT 2.2 UF 10% 20VDCW                    | 56289    | 150D225X9020A2-DYS |
| A9C35                 | 0160-0163      |     | C:FXD MY 0.033 UF 10% 200VDCW                    | 56289    | 192P33392-PTS      |
| A9C35                 | 0160-0168      |     | C:FXD MY 0.1 UF 10% 200VDCW<br>(OPT 005 ONLY)    | 56289    | 192P10492-PTS      |
| A9C36                 | 0160-2146      |     | C:FXD CER 0.02 UF +80-20% 100VDCW                | 91418    | TA                 |
| A9C37                 | 0180-0291      | 1   | C:FXD ELECT 1.0 UF 10% 35VDCW                    | 56289    | 150D105X9035A2-DYS |
| A9C37                 | 0180-0197      |     | C:FXD ELECT 2.2 UF 10% 20VDCW<br>(OPT 005 ONLY)  | 56289    | 150D225X9020A2-DYS |
| 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                 |                | 1   | (OPT 005 ONLY)                                   |          |                    |
| A9C39                 | 0180-0159      |     | 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      |     | C:FXD CER 0.05 UF +80-20% 100VDCW                | 84411    | TYPE TA            |
| A9CR1                 | 1901-0033      | 2   | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR2                 | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR3                 | 1902-3104      |     | DIODE:BREAKDOWN 5.62V 5%                         | 04713    | S210939-110        |
| A9CR4                 | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR5                 | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR6                 | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR7                 | 1901-0033      | 1   | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR8                 | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR9                 | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR10                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR11                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR12                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR13                | 1902-3104      |     | DIODE:BREAKDOWN 5.62V 5%                         | 04713    | S210939-110        |
| A9CR14                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR15                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR16                |                |     | NOT ASSIGNED                                     |          |                    |
| A9CR17                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR18                | 1901-0033      | 1   | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR19                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR20                | 1902-0025      |     | DIODE,BREAKDOWN:10.0V 5% 400 MW                  | 28480    | 1902-0025          |
| A9CR21                |                |     | NOT ASSIGNED                                     |          |                    |
| A9CR22                | 1901-0033      | 1   | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR23                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR24                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR25                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR26                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR27                | 1901-0033      | 1   | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR28                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR29                | 1901-0033      |     | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9CR30                |                |     | NOT ASSIGNED                                     |          |                    |
| A9CR31                | 1901-0033      | 1   | DIODE:SILICON 100MA 180MV                        | 07263    | F03369             |
| A9E1                  | 1820-0203      |     | IC:OPERATIONAL AMPLIFIER                         | 07263    | SL8940             |
| A9L1                  |                |     | NOT ASSIGNED                                     |          |                    |
| A9L2                  | 9140-0131      |     | COIL:FXD RF 10 MH                                | 28480    | 9140-0131          |
| A9L2                  | 9100-2867      |     | COIL/CHOKE 24000 UH 5%                           | 82142    | 10289-3            |
| A9L2                  |                |     | (OPT 005 ONLY)                                   |          |                    |
| A9Q1                  | 1854-0221      | 1   | 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      | 1   | 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                 |                | 1   | 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          |

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 |
|-----------------------|----------------|-----|-----------------------------------|----------|-----------------|
| A9Q16                 | 1854-0071      | 1   | TSTR:SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071       |
| A9Q17                 |                |     | NOT ASSIGNED                      |          |                 |
| A9Q18                 | 1854-0295      |     | 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      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W   | 28480    | 0757-0438       |
| A9R3                  | 0757-0443      |     | 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 WM 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      |     | R:FXD MET FLM 147K OHM 1% 1/8W    | 28480    | 0698-3452       |
| A9R34                 | 2100-1775      | 2   | R:VAR WM 5K OHM 5% TYPE H 1W      | 28480    | 2100-1775       |
| A9R35                 | 0698-3161      |     | 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      |     | R:FXD MET FLM 2.61K OHM 1% 1/8W   | 28480    | 0698-0085       |
| A9R38                 | 0757-0460      |     | R:FXD MET FLM 61.9K OHM 1% 1/8W   | 28480    | 0757-0460       |
| A9R39                 | 0757-0428      | 2   | R:FXD MET FLM 1.62K OHM 1% 1/8W   | 28480    | 0757-0428       |
| A9R40                 | 0698-3162      |     | 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      | 1   | 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      |     | 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       |

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 |
|-----------------------|----------------|-----|-------------------------------------------------------|----------|-----------------|
| 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-               |                |     | NOT ASSIGNED                                          |          |                 |
| A9R105                |                |     | 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 (OPT 003 AND 011 ONLY) | 28480    | 0698-4087       |
| A9R107                |                |     |                                                       |          |                 |
| 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 (OPT 006 ONLY)         | 28480    | 0757-0465       |
| A9R112                |                |     |                                                       |          |                 |
| 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 (OPT 001 ONLY)         | 28480    | 0698-3428       |
| A9R113                |                |     |                                                       |          |                 |
| A9R113                | 0683-0565      |     | R:FXD COMP 5.6 OHM 5% 1/4W (OPT 002 AND 011 ONLY)     | 01121    | CB 0565         |
| A9R113                |                |     |                                                       |          |                 |
| 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       |

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 |
|-----------------------|----------------|-----|------------------------------------------------------|----------|-----------------|
| A9R120                | 2100-1768      | 1   | R:VAR WW 20 OHM 5% TYPE H 1W                         | 28480    | 2100-1768       |
| A9R121                | 0757-0402      |     | 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       |
| A9R123                | 0698-6276      |     | FACTORY SELECTED PART<br>R:FXD FLM 12.5K OHM 1% 1/8W | 28480    | 0698-6276       |
| A9R124                |                | 1   | NOT ASSIGNED                                         |          |                 |
| A9R125                | 0698-4317      |     | NOT ASSIGNED                                         | 28480    | 0698-4317       |
| A9R126                |                |     | R:FXD MET FLM 5620 OHM 1.0% 1/2W                     |          |                 |
| A9R127                | 0757-0317      |     | NOT ASSIGNED                                         | 28480    | 0757-0317       |
| A9R128                |                | 3   | 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                                         | 28480    | 0698-3159       |
| A9R131                | 2100-1777      |     | R:VAR WW 20K OHM 5% TYPE H 1W                        | 28480    | 2100-1777       |
| A9R132                | 0757-0441      | 4   | 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      |     | 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      | 1   | 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      | 1   | 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      | 1   | 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      |     | R:FXD MET FLM 4.64K OHM 1% 1/8W                      | 28480    | 0698-3155       |
| A9R148                | 0757-0442      | 1   | 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      | 1   | 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      | 1   | 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      | 2   | R:FXD MET FLM 28.7K OHM 1% 1/8W                      | 28480    | 0698-3449       |
| A9R159                |                |     | (OPT 005 ONLY)                                       | 28480    |                 |
| A9R160                | 2100-1776      |     | R:VAR WW 10K OHM 5% TYPE H 1W                        | 28480    | 2100-1776       |
| A9R161                | 0757-0464      |     | R:FXD MET FLM 90.9K OHM 1% 1/8W                      | 28480    | 0757-0464       |
| A9R162                | 2100-1776      | 1   | R:VAR WW 10K OHM 5% TYPE H 1W                        | 28480    | 2100-1776       |
| A9R162                | 2100-0969      |     | R:VAR MET FLM 50K OHM 20%<br>(OPT 001 AND 002 ONLY)  | 75042    | CT150           |
| A9R162                |                |     | R:FXD MET FLM 10.0K OHM 1% 1/8W                      | 28480    | 0757-0442       |
| A9R163                | 0757-0442      |     | R:FXD MET FLM 5.11K OHM 1% 1/8W                      | 28480    | 0757-0438       |
| A9R163                | 0757-0438      | 2   | (OPT 005 ONLY)                                       | 28480    |                 |
| A9R163                |                |     | R:FXD MET FLM 4.22K OHM 1% 1/8W                      | 28480    | 0698-3154       |
| A9R164                | 0698-3154      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W                      | 28480    | 0757-0442       |
| A9R165                | 0757-0442      |     | R:FXD MET FLM 464K OHM 1% 1/8W                       | 28480    | 0698-3260       |
| A9R166                | 0698-3260      | 1   | R:FXD MET FLM 3.16K OHM 1% 1/2W                      | 28480    | 0698-3410       |
| A9R167                | 0698-3410      |     | R:FXD MET FLM 23.7K OHM 1% 1/2W                      | 28480    | 0698-3417       |
| A9R168                | 0698-3417      |     | R:FXD MET FLM 7.50K OHM 1% 1/8W                      | 28480    | 0757-0440       |
| A9R169                | 0757-0440      |     | R:FXD MET FLM 10.0K OHM 1% 1/8W                      | 28480    | 0757-0442       |
| A9R170                | 0757-0442      | 1   | R:FXD MET FLM 2.15K OHM 1% 1/8W                      | 28480    | 0698-0084       |
| A9R171                | 0698-0084      |     | R:FXD MET FLM 51.1 OHM 1% 1/8W                       | 28480    | 0757-0394       |
| A9R172                | 0757-0394      |     |                                                      |          |                 |
| A9R173                | 0757-0397      |     | R:FXD MET FLM 68.1 OHM 1% 1/8W                       | 28480    | 0757-0397       |
| A9R174                | 0757-0280      | 1   | 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      |     | 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      | 1   | R:FXD MET FLM 51.1 OHM 1% 1/8W                       | 28480    | 0757-0394       |
| A9R183                | 2100-2497      |     | 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    | 150D475X903582-DYS   |
| A10C2                 | 0180-0161      | 1   | C:FXD ELECT 3.3 UF 20% 35VDCW      | 56289    | 150D335X003582-DYS   |
| A10C3                 | 0180-0094      | 2   | C:FXD ELECT 100 UF +75-10% 25VDCW  | 56289    | 300107G025002-DSM    |
| A10C4                 | 0180-0161      | 1   | C:FXD ELECT 3.3 UF 20% 35VDCW      | 56289    | 150D335X003582-DYS   |
| A10C5                 | 0160-2055      | 18  | C:FXD CER 0.01 UF +80-20% 100VDCW  | 56289    | C023F101F1031S22-CDH |
| A10C6                 | 0180-0097      | 4   | C:FXD TANT. 47 UF 10% 35VDCW       | 56289    | 150D476X903552-DYS   |
| A10C7                 | 0180-1743      | 7   | C:FXD ELECT 0.1 UF 10% 35VDCW      | 56289    | 150D104X903552-DYS   |
| A10C8                 | 0180-0097      | 1   | C:FXD TANT. 47 UF 10% 35VDCW       | 56289    | 150D476X903552-DYS   |
| A10C9                 | 0180-1797      | 1   | C:FXD ELECT 50 UF +50-10% 150VDCW  | 28480    | 0180-1797            |
| A10C10                | 0180-0094      | 2   | C:FXD ELECT 100 UF +75-10% 25VDCW  | 56289    | 300107G025002-DSM    |
| A10C11                | 0180-0089      | 2   | C:FXD ELECT 10UF-10%+100% 150VDCW  | 56289    | 3001066150DF4        |
| A10C12                | 0180-0089      | 2   | C:FXD ELECT 10UF-10%+100% 150VDCW  | 56289    | 3001066150DF4        |
| A10CR1                | 1902-3036      | 2   | DIODE: BREAKDOWN 3.16V 5%          | 04713    | SZ10939-38           |
| A10CR2                | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR3                | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR4                | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR5                | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR6                | 1902-0071      | 1   | DIODE: BREAKDOWN 9.0V 5%           | 28480    | 1902-0071            |
| A10CR7                | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR8                | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR9                | 1902-3036      | 1   | DIODE: BREAKDOWN 3.16V 5%          | 04713    | SZ10939-38           |
| A10CR10               | 1902-3125      | 1   | DIODE: BREAKDOWN 6.98V 2% 400MW    | 28480    | 1902-3125            |
| A10CR11               | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR12               | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR13               | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10CR14               | 1901-0033      | 1   | DIODE: SILICON 100MA 180WV         | 07263    | FD3369               |
| A10Q1                 | 1854-0221      | 1   | TSTR: SI NPN(REPL. BY 2N4044)      | 28480    | 1854-0221            |
| A10Q2                 | 1854-0071      | 1   | TSTR: SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071            |
| A10Q3                 | 1853-0001      | 1   | TSTR: SI NPN(SELECTED FROM 2N1132) | 28480    | 1853-0001            |
| A10Q4                 | 1853-0010      | 5   | TSTR: SI PNP(SELECTED FROM 2N3251) | 28480    | 1853-0010            |
| A10Q5                 | 1854-0071      | 2   | 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      | 2   | TSTR: SI PNP                       | 04713    | SS 2109              |
| A10Q9                 | 1854-0039      | 1   | TSTR: SI NPN                       | 80131    | 2N3053               |
| A10Q10                | 1854-0221      | 1   | TSTR: SI NPN(REPL. BY 2N4044)      | 28480    | 1854-0221            |
| A10Q11                | 1854-0071      | 1   | TSTR: SI NPN(SELECTED FROM 2N3704) | 28480    | 1854-0071            |
| A10Q12                | 1853-0010      | 1   | TSTR: SI PNP(SELECTED FROM 2N3251) | 28480    | 1853-0010            |
| A10Q13                | 1853-0010      | 1   | 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      | 1   | 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      | 1   | 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      | 1   | R:FXD MET FLM 10.0K OHM 1% 1/8W    | 28480    | 0757-0442            |
| A10R9                 | 0757-0280      | 1   | 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      | 1   | R:FXD MET FLM 100K OHM 1% 1/8W     | 28480    | 0757-0465            |
| A10R14                | 0757-0465      | 1   | 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      | 1   | 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      | 1   | 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      | 1   | R:FXD MET FLM 10.0K OHM 1% 1/8W    | 28480    | 0757-0442            |
| A10R23                | 0757-0280      | 1   | 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      | 1   | R:FXD MET FLM 1K OHM 1% 1/8W       | 28480    | 0757-0280            |
| A10R28                | 0757-0401      | 1   | R:FXD MET FLM 100 OHM 1% 1/8W      | 28480    | 0757-0401            |
| A10R29                | 0757-0401      | 1   | 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      | 1   | R:FXD MET FLM 14.7K OHM 1% 1/8W       | 28480    | 0698-3156          |
| A11R8                 | 0698-3156      | 1   | 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      | 1   | C:FXD ELECT 1.0 UF 10% 35VDCW         | 56289    | 1500105X9035A2-DYS |
| A12C3                 | 0180-0106      | 1   | C:FXD ELECT 60 UF 20% 6VDCW           | 28480    | 0180-0106          |
| A12R1                 | 0757-0280      | 2   | 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    | B8-2219            |
| 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    | 080                |
| 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    | 080                |
| 25                    | 2190-0016      | 1   | WASHER:LOCK PH BRZ NP                 | 00000    | 080                |
| 26                    | 2190-0401      | 2   | WASHER:FIBER FOR #4 SCREW             | 00000    | 080                |
| 27                    | 2360-0197      | 1   | SCREW:SST PAN HD 6-32 X .375          | 00000    | 080                |
| 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    | 080                |
| 30                    | 3050-0017      | 4   | WASHER:FLAT PHOS BRONZE               | 00000    | 080                |
| 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      | 1   | CABLE:LACING VIOLET(SPECIAL)          | 87473    | EP127 CORD         |

See introduction to this section for ordering information

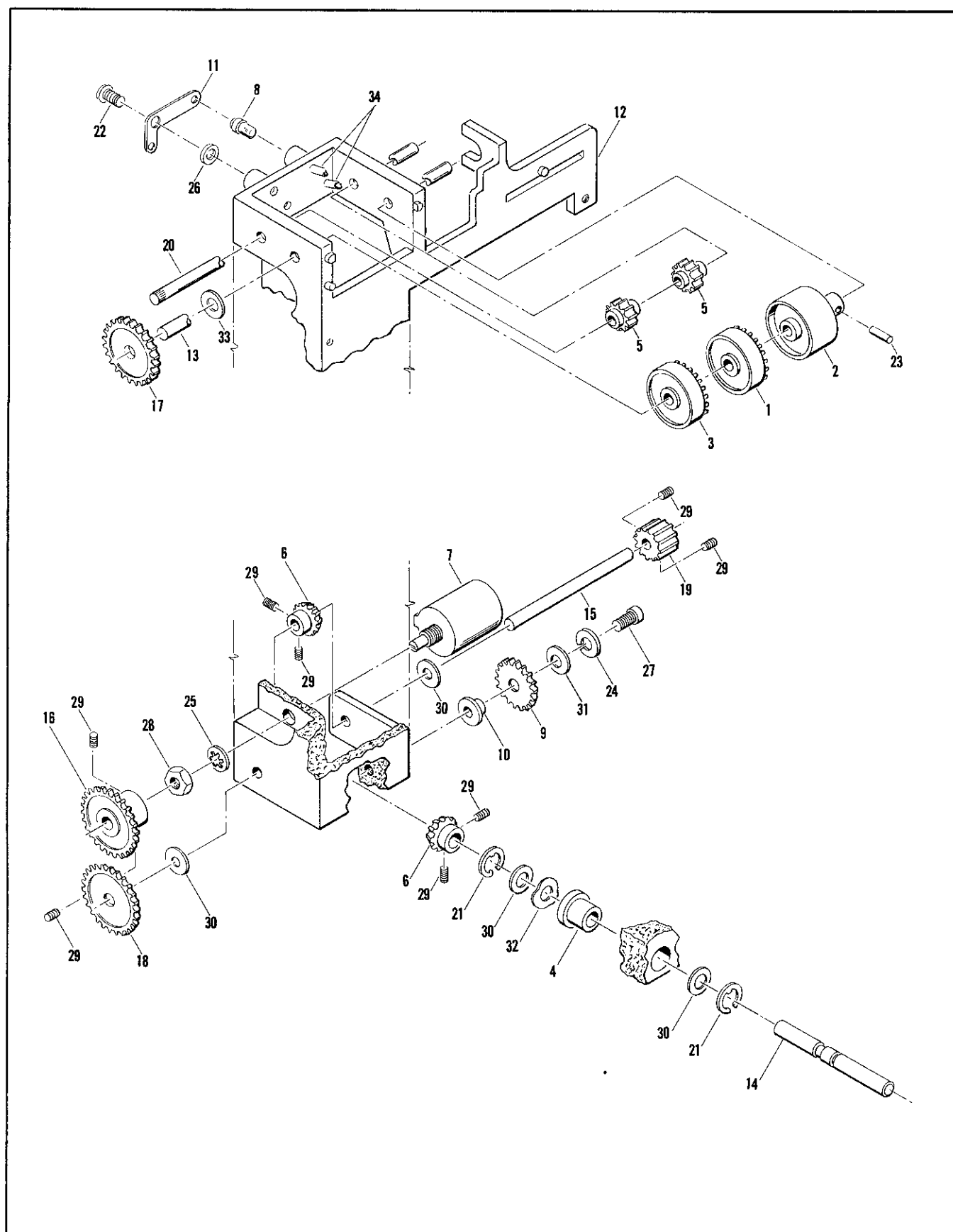


Figure 6-1. Frequency Readout, A13 Assembly

Table 6-2. Replaceable Parts

| Reference Designation | HP Part Number | Qty | Description                                                                       | Mfr Code | Mfr Part Number      |
|-----------------------|----------------|-----|-----------------------------------------------------------------------------------|----------|----------------------|
| A14                   | 08601-6047     | 1   | BROADBAND AMPLIFIER ASSY<br>(INCL C1, J1-2, A14A1 ASSY & COVER)<br>(OPT 007 ONLY) | 28480    | 08601-6047           |
| A14                   |                |     |                                                                                   |          |                      |
| 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    | C067B102E10ZS26-CDH  |
| A14A1C2               | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-CDH  |
| A14A1C3               | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-CDH  |
| A14A1C4               | 0160-2266      | 12  | C:FxD CER 24 PF 5% 500VDCW                                                        | 72982    | 301-000-C0G0-240J    |
| A14A1C5               | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-CDH  |
| A14A1C6               | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-CDH  |
| A14A1C7               | 0160-2250      | 1   | C:FxD CER 5.1 PF 500VDCW                                                          | 72982    | 301-000-C0H0-519E    |
| A14A1C7               |                |     | FACTORY SELECTED PART                                                             |          |                      |
| A14A1C8               | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-CDH  |
| A14A1C9               | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-CDH  |
| A14A1C10              | 0150-0050      |     | C:FxD CER 1000 PF +80-20% 1000VDCW                                                | 56289    | C067B102E10ZS26-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<br>(OPT 001 ONLY)                                              | 28480    | 08601-6062           |
| A15                   |                |     |                                                                                   |          |                      |
| A15                   | 08601-6075     | 1   | AM/FM MONITOR ASSY<br>(OPT 002 AND 011 ONLY)                                      | 28480    | 08601-6075           |
| A15                   |                |     |                                                                                   |          |                      |
| 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    | RDH19FC1060JF3C      |
| 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 |
|-----------------------|----------------|-------------|-------------------------------------|----------|-----------------|
| A1507                 | 1855-0020      | 1<br>3<br>5 | TSTR:SL FET N-CHANNEL               | 28480    | 1855-0020       |
| A1508                 | 1855-0062      |             | TSTR:SI FET 30V                     | 01295    | 2N1595          |
| A15R1                 | 0683-5145      |             | R:FXD COMP 510K OHM 5% 1/4W         | 01121    | CB 5145         |
| A15R2                 | 0757-0458      |             | 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      | 4           | R:FXD MET FLM 1K OHM 1% 1/8W        | 28480    | 0757-0280       |
| A15R5                 | 0757-0440      |             | R:FXD MET FLM 7.50K OHM 1% 1/8W     | 28480    | 0757-0440       |
| A15R5                 |                |             | (OPT 001 ONLY)                      |          |                 |
| A15R5                 | 0698-3159      |             | R:FXD MET FLM 26.1K OHM 1% 1/8W     | 28480    | 0698-3159       |
| A15R5                 |                | 8           | (OPT 002 AND 011 ONLY)              |          |                 |
| A15R6                 | 0757-0442      | 4<br>1      | R:FXD MET FLM 10.0K OHM 1% 1/8W     | 28480    | 0757-0442       |
| A15R7                 | 0757-0280      |             | R:FXD MET FLM 909 OHM 1% 1/8W       | 28480    | 0757-0280       |
| A15R8                 | 0757-0288      |             | 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      | 3<br>2      | 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      |             | R:FXD MET FLM 3.16K OHM 1% 1/8W     | 28480    | 0757-0279       |
| A15R15                | 2100-2489      |             | R:VAR FLM 5K OHM 10% LIN 1/2W       | 28480    | 2100-2489       |
| A15R16                | 0757-0442      | 4           | 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      |             | 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      | 2           | 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      | 1           | 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      | 1<br>1      | 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      |             | R:VAR FLM 50K OHM 10% LIN 1/2W      | 28480    | 2100-2517       |
| A15R35                | 0757-0463      |             | R:FXD MET FLM 82.5K OHM 1% 1/8W     | 28480    | 0757-0463       |
| A15R35                |                | 2           | FACTORY SELECTED PART               |          |                 |
| A15U1                 | 1820-0201      |             | INTEGRATED CIRCUIT:OPERATIONAL AMPL | 04713    | MC1439G         |
| A15U2                 | 1820-0201      |             | INTEGRATED CIRCUIT:OPERATIONAL AMPL | 04713    | MC1439G         |

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    |
|-----------------------|----------------|-----|-------------------------------------------------------|----------|--------------------|
|                       |                |     | 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    | 1500105X9035A2-DYS |
| CR1                   | 1901-0033      |     | DIODE:SILICON 100MA 180MV                             | 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                    | 2110-0312      | 1   | 230V OPERATION<br>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          |
| J12                   | 1250-0102      |     | {OPT 004}<br>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<br>(AC LINE)                        | 82389    | 11A-1009A          |
| 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-AG5D-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   |                                      |          |                 |
|                       | 08601-0025     | 1   | (OPT 001, 002)                       | 28480    | 08601-0025      |
|                       |                |     | PANEL:FRONT                          |          |                 |
|                       |                |     | (OPT 011)                            |          |                 |
|                       | 1400-0084      | 1   | REAR PANEL MISCELLANEOUS             | 75915    | 342014          |
|                       | 6960-0002      | 1   | FUSEHOLDER:EXTRACTOR POST TYPE       | 76530    | SS-48152        |
|                       | 08601-00032    |     | PLUG:HOLE FOR 1/2" DIA               | 28480    | 08601-00032     |
|                       |                |     | PANEL:REAR                           |          |                 |

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        |

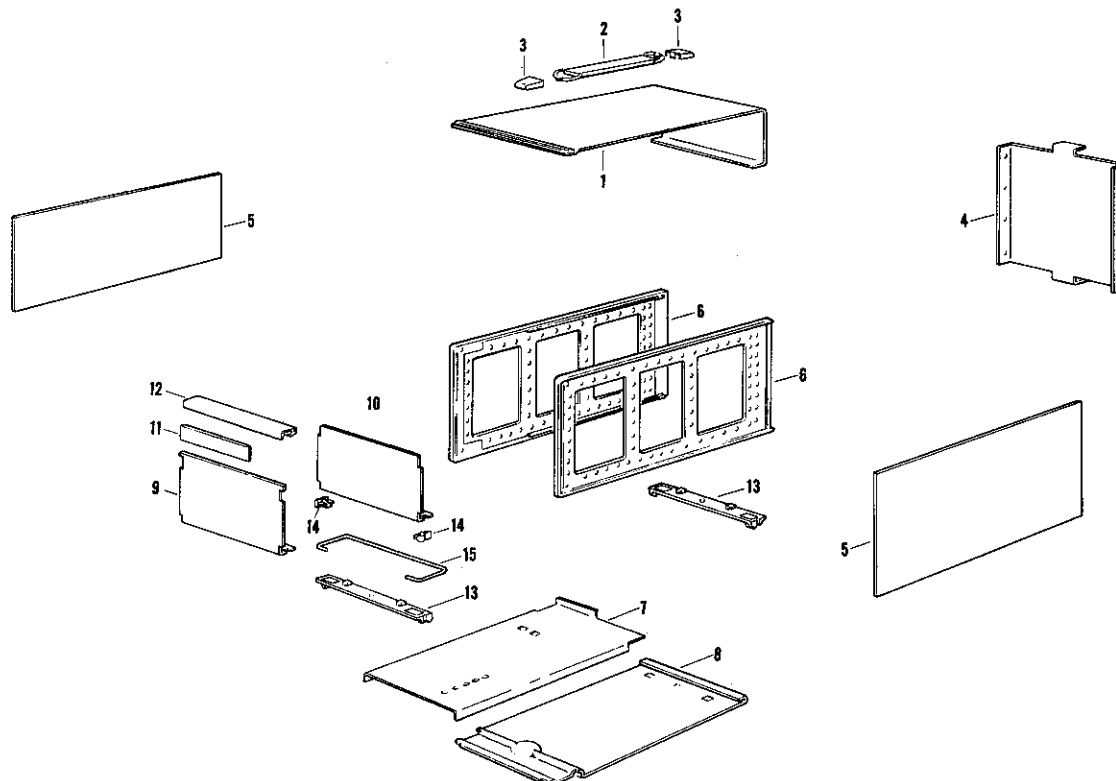


Figure 6-2. Cabinet Parts

See introduction to this section for ordering information

Table 6-3. Code List of Manufacturers

| The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. |                                                                             |                            |          |                                                                        |                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------|----------|------------------------------------------------------------------------|------------------------------|
| Code No.                                                                                                                                                                     | Manufacturer                                                                | Address                    | Code No. | Manufacturer                                                           | Address                      |
| 00000                                                                                                                                                                        | U.S.A. Common . . .                                                         | Any Supplier of U.S.A.     | 72862    | Elastic Stop Nut, Division                                             |                              |
| 00853                                                                                                                                                                        | Sangamo Electric Co.                                                        |                            |          | Amerace Esna Corp. . .                                                 | Union, N.J. 07083            |
|                                                                                                                                                                              | Pickens Division . . .                                                      | Pickens, S.C. 29671        | 72982    | Erie Technological Products, Inc. . . . .                              | Erie, Pa. 16512              |
| 01121                                                                                                                                                                        | Allen Bradley Co. . .                                                       | Milwaukee, Wisc. 53204     | 73734    | Federal Screw Prod. Inc.                                               | Chicago, Ill. 60618          |
| 01295                                                                                                                                                                        | Texas Instruments Inc.                                                      |                            | 75042    | International Resistance Co., Inc. . . . .                             | Philadelphia, Pa. 19108      |
|                                                                                                                                                                              | Semiconductor Components Division . . . . .                                 | Dallas, Texas 75231        | 75915    | Littlefuse, Inc. . . . .                                               | DesPlaines, Ill. 60016       |
| 02114                                                                                                                                                                        | Ferroxcube Corp. . .                                                        | Saugerties, N.Y. 12477     | 76530    | Cinch Monadnock Mills, Division                                        |                              |
| 02660                                                                                                                                                                        | Amphenol Corp. . . .                                                        | Broadview, Ill. 60153      |          | United Carr Fastener Corp. . . . .                                     | City of Industry, Cal. 91746 |
| 04222                                                                                                                                                                        | HI-Q Division of Aerovox Corp. . . . .                                      | Myrtle Beach, S.C. 29577   | 76854    | Oak Manufacturing Co., Division Oak Electro/Netics Corporation . . . . | Crystal Lake, Ill. 60014     |
| 04713                                                                                                                                                                        | Motorola Semiconductor Products Division . .                                | Phoenix, Ariz. 85008       | 78488    | Stackpole Carbon Co.                                                   | St. Marys, Pa. 15857         |
| 07263                                                                                                                                                                        | Fairchild Camera and Instrument Corporation, Semiconductor Division . . . . | Mountain View, Cal. 94040  | 79136    | Waldes Kohinoor Inc. . . . .                                           | Long Island City, N.Y. 11101 |
| 12136                                                                                                                                                                        | Philadelphia Handle Company . . . . .                                       | Camden, N.J. 08103         | 80120    | Schnitzer Alloy Products Company . . . . .                             | Elizabeth, N.J. 07206        |
| 12881                                                                                                                                                                        | Metex Corp. . . . .                                                         | Edison, N.J. 08817         | 80131    | Electronic Industries Association . . . .                              | Washington, D.C. 20006       |
| 18911                                                                                                                                                                        | Durant Mfg. Co. . . .                                                       | Milwaukee, Wisc. 53201     | 81073    | Grayhill . . . . .                                                     | LaGrange, Ill. 60525         |
| 19701                                                                                                                                                                        | Electra/Midland Corp. . . . .                                               | Mineral Wells, Tex. 76067  | 82142    | Airco Speed Electric Company . . . . .                                 | DuBois, Pa. 15801            |
| 28480                                                                                                                                                                        | Hewlett-Packard Co. .                                                       | Palo Alto, Cal. 94304      | 82389    | Switchcraft Inc. . . . .                                               | Chicago, Ill. 60630          |
| 36196                                                                                                                                                                        | Stanwyck Coil Products Ltd. . . . .                                         | Hawksbury, Ontario, Canada | 84411    | TWR Capacitor Div. . .                                                 | Ogallala, Neb. 69153         |
| 56289                                                                                                                                                                        | Sprague Electric Company . . . . .                                          | N. Adams, Mass. 01247      | 87034    | Marco & Oak Industries, Division Oak Electro/Netics Corp. . . . .      | Anaheim, Calif. 92803        |
| 70903                                                                                                                                                                        | Belden Corp. . . . .                                                        | Chicago, Ill. 60644        | 87473    | Western Fibrous Glass Products Co. . . .                               | San Francisco, Cal. 94107    |
| 71041                                                                                                                                                                        | Boston Gear Works, Division North American Rockwell Corporation . . . .     | Quincy, Mass. 02171        | 91418    | Radio Materials Co. . .                                                | Chicago, Ill. 60646          |
| 71400                                                                                                                                                                        | Bussmann Manufacturing, Division McGraw-Edison Co., .                       | St. Louis, Mo. 63017       | 91506    | Augat Inc. . . . .                                                     | Attleboro, Mass. 02703       |
| 71744                                                                                                                                                                        | Chicago Miniature Lamp Works . . . . .                                      | Chicago, Ill. 60640        | 91929    | Honeywell Inc., Microswitch Div. . . .                                 | Freeport, Ill. 61032         |
| 71785                                                                                                                                                                        | Cinch Manufacturing Co., Division United Carr Fastener Corp. . . . .        | Chicago, Ill. 60624        | 96733    | San Fernando Electric Mfg. Co. . . . .                                 | San Fernando, Cal. 91341     |
| 72136                                                                                                                                                                        | Electro Motive Mfg. Co., Inc. . . . .                                       | Willimantic, Conn. 06226   | 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<br>or Number                                                                        | Make Manual<br>Changes | Serial Prefix<br>or Number | Make Manual<br>Changes |
|---------------------------------------------------------------------------------------------------|------------------------|----------------------------|------------------------|
| 959-                                                                                              | 1                      | 839-00528                  | 1 thru 8               |
| 954-                                                                                              | 1, 2                   | 839-00524 thru<br>-00526   |                        |
| 945-                                                                                              | 1 thru 3               | 839-00497 thru<br>-00522   |                        |
| 912-00881 thru<br>912-01030                                                                       | 1 thru 4               | 839-00469 thru<br>-00495   |                        |
| 912-00581 thru<br>912-00880                                                                       | 1 thru 5               | 839-00463 thru<br>-00466   |                        |
| 912-00531 thru<br>912-00580                                                                       | 1 thru 6               | 839-00381 thru<br>-00459   |                        |
| 839-00530<br>-00529<br>-00527<br>-00523<br>-00496<br>-00468<br>-00467<br>839-00460 thru<br>-00462 | 1 thru 7               | 839-00331 thru<br>-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                            |                         |                         |            |                     |            |            |            |                                |             |             |                |             | No<br>Prefix                        |
|--------|--------------------------------------------------|-------------------------|-------------------------|------------|---------------------|------------|------------|------------|--------------------------------|-------------|-------------|----------------|-------------|-------------------------------------|
|        | A1<br>Assy                                       | A2<br>Assy              | A2<br>Assy              | A4<br>Assy | A5<br>Assy          | A6<br>Assy | A7<br>Assy | A8<br>Assy | A9<br>Assy                     | A10<br>Assy | A11<br>Assy | A12<br>Assy    | A13<br>Assy |                                     |
| 1      |                                                  | A1C14<br>A1C15          |                         |            |                     |            |            |            |                                |             |             |                |             | FL1, F1, S7,<br>S8, W1              |
| 2      |                                                  | A1L5                    |                         |            |                     |            |            |            |                                |             |             |                |             |                                     |
| 3      | A1                                               | A1R16<br>A1R19<br>A1R12 |                         | A1         |                     |            |            |            | Q11/42<br>R3/18/19<br>R173/124 |             |             | C2<br>(wiring) |             | R5/6/10<br>C4                       |
| 4      |                                                  |                         |                         |            |                     |            |            |            |                                |             |             |                |             | R2<br>Bracket                       |
| 5      |                                                  |                         |                         |            | Module<br>Box       |            |            |            |                                |             |             |                |             |                                     |
| 6      |                                                  |                         |                         |            |                     |            |            |            |                                | CR14        |             |                |             |                                     |
| 7      |                                                  | A1C7<br>A1R1-2          | A1C27<br>A1C28<br>A1C29 | A1C17      | A1R9-10<br>A1R12-13 |            |            |            |                                | R10<br>R12  |             |                |             |                                     |
| 8      | A1C5<br>A1C10<br>A1L1<br>A1R19<br>A1R22<br>A1R30 |                         |                         |            |                     |            |            |            |                                |             |             |                |             |                                     |
| 9      |                                                  |                         |                         |            |                     |            |            |            |                                |             |             |                |             | Q3                                  |
| 10     | A1                                               | A1                      | A2                      | A1         | A1                  |            |            |            | Q17/18<br>R11/23<br>R157/165   |             |             |                |             | FL1<br>S10<br>and<br>specifications |
| 11     |                                                  |                         |                         |            |                     | A1R6       |            |            | R180<br>C14                    |             |             |                |             |                                     |
| 12     |                                                  | A1R8<br>A1R2            | A1C8                    | A2         | A1R2<br>A1C14/C34   |            |            |            |                                |             |             |                |             |                                     |
| 13     |                                                  |                         |                         | A1R20      | A1Q6                | A1         |            |            | R169<br>R134<br>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  $\mu$ F.  
Replace A9CR31 with short circuit.  
Change A9R3 to 23.7K and A9R2 to 9090 ohms.  
Change A9C11 to 0.01  $\mu$ F.  
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  $\mu$ F.  
Change capacitor C4 to 0.33  $\mu$ F.

**Table 6-2, Replaceable Parts:**

Change capacitor A9C1 to HP Part No. 0180-1745 C:FXD 1.5  $\mu$ F 10% 35 VDCW.  
Change capacitor A9C11 to HP Part No. 0150-0093 C:FXD CER 0.01  $\mu$ F +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  $\mu$ F 20% 6 VDCW.  
Change capacitor C4 to HP Part No. 0160-0163 C:FXD MY 0.033  $\mu$ F 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  $\mu$ F.

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  $\mu$ F 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  $\mu$ F, A1A1C10 to 1000 pF, A1A1L1 to 200  $\mu$ H, 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  $\mu$ F +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  $\mu$ H.

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 shown 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:  $\pm 5\%$  of sweep width or  $\pm 10$  kHz, high range,  $\pm 5\%$  of sweep width or  $\pm 1$  kHz, low range, whichever is greater.

Internal FM:

High Range: 75 kHz  $\pm 20\%$  peak deviation, 1 kHz range.

Low Range: 7.5 kHz  $\pm 20\%$  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  $\mu$ F.

## 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  $\mu$ F.**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  $\mu$ H 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:
 

|                       |                            |
|-----------------------|----------------------------|
| RANGE . . . . .       | 110                        |
| CW/SWEEP . . . . . CW | 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.

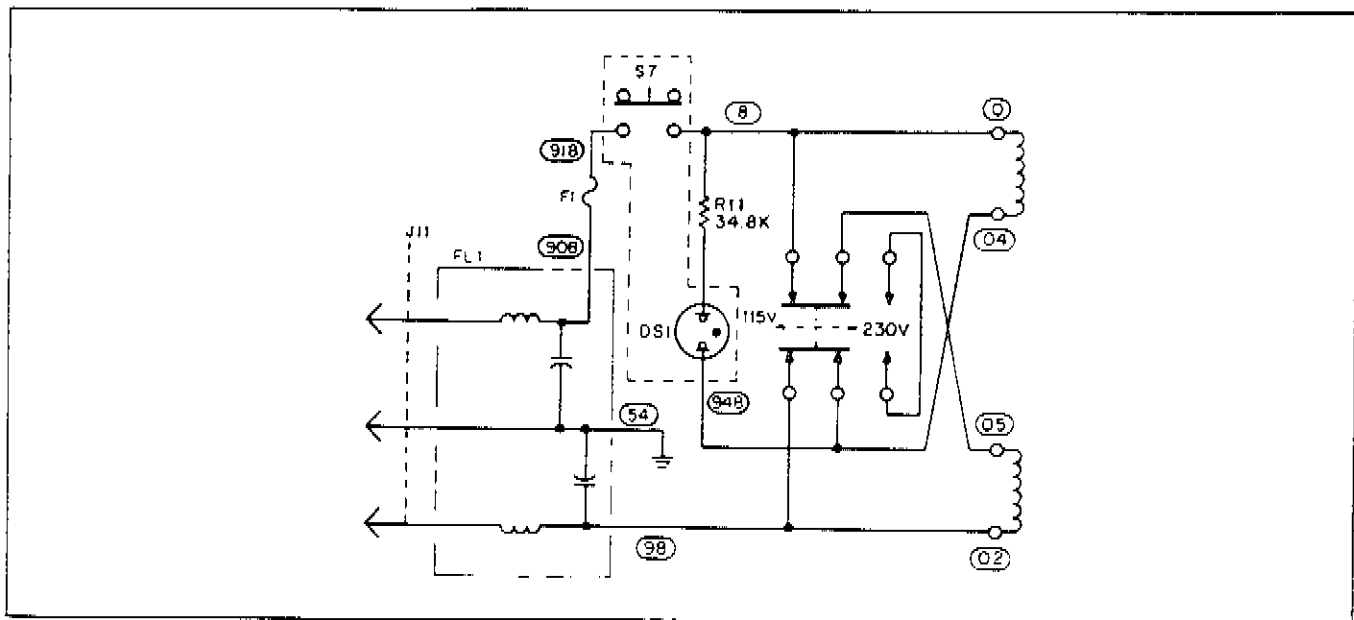


Figure 7-1. AC Primary Circuit  
(Part of Change 1)

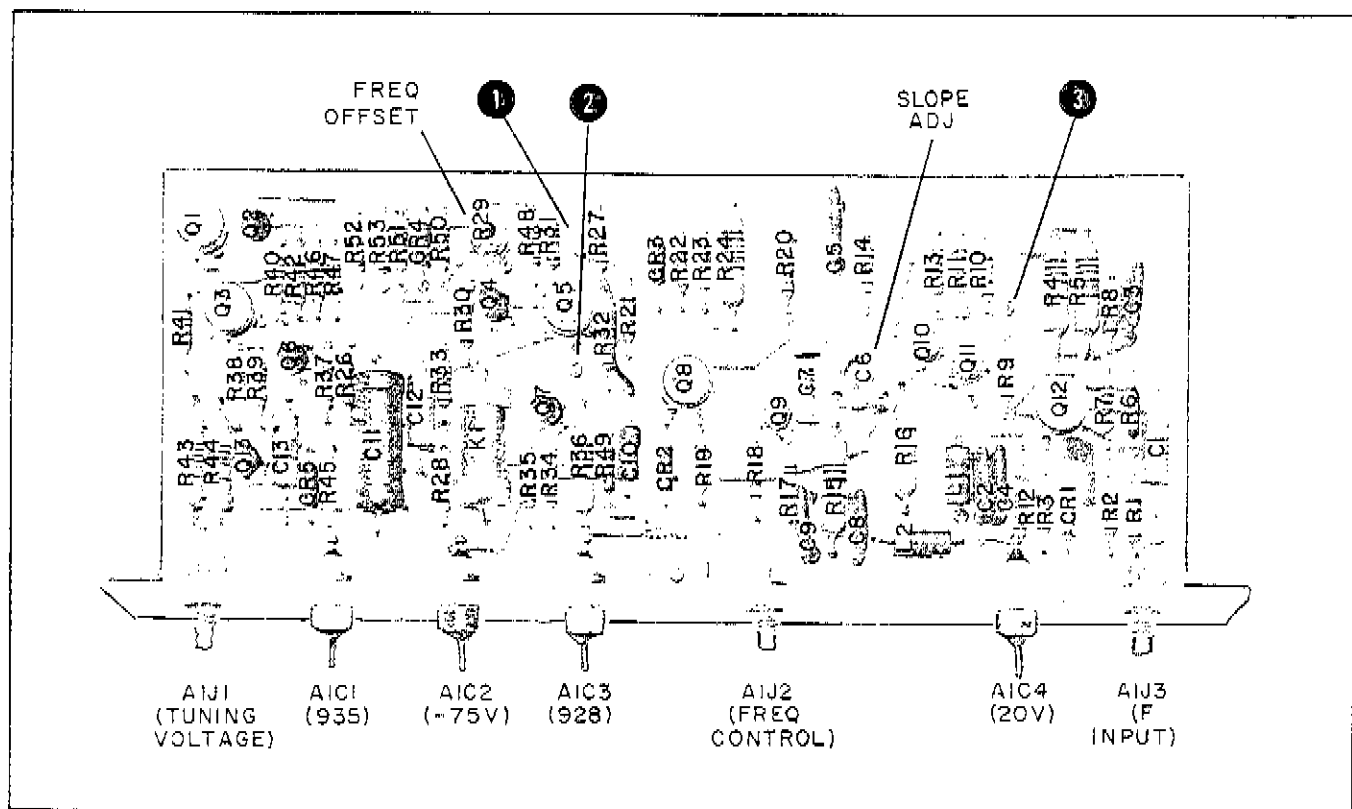


Figure 7-2. Component Identification A1A1 Discriminator Assembly  
(Part of Change 3)

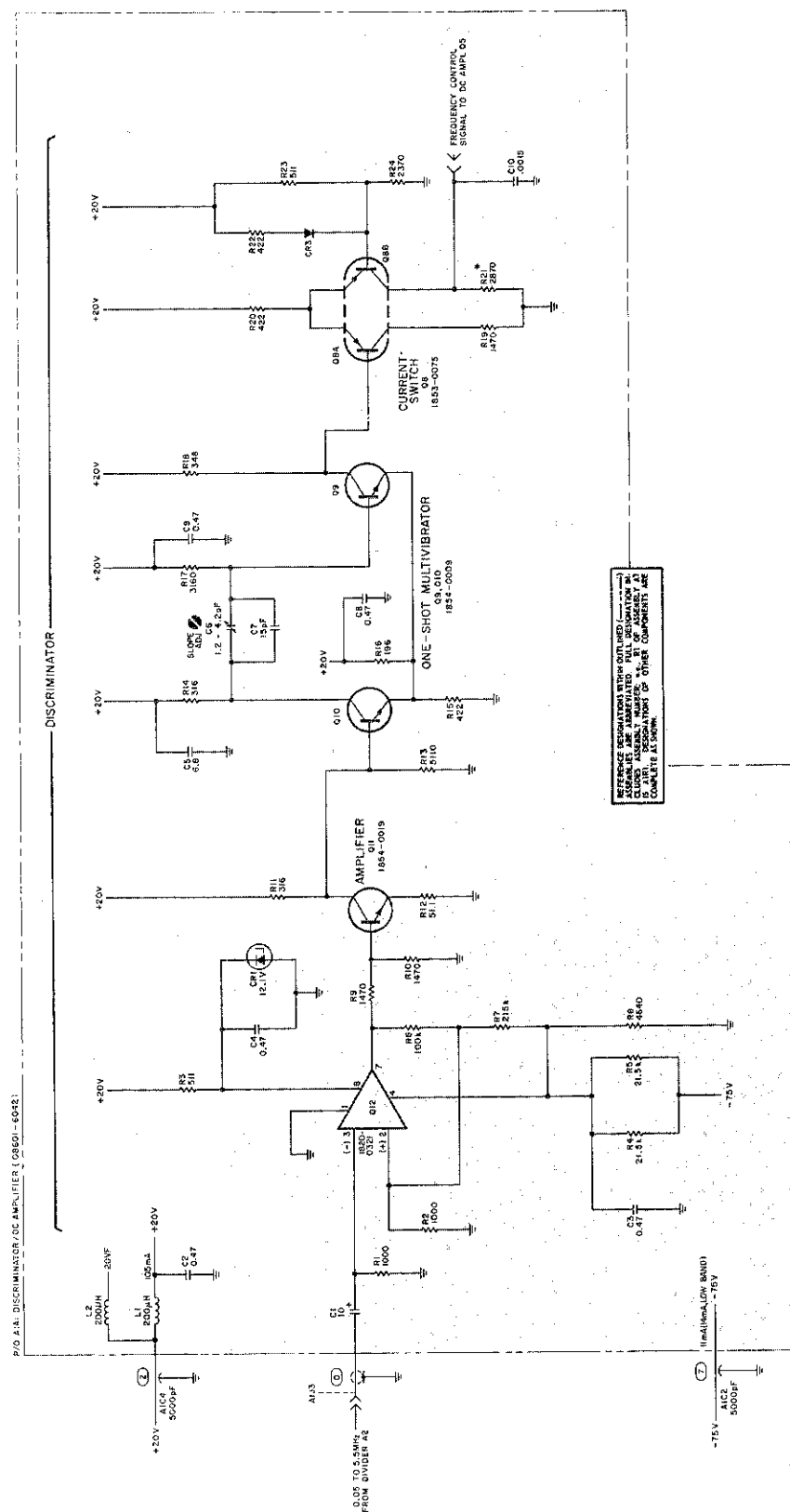


Figure 7-3. A1A1 Discriminator Circuit, Schematic Diagram  
(Part of Change 3)

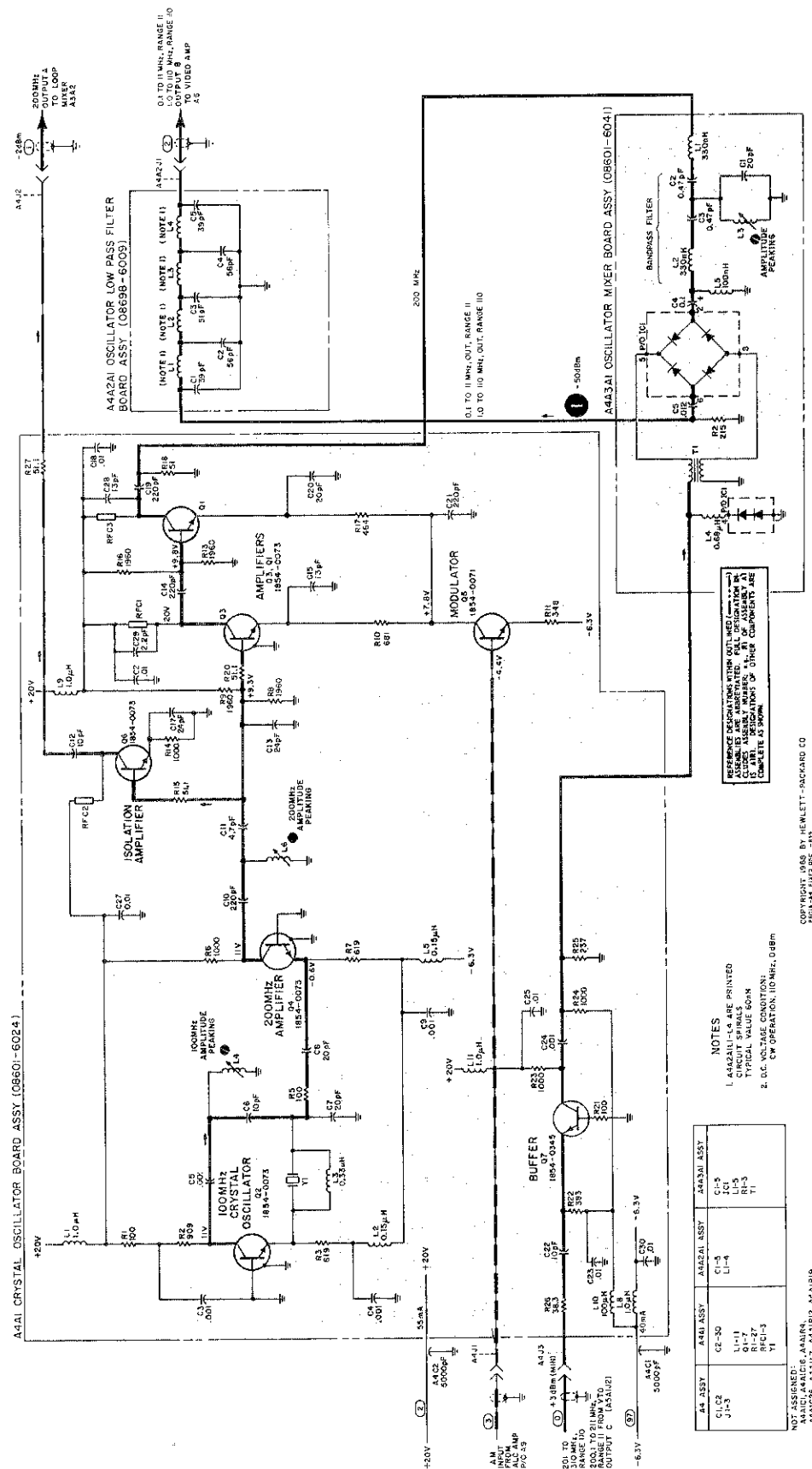


Figure 7-4. A4 Crystal Oscillator, Modulator, Oscillator Mixer, Oscillator Low Pass Filter, Schematic Diagram  
(Part of Change 3)

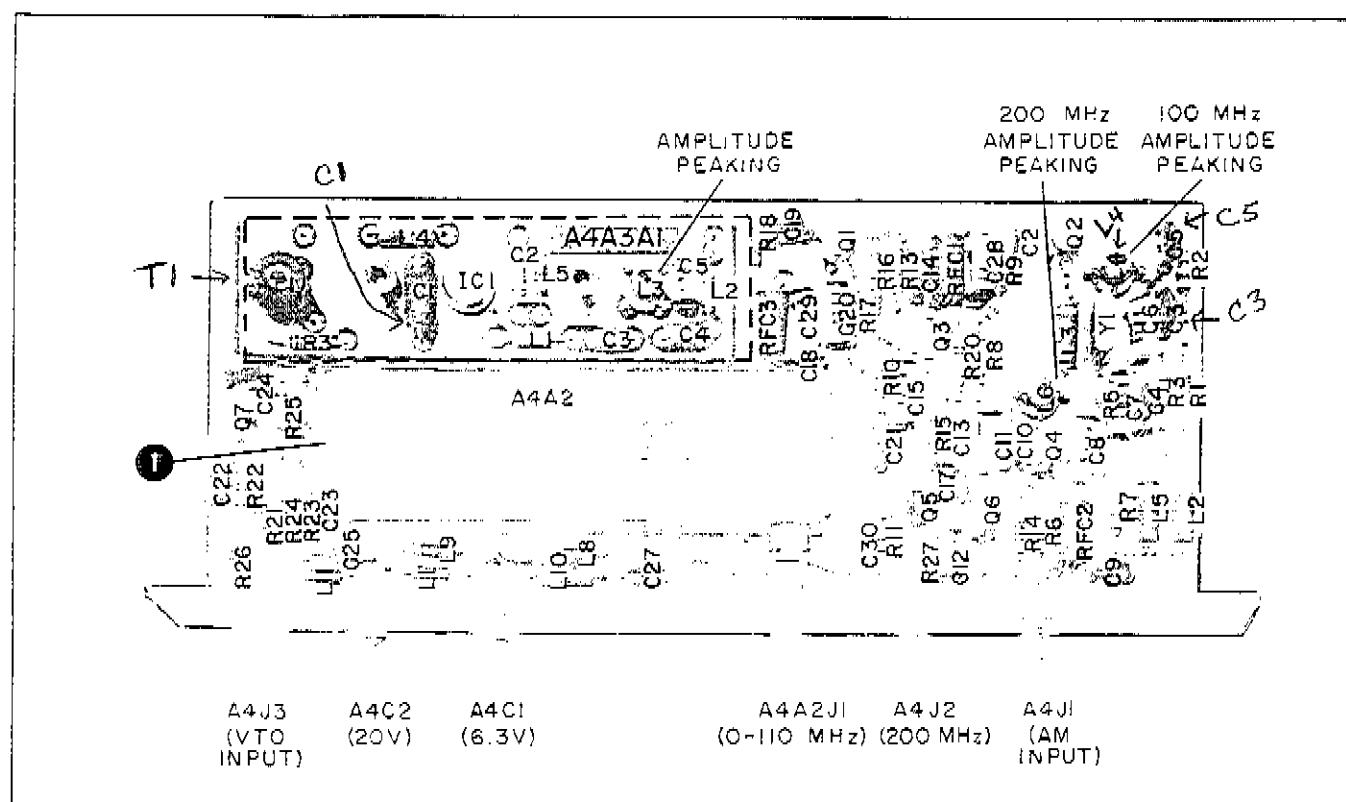


Figure 7-5. Component Identification, A4A1 Crystal Oscillator Assembly  
(Part of Change 3)

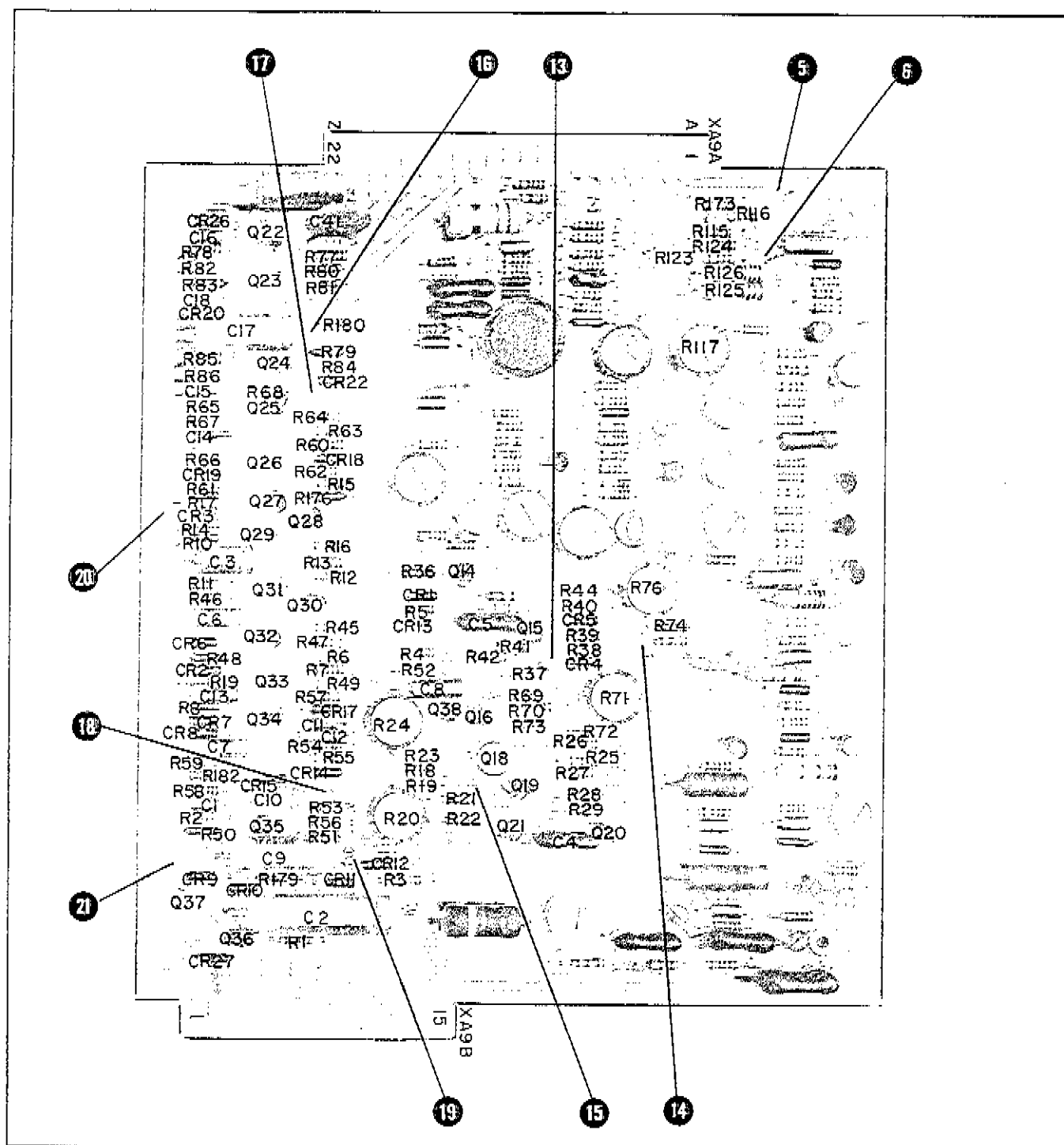


Figure 7-6. Component Identification, Sweep Generator, P/O A9  
(Part of Change 3)

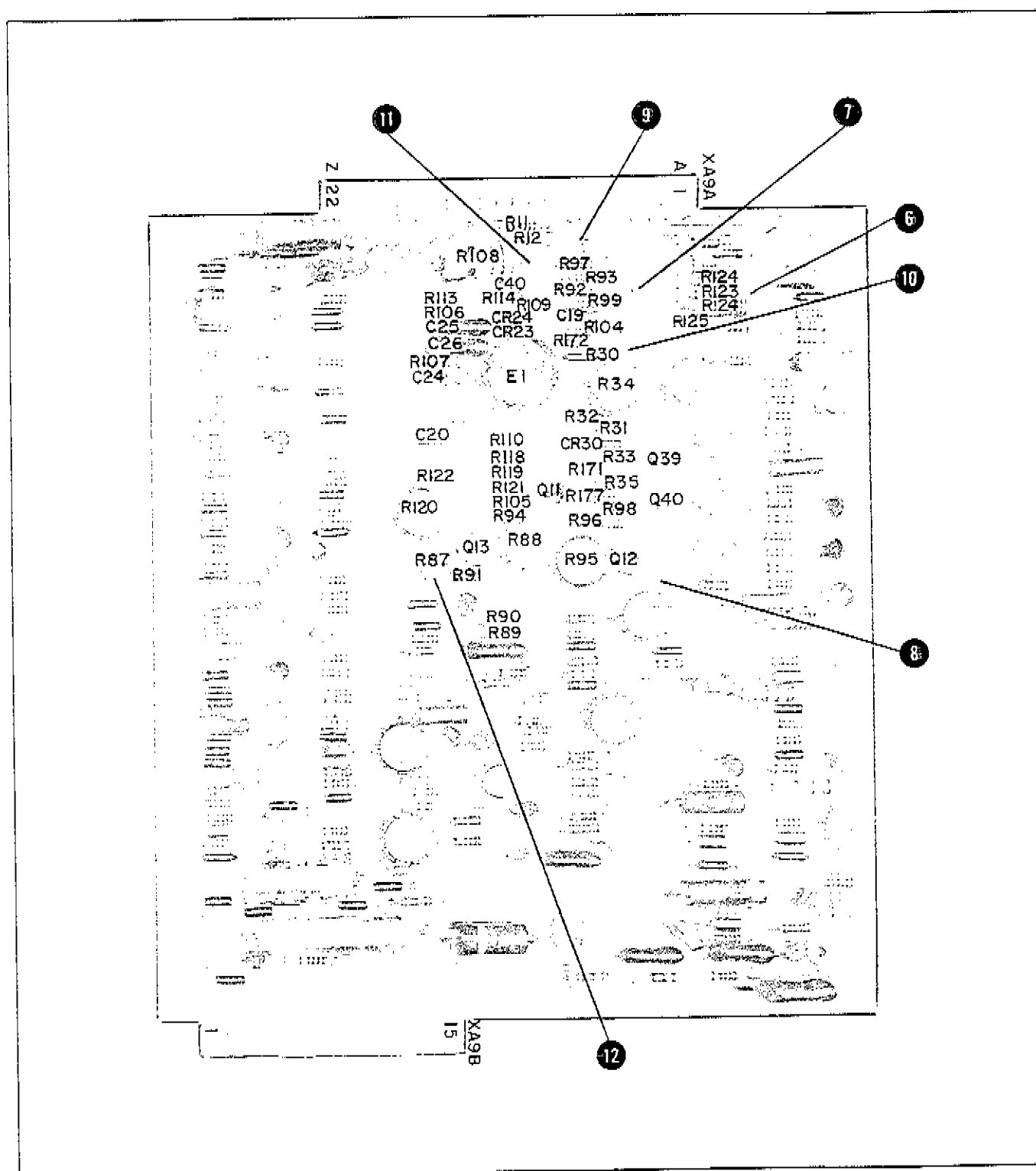


Figure 7-7. Component Identification, Summing Amplifier, P/O A9  
(Part of Change 3)

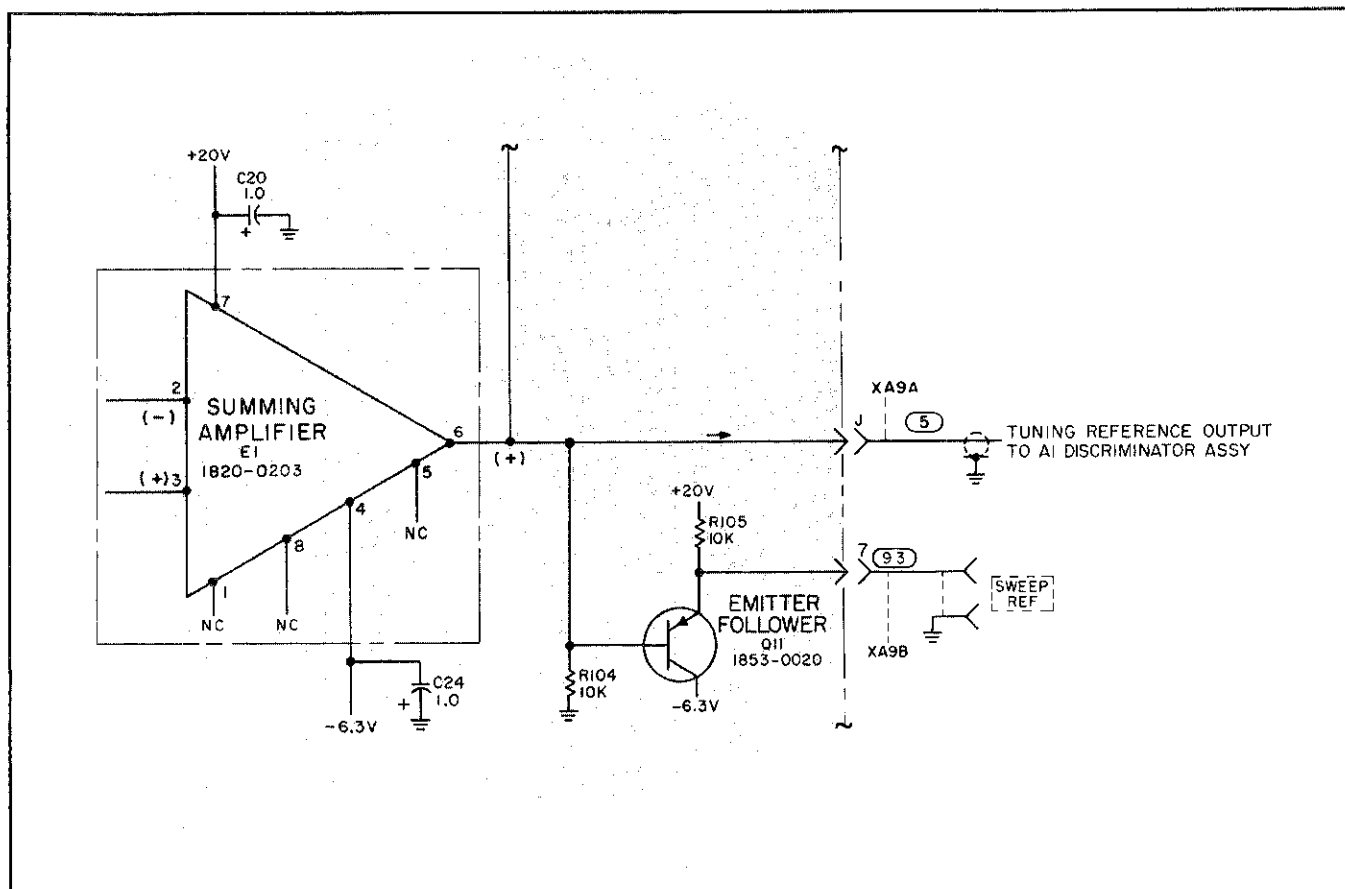


Figure 7-8. Sweep Reference Circuit, P/O A9  
(Part of Change 3)

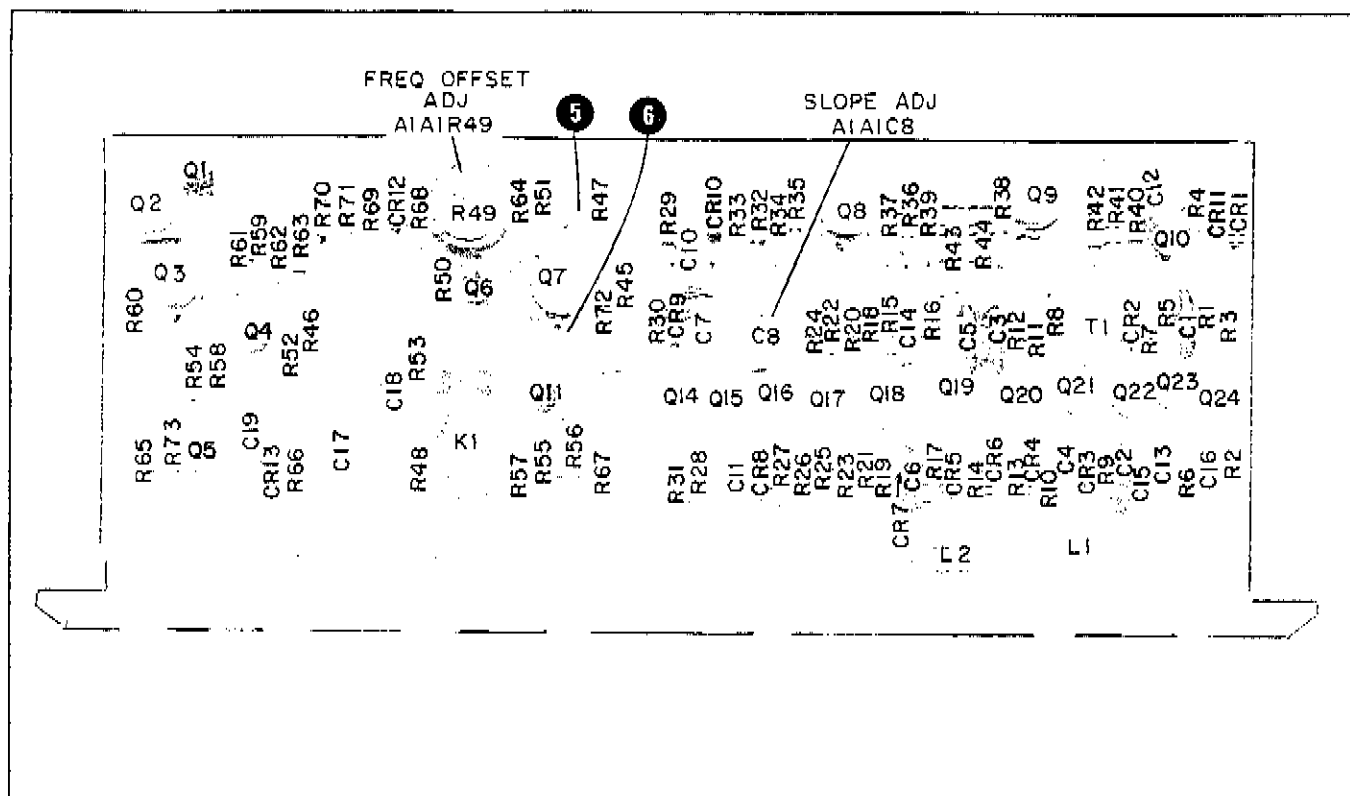


Figure 7-9. Component Identification, A1A1 Discriminator Assembly  
(Part of Change 10)

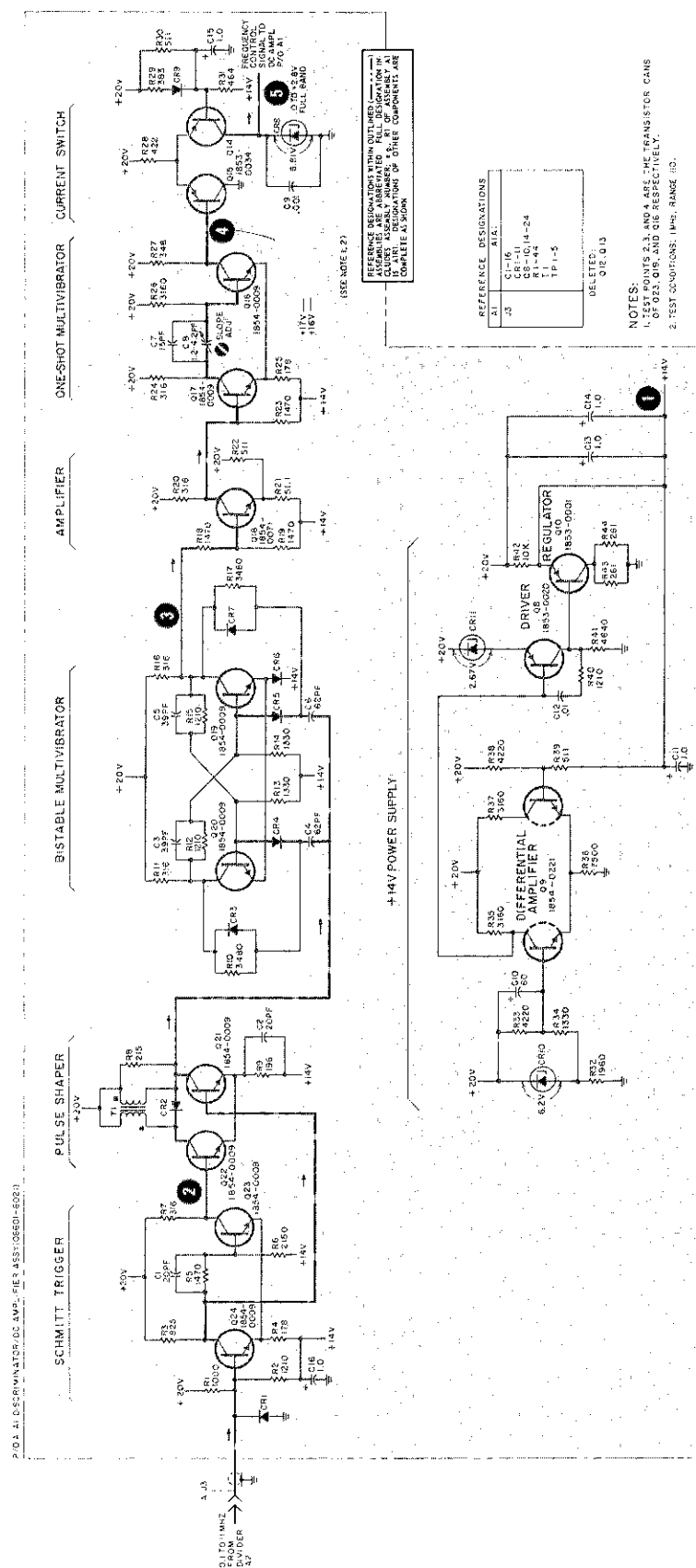


Figure 7-10. A1A1 Discriminator Circuit, Schematic Diagram  
(Part of Change 10)

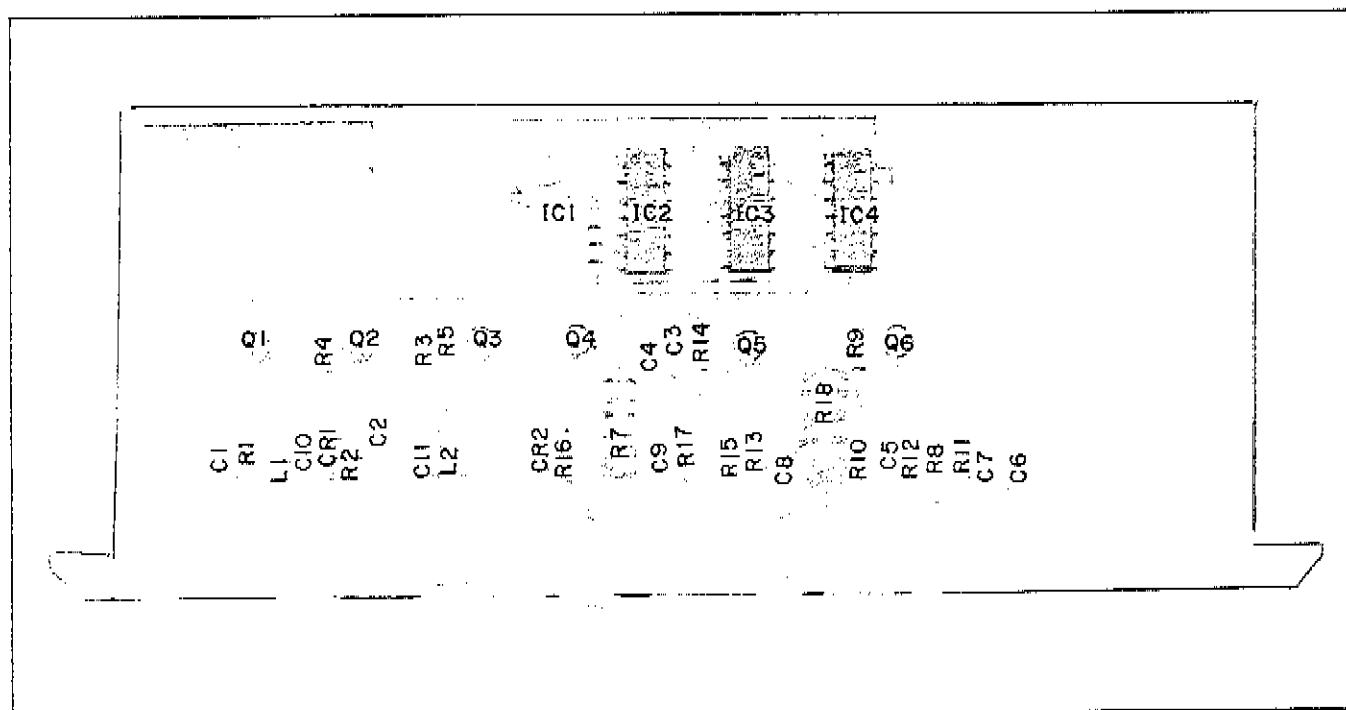


Figure 7-11. Component Identification, A2 Divider Assembly  
(Part of Change 10)

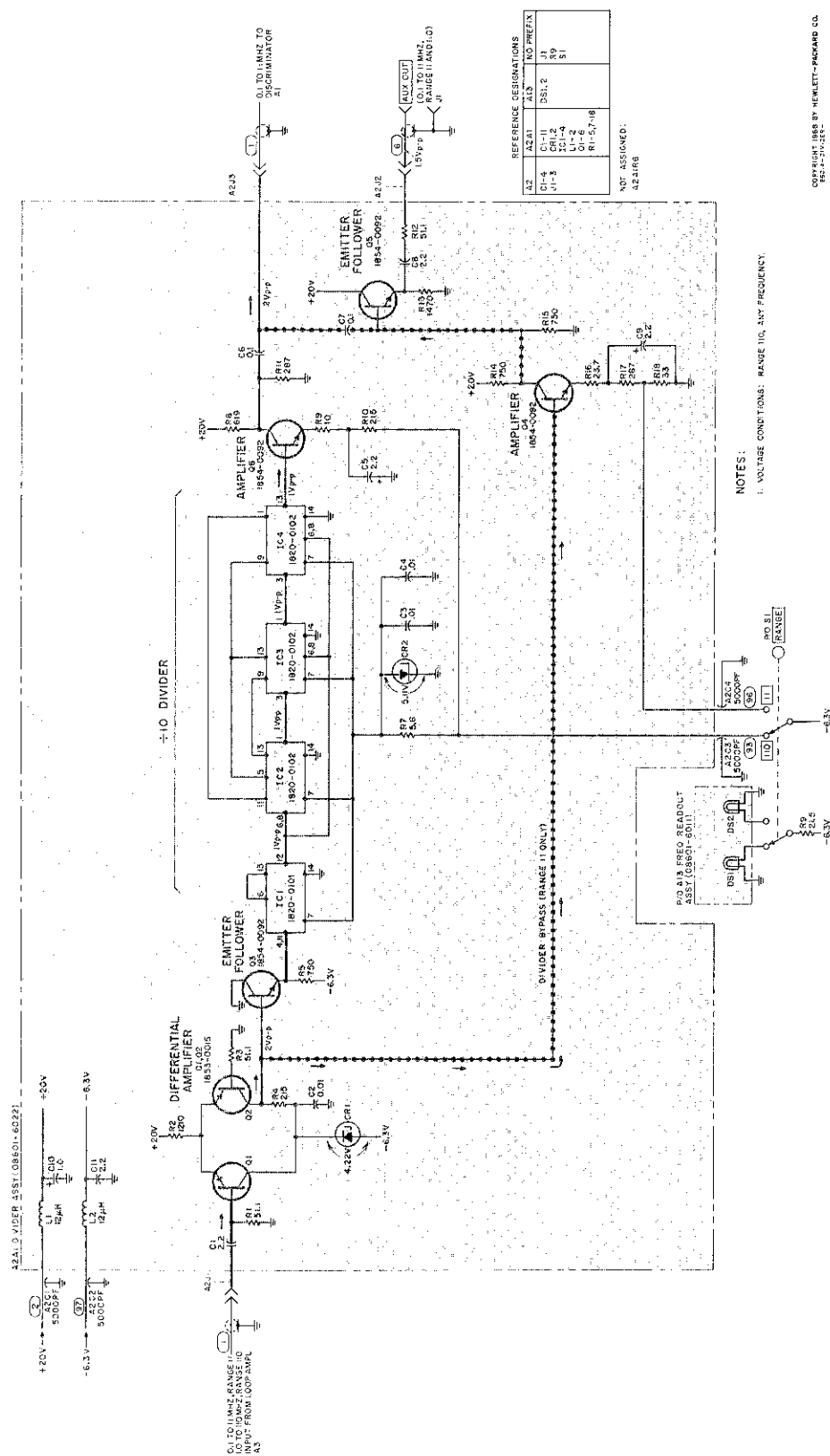


Figure 7-12. A2 Divider Assembly, Schematic Diagram  
(Part of Change 10)

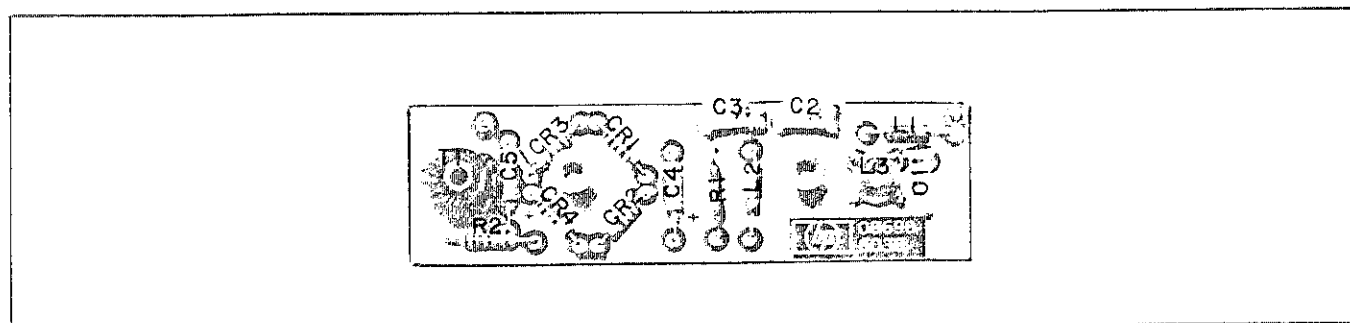


Figure 7-13. Component Identification, A3A2A1 Mixer Assembly  
(Part of Change 10)

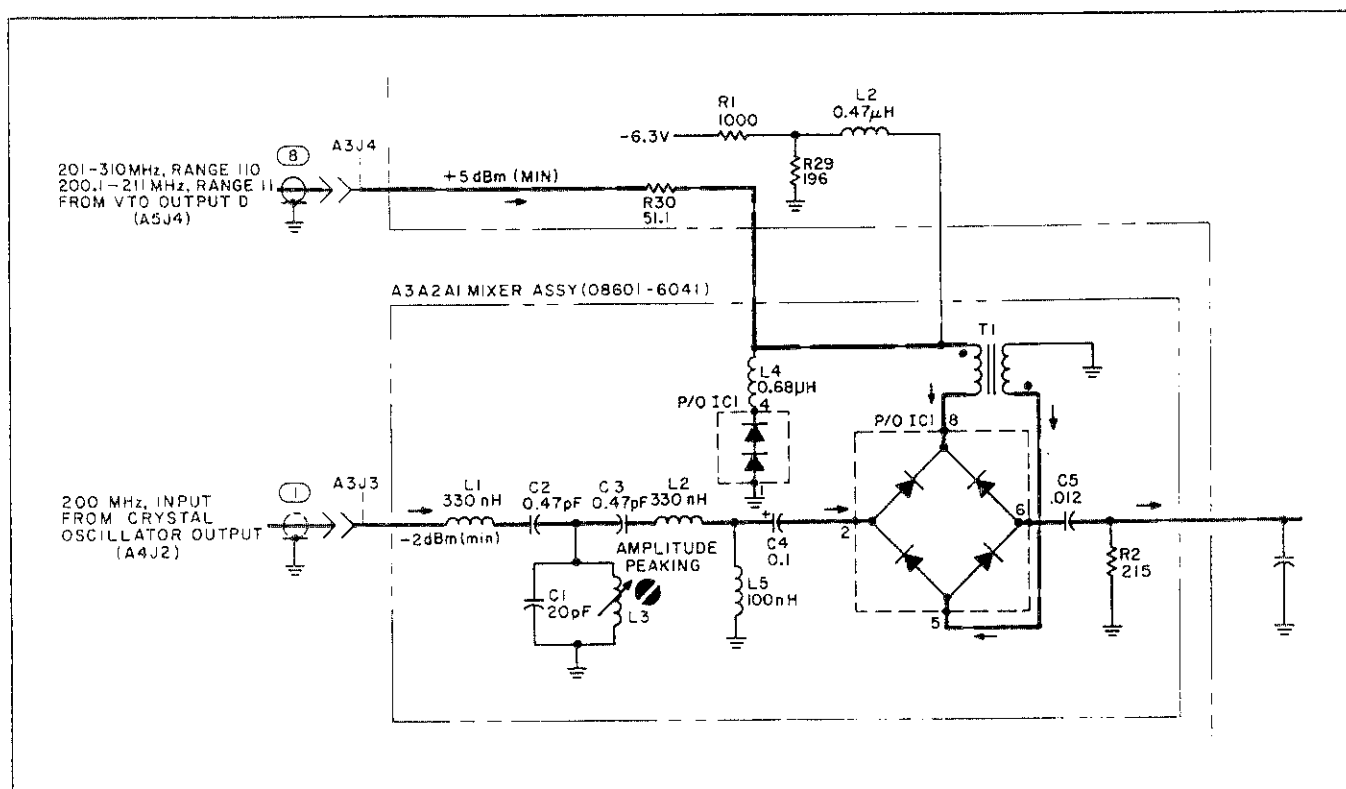


Figure 7-14. A3A2A1 Mixer Assembly, Schematic Diagram  
(Part of Change 10)

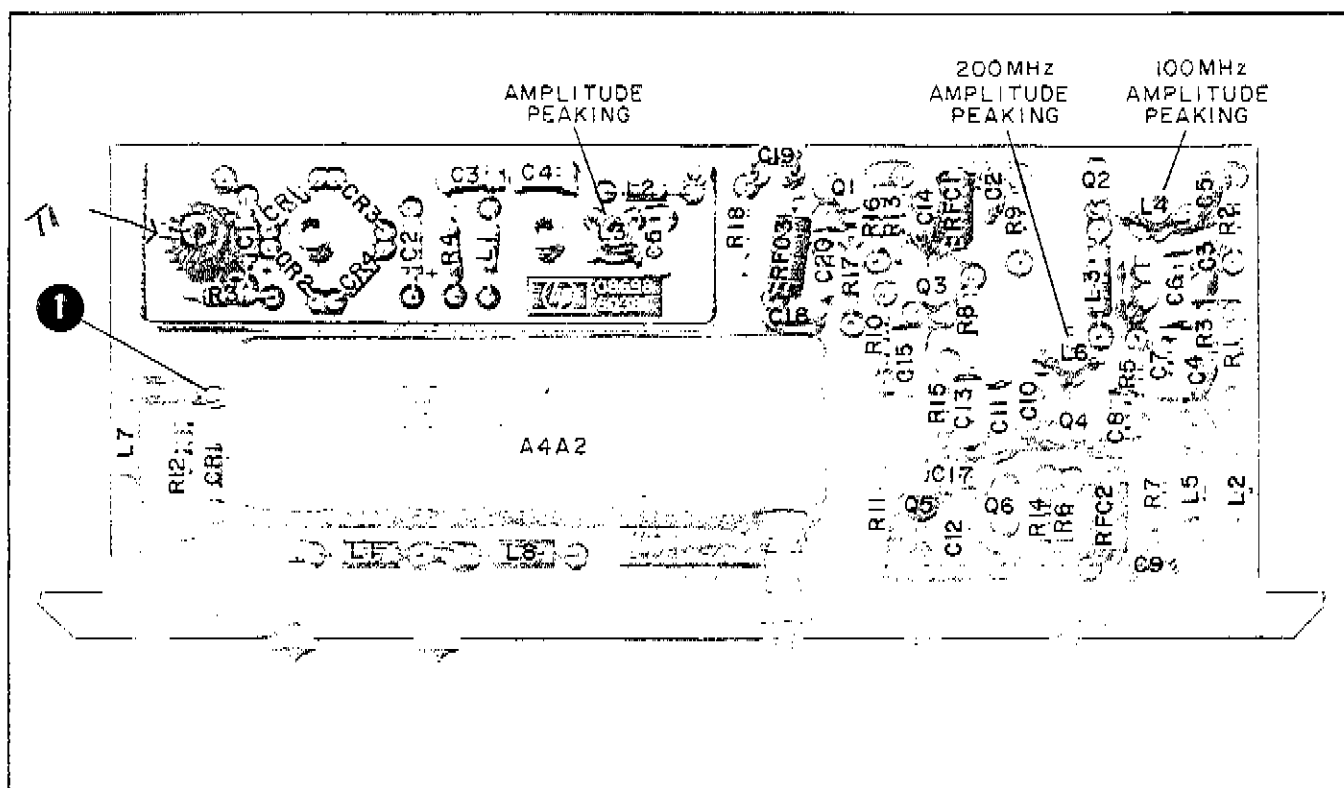


Figure 7-15. Component Identification, A4A1 Crystal Oscillator Assembly  
(Part of Change 10)

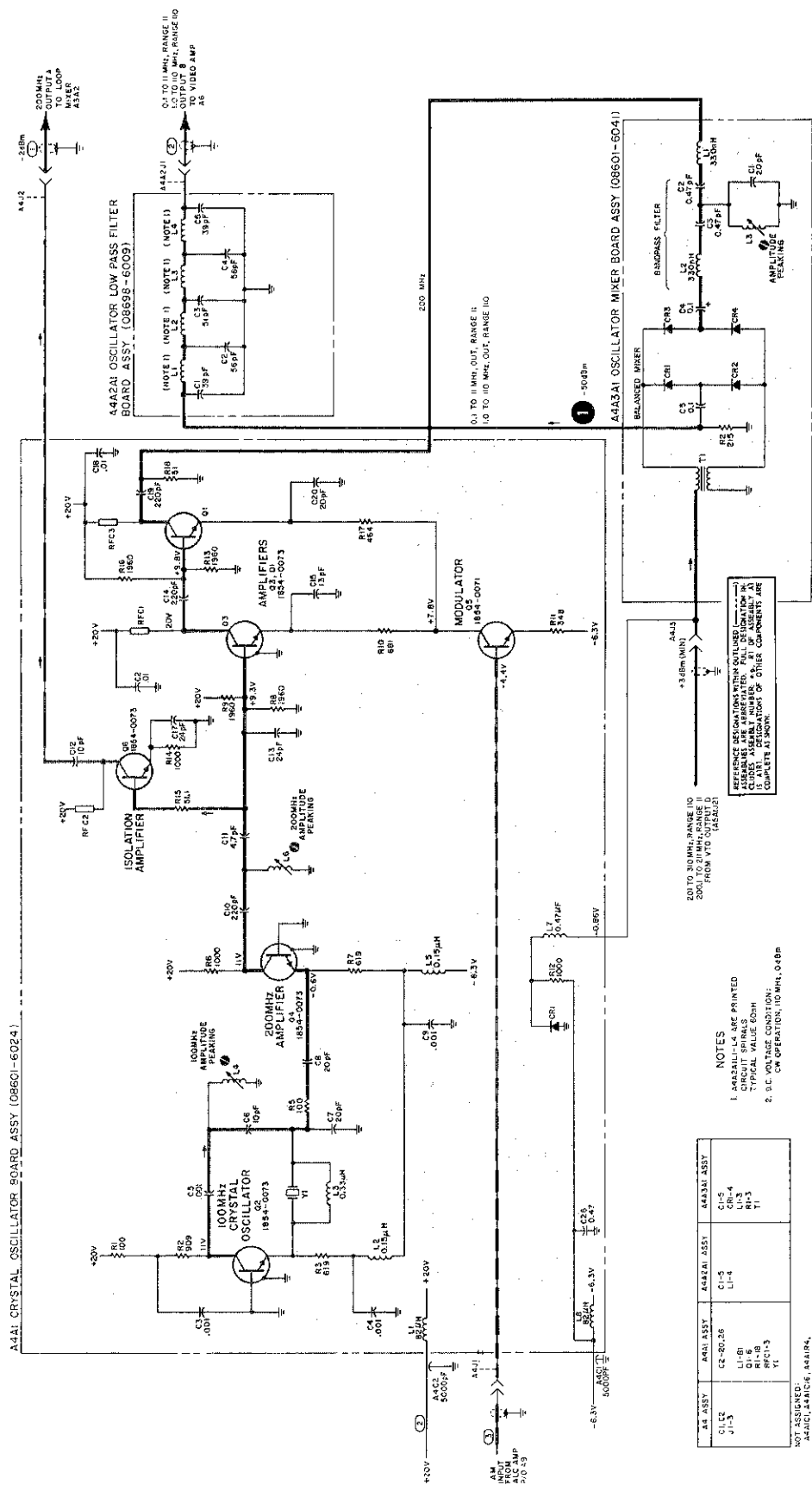


Figure 7-16. A4 Crystal Oscillator Assembly, Schematic Diagram (Part of Change 10)

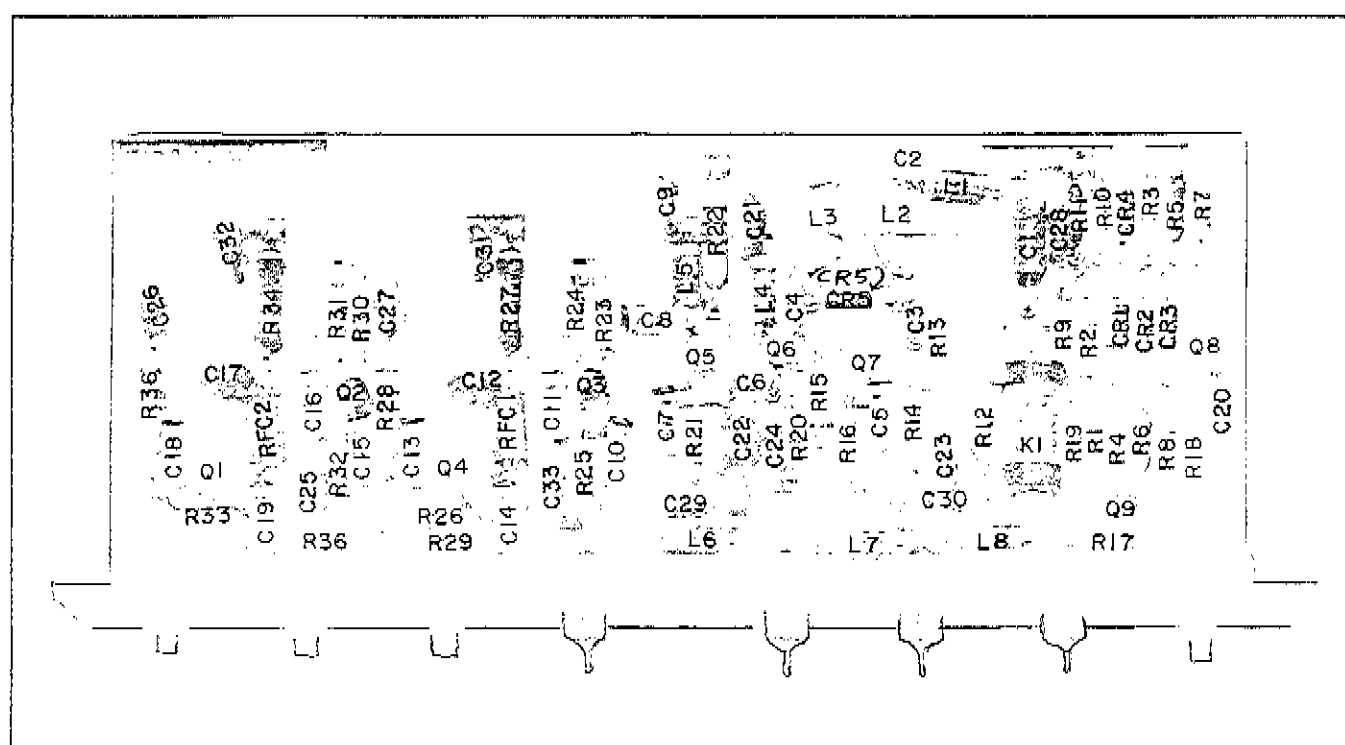


Figure 7-17. Component Identification, A5 VTO Assembly  
(Part of Change 10)

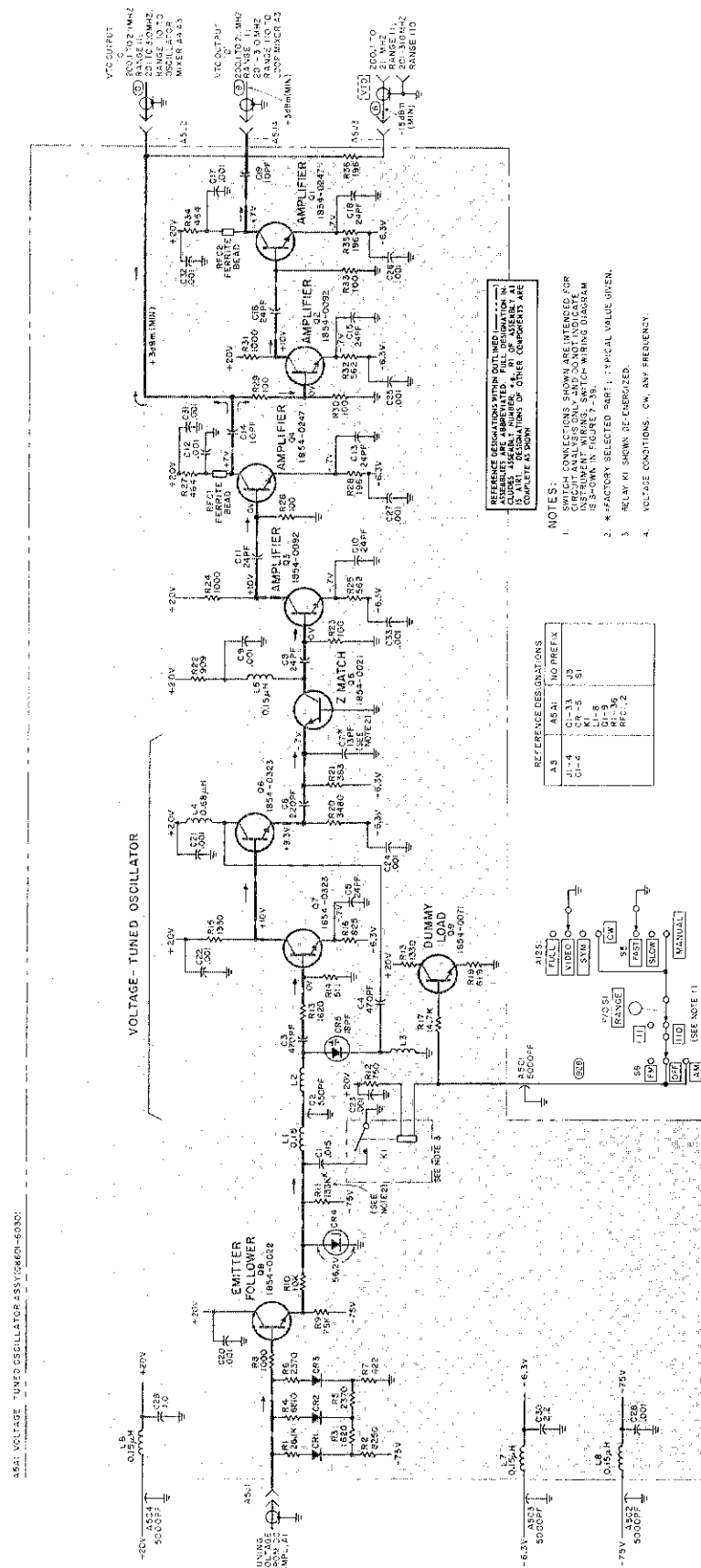


Figure 7-18. A5 VTO Assembly, Schematic Diagram  
(Part of Change 10)

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 |
| A2A1C11               | 1902-3070      | 1   | DIODE:BREAKDOWN 4.22V 5%             | 04713    | SZ10939-74         |
| A2A1C12               | 1902-0579      | 1   | DIODE BREAKDOWN:5.11V                | 28480    | 1902-0579          |
| A2A1C13               | 1820-0101      | 1   | INTEGRATED CIRCUIT:DIFFERENTIAL AMPL | 04713    | MC1034P            |
| A2A1C14               | 1820-0102      | 3   | INTEGRATED CIRCUIT:J-K FLIP FLOP     | 04713    | MC1013P            |
| A2A1C15               | 1820-0102      |     | INTEGRATED CIRCUIT:J-K FLIP FLOP     | 04713    | MC1013P            |
| A2A1C16               | 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                | 0757-0420      | 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          |

See introduction to this section for ordering information

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-NPD-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    |
| A4A1C21               | 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 8D 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 8D ASSY, TYPICAL VALUE 60 NH |          |                      |
| A4A2A1L2              |                |     | NSR, P/O 8D ASSY, TYPICAL VALUE 60 NH |          |                      |
| A4A2A1L3              |                |     | NSR, P/O 8D ASSY, TYPICAL VALUE 60 NH |          |                      |
| A4A2A1L4              |                |     | NSR, P/O 8D 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 substituted 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 Soldapull, 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 damage plated-through conductor.*

#### NOTE

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

### 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.

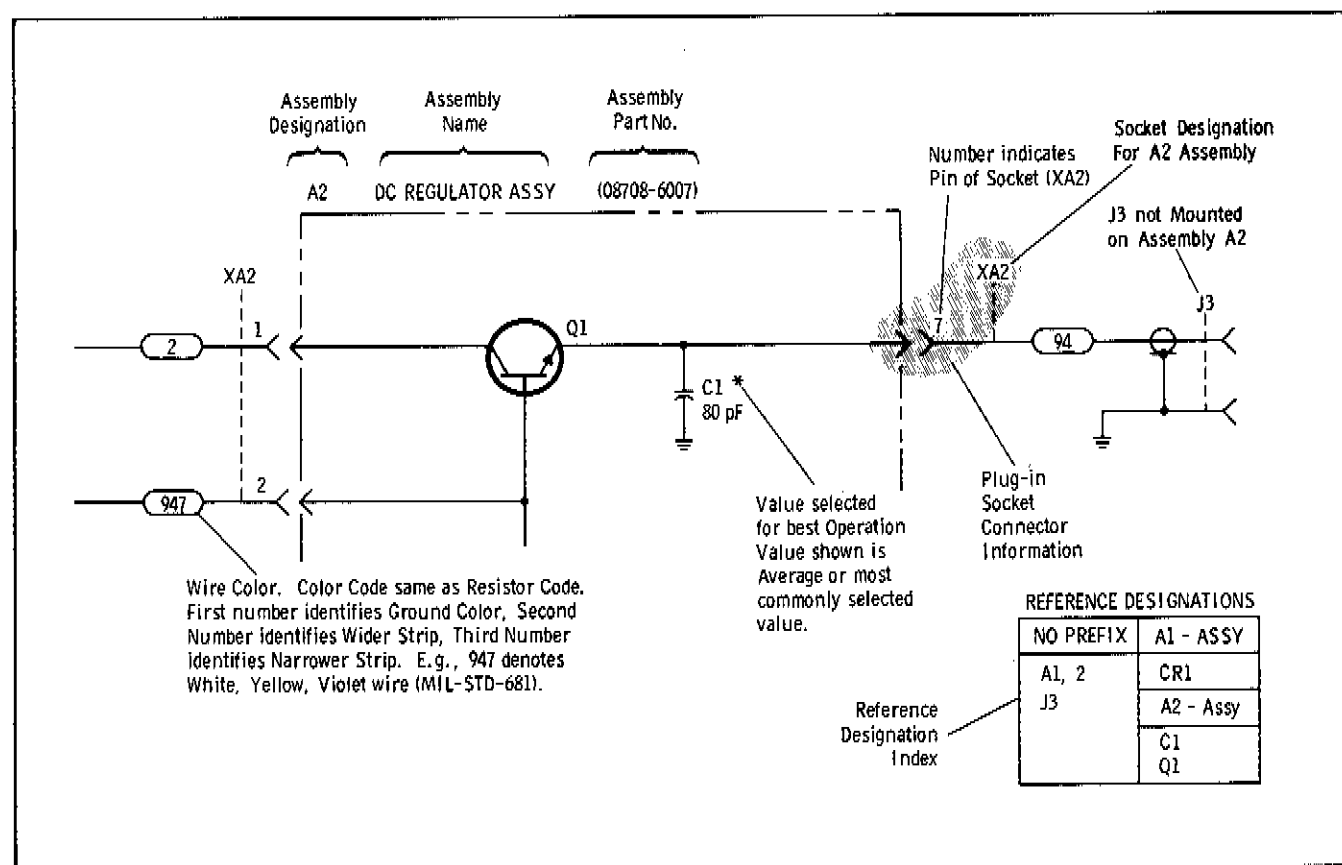


Figure 8-1. General Information on Schematic Diagrams

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.

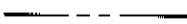
|                                                                                     |                                                                                                                                                                                                                                                                                                  |                                                                                     |                                  |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------|
|    | 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.                                                                                                                                                                                                                              |                                                                                     |                                  |
|    | Heavy dashed line with arrows indicates path and direction of main feedback.                                                                                                                                                                                                                     |                                                                                     |                                  |
|  | Wiper moves toward CW with clockwise rotation of control as viewed from shaft or knob.                                                                                                                                                                                                           |                                                                                     |                                  |
|  | Numbers in stars on circuit assemblies show locations of test points.                                                                                                                                                                                                                            |                                                                                     |                                  |
|  | Encloses wire color code. Code used (MIL-STD-681) is the same as the resistor color code. First number identifies the base color, second number the wider stripe, and the third number identifies the narrower stripe. E.g., (947) denotes white base, yellow wide stripe, violet narrow stripe. |                                                                                     |                                  |
|  | 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.

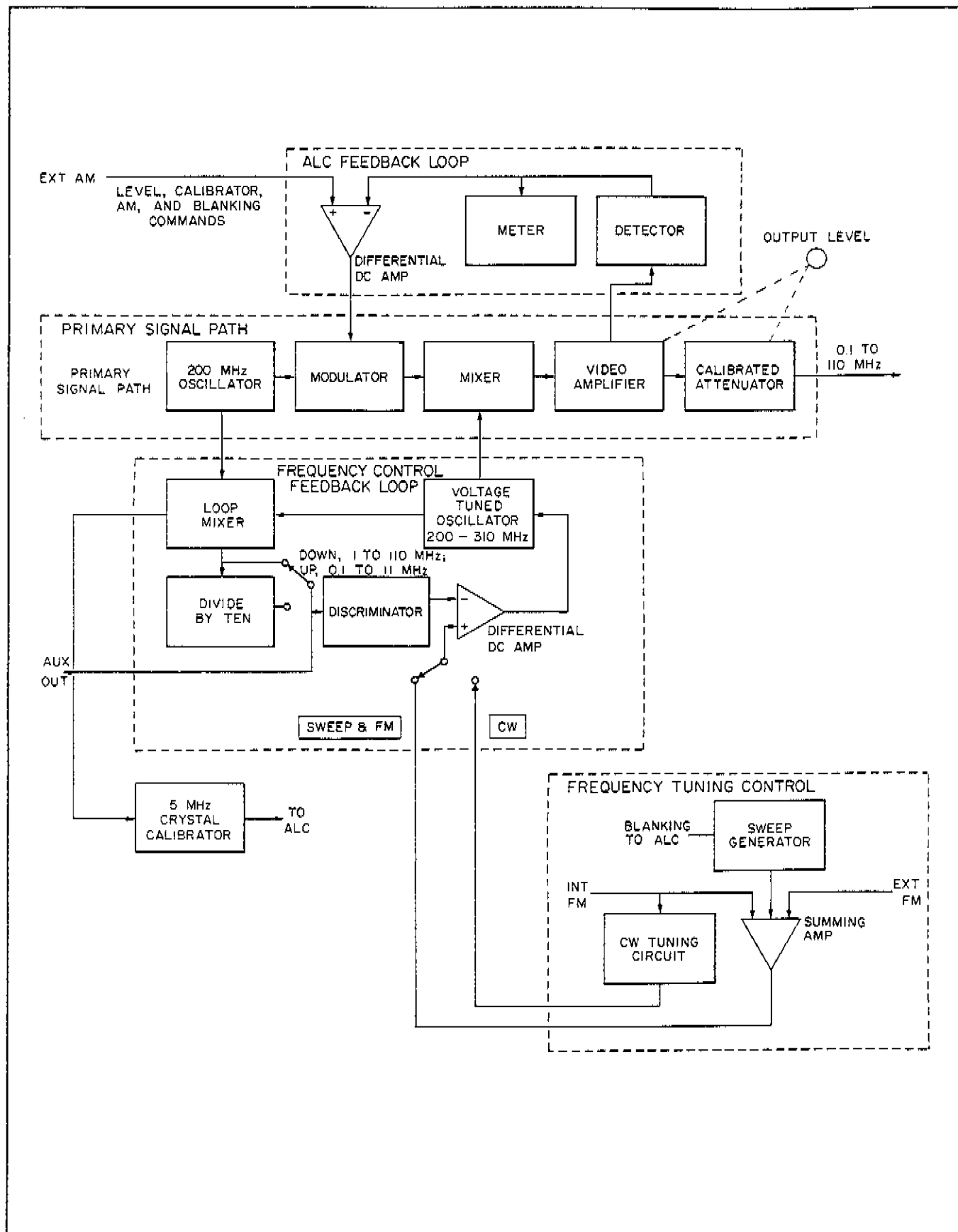
8-33. The 200 MHz fixed-oscillator output is mixed with the 200.1 to 310 MHz VTO output in the loop mixer. The 0.1 to 11 MHz difference frequency output is applied to a frequency discriminator. (Because the discriminator frequency range is limited, a divide by 10 divider precedes the discriminator during 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.

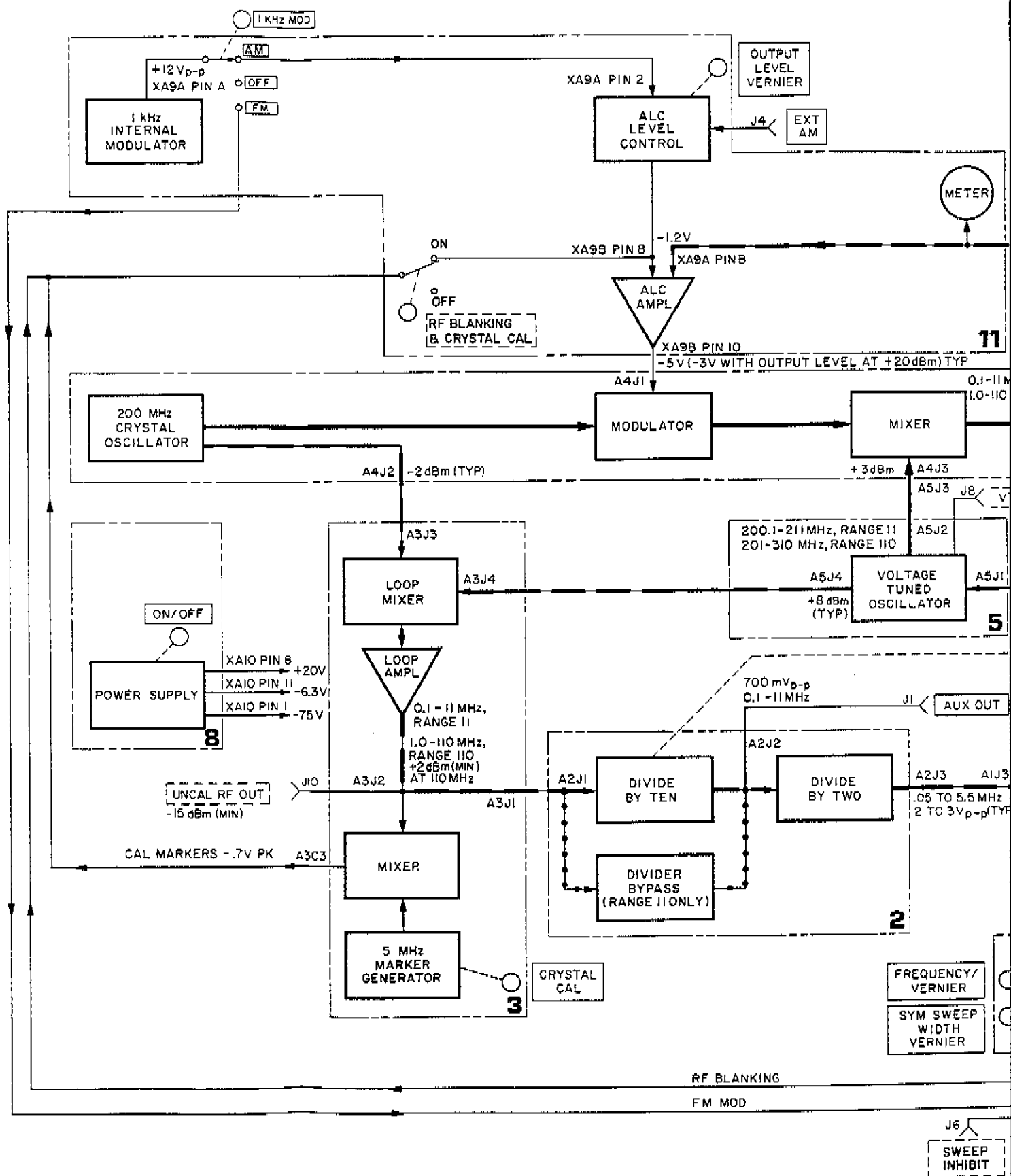
8-37. Internal and external frequency-modulation signals are imposed on the sweep generator tuning voltage at the summing amplifier during the SYM mode of operation.



BLOCK  
DIAGRAM

Figure 8-3. 8601A Simplified Block Diagram

FIG. 8-4  
SHT. 1 of 2



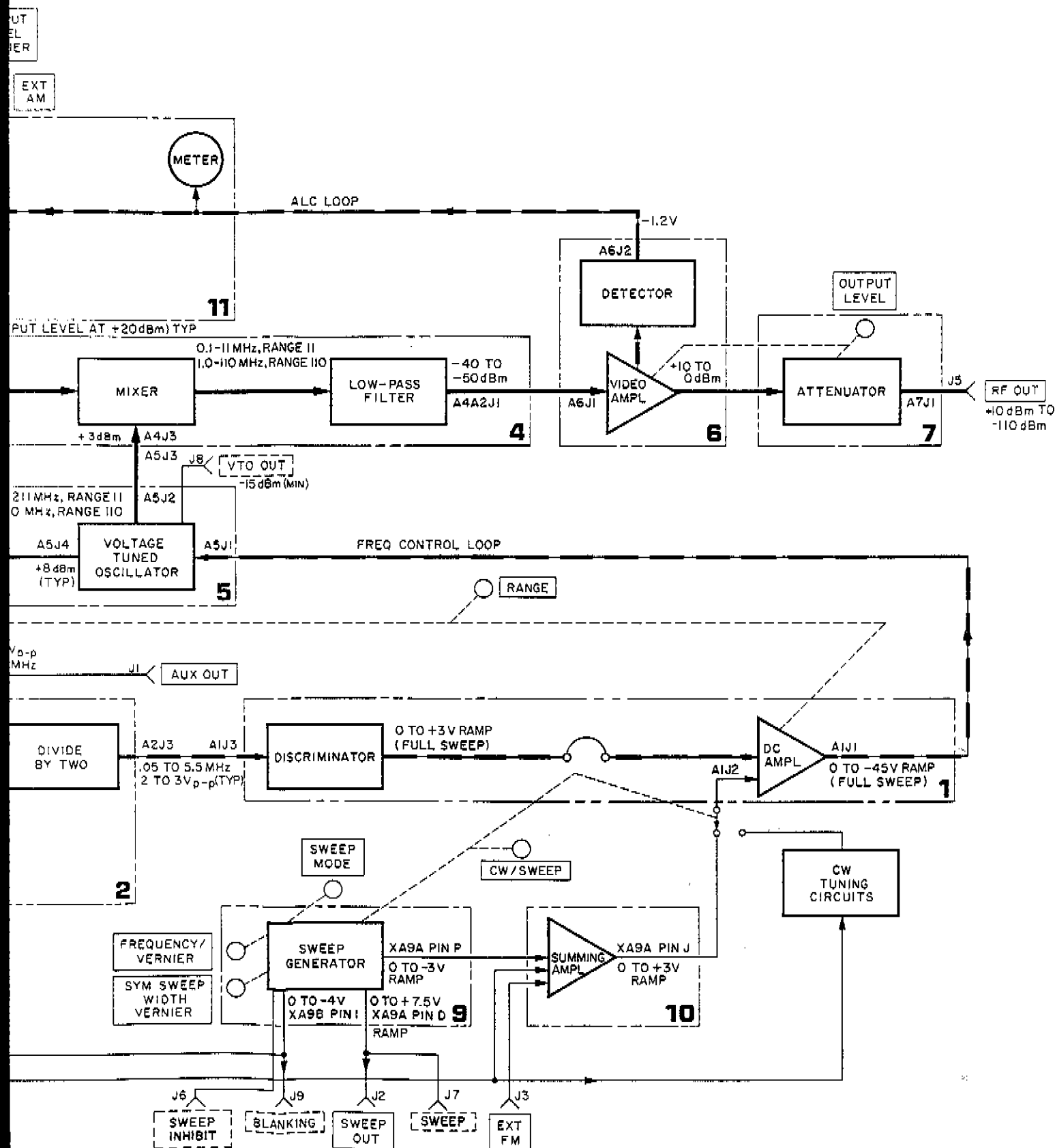


Figure 8-4. Detailed Block Diagram

FIG. 8-5  
SAT. 1 OF 4

OVERA

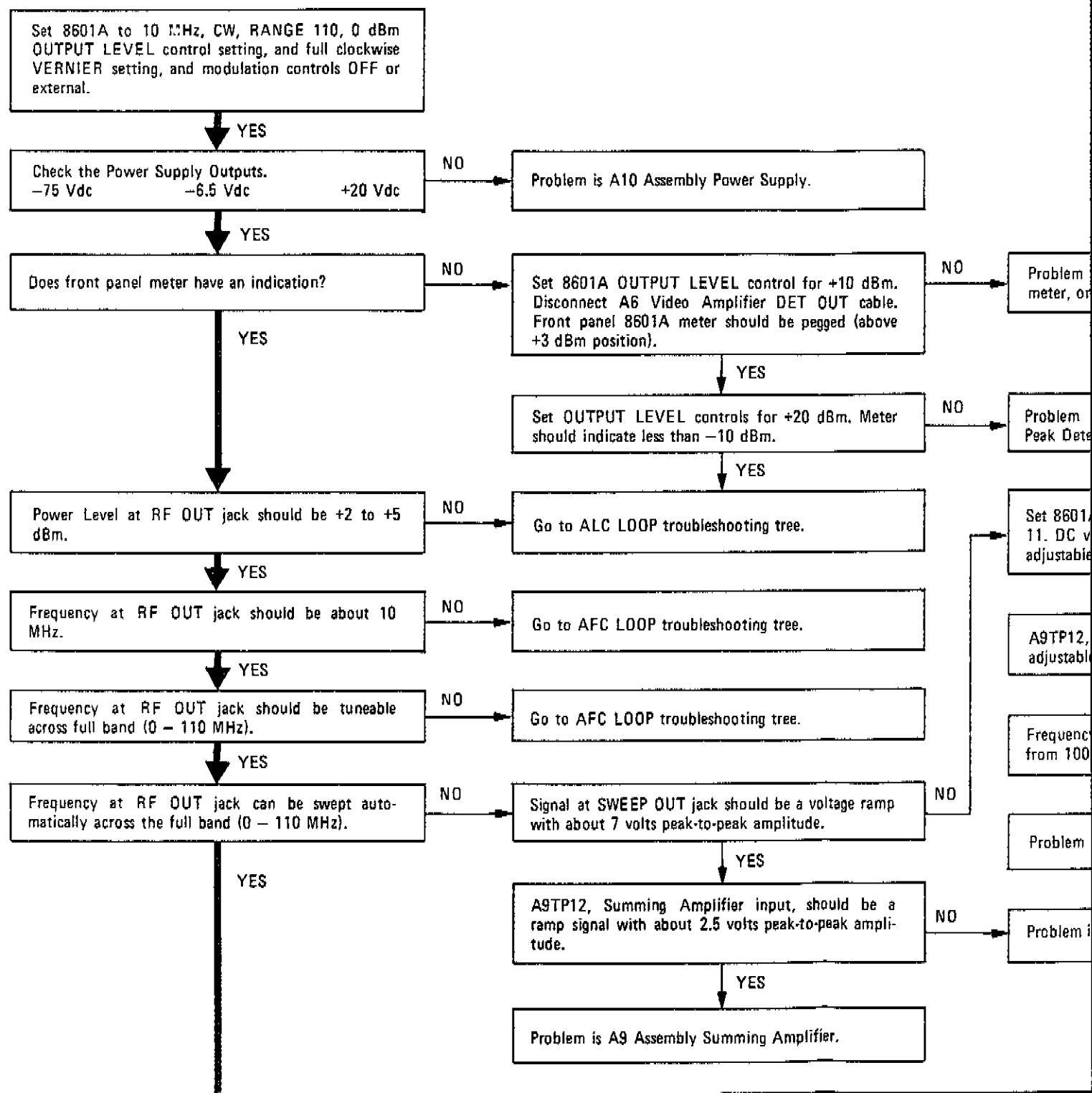


FIG. 8-5  
SHT. 2 of 4

# OVERALL TROUBLESHOOTING TREE

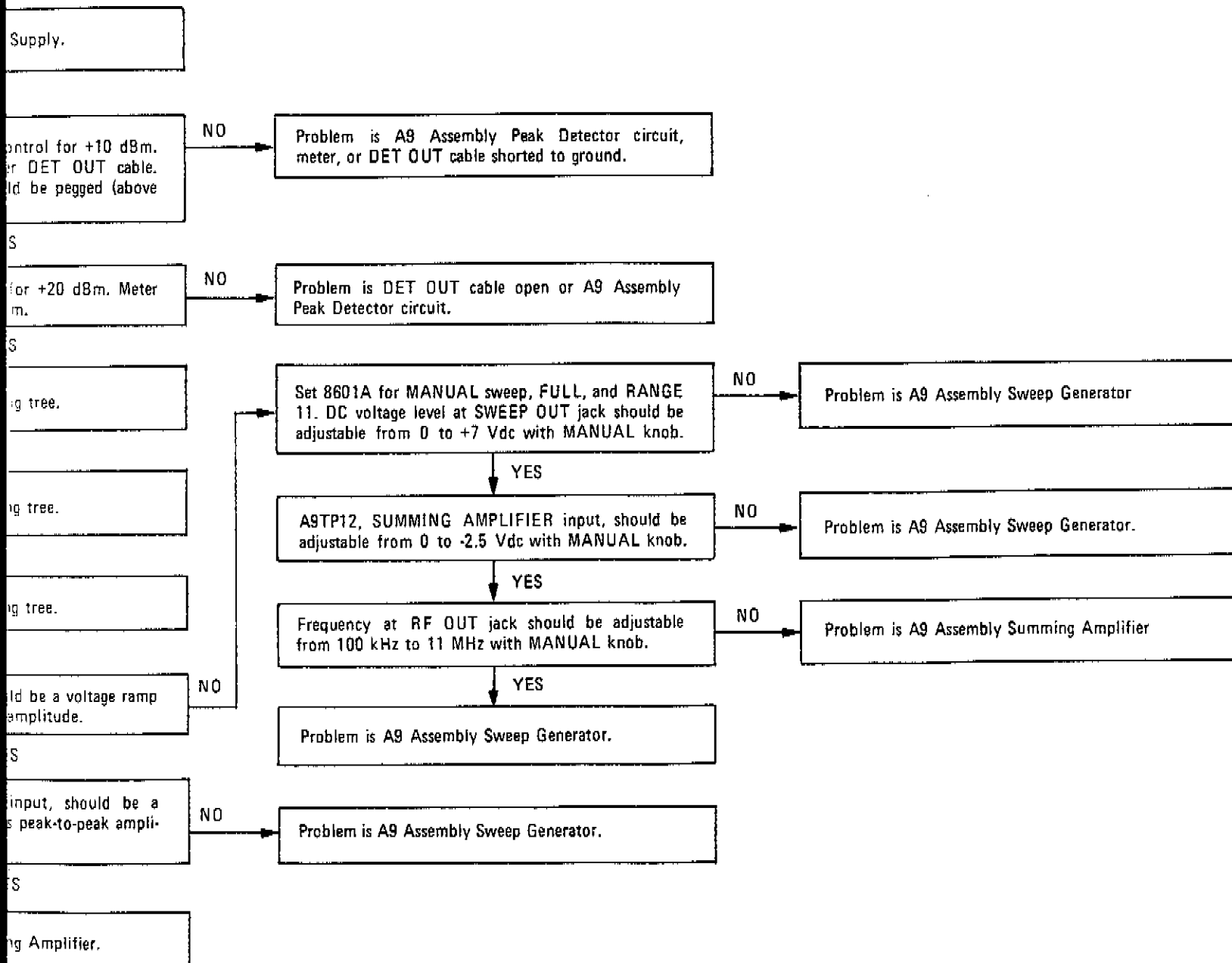
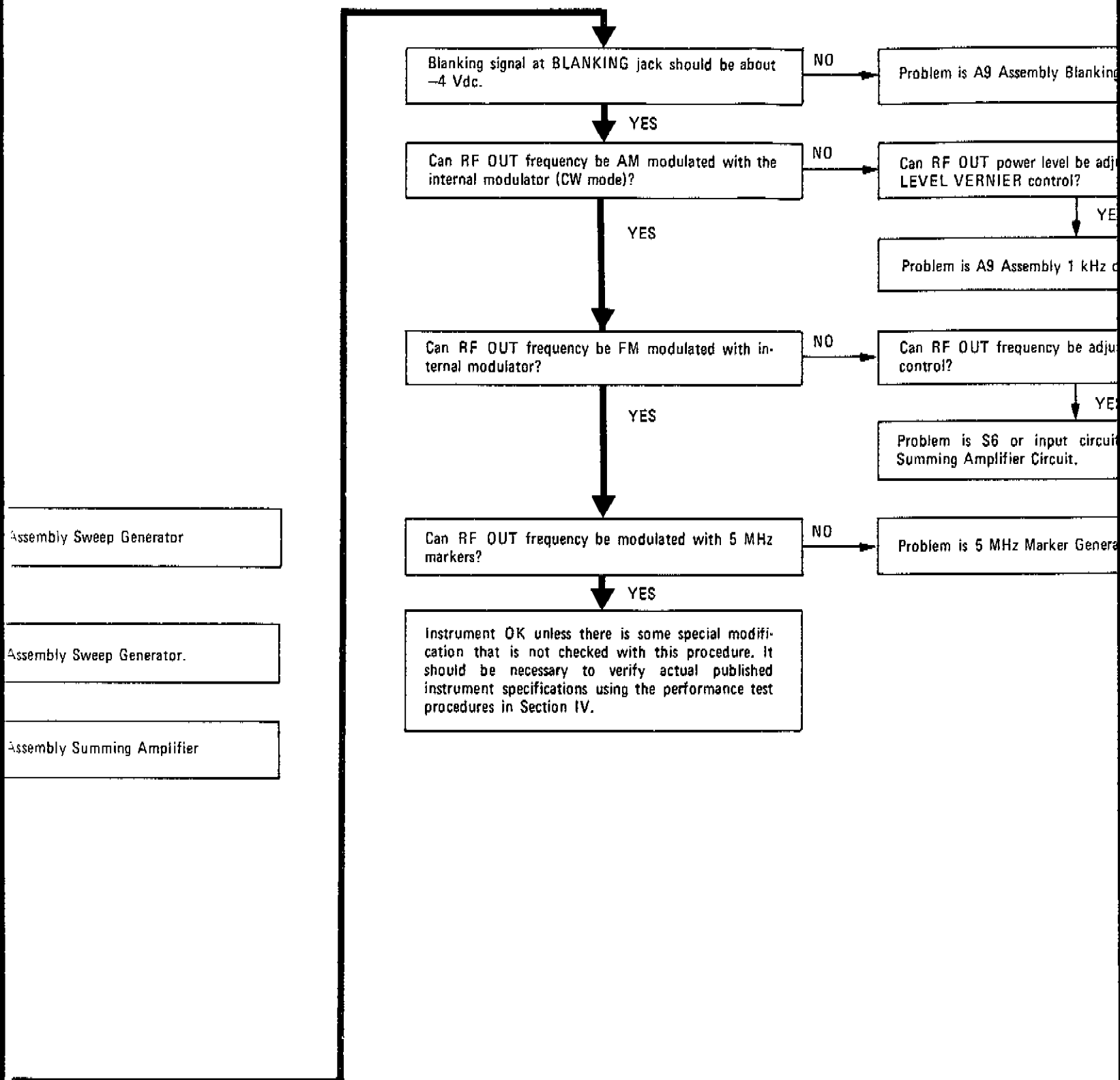


FIG. 8-5  
SHT. 3 of 4

Service



TROUBLESHOOTING TREE

Figure 8-5. Troubleshooting Tree  
8-6

FIG. 8-5  
SHT. 4 of 4

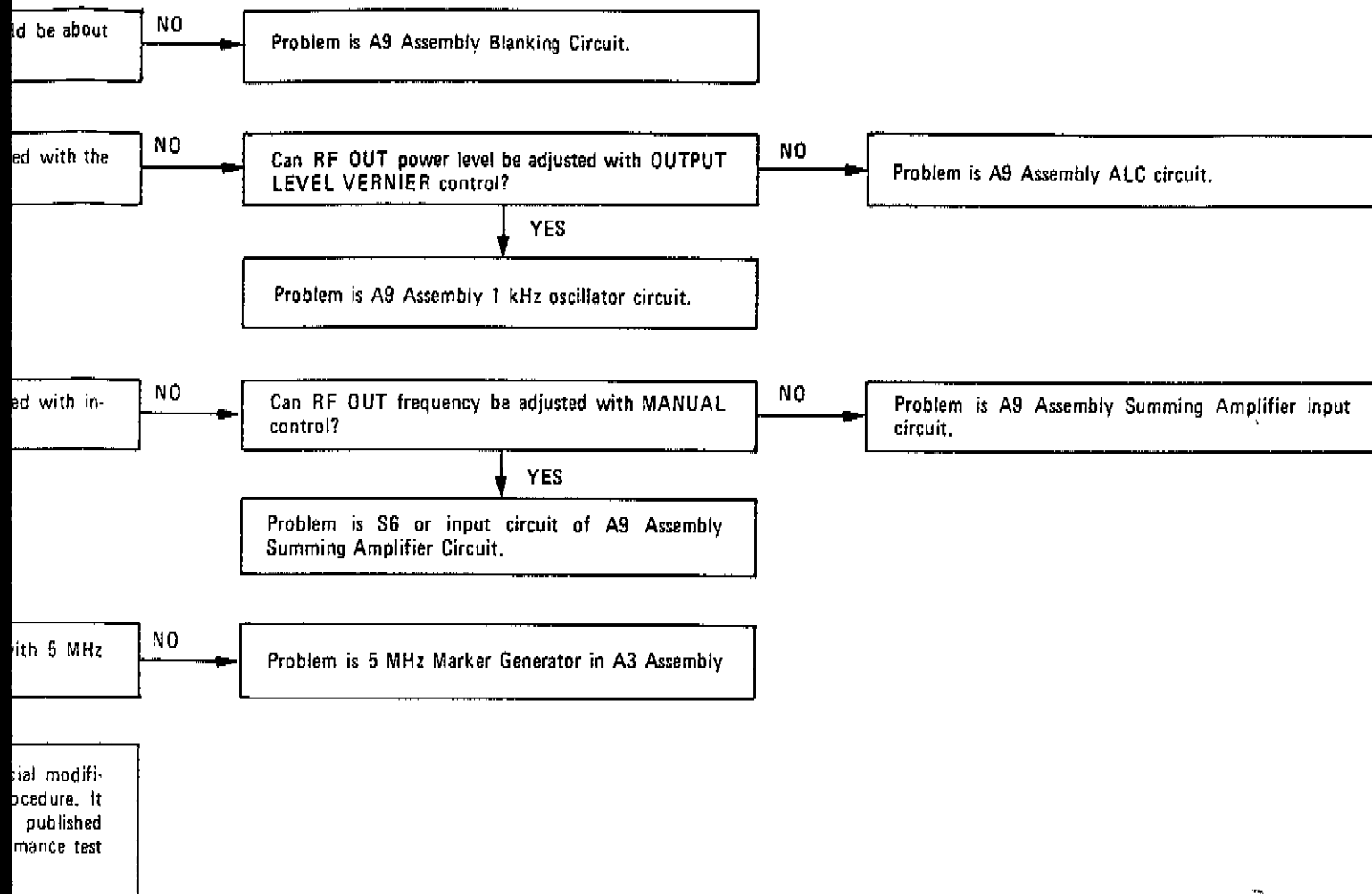
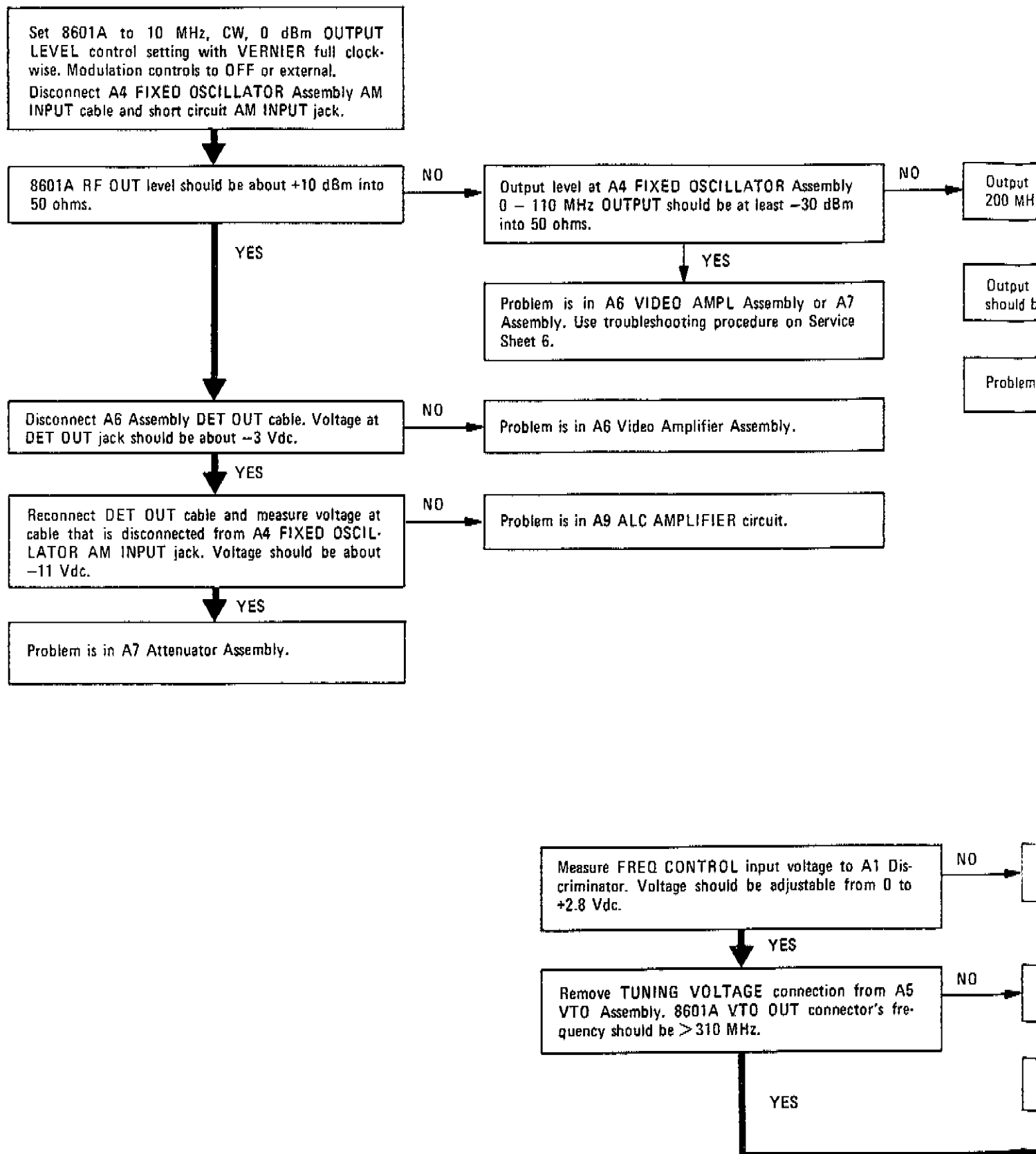


Figure 8-5. Troubleshooting Tree (1 of 2)

Model 8601A

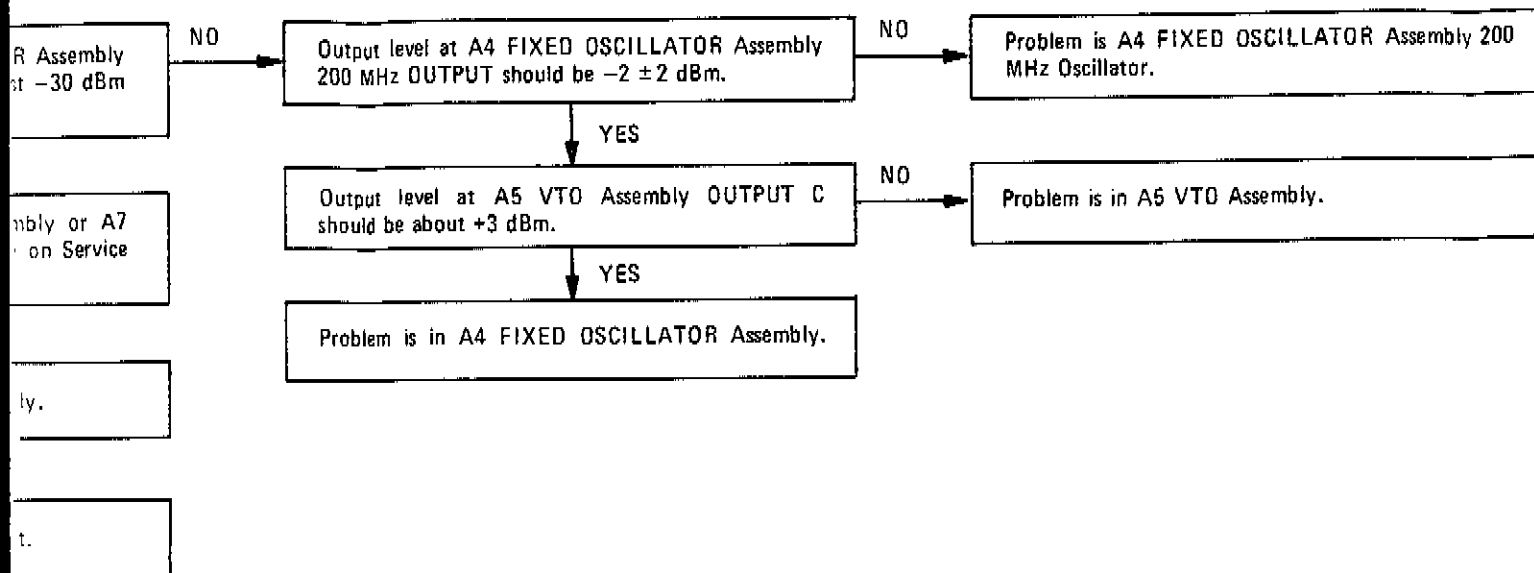
*FIG-8-5a*  
*Sheet 1 of 4*



TROUBLESHOOTING  
TREE

FIG. 8-5a.  
 SH. 2 OF 4

### ALC LOOP TROUBLESHOOTING TREE



### AFC LOOP TROUBLESHOOTING TREE

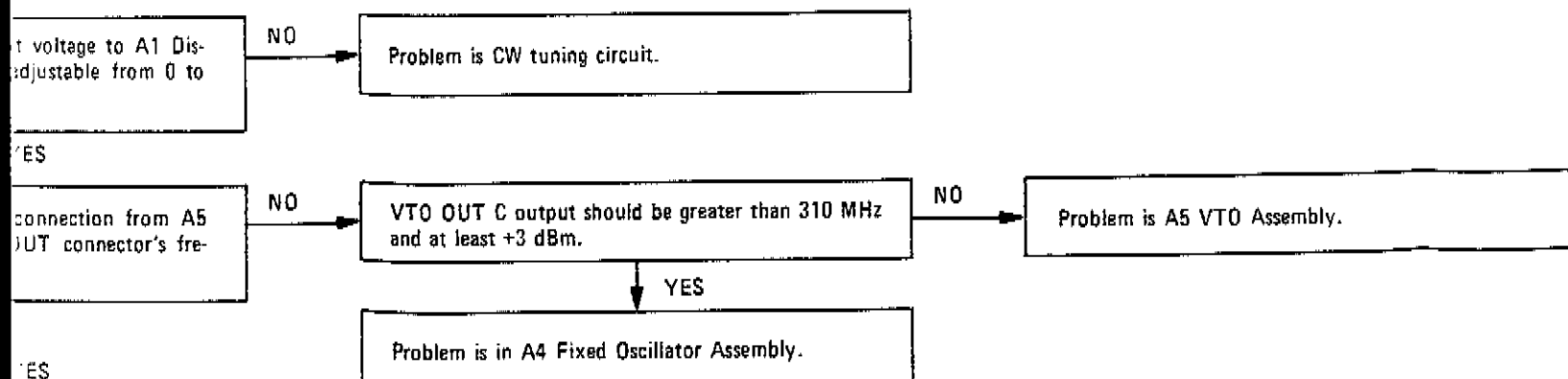


FIG. 8-5a  
SAT. 3074

Problem is A4 FIXED OSCILLATOR Assembly 200  
Hz Oscillator.

Problem is in A5 VTO Assembly.

Problem is A5 VTO Assembly.

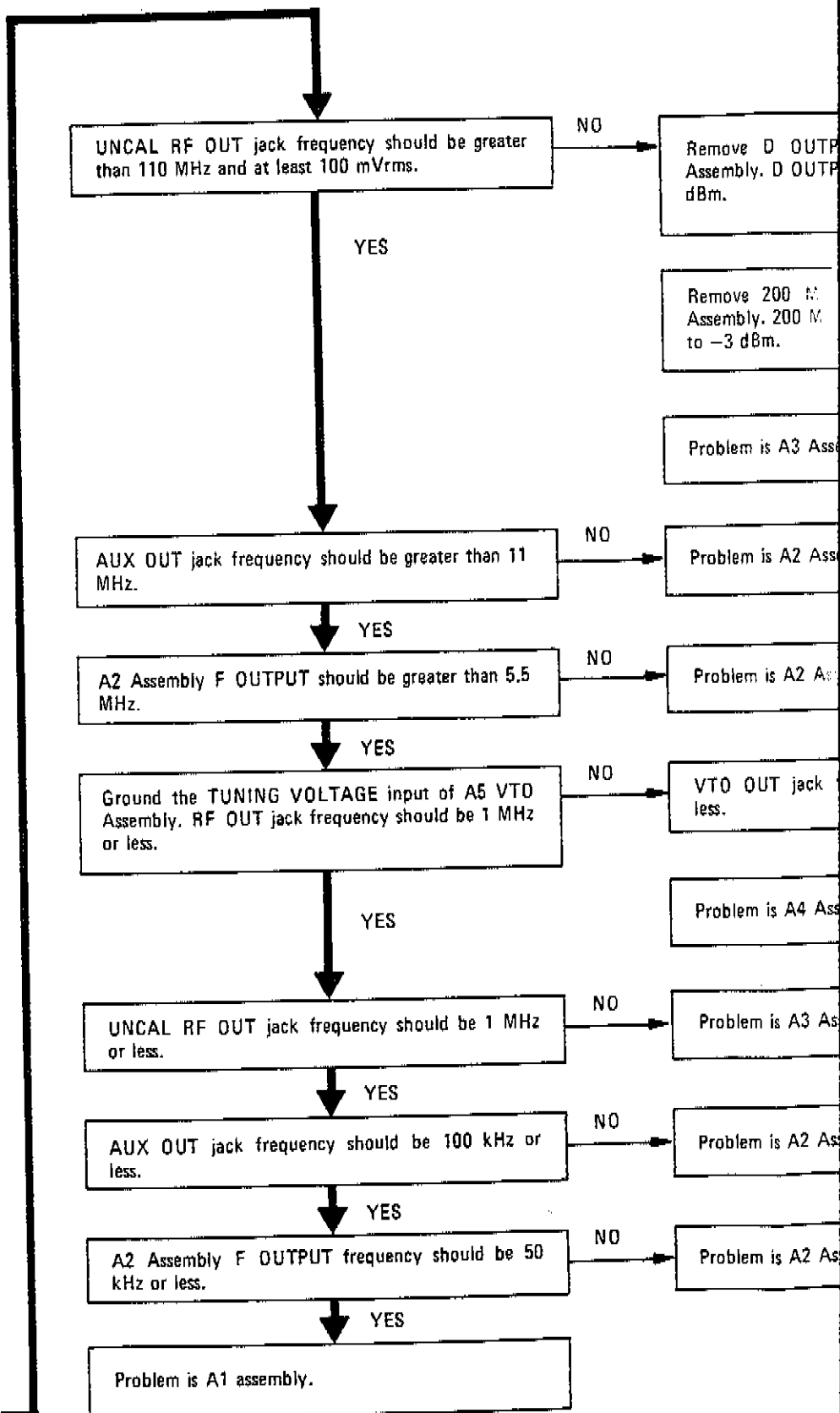


FIG. 8-5a  
 SH. 4 of 4

Service

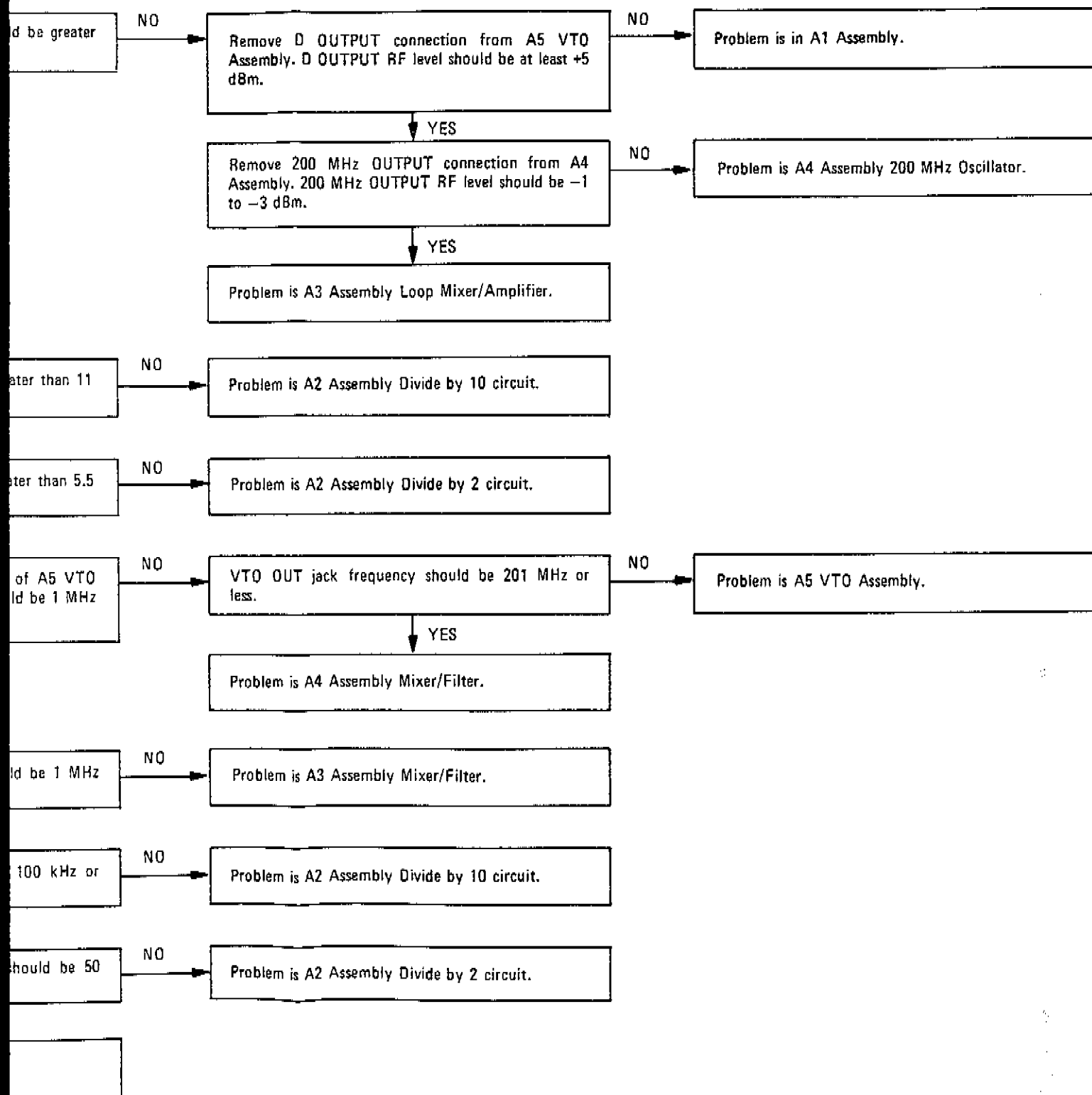


Figure 8-5. Troubleshooting Tree (2 of 2)

**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 dis-

criminator 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.

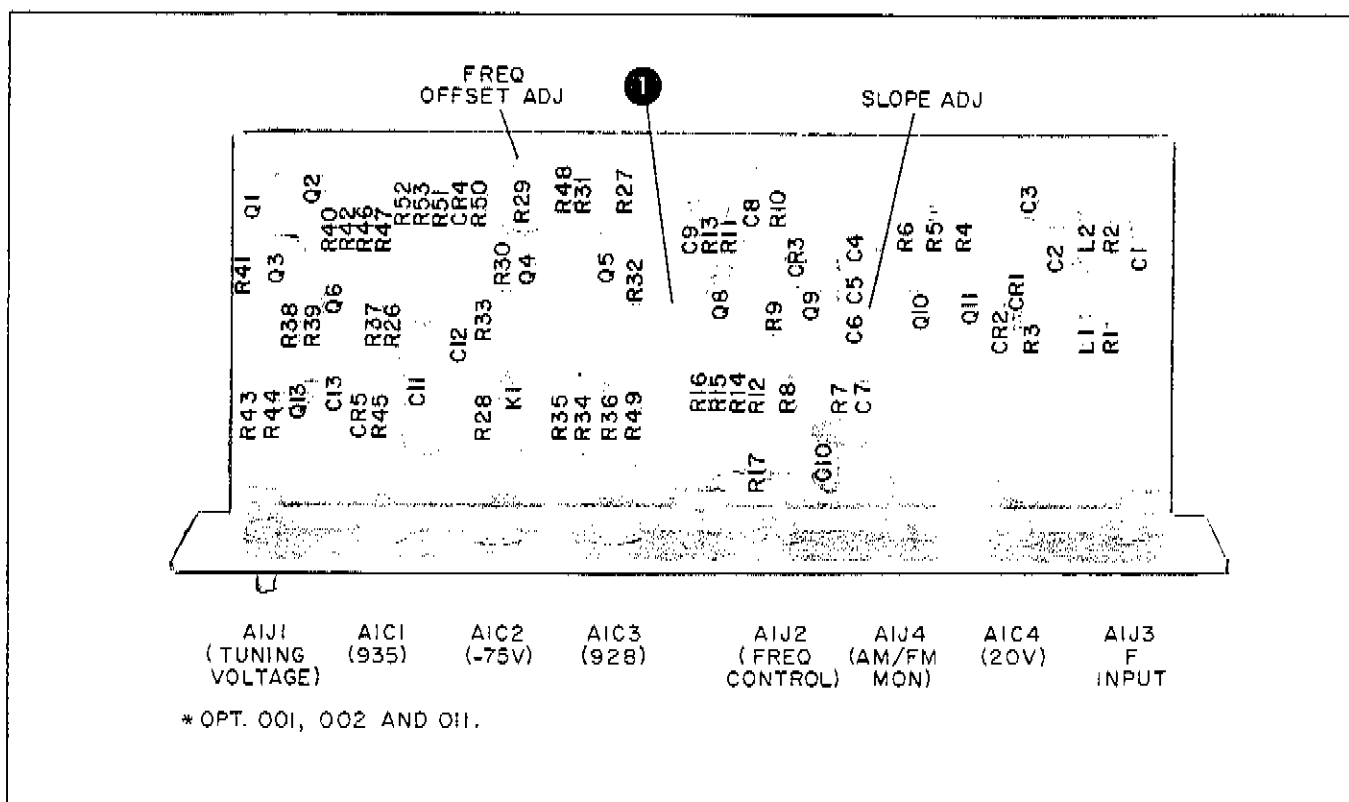


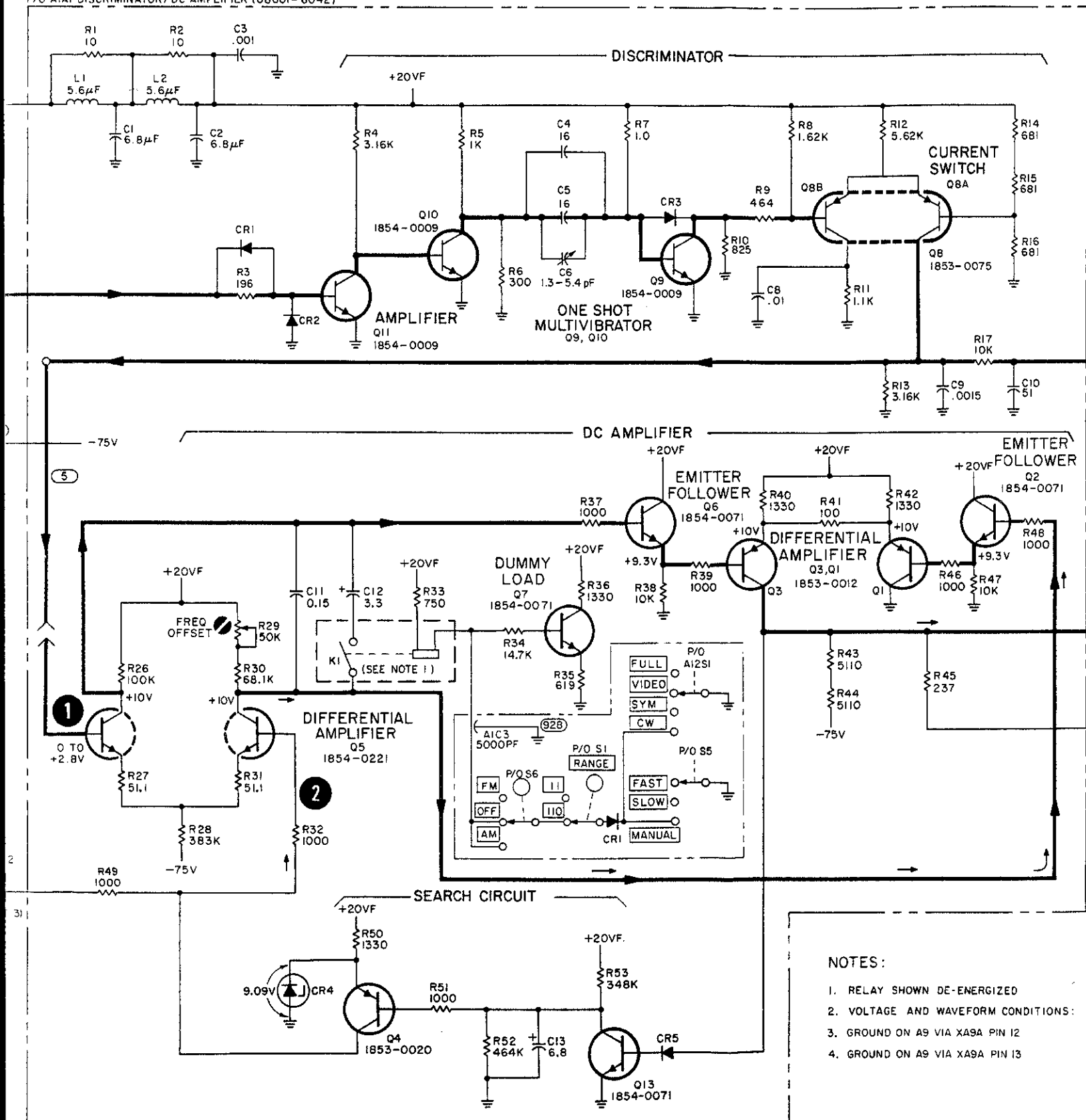
Figure 8-6. A1A1 Discriminator/DC Amplifier, Component Identification

FIG. 8-7  
SHT. 1 of 3



FIG. 8-7  
SHR. 2 of 3

P/O A1A1 DISCRIMINATOR/DC AMPLIFIER (08601-6042)



NOTES:

1. RELAY SHOWN DE-ENERGIZED
2. VOLTAGE AND WAVEFORM CONDITIONS: A
3. GROUND ON A9 VIA XA9A PIN 12
4. GROUND ON A9 VIA XA9A PIN 13

FIG. 8-7  
SHR. 3 of 3

Service

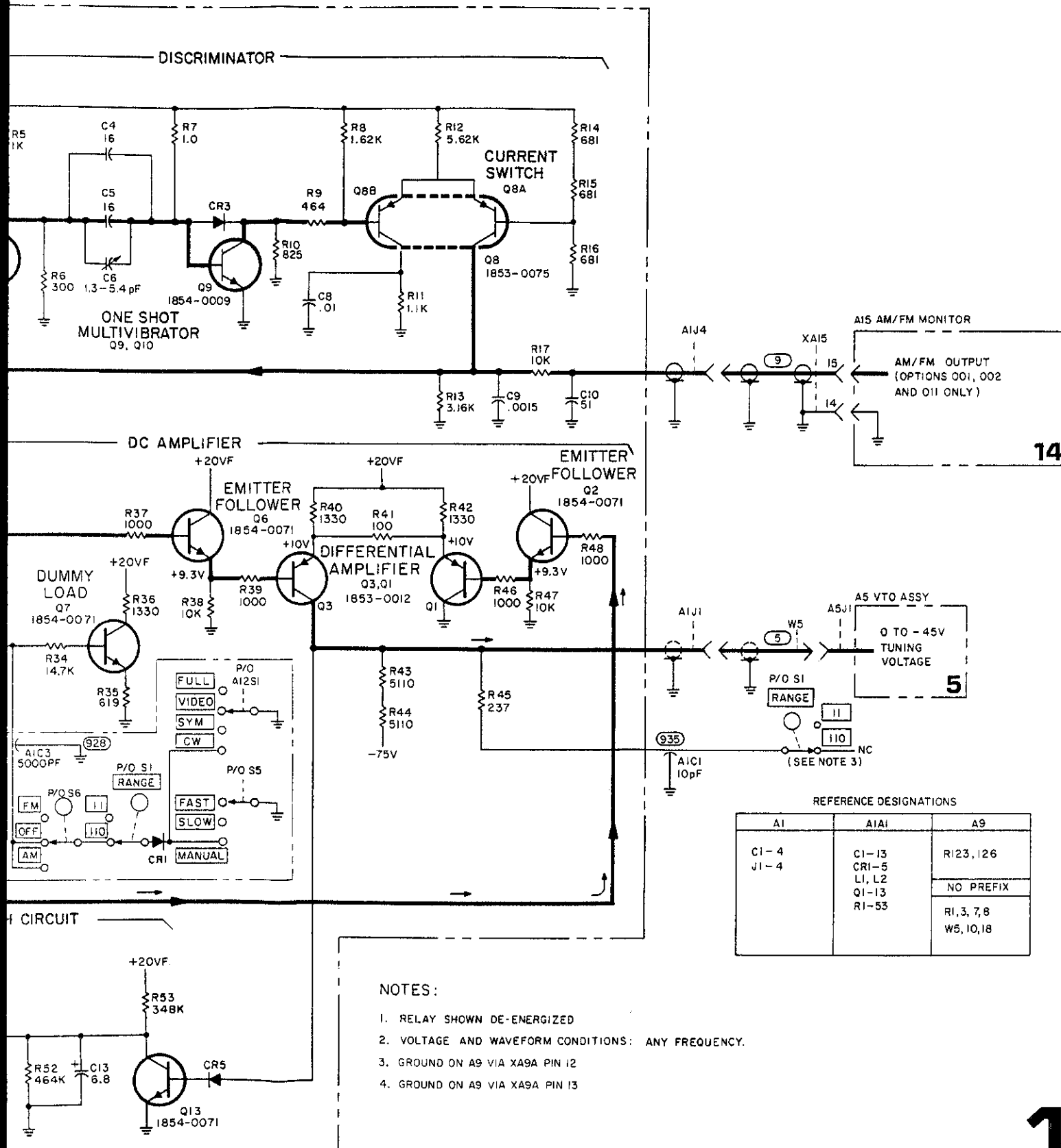


Figure 8-7. A1 Discriminator/DC Amplifier, Schematic Diagram

8-9b

## 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.

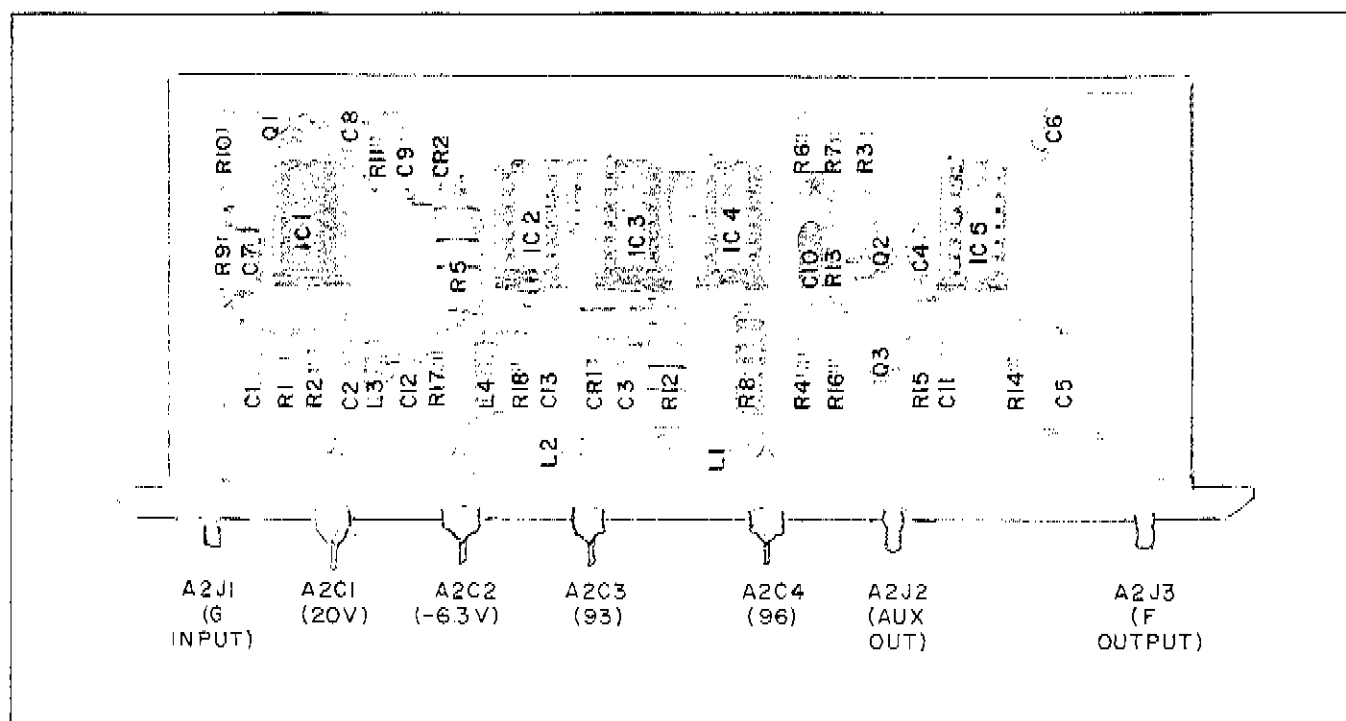


Figure 8-8. A2 Divider/Divider Bypass, Component Identification (Serial Prefixed 912- thru 945-)

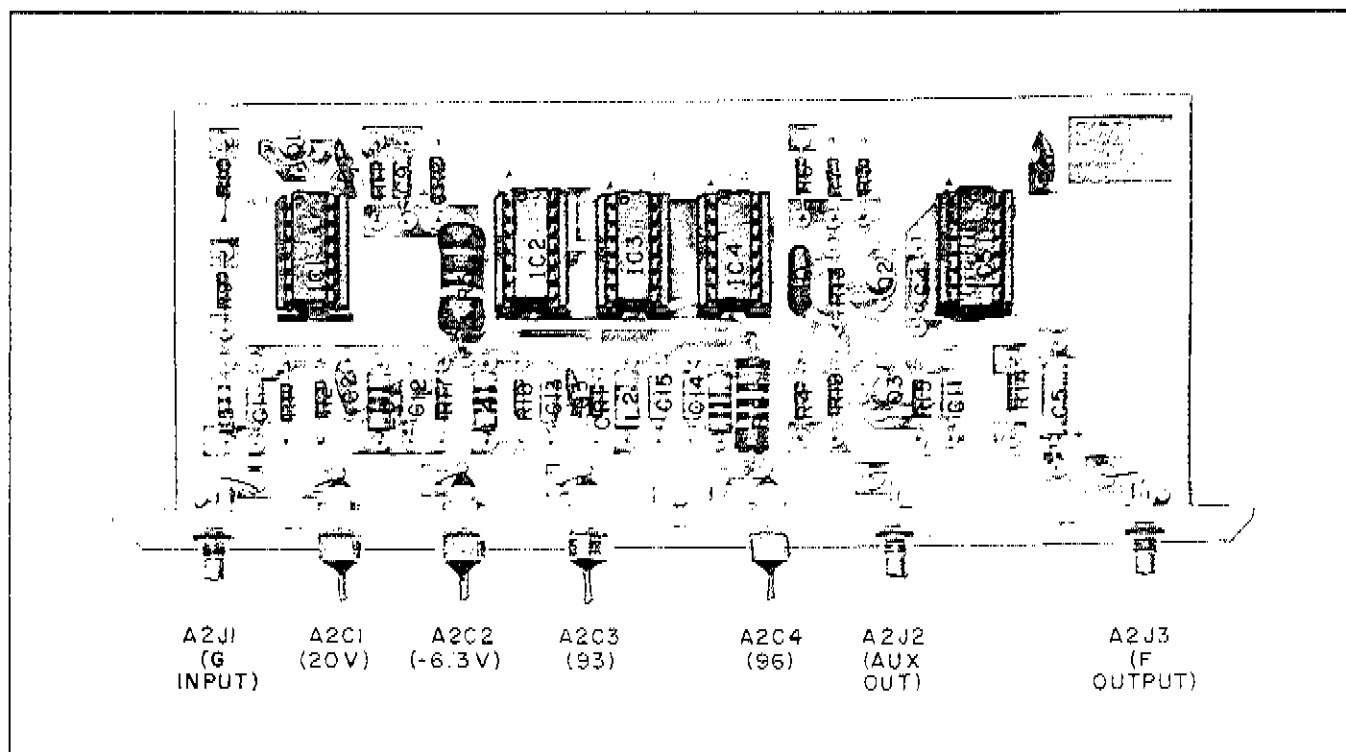


Figure 8-9. A2 Divider/Divider Bypass, Component Identification (Serial Prefixed 954- and Above)

FIG. 8-10  
SMT. 1 of 3

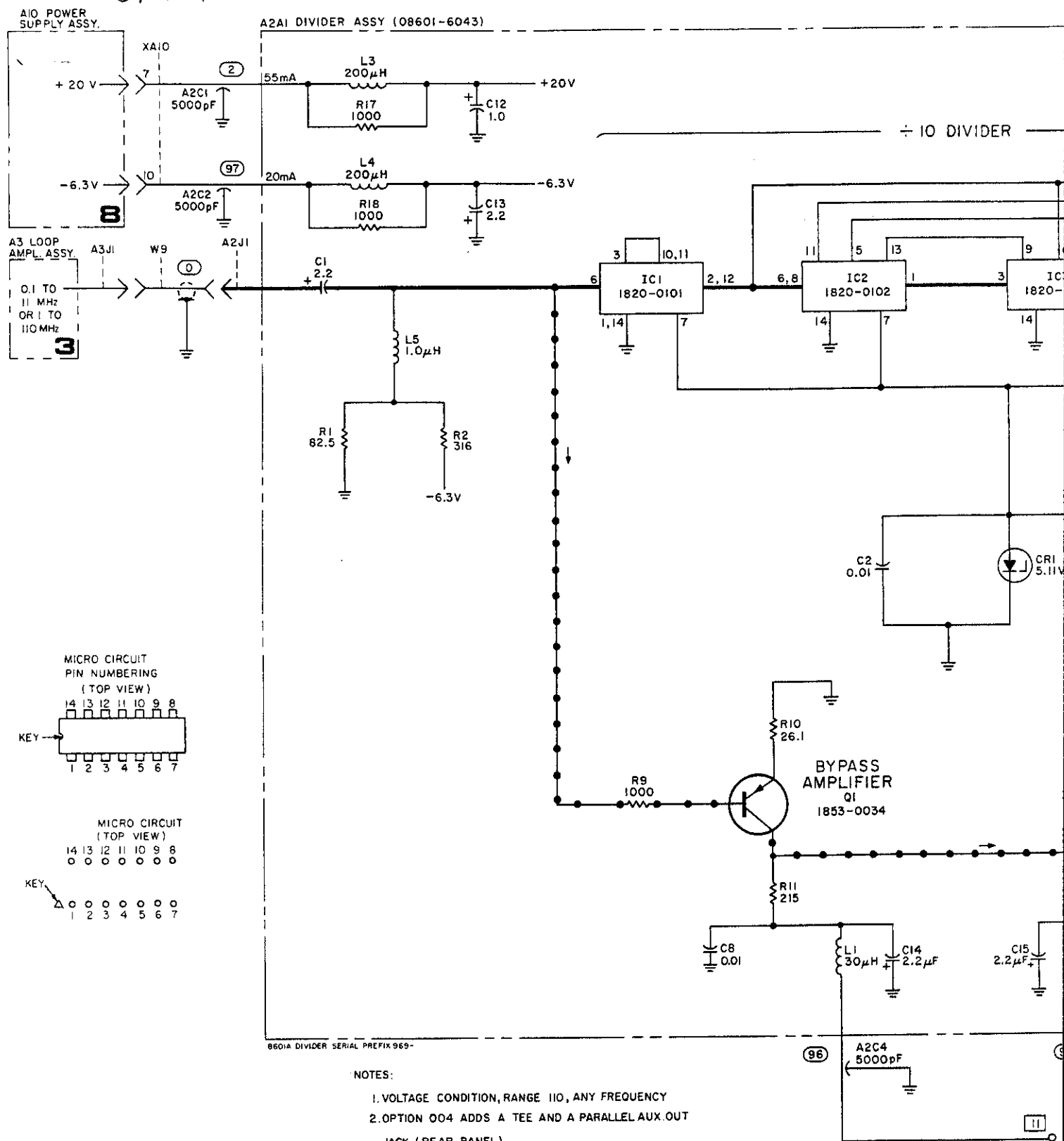


FIG. 8-10  
SMT. 2 of 3

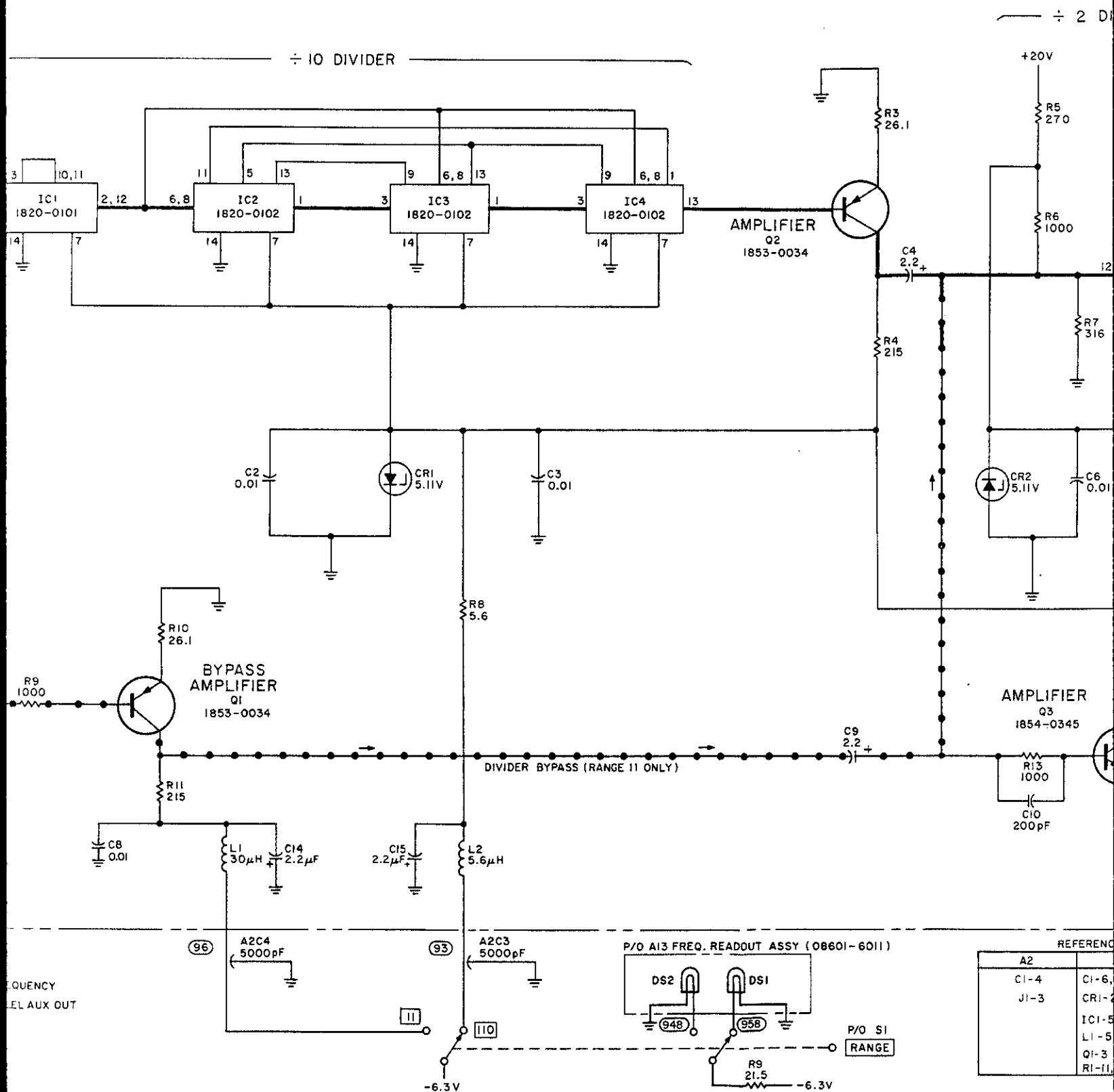
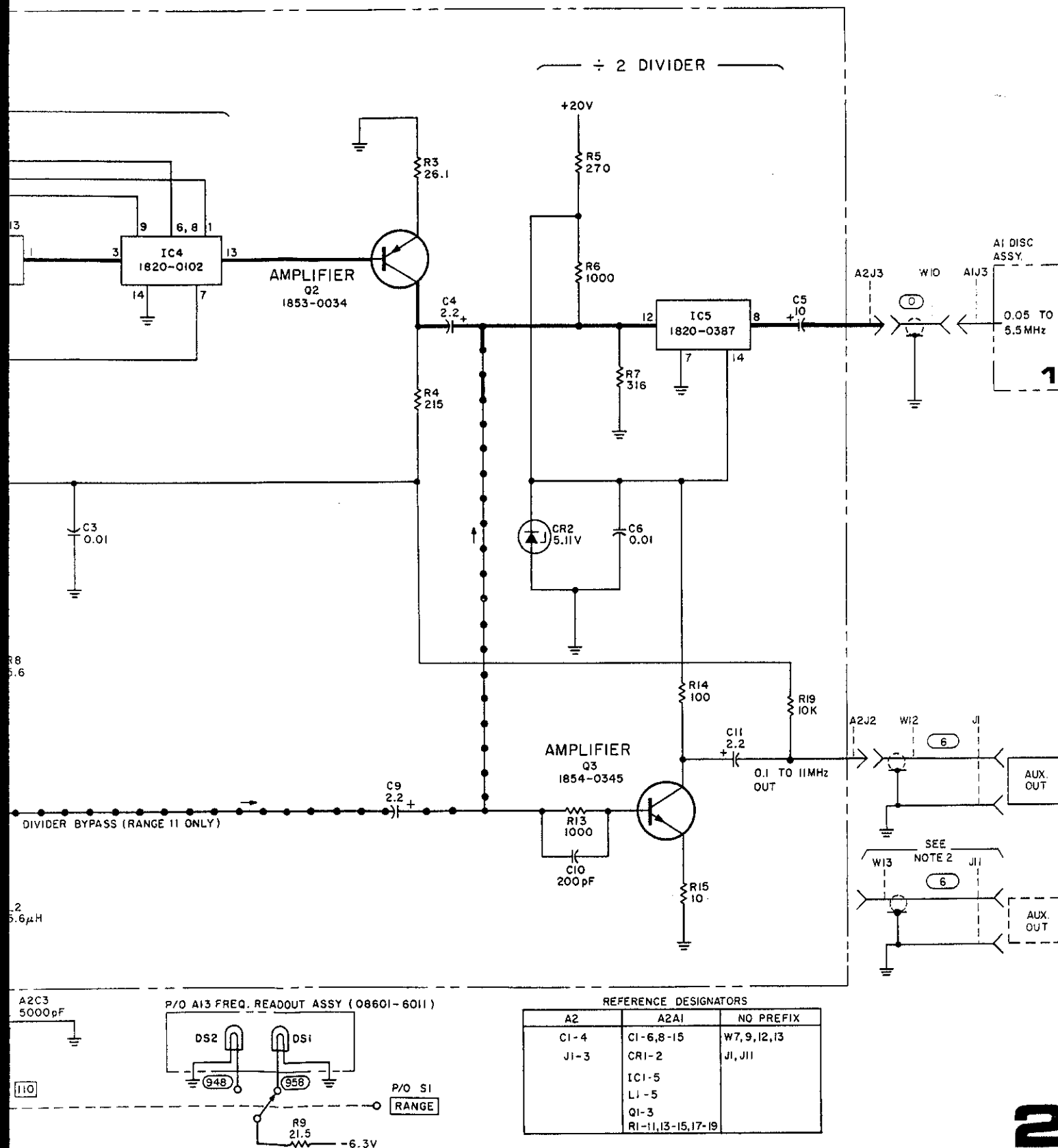


FIG. 8-10  
SMT. 3 of 3

Service



2

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

8-11b

### 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.

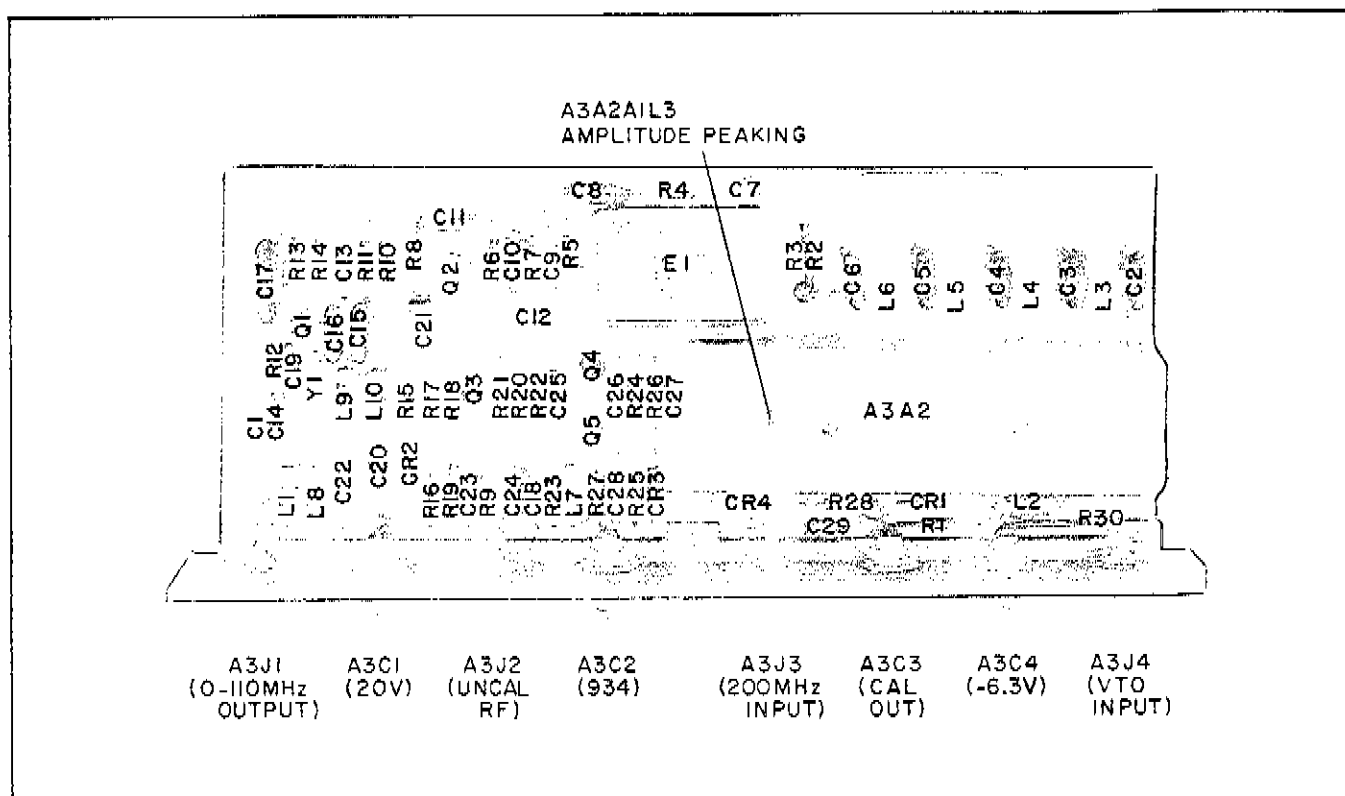


Figure 8-11. A3A1 Loop Amplifier/Crystal Calibrator, Component Identification

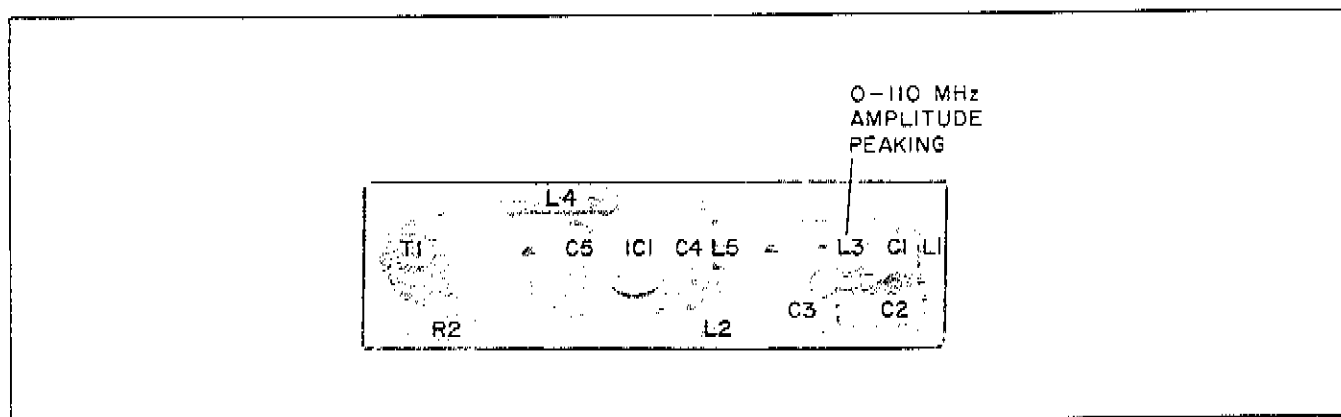


Figure 8-12. A3A1A1 Mixer, Component Identification

FIG. 8-13  
SNT 1 of 3

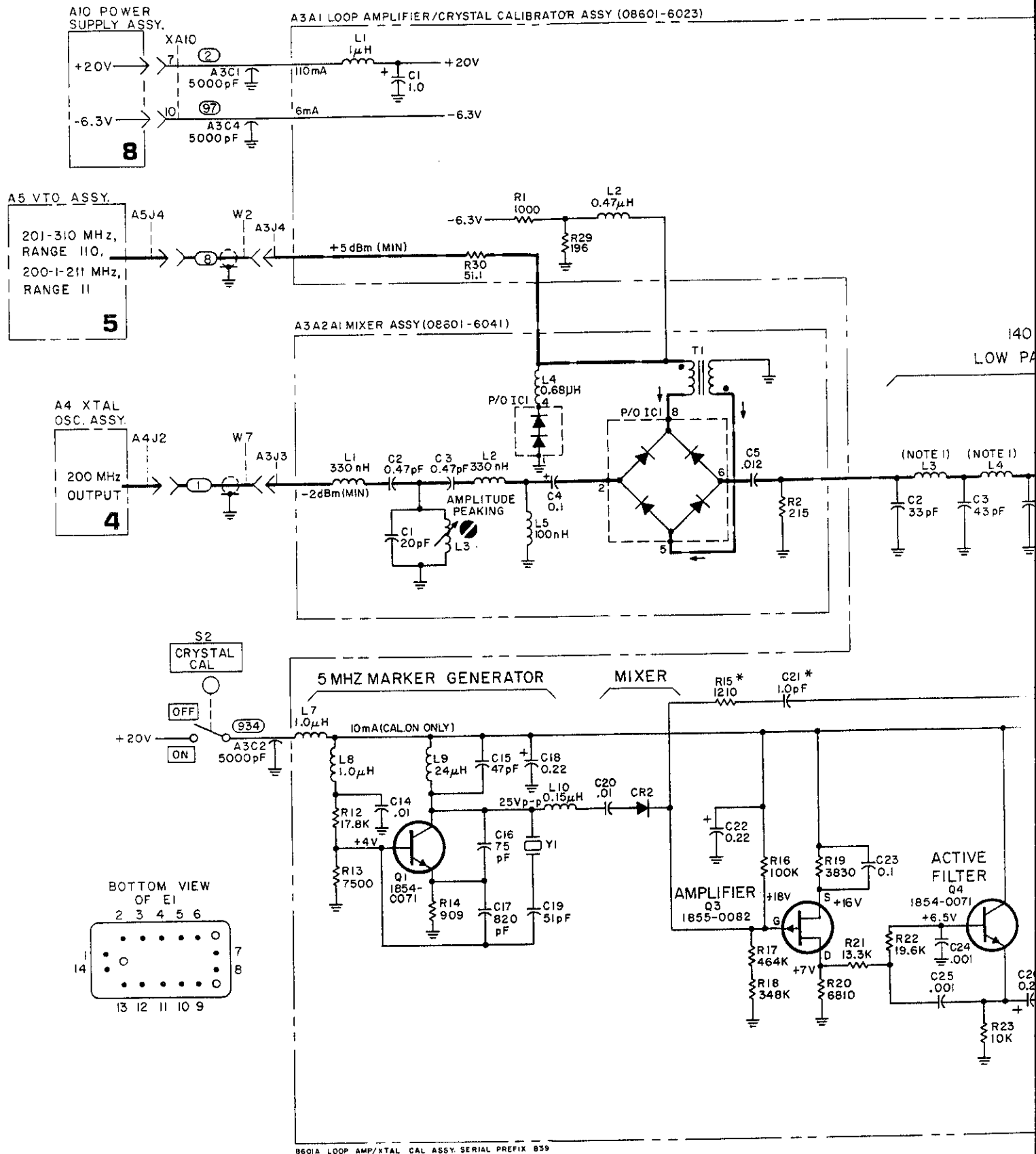


FIG. 8-13  
SHT. 2 OF 3

ATOR ASSY (08601-6023)

REFE  
ASSE  
CLUD  
IS A  
COMP

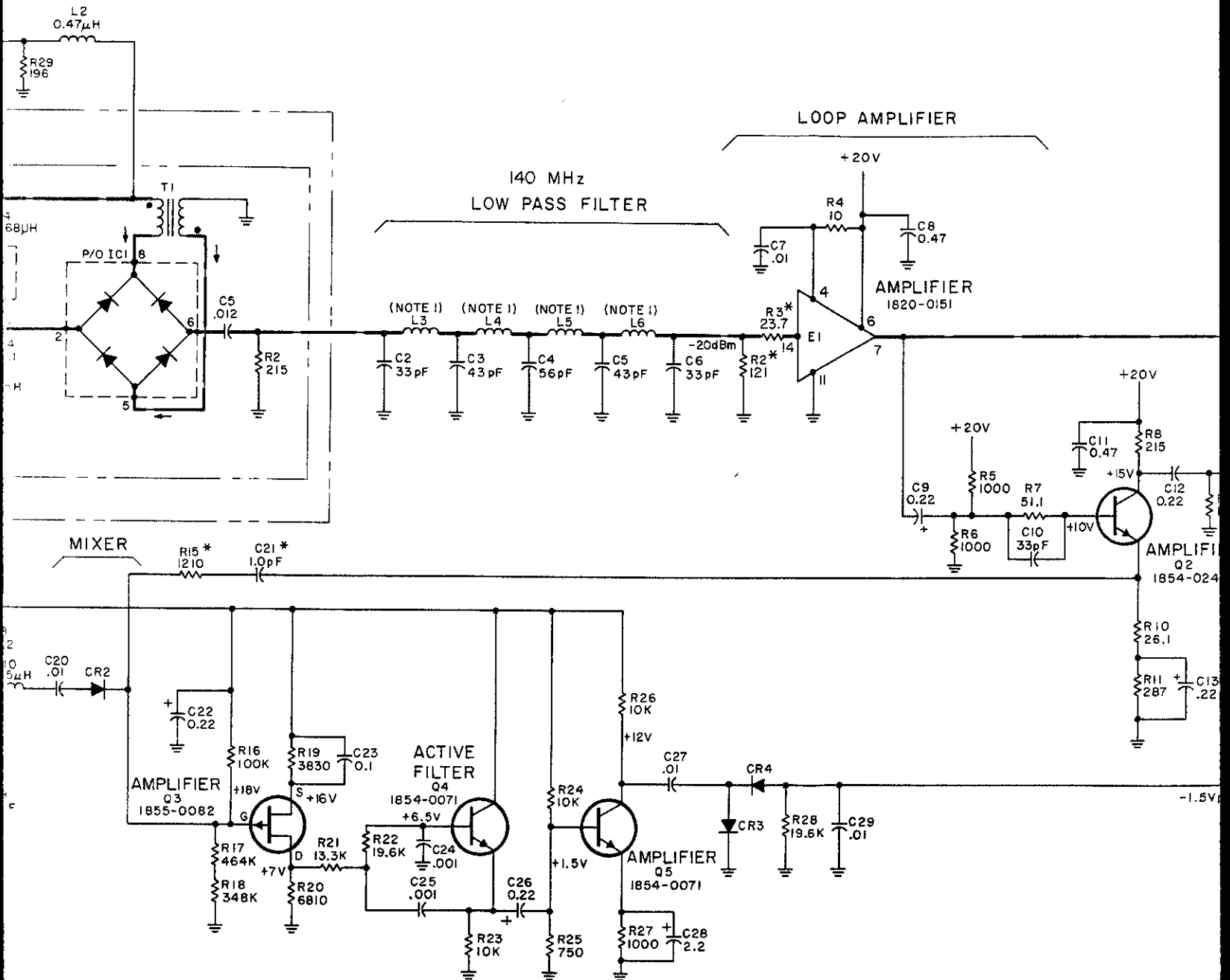


Figure 8

FIG. 8-13  
SHT. 3 OF 3

Service

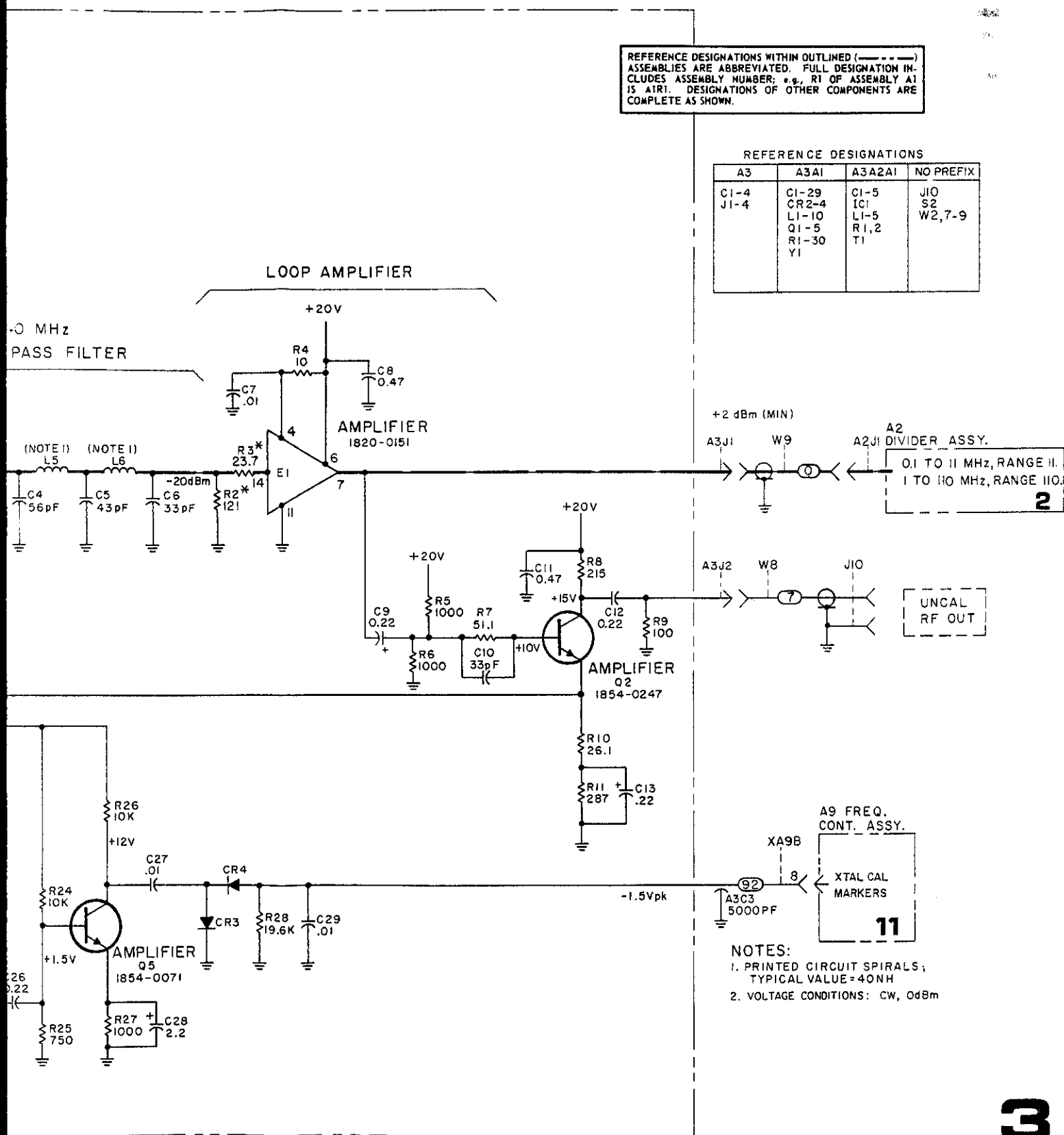


Figure 8-13. A3 Loop Amplifier/Crystal Calibrator, Mixer, Schematic Diagram

8-13b

## 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.

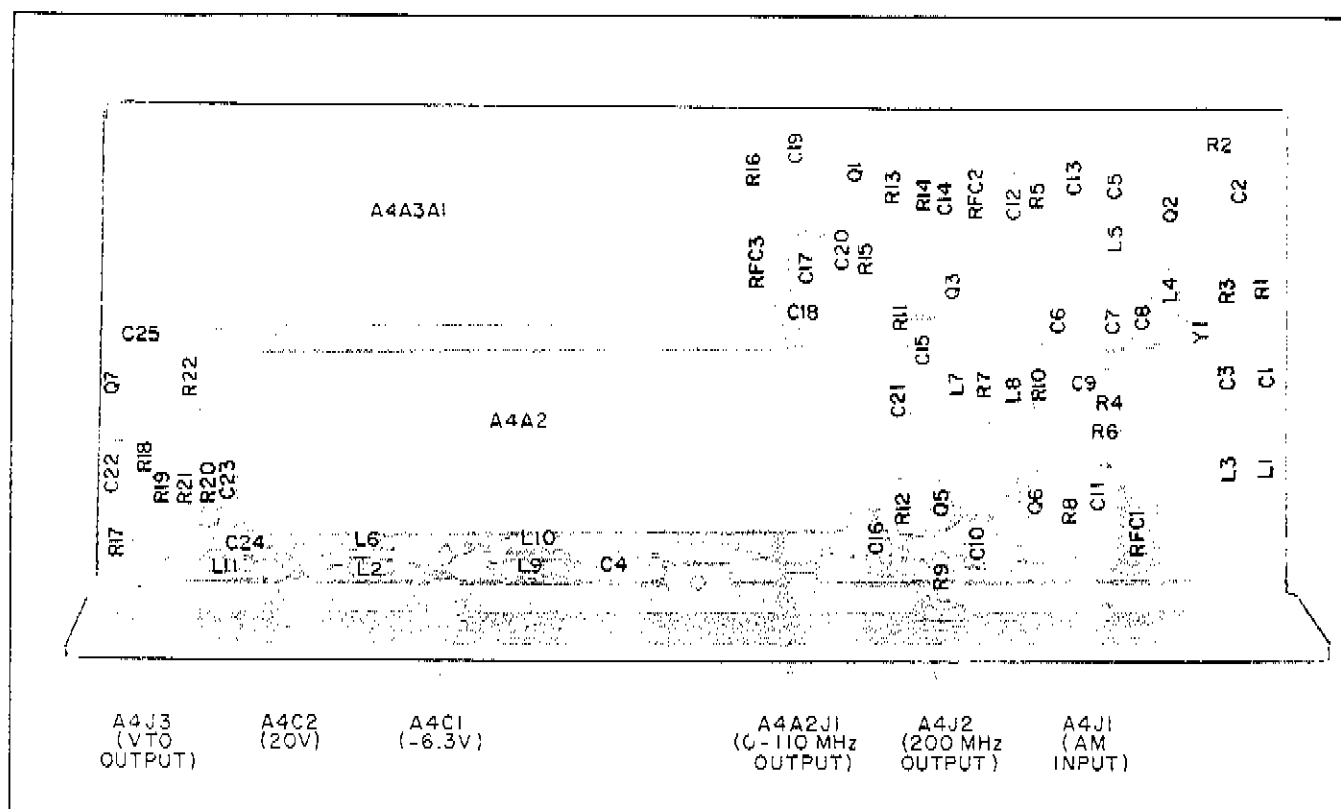


Figure 8-14. A4A1 Crystal Oscillator, Component Identification

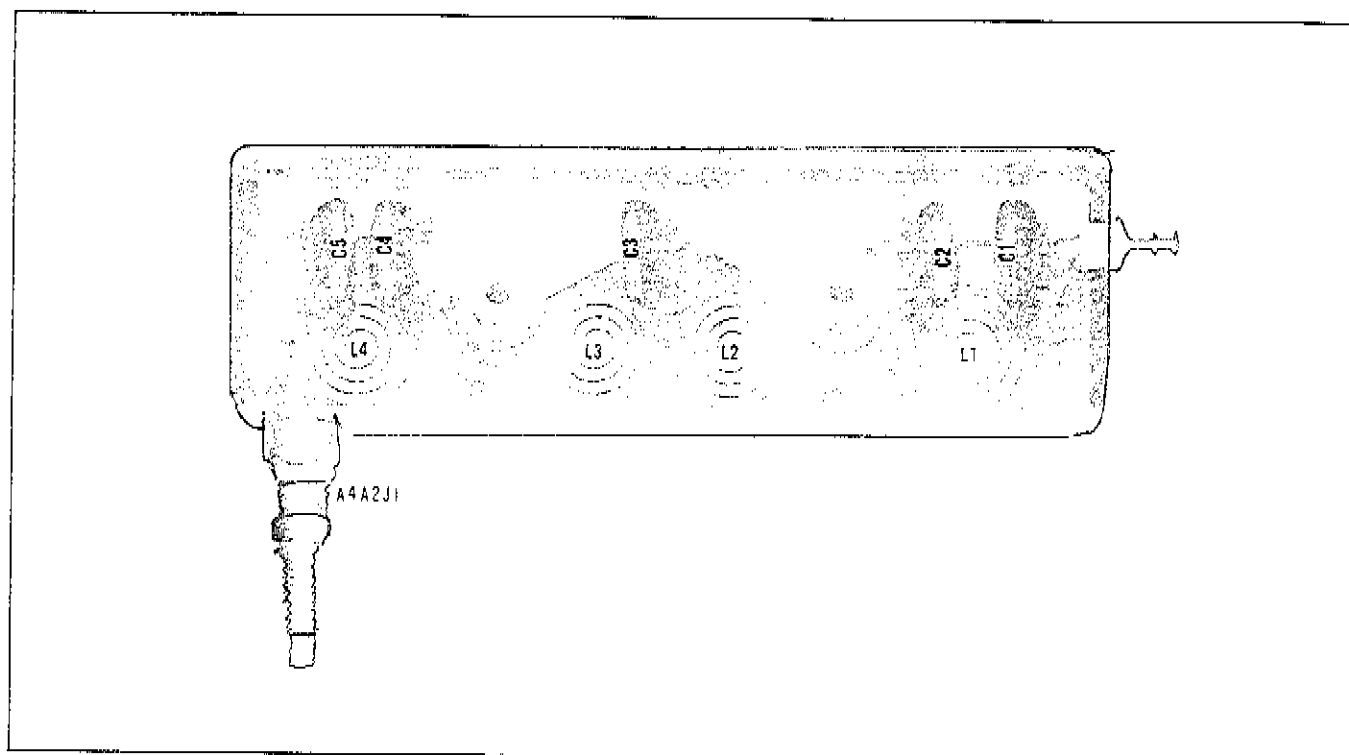


Figure 8-15. A4A2A1 Low Pass Filter, Component Identification

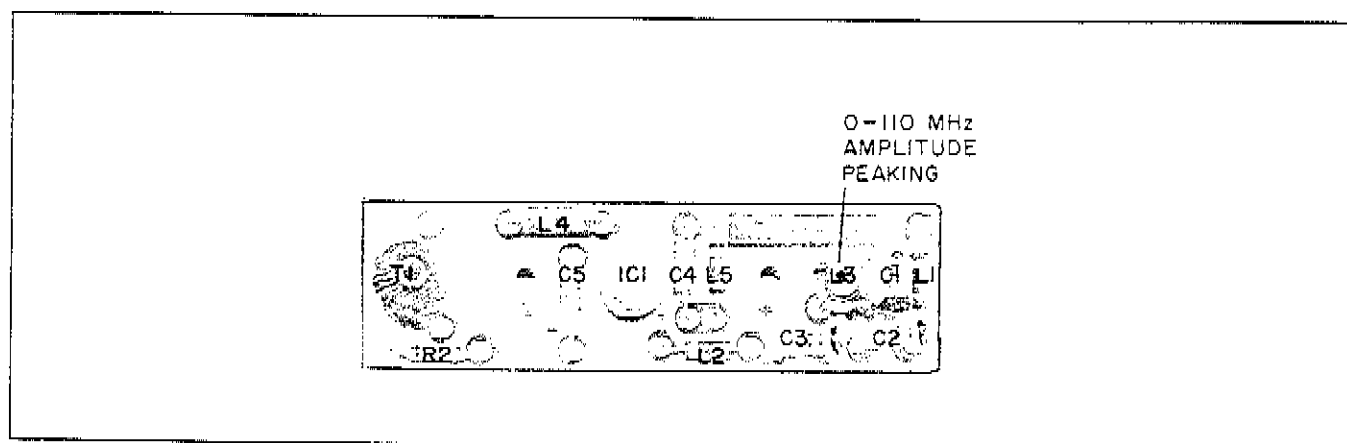
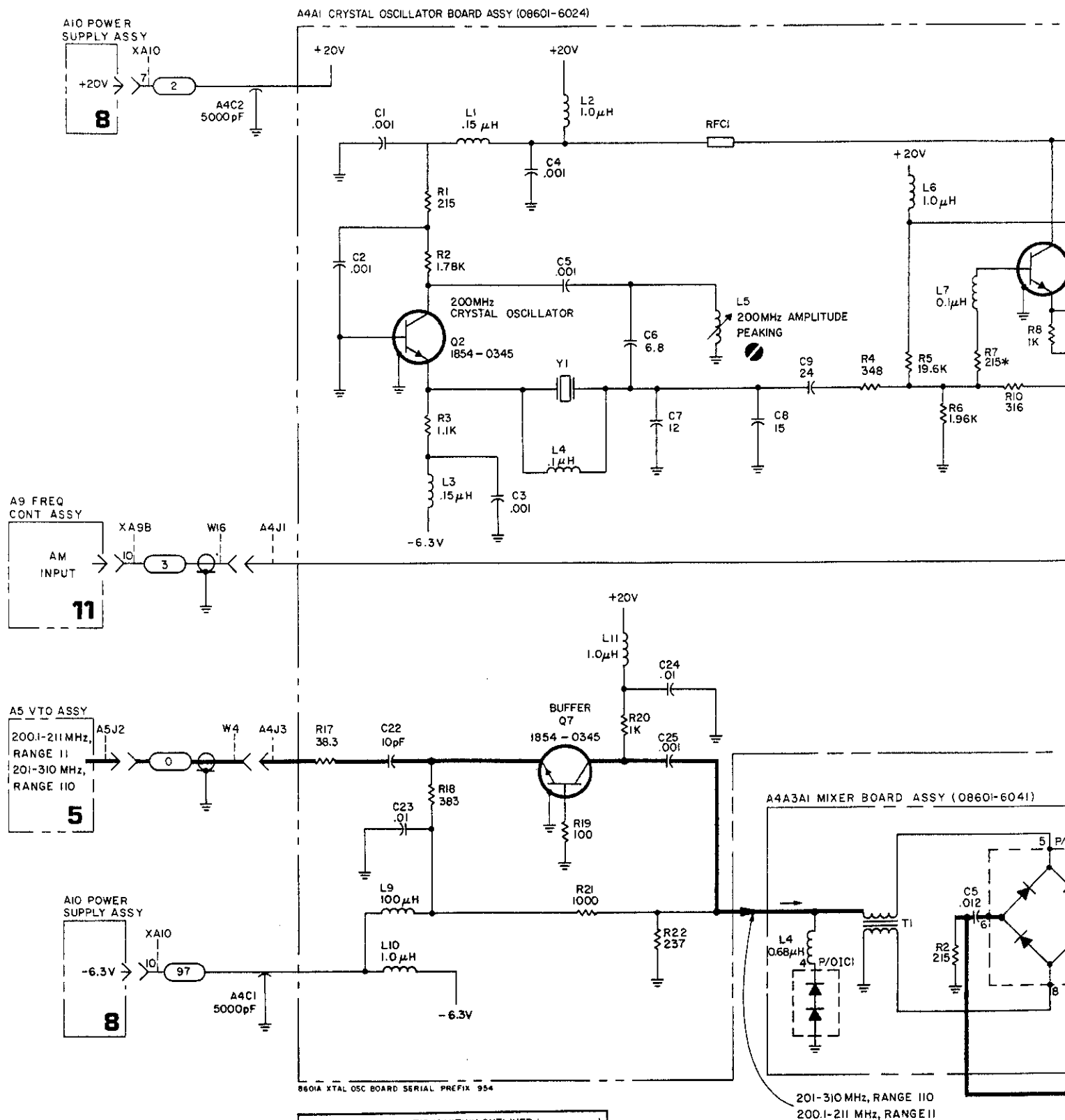


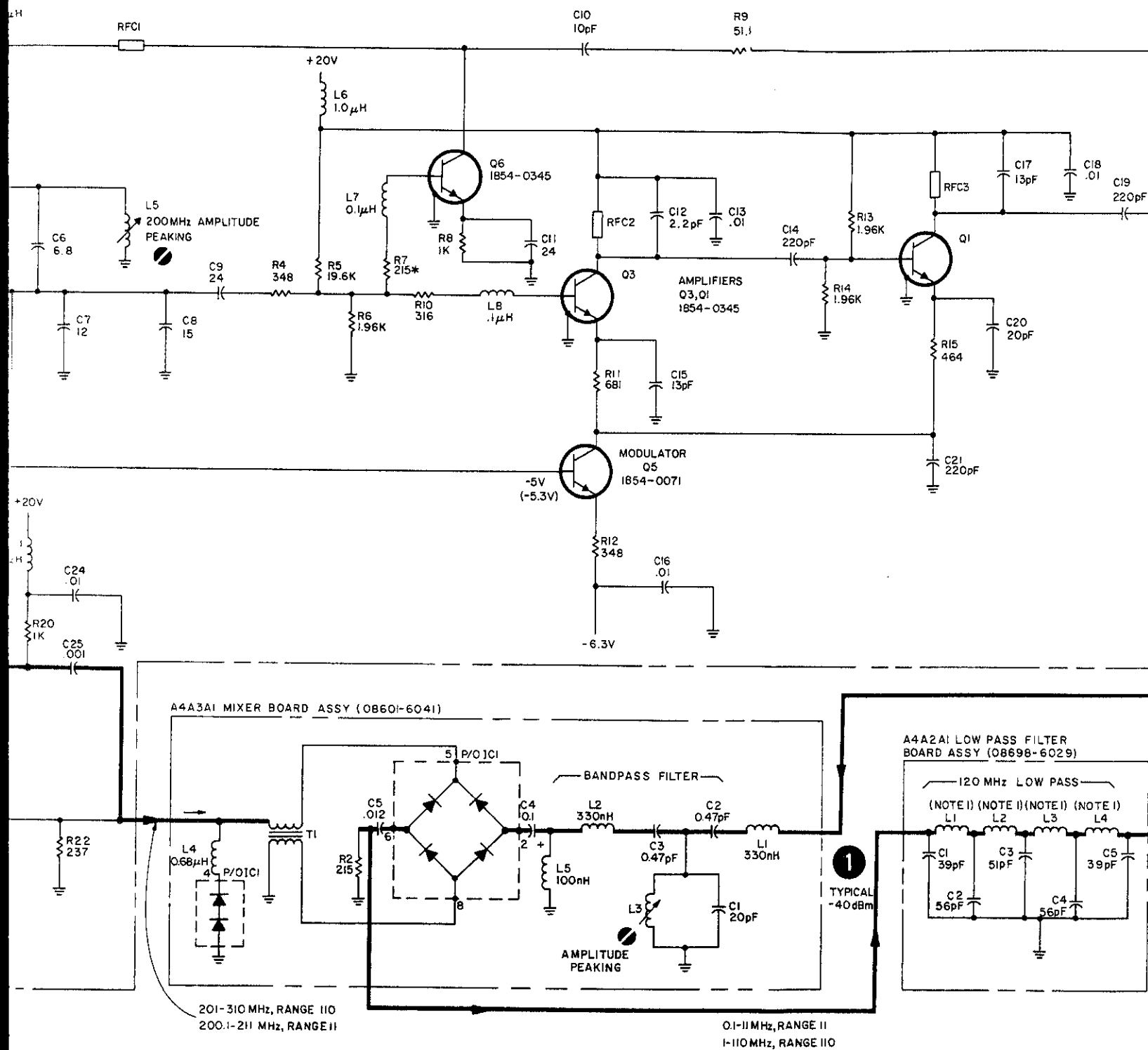
Figure 8-16. A4A3A1 Mixer, Component Identification

FIG. 8-17  
SMT. 1 of 3



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

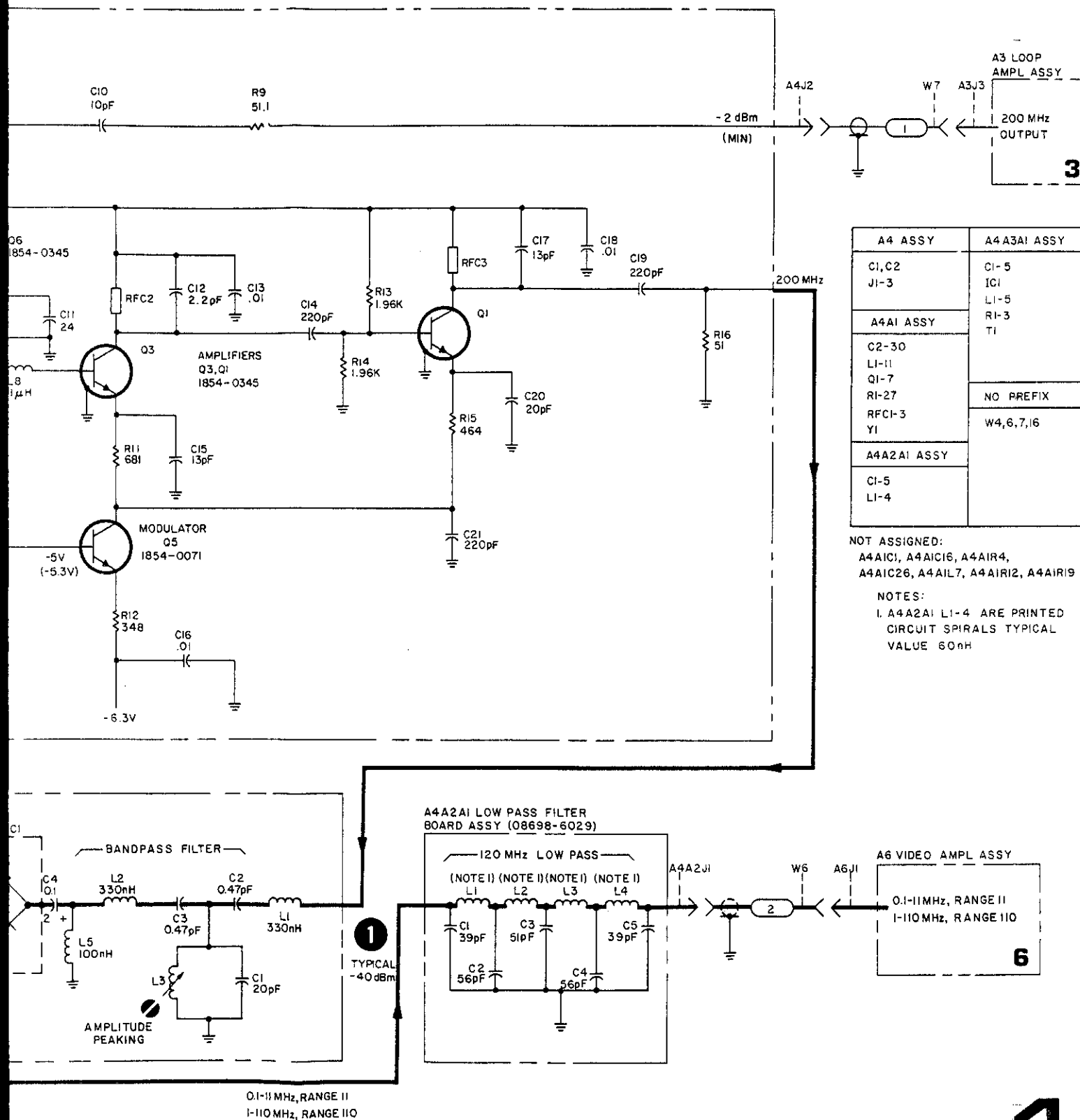
FIG. 8-17  
SMT. 2 of 3



Figure

FIG. 8-17  
SH. 3 of 3

Service



4

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 is 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.

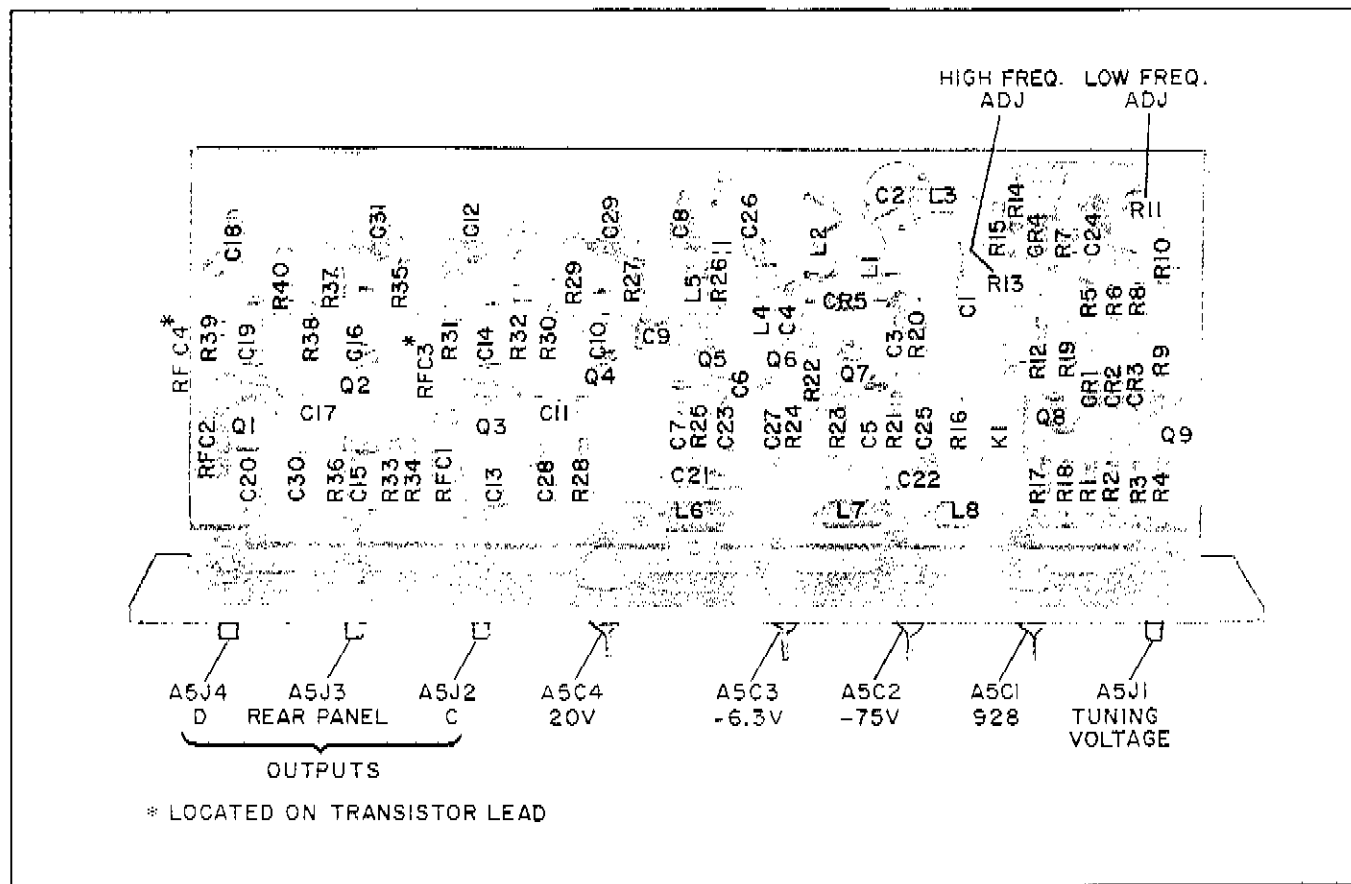
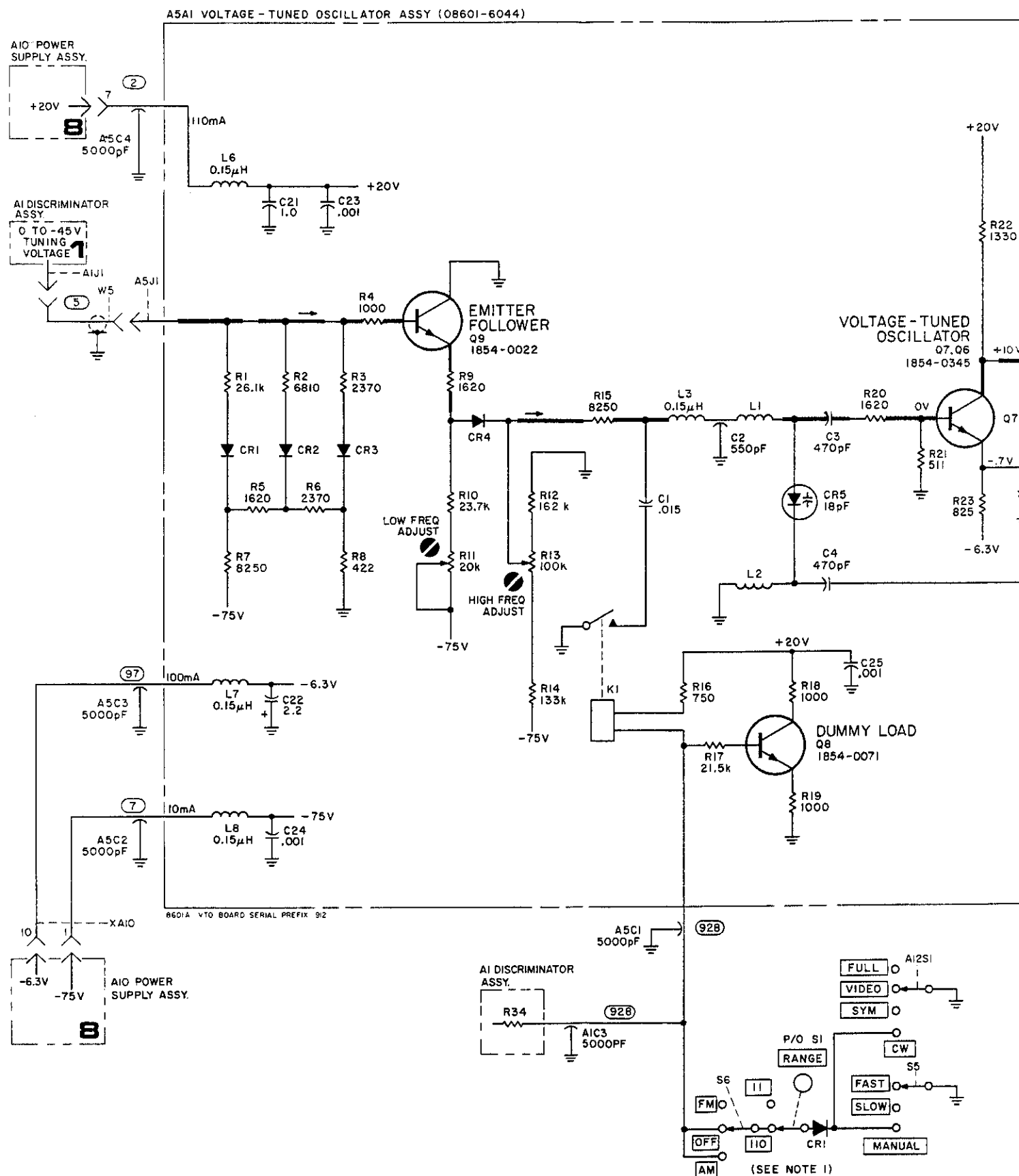
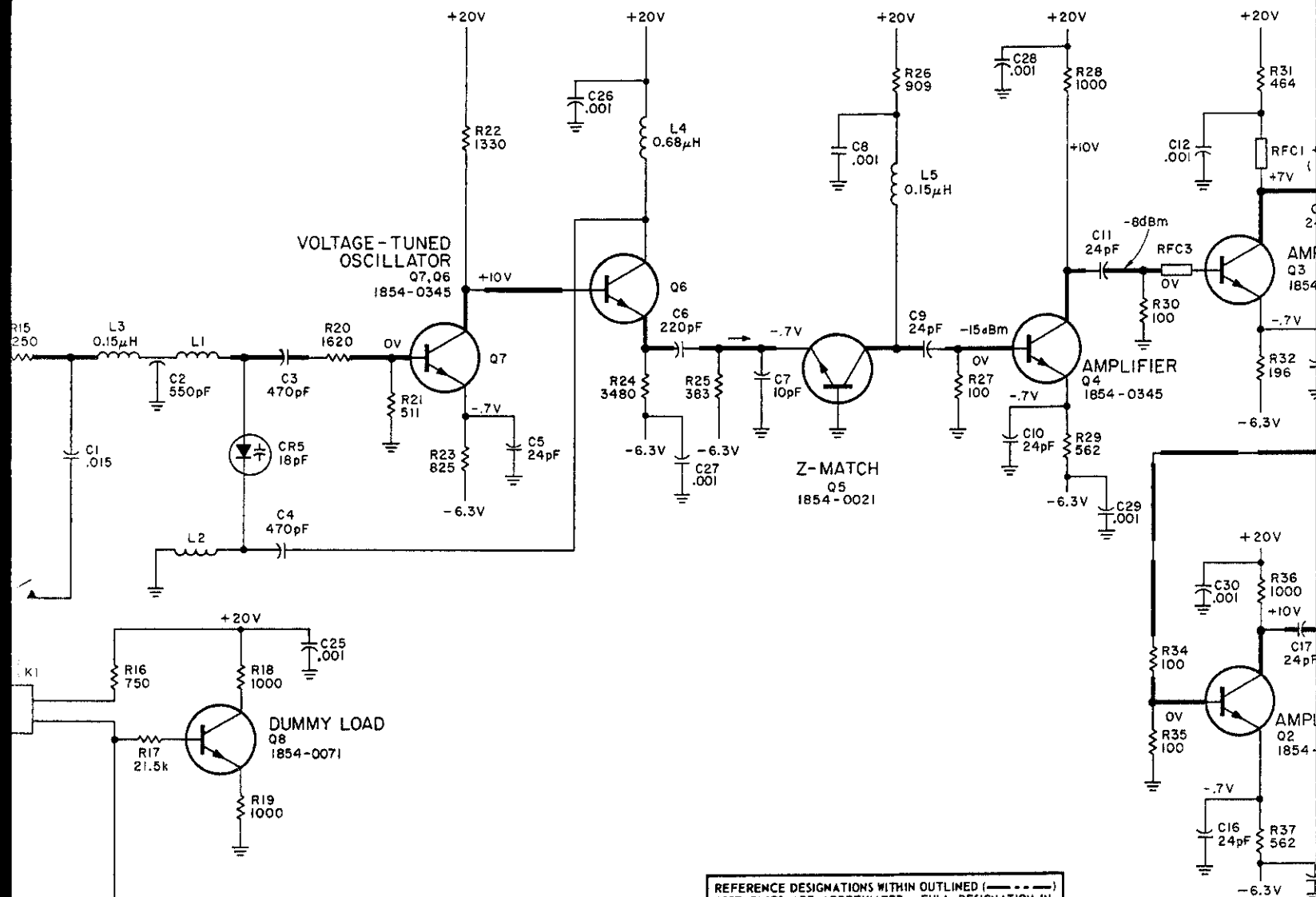


Figure 8-18. A5 VTO, Component Identification

FIG. 8-19  
SMT. 1 of 3



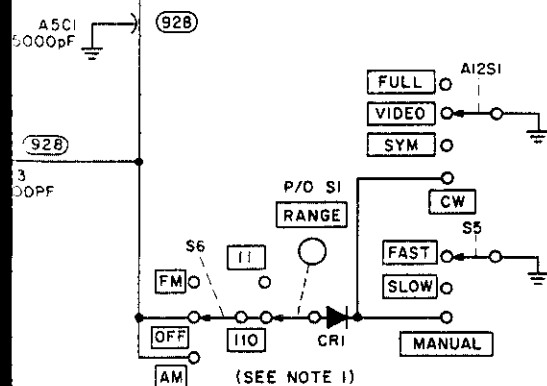
F16. 8-19  
Snr. 2 of 3

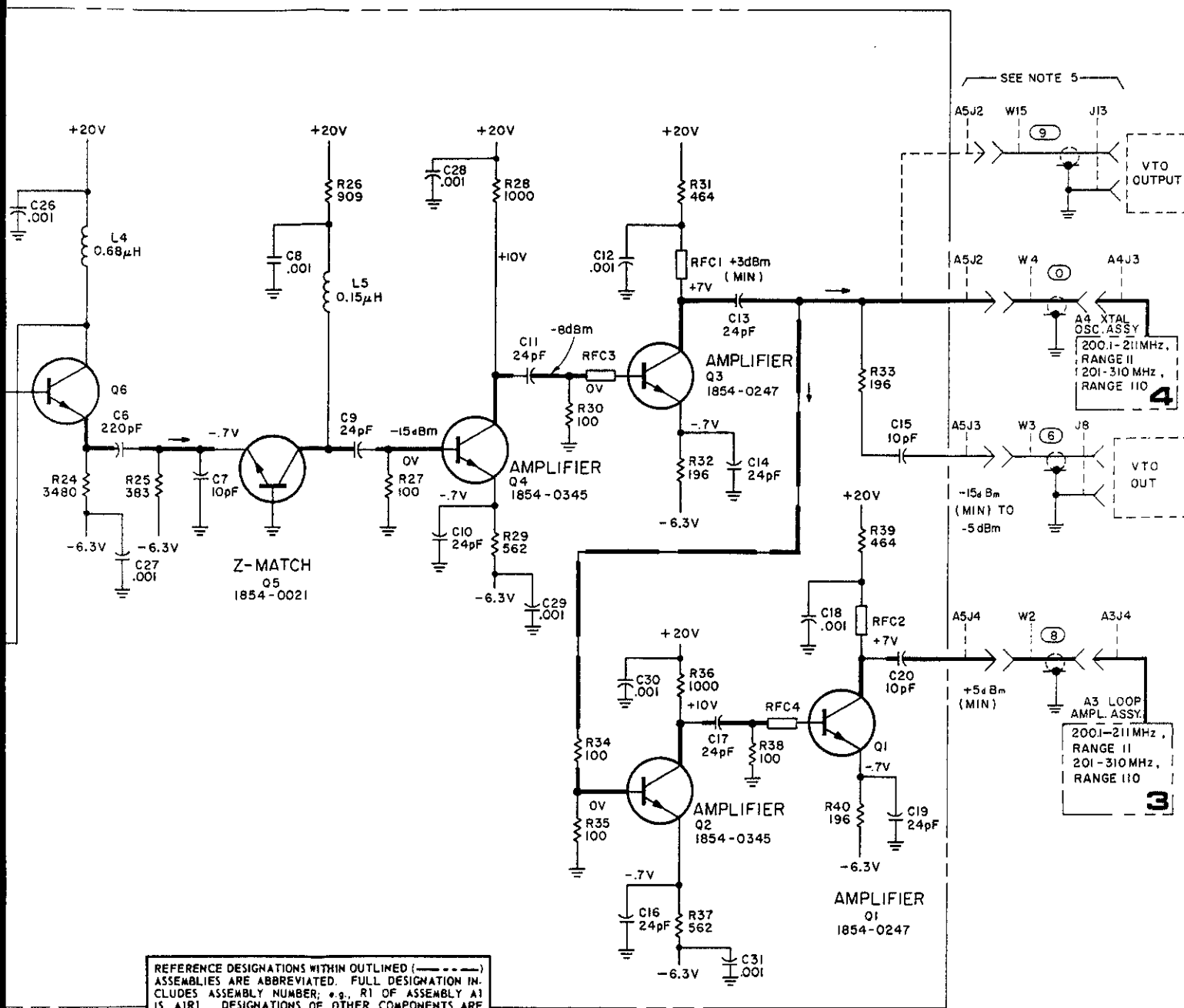


REFERENCE DESIGNATIONS WITHIN OUTLINED (---) ASSEMBLIES ARE ABBREVIATED. FULL DESIGNATION INCLUDES ASSEMBLY NUMBER, e.g., R1 OF ASSEMBLY A1 IS A1R1. DESIGNATIONS OF OTHER COMPONENTS ARE COMPLETE AS SHOWN.

#### 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.





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 | CRI - 5  | SI, 5, 6   |
|        | K1       | W2 - 5, 15 |
|        | L1 - 8   |            |
|        | Q1 - 9   |            |
|        | R1 - 40  |            |
|        | RFC1 - 4 |            |

## 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.

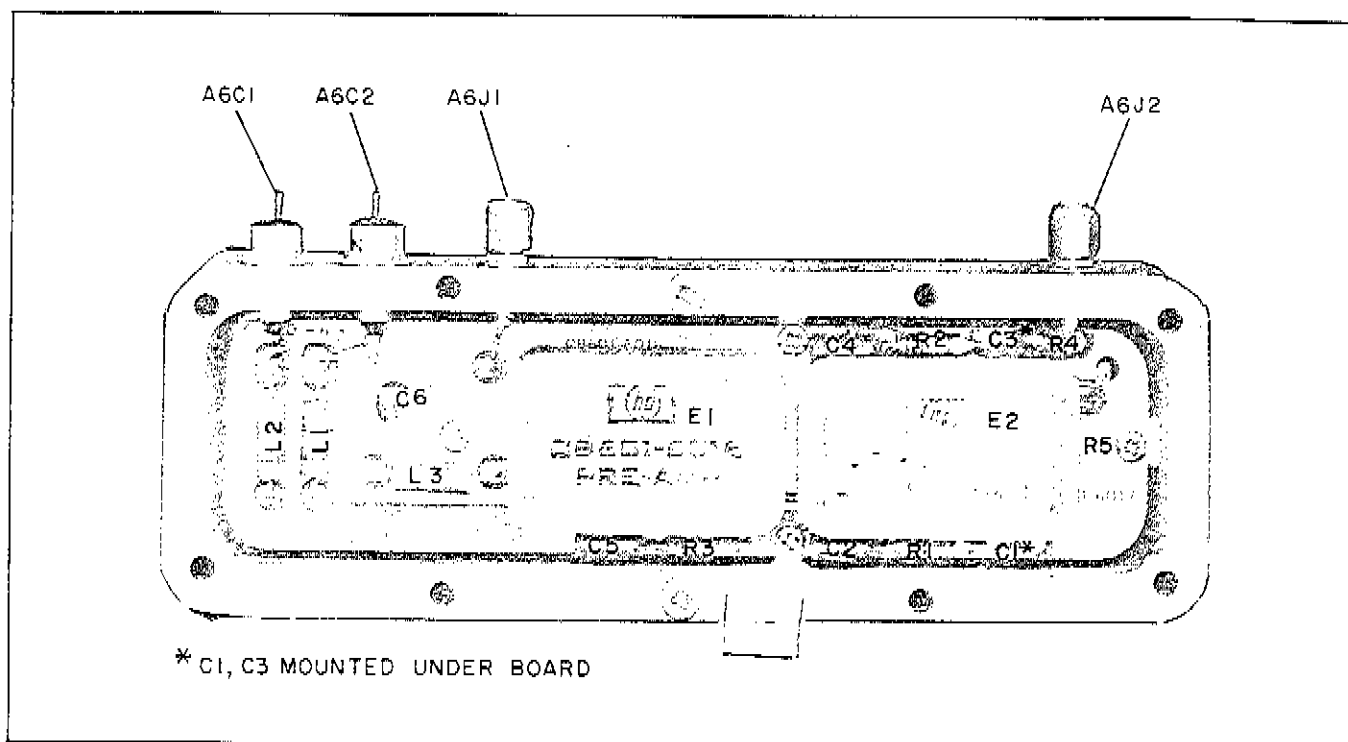


Figure 8-20. A6 Video Amplifier, Component Identification (Serial Prefixed 828- and Below)

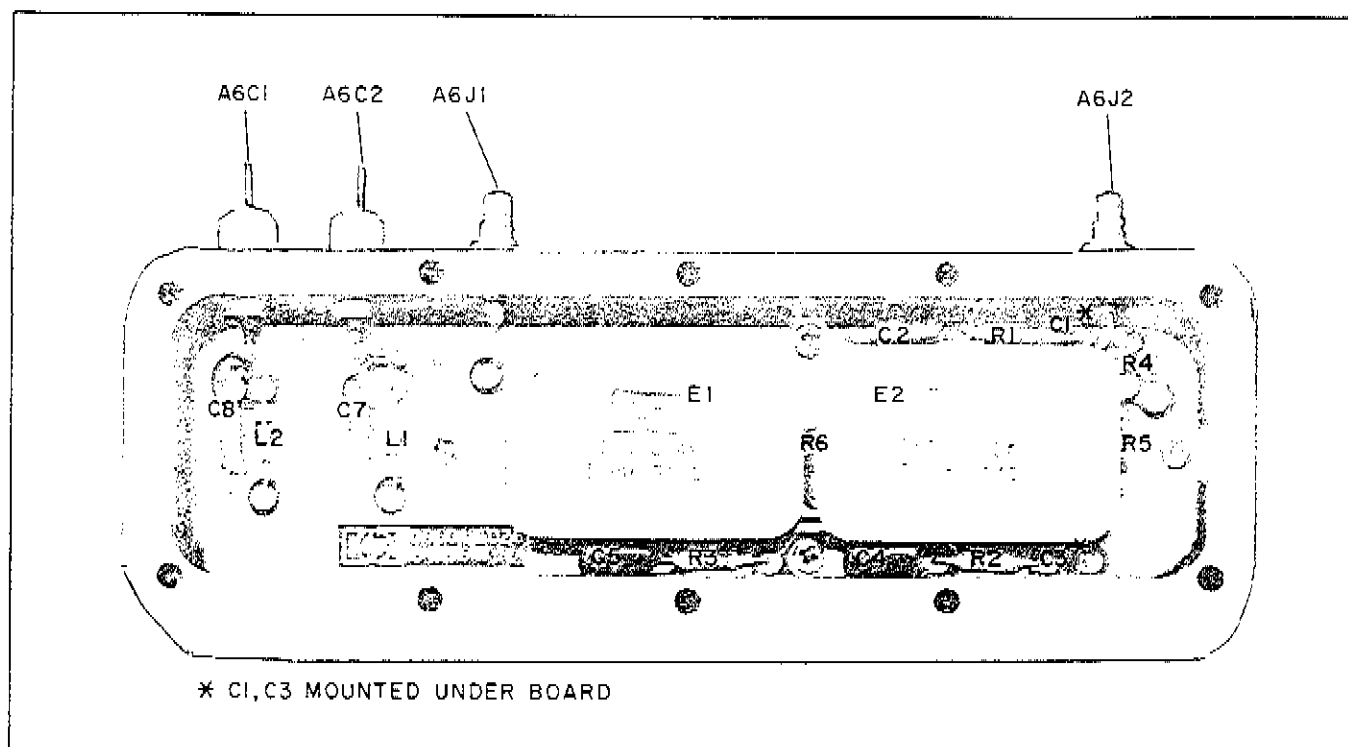
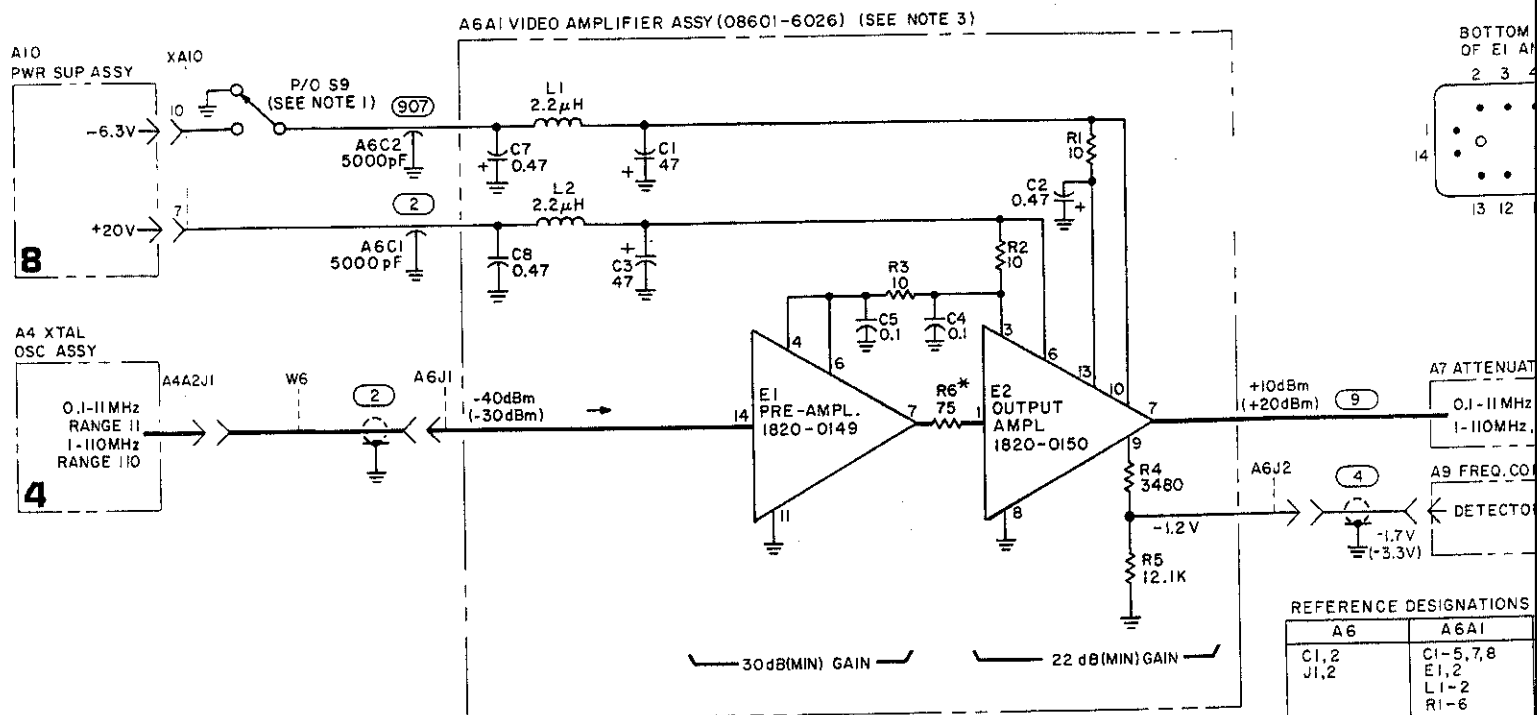


Figure 8-21. A6 Video Amplifier, Component Identification (Serial Prefixed 838- and Above)

FIG. 8-22  
SMT. 1 of 2



NOTES:

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

8601A-VISIO AMPLIFIER A6 SER. PRE. 838

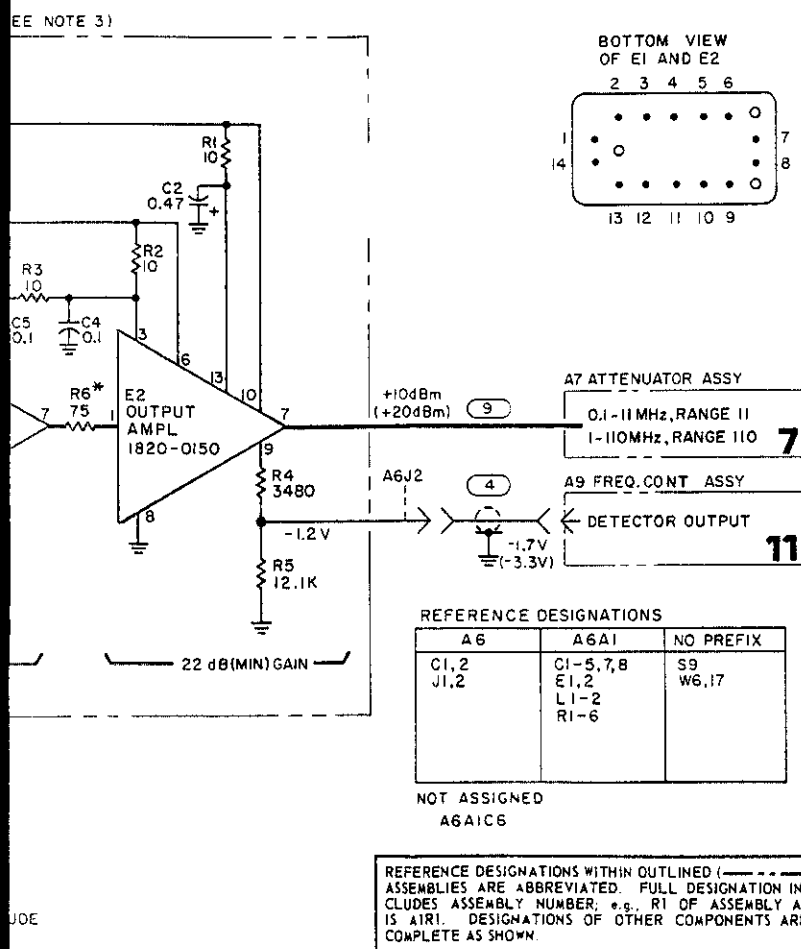
REFERENCE DESIGNATIONS

| A6           | A6A1                             |
|--------------|----------------------------------|
| C1,2<br>J1,2 | C1-5,7,8<br>E1,2<br>L1-2<br>R1-6 |

NOT ASSIGNED  
A6A1C6

REFERENCE DESIGNATIONS WITHIN OUT ASSEMBLIES ARE ABBREVIATED. FULL INCLUDES ASSEMBLY NUMBER; e.g., R1 IS A1R1. DESIGNATIONS OF OTHER COMPLETE AS SHOWN.

FIG. 8-22  
SHT. 2 of 2



6

Figure 8-22. A6 Video Amplifier, Schematic Diagram

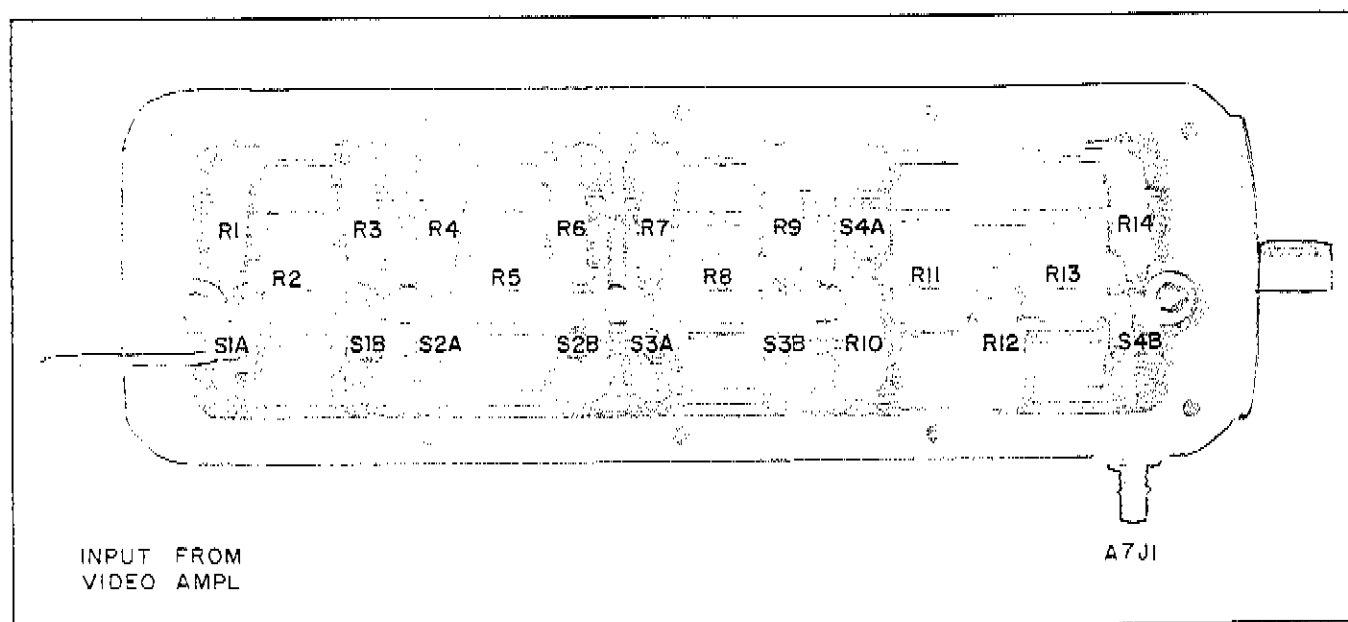
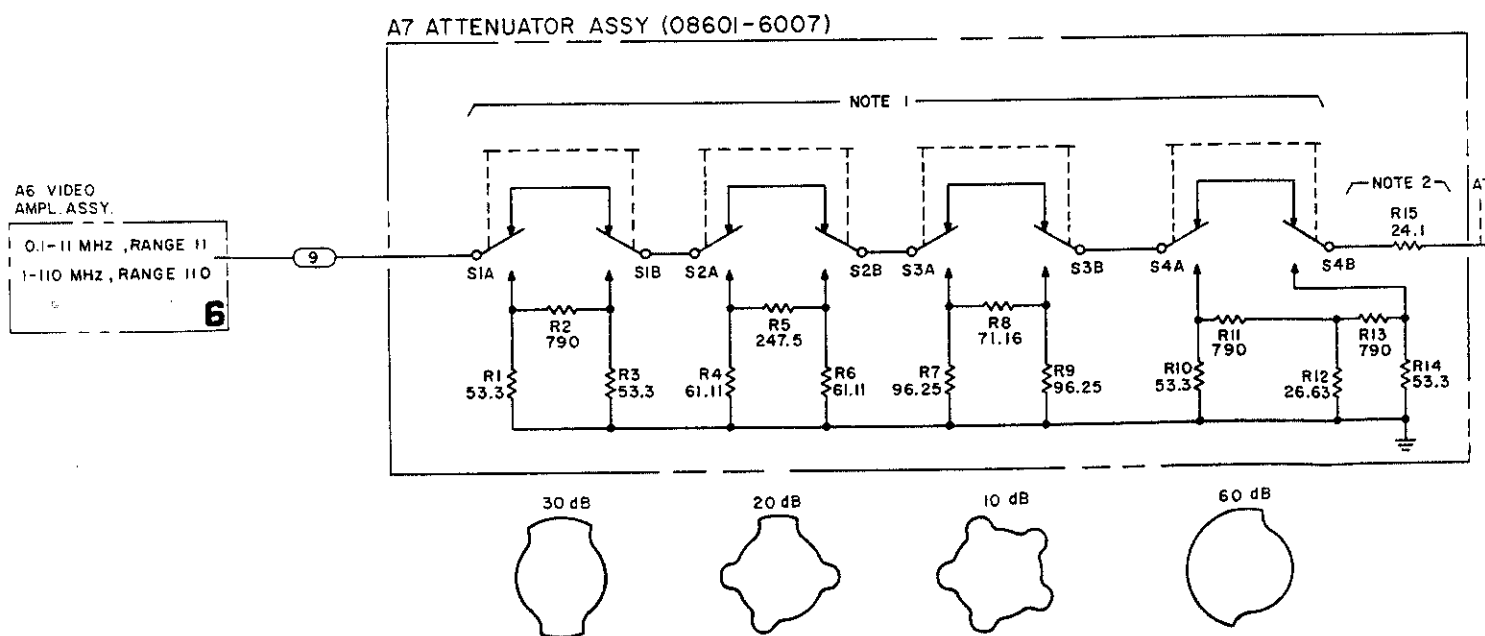
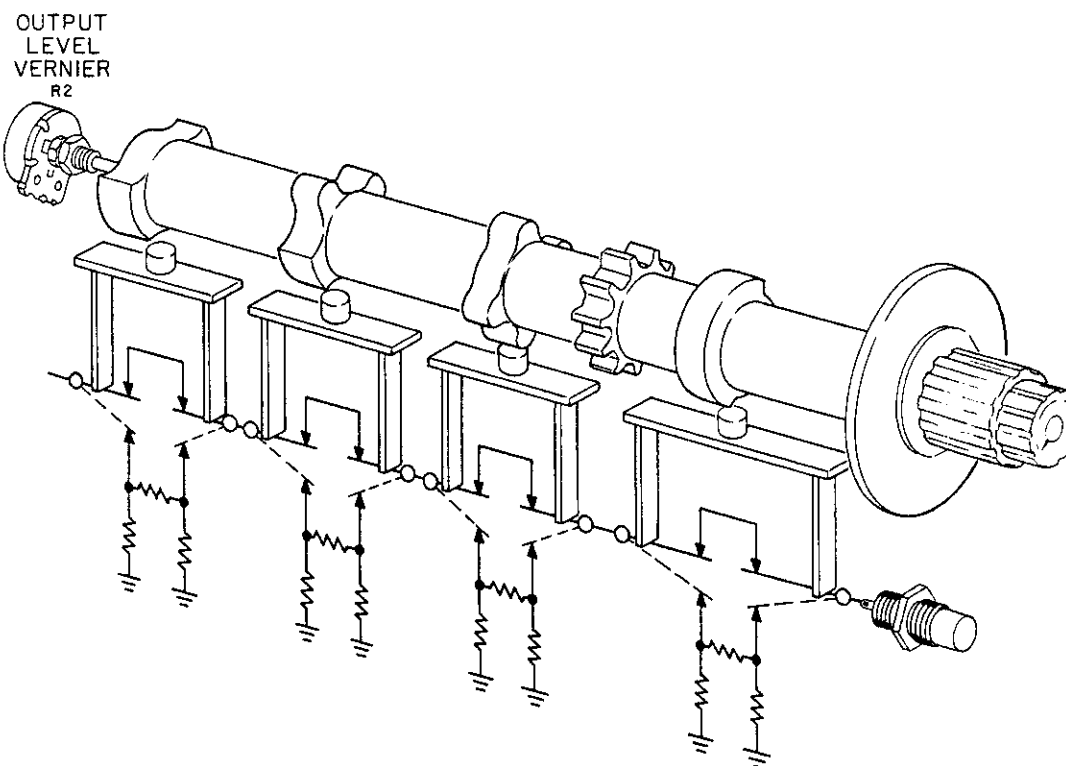


Figure 8-23. A7 Attenuator, Component Identification

FIG. 8-24  
SHT. 1 OF 2



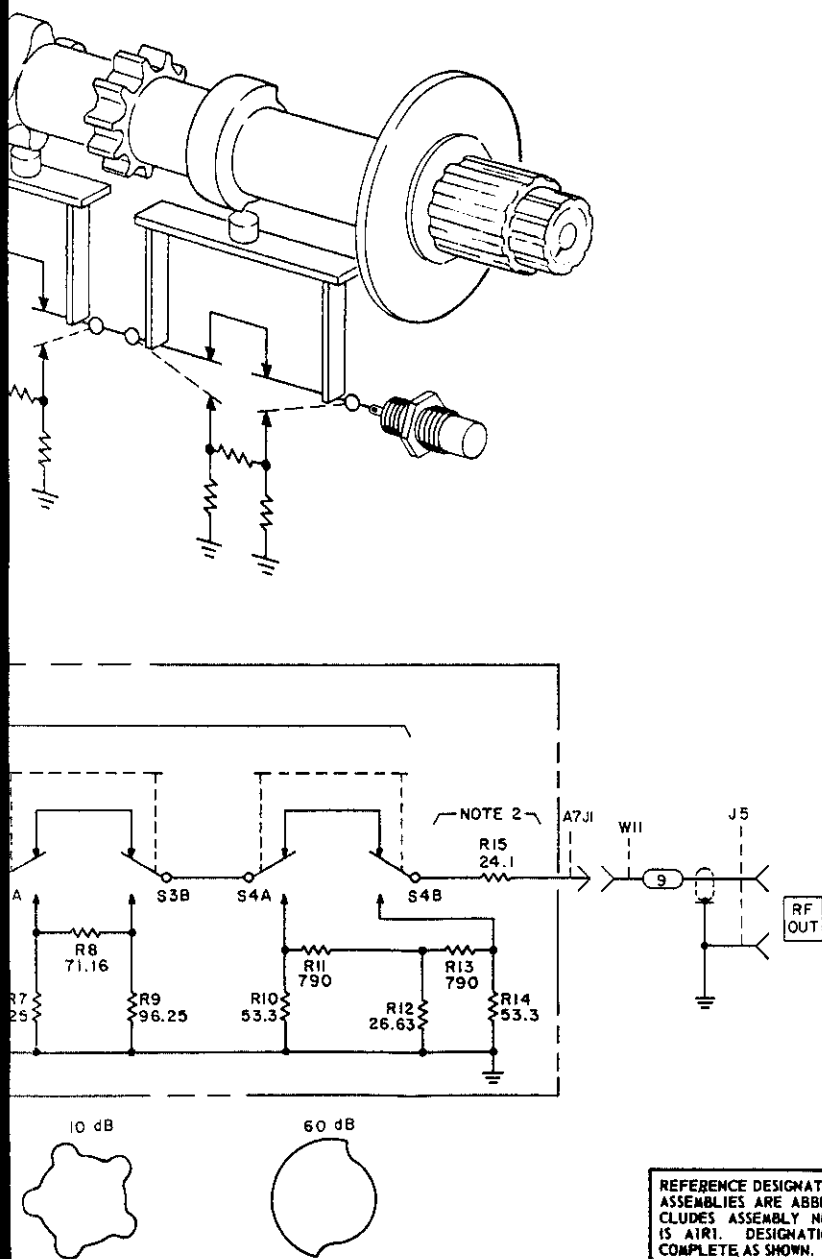
NOTE

1. MICROSWITCH SHOWN IN NORMAL (UNOPERATED) CONDITION
2. RESISTOR A7R15 INSTALLED FOR OPTIONS 008,009 AND 010 ONLY.

CAM PROFILES

| REFERENCE DESIGN |  |
|------------------|--|
| A7               |  |
| J1               |  |
| R1-14            |  |
| S1-8             |  |

FIG. 8-24  
SMT. 2 of 2



ILES

## REFERENCE DESIGNATIONS

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

Figure 8-24. A7 Attenuator, Schematic Diagram  
8-21b

## 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.

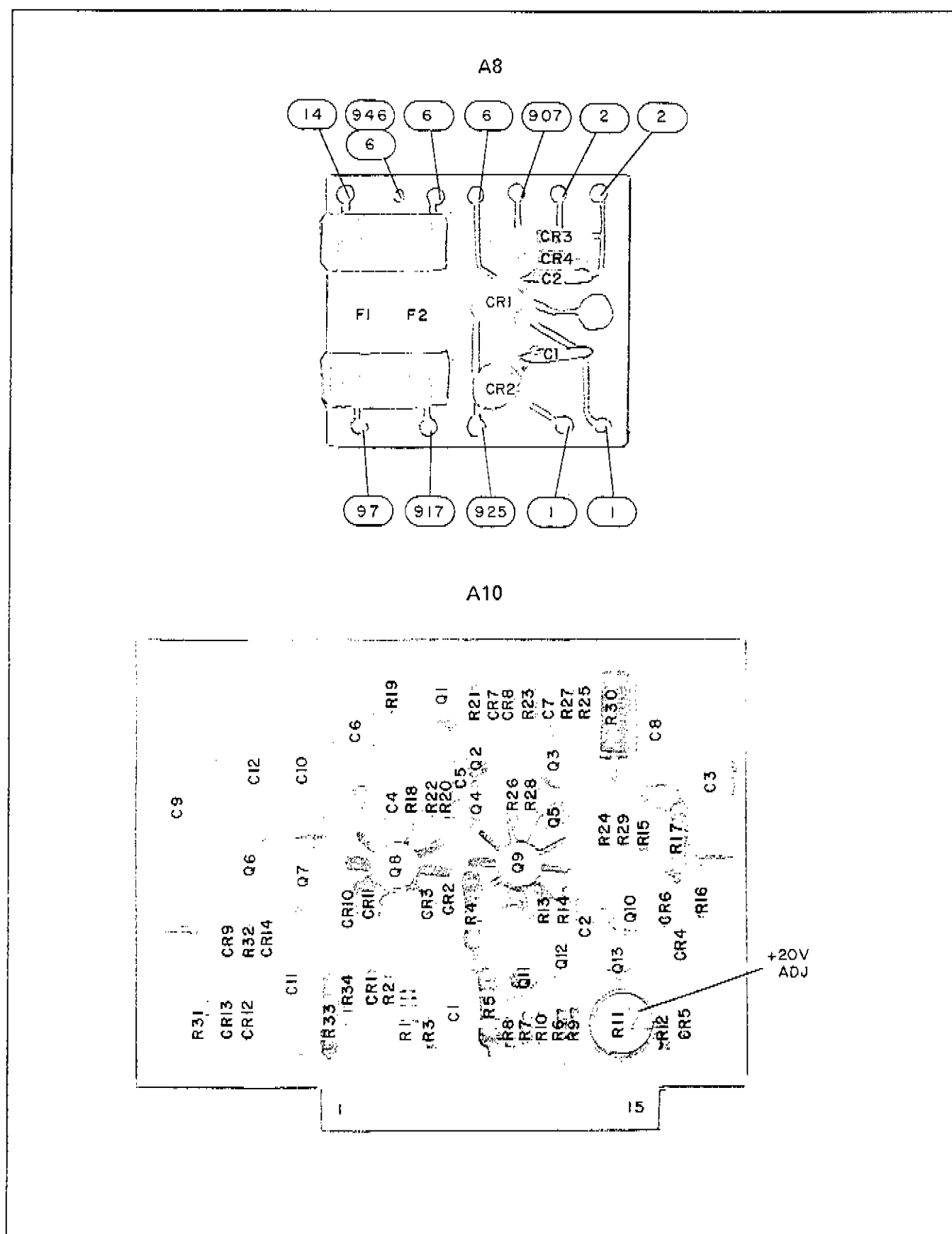


Figure 8-25. A8 Rectifier, A10 Power Supply, Component Identification

FIG. 8-26  
SHT. 1 of 3

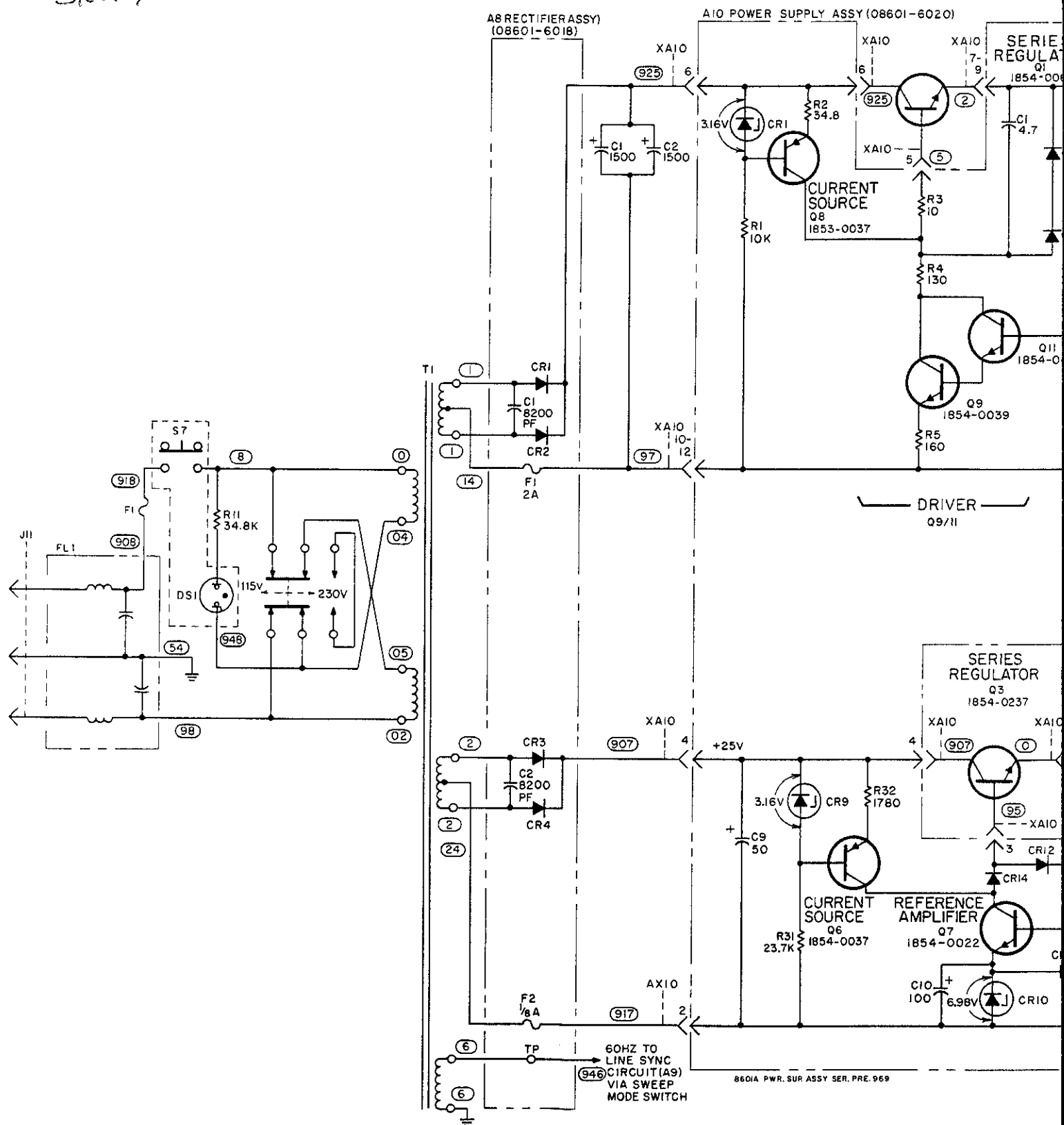
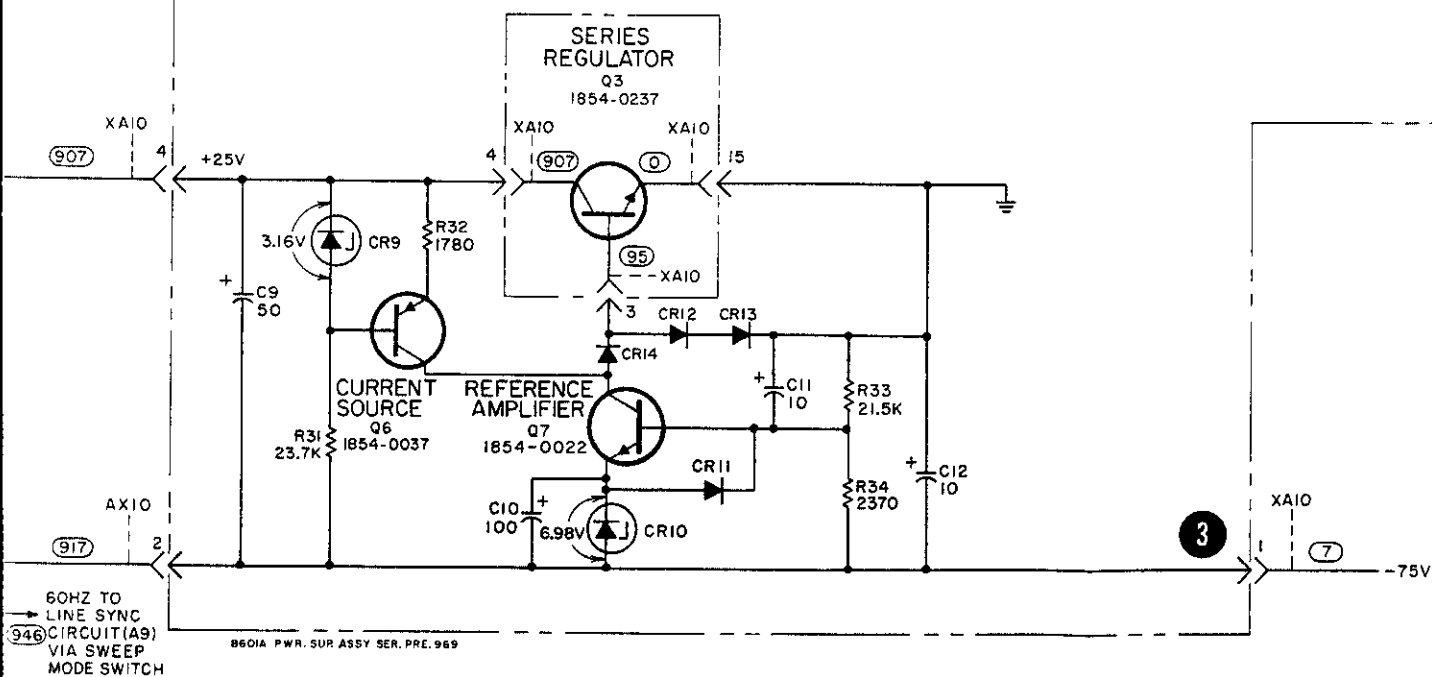
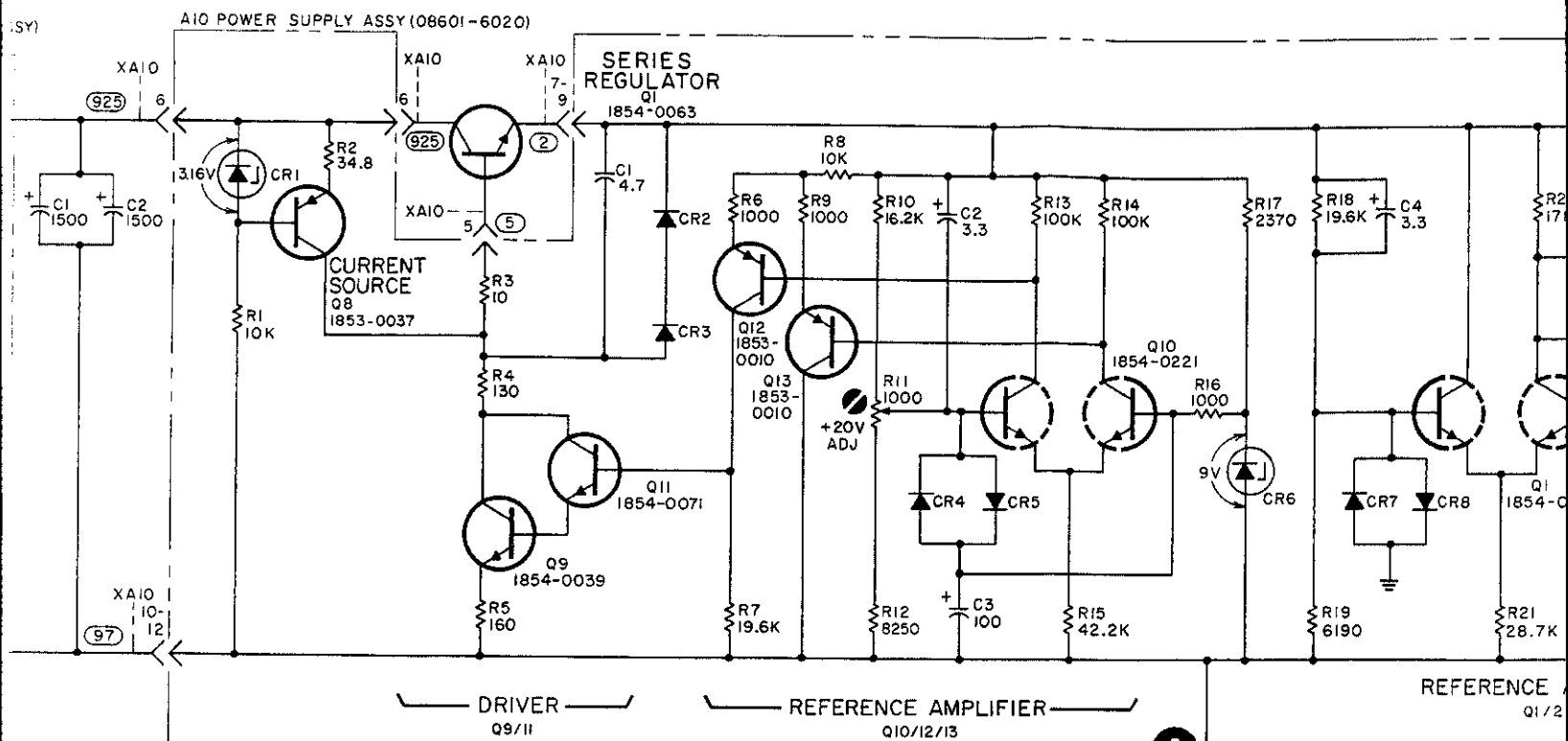


FIG. 8-26  
SHT. 2 of 3



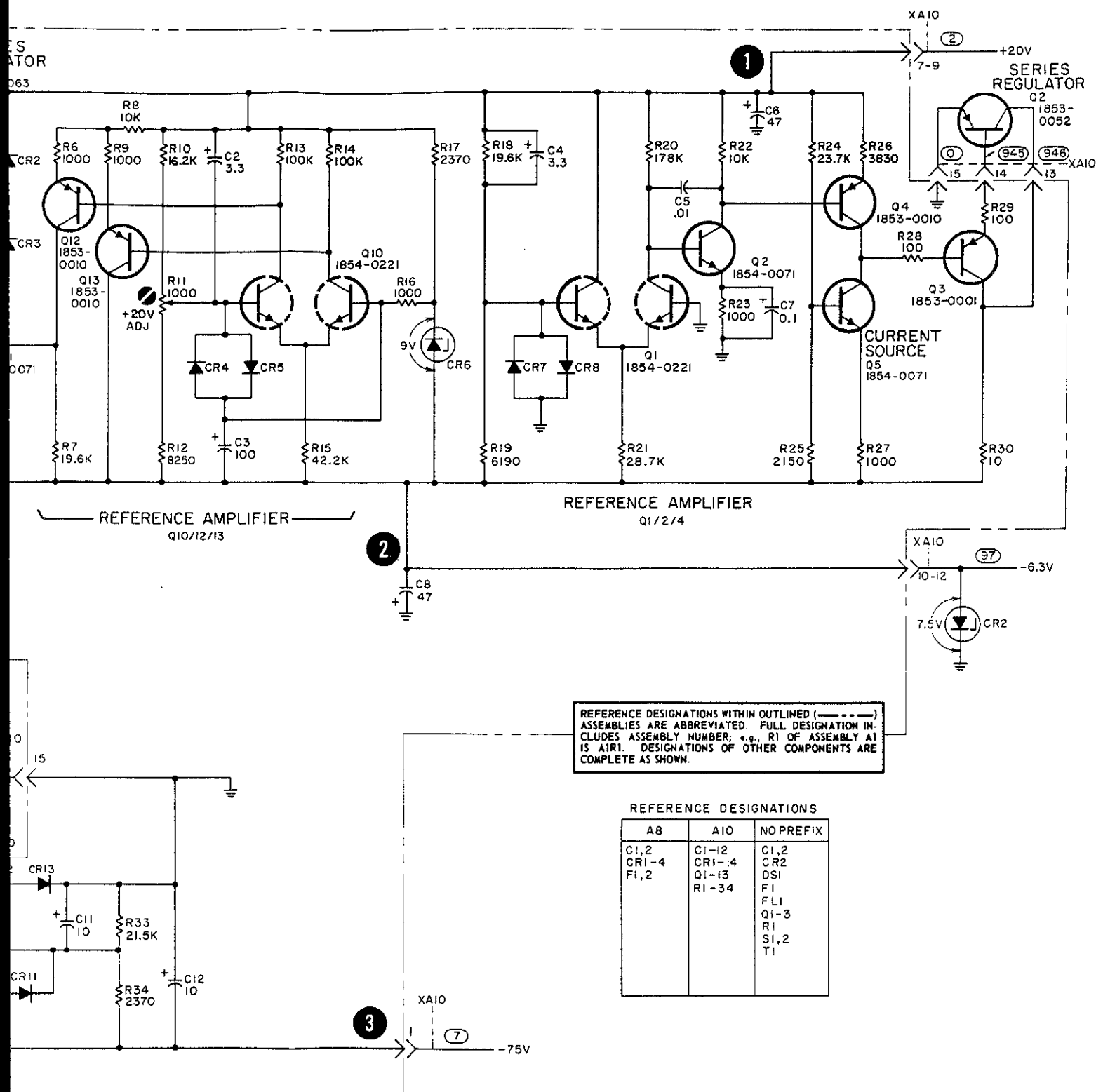
REFERENCE DESIGN  
ASSEMBLIES ARE  
INCLUDES ASSEMBLY  
IS AIR1. DESIGN  
COMPLETE AS SHOWN

## REFER

|       |
|-------|
| A8    |
| CI,2  |
| CR1-4 |
| FI,2  |

FIG. 8-26  
SHT. 3 of 3

Service



8

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

8-23b

## 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.  $\Delta$  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.

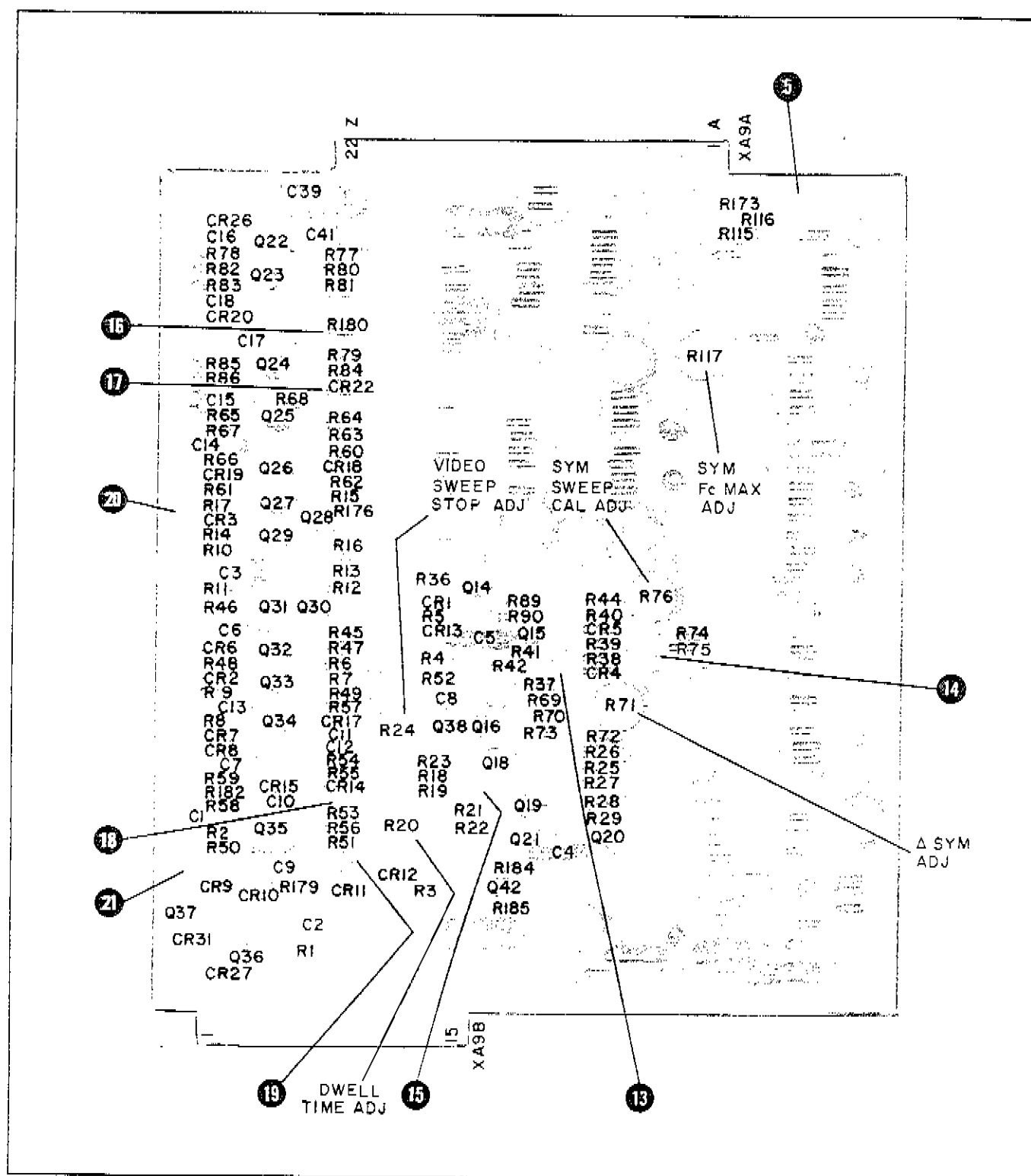


Figure 8-27. P/O A9 Assembly, Sweep Generator, Component Identification

FIG. 8-28  
SHT. 1 OF 3

P/O A9 FREQUENCY CONTROL ASSY (08601-6019)

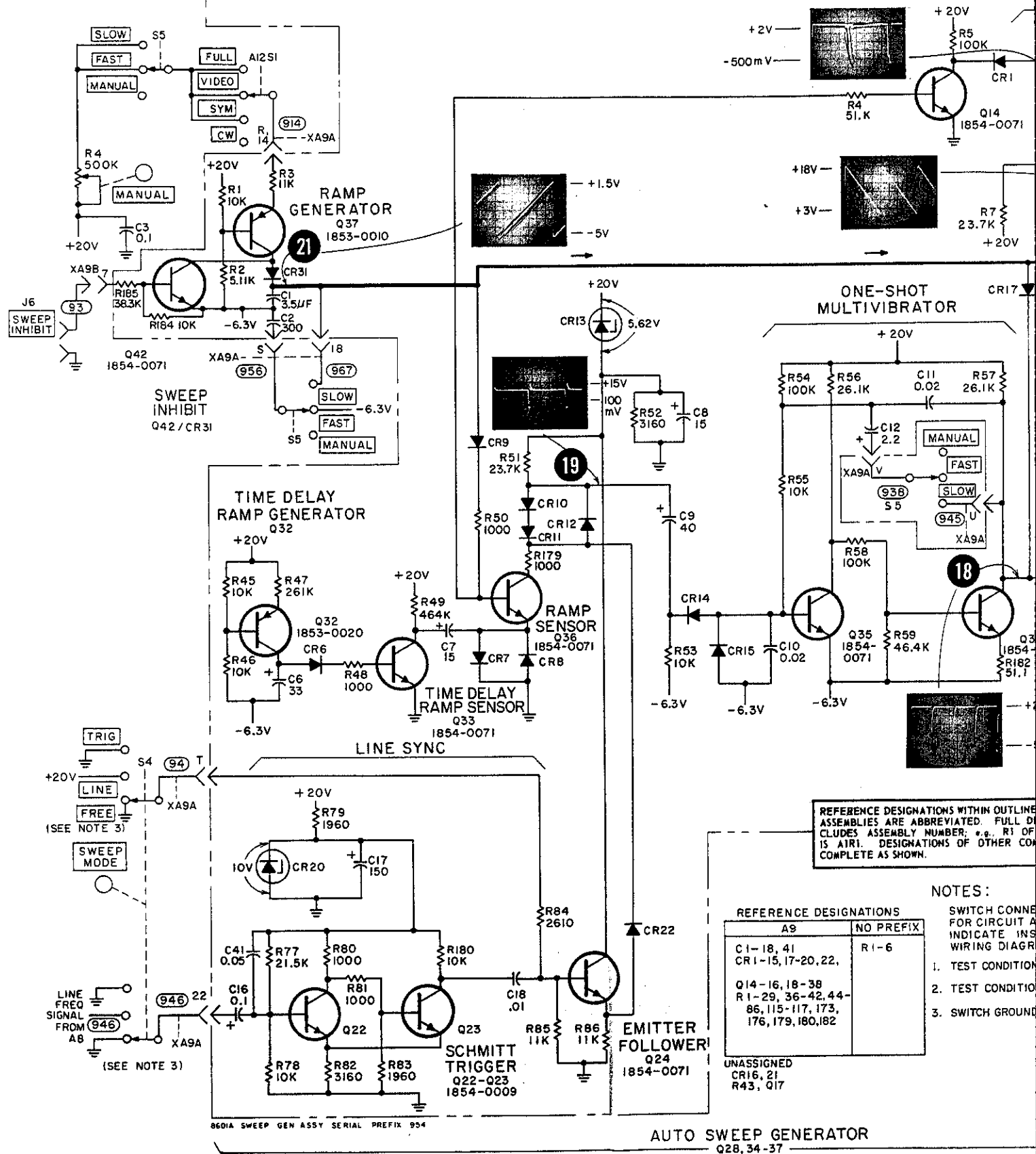
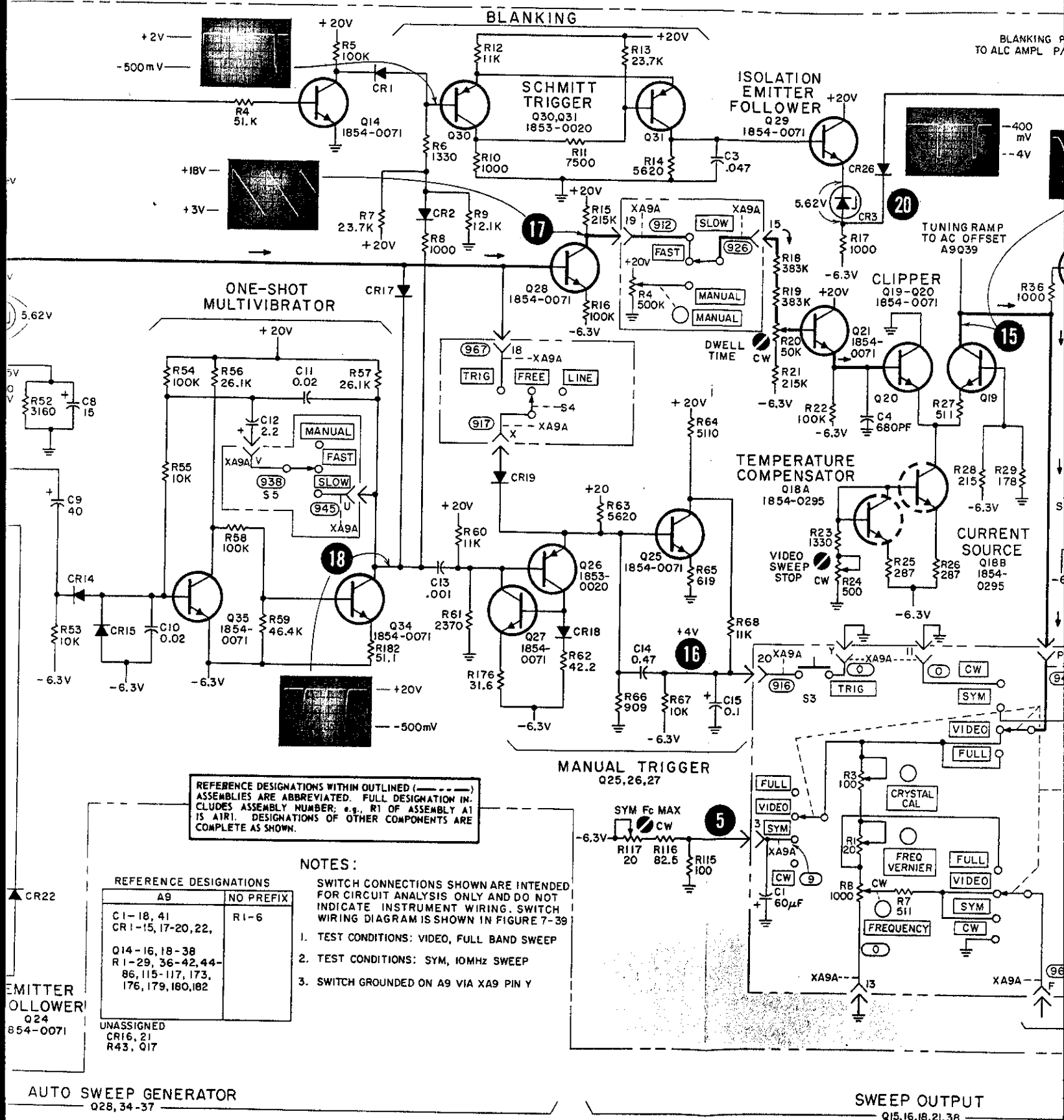


FIG. 8-28  
SHT. 2 OF 3



Figure

FIG. 8-28  
SMT. 3 of 3

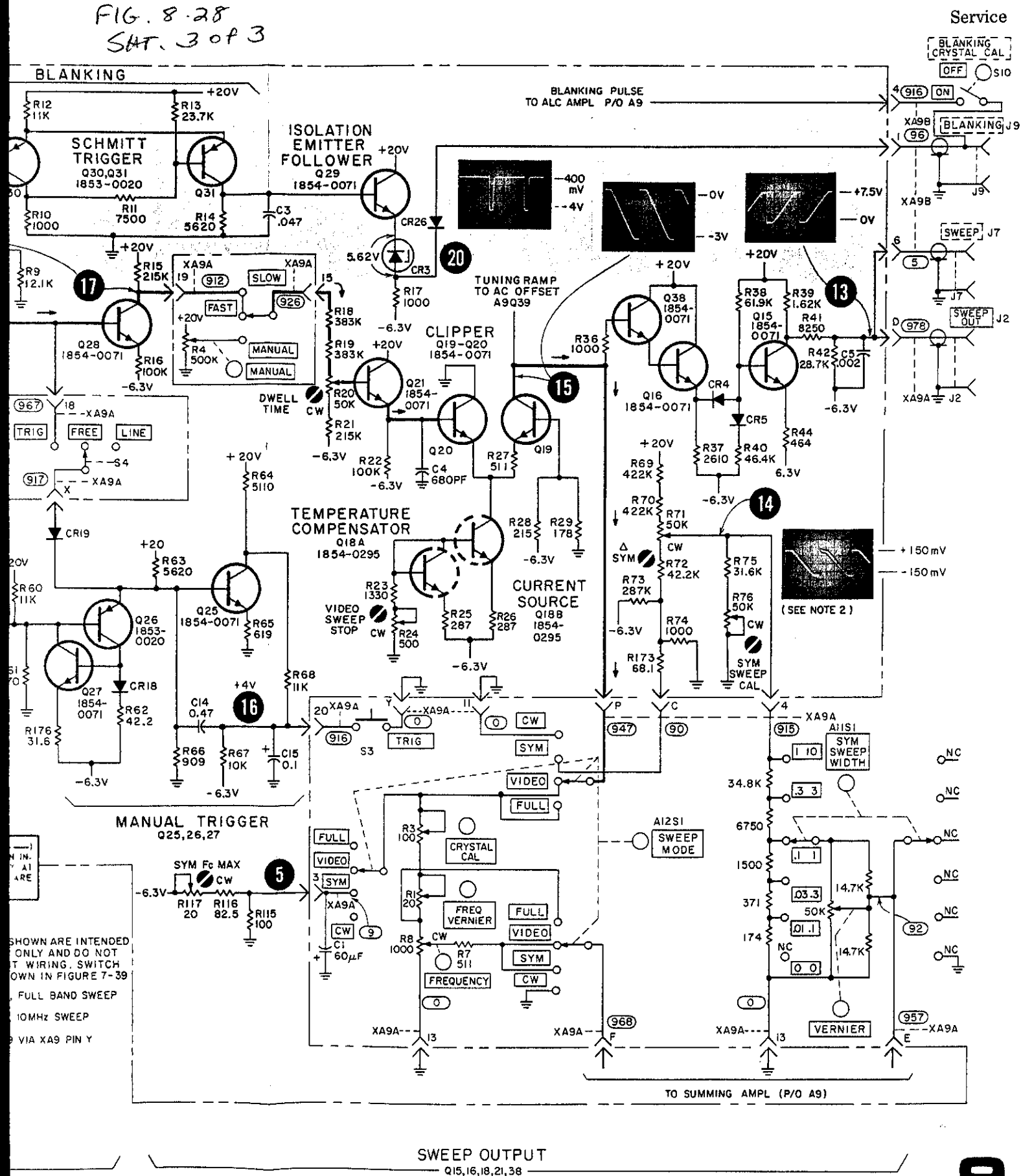


Figure 8-28. P/O A9 Assembly, Sweep Generator, Schematic Diagram

## 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.

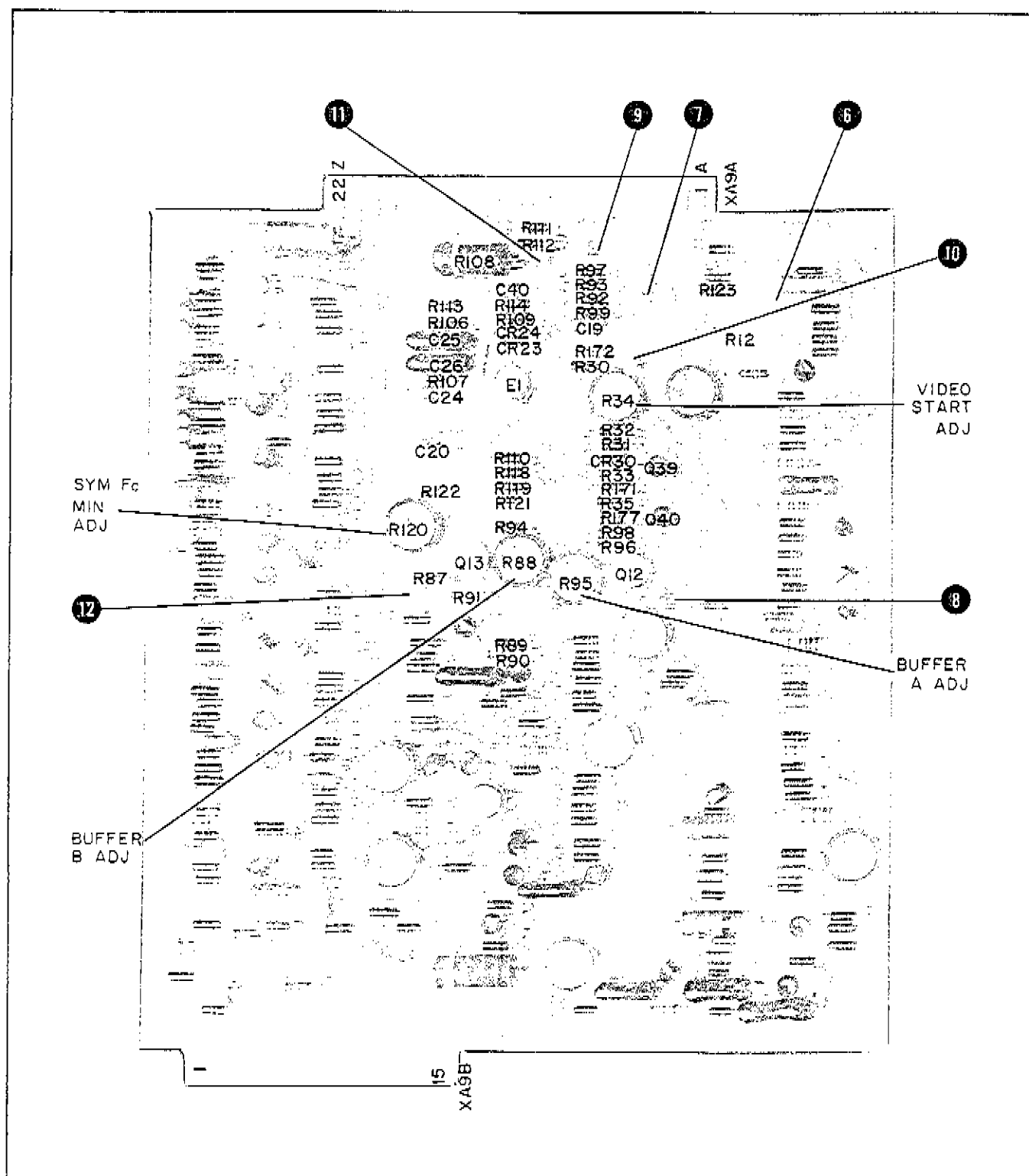


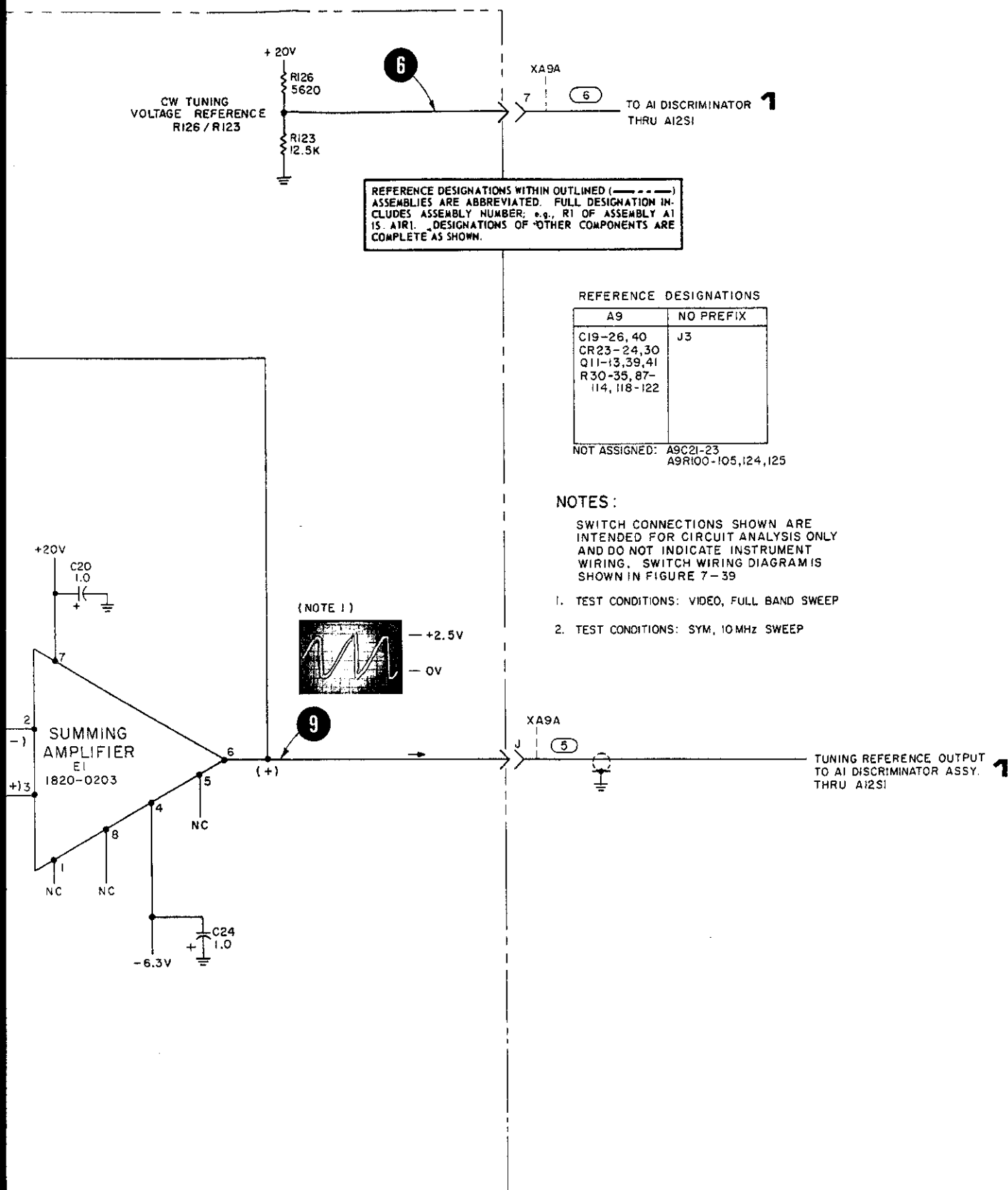
Figure 8-29. P/O A9 Assembly Summing Amplifier, Component Identification

AC OFFSET



FIG. 8-30  
SHT. 2 of 2

Service



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Figure 8-30. P/O A9 Assembly, Summing Amplifier, Schematic Diagram

8-27b

**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.

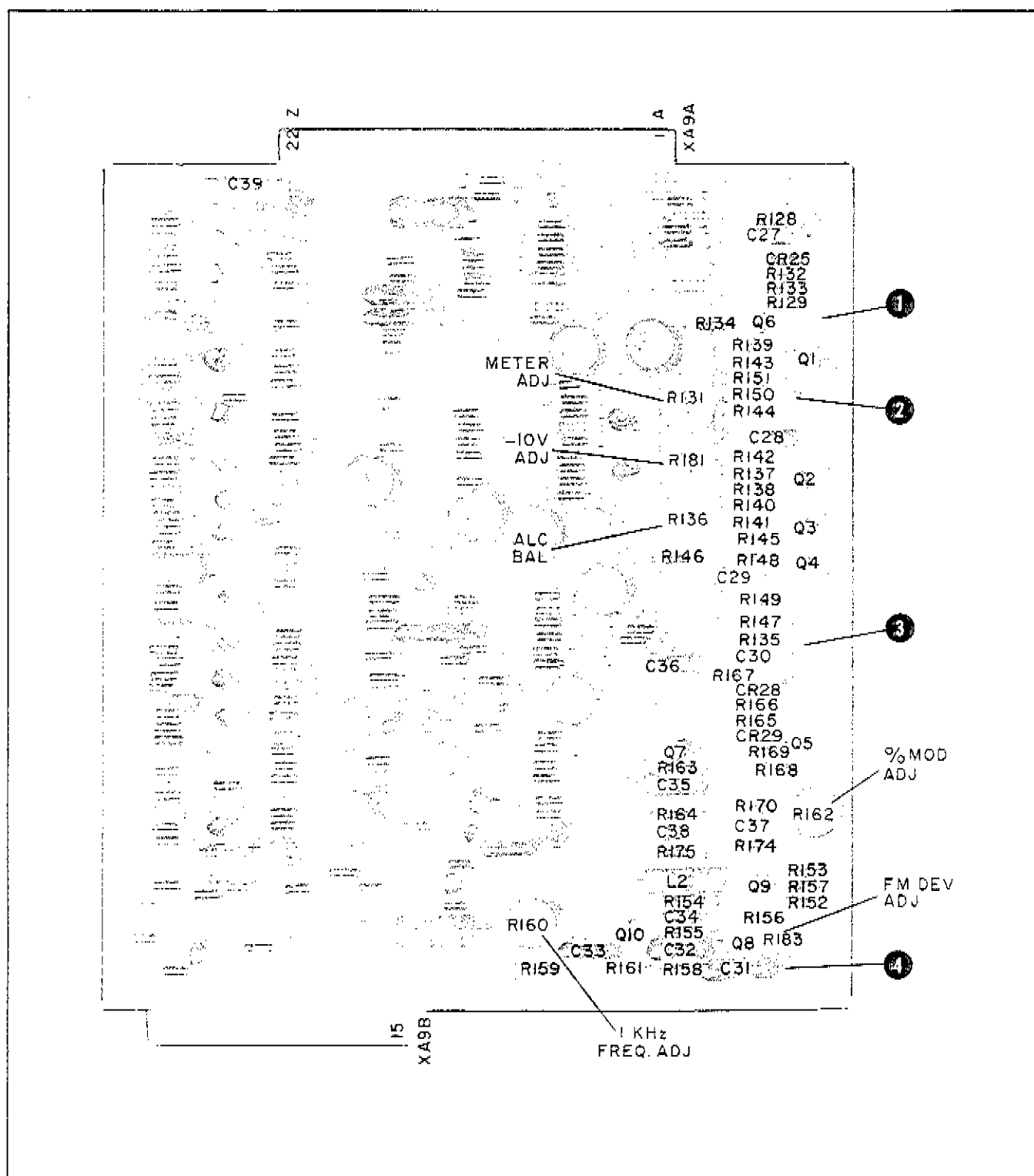


Figure 8-31. P/O A9 Assembly, ALC Amplifier, Component Identification

FIG. 8-32  
SHT. 1 OF 3

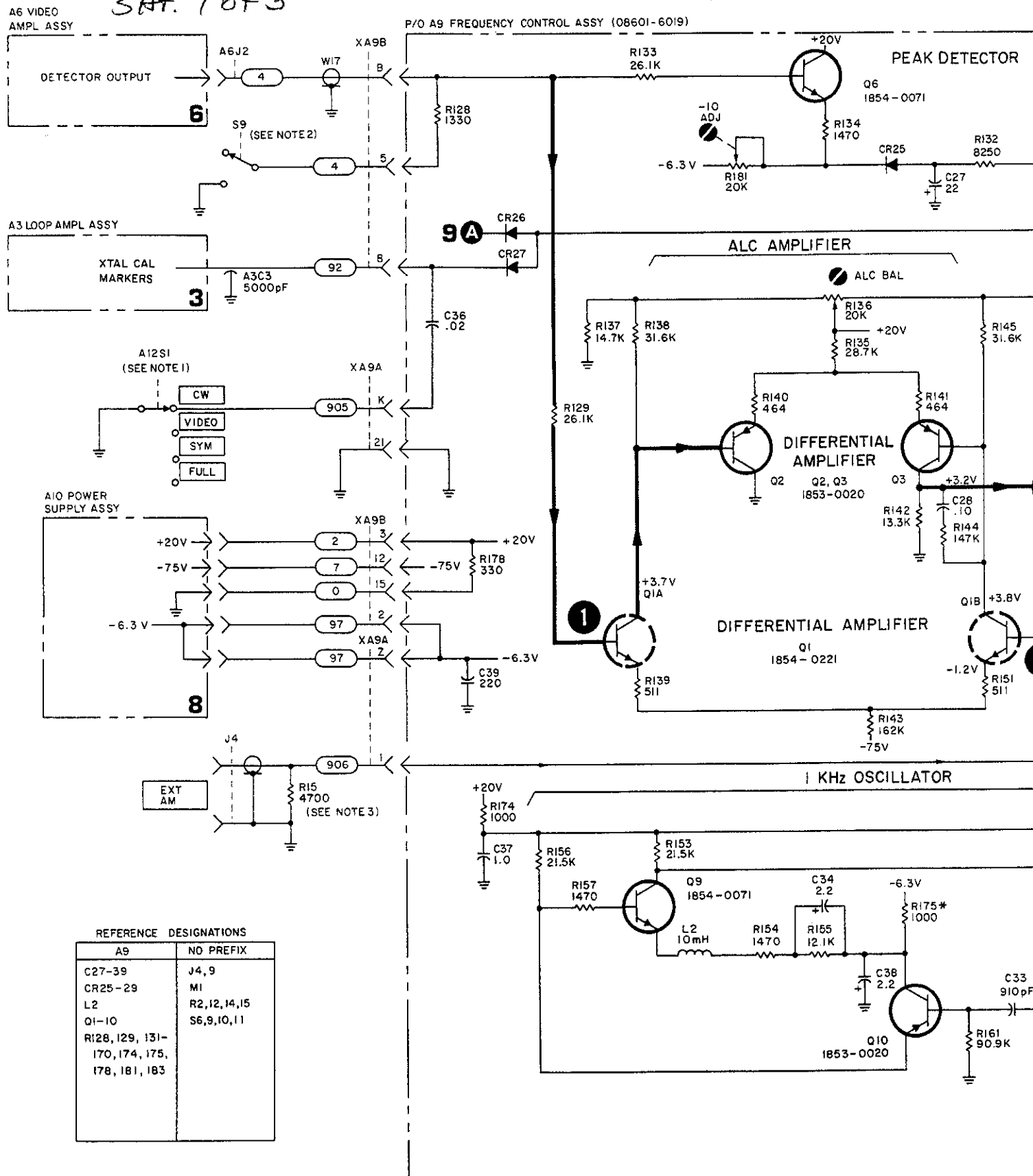
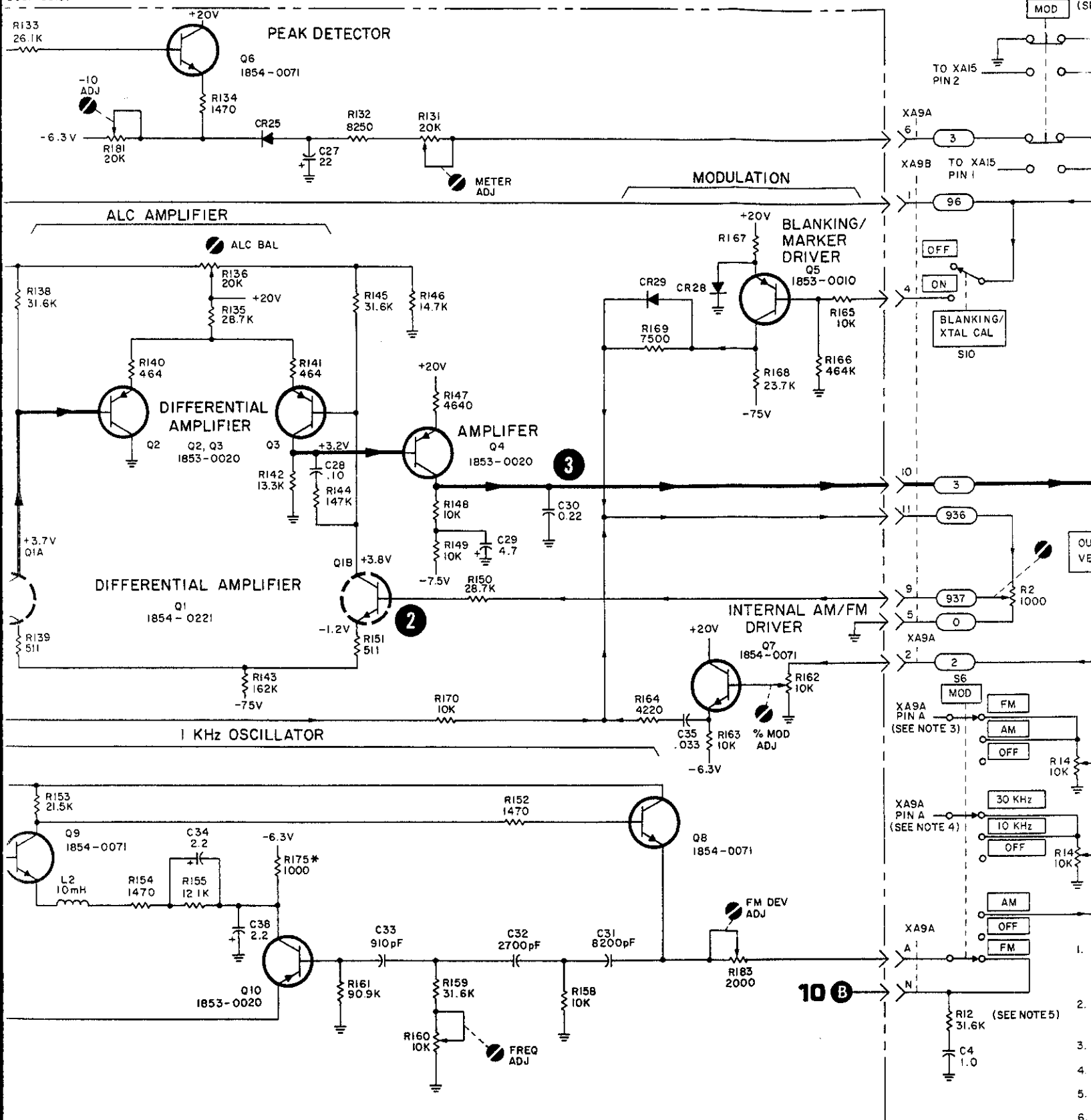


FIG. 8-32  
SH. 2 OF 3

8601-60191





8-29b

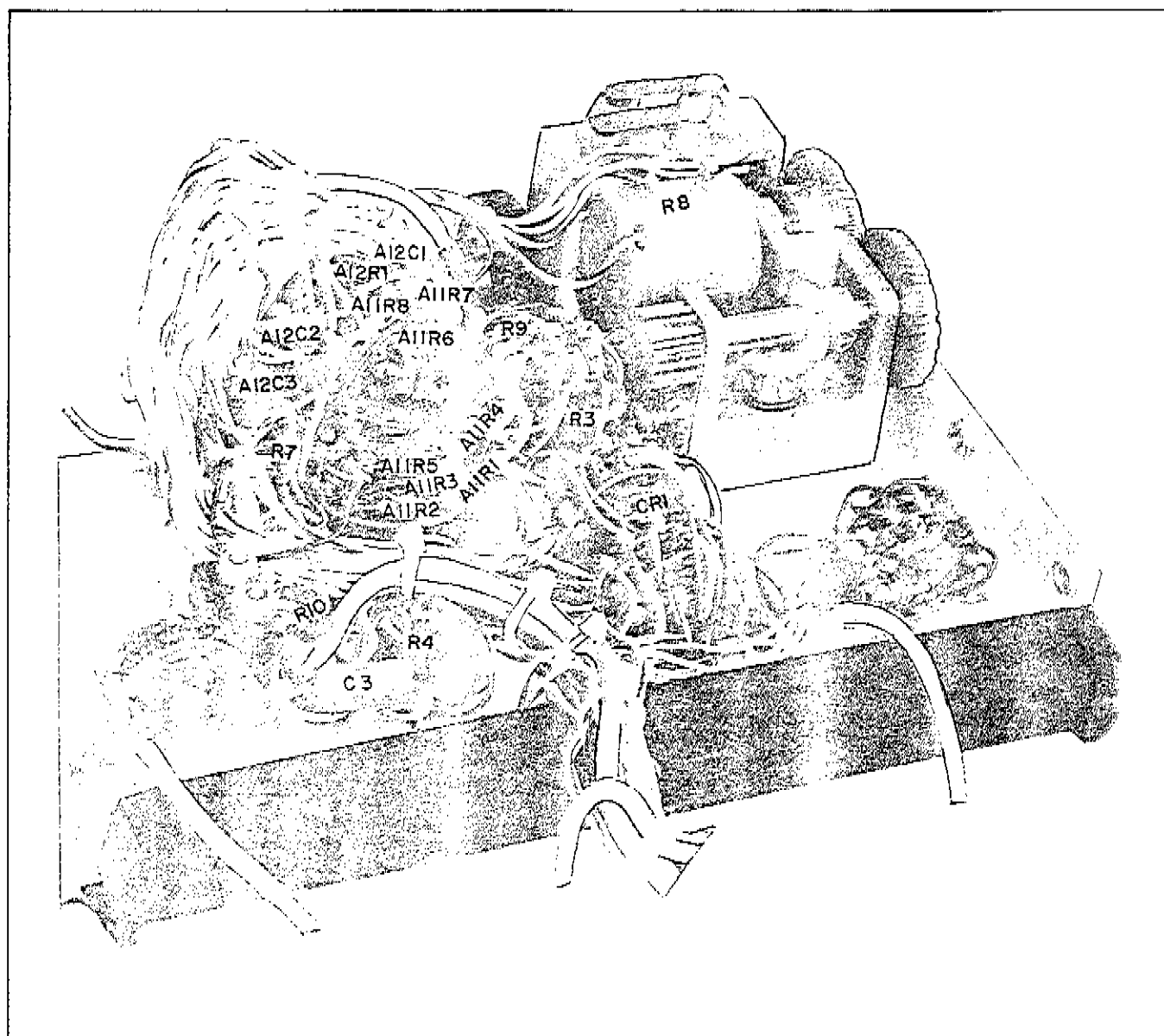
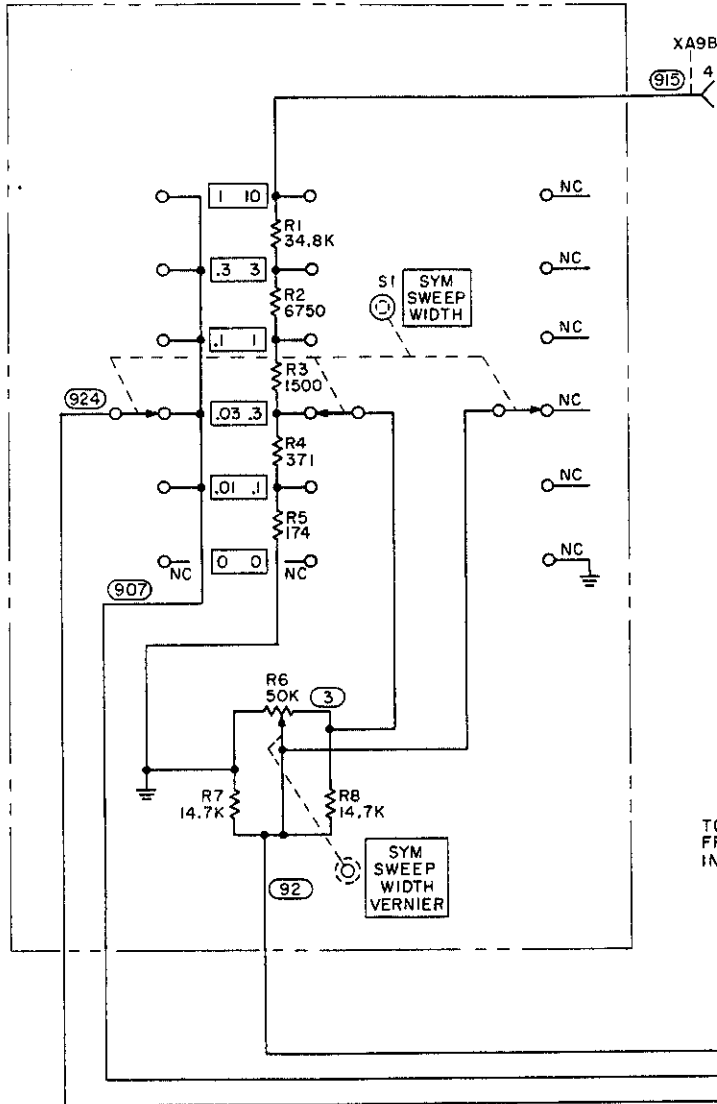


Figure 8-33. Front Panel Wiring, Component Identification

FIG. 8-34  
SHT. 1 of 2

A11 SYM SWEEP WIDTH SWITCH ASSY (08601-6010)



A12 CW/SWEEP SWITCH ASSY (08601-6027)

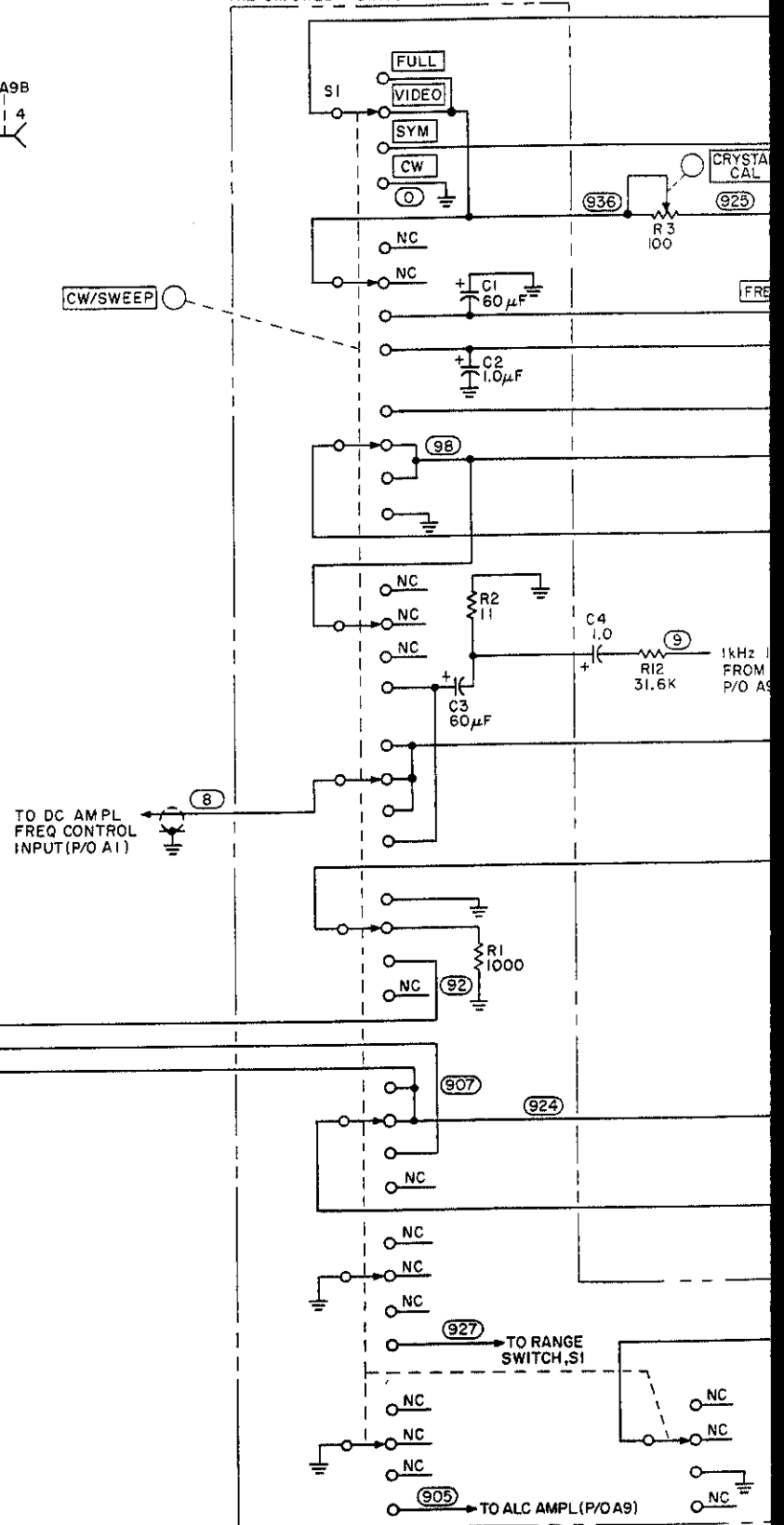


FIG. 8-34  
SHT. 2 of 2

## SWEEP MODE SWITCHES (3100-2055)

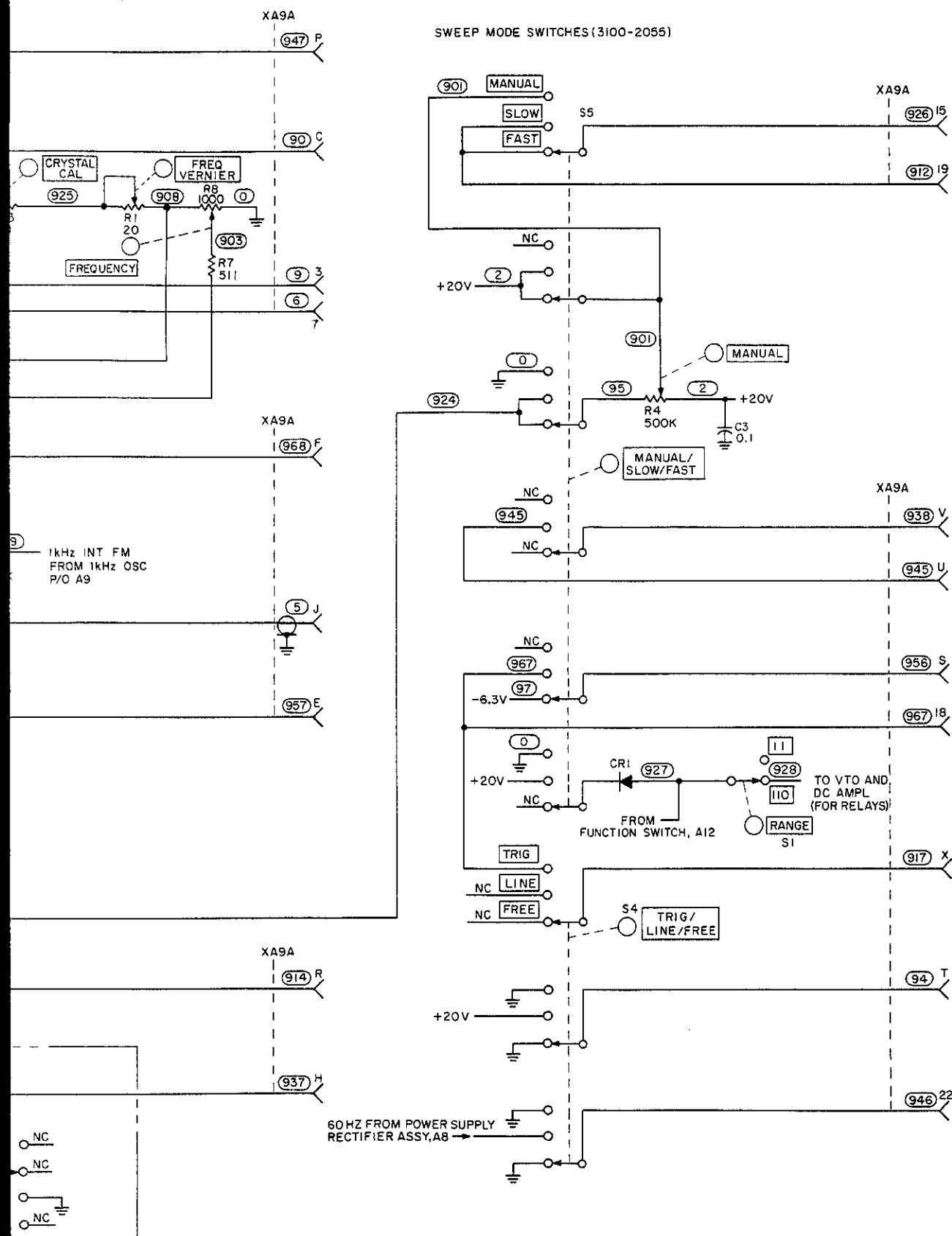


Figure 8-34. S5/A11/A12 Front Panel Switching, Schematic Diagram

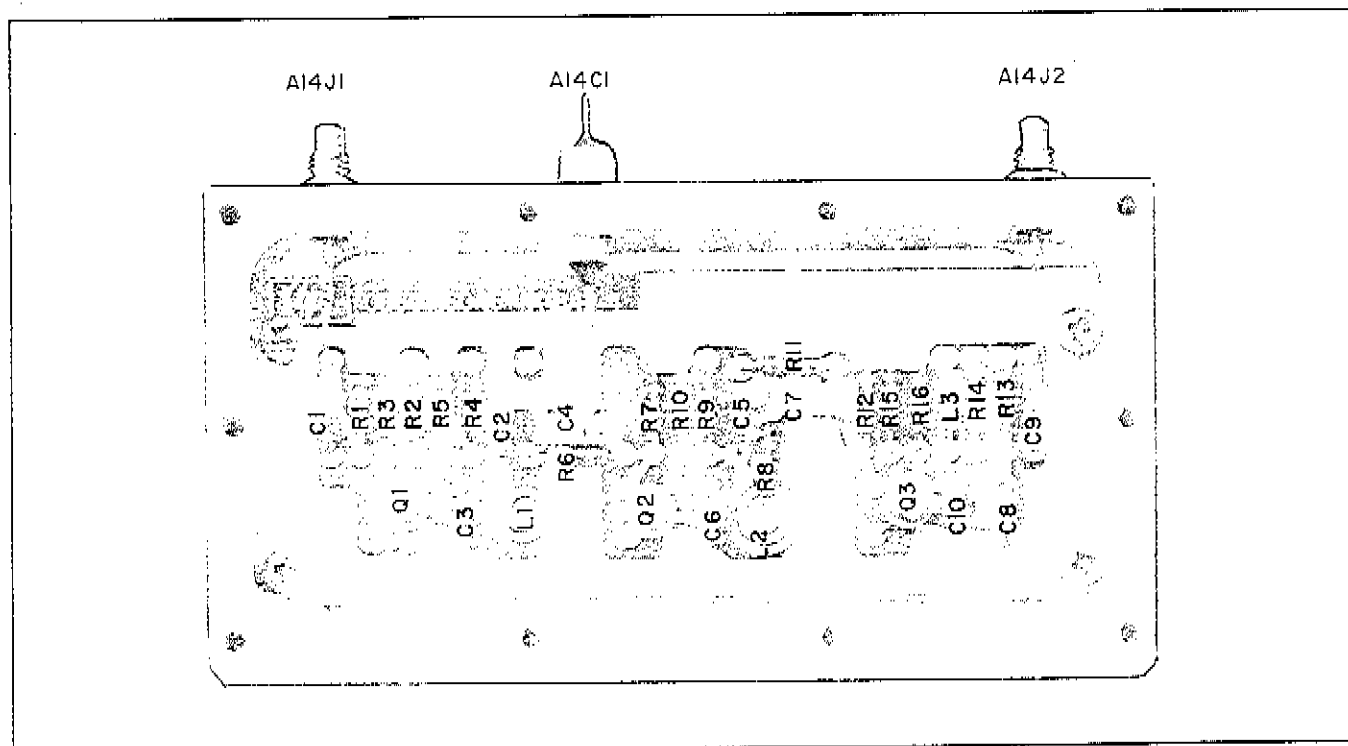


Figure 8-35. A14 Broadband Amplifier, Component Identification

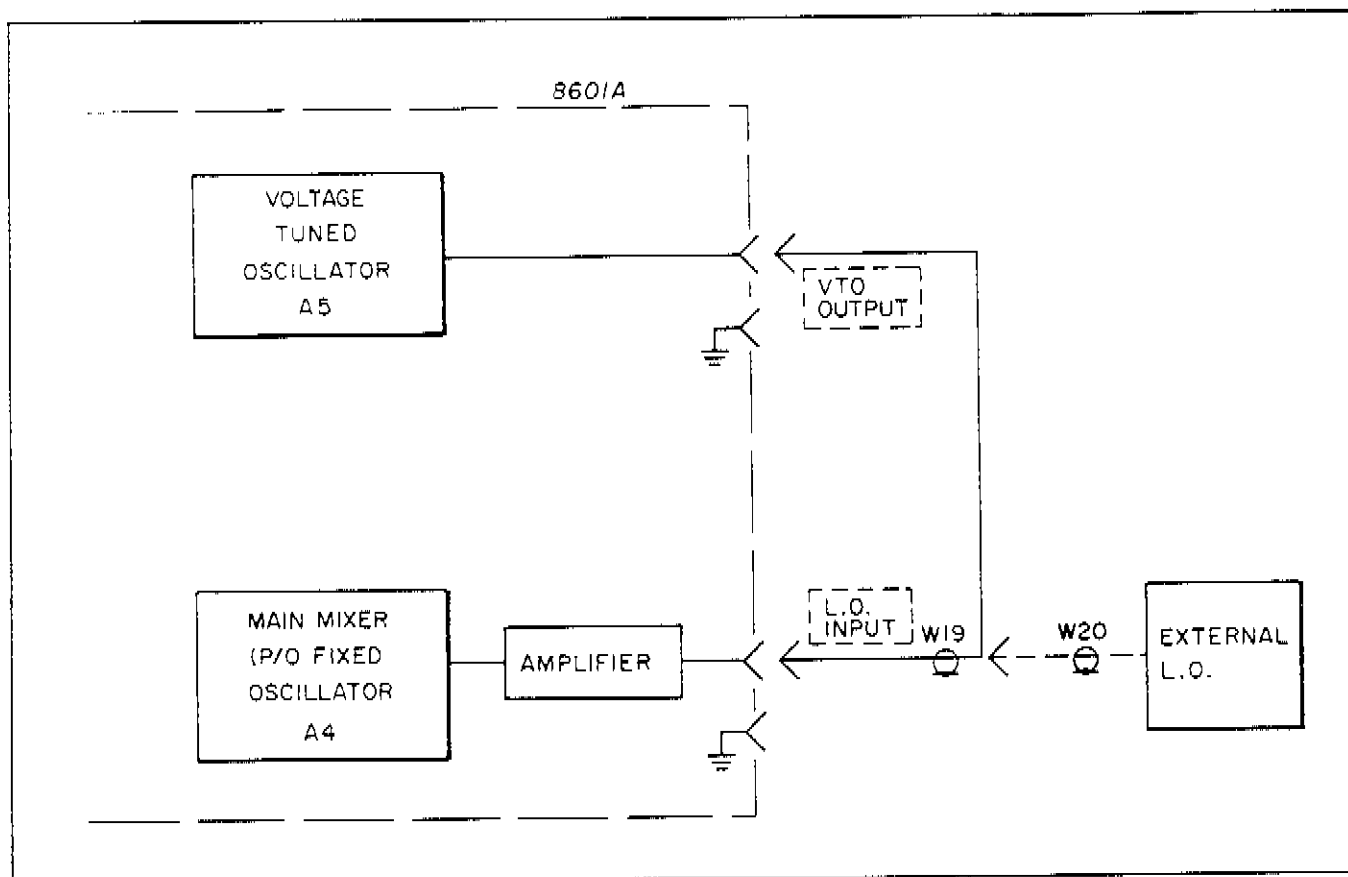
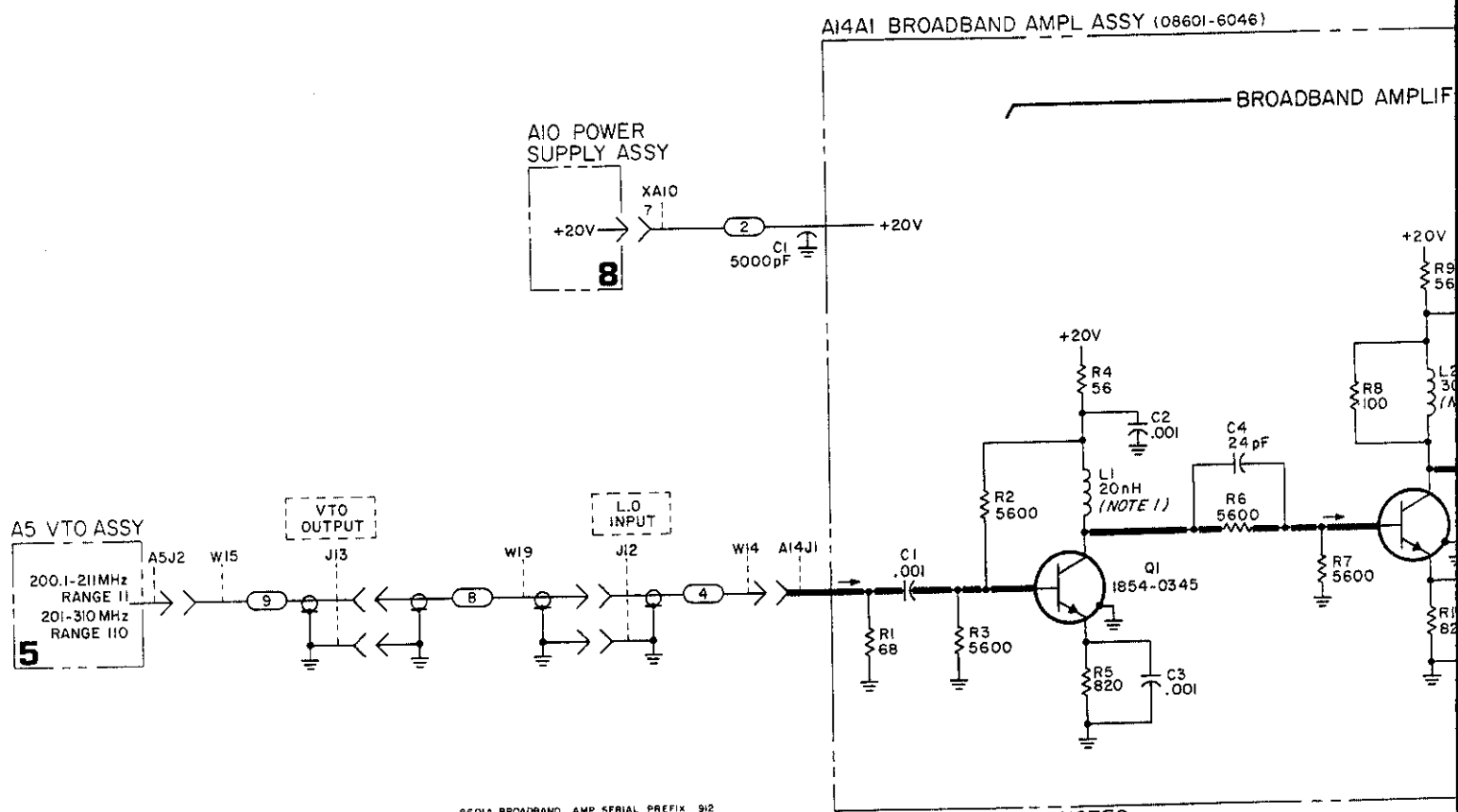


Figure 8-36. Block Diagram, 8601A Option 007

FIG. 8-37  
SMT. 1 of 3



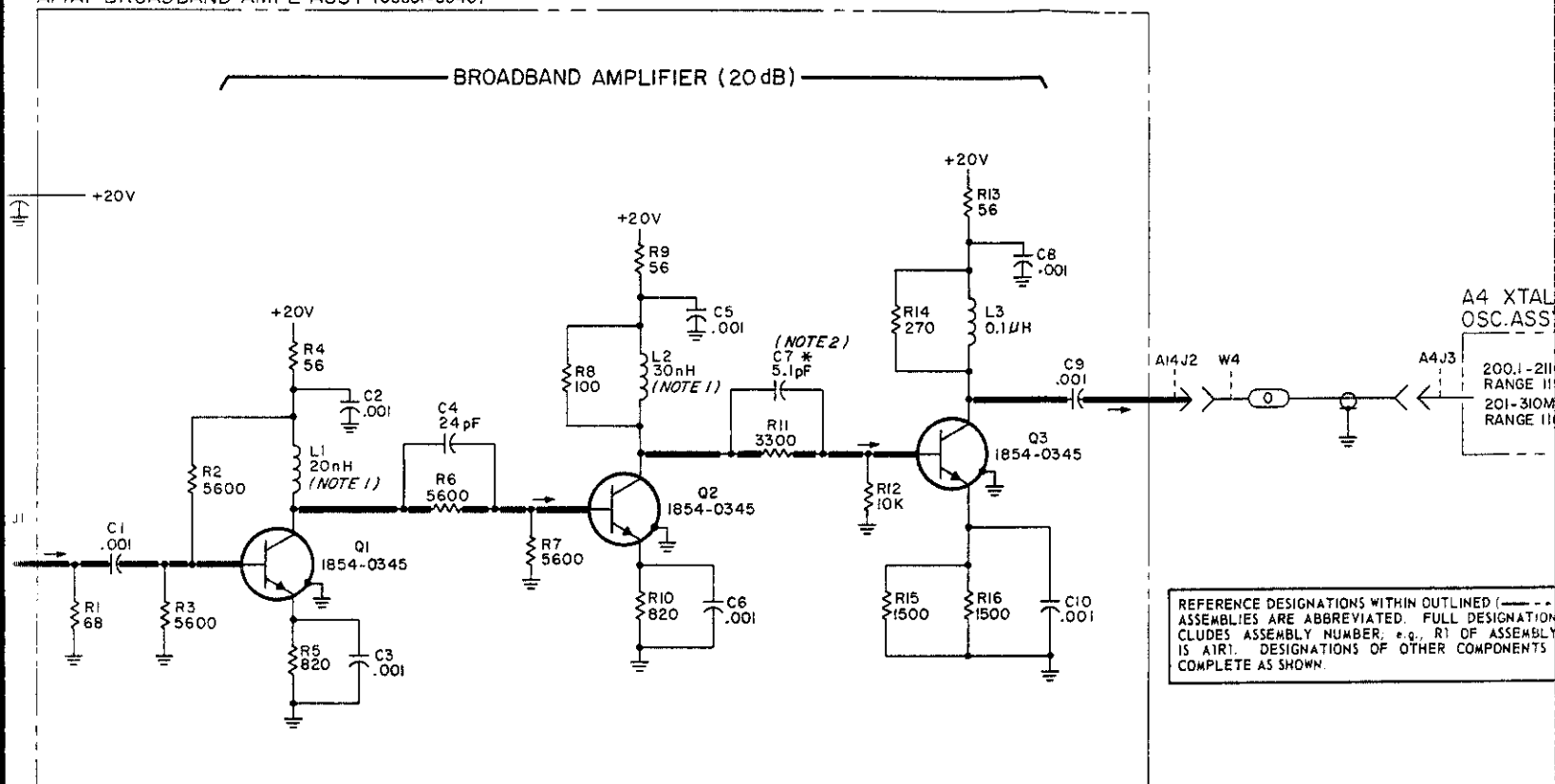
8601A BROADBAND AMP SERIAL PREFIX 912

#### NOTES:

1. PRINTED CIRCUIT SPIRALS, P/O BOARD ASS
2. \* = FACTORY SELECTED PART;  
TYPICAL VALUE GIVEN  
C7 IS SELECTED FOR SPURIOUS RESP  
≥ 40dB BELOW CARRIER WITH OUTP  
SET AT +10 dBm AND VERNIER SET F  
METER READING

FIG. 8-37  
SAT. 2 of 3

AI4AI BROADBAND AMPL ASSY (08601-6046)



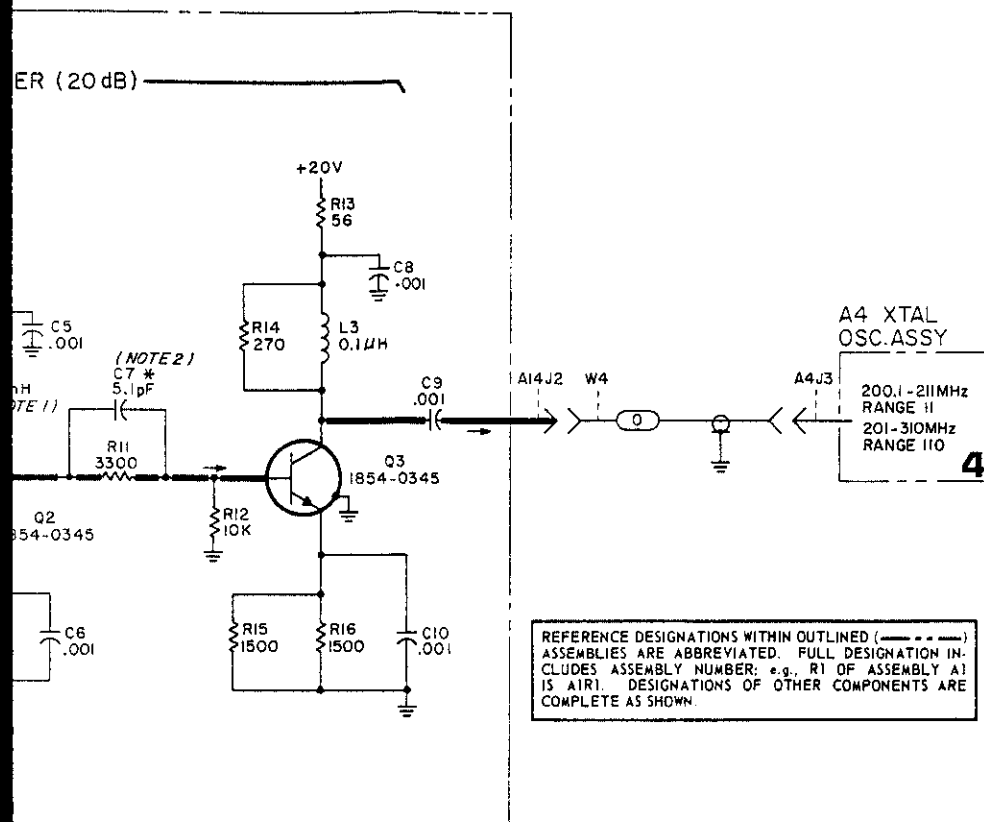
NOTES:

1. PRINTED CIRCUIT SPIRALS, P/O BOARD ASSY
2. \* = FACTORY SELECTED PART;  
TYPICAL VALUE GIVEN  
C7 IS SELECTED FOR SPURIOUS RESPONSES  
≥ 40dB BELOW CARRIER WITH OUTPUT LEVEL  
SET AT +10dBm AND VERNIER SET FOR -10dBm  
METER READING

REFERENCE DESIGNATIONS

| AI4 ASSY | AI4AI |
|----------|-------|
| C1       | C1-10 |
| J1, 2    | L1-3  |
|          | Q1-3  |
|          | R1-16 |

FIG. 8-37  
SHEET 3 of 3



## REFERENCE DESIGNATIONS

| A14 ASSY | A14A1 |
|----------|-------|
| C1       | C1-10 |
| J1, 2    | L1-3  |
|          | Q1-3  |
|          | R1-16 |

USES  
LEVEL  
-10dBm

13

Figure 8-37. A14 Broadband Amplifier, Schematic Diagram (Option 007 Only)

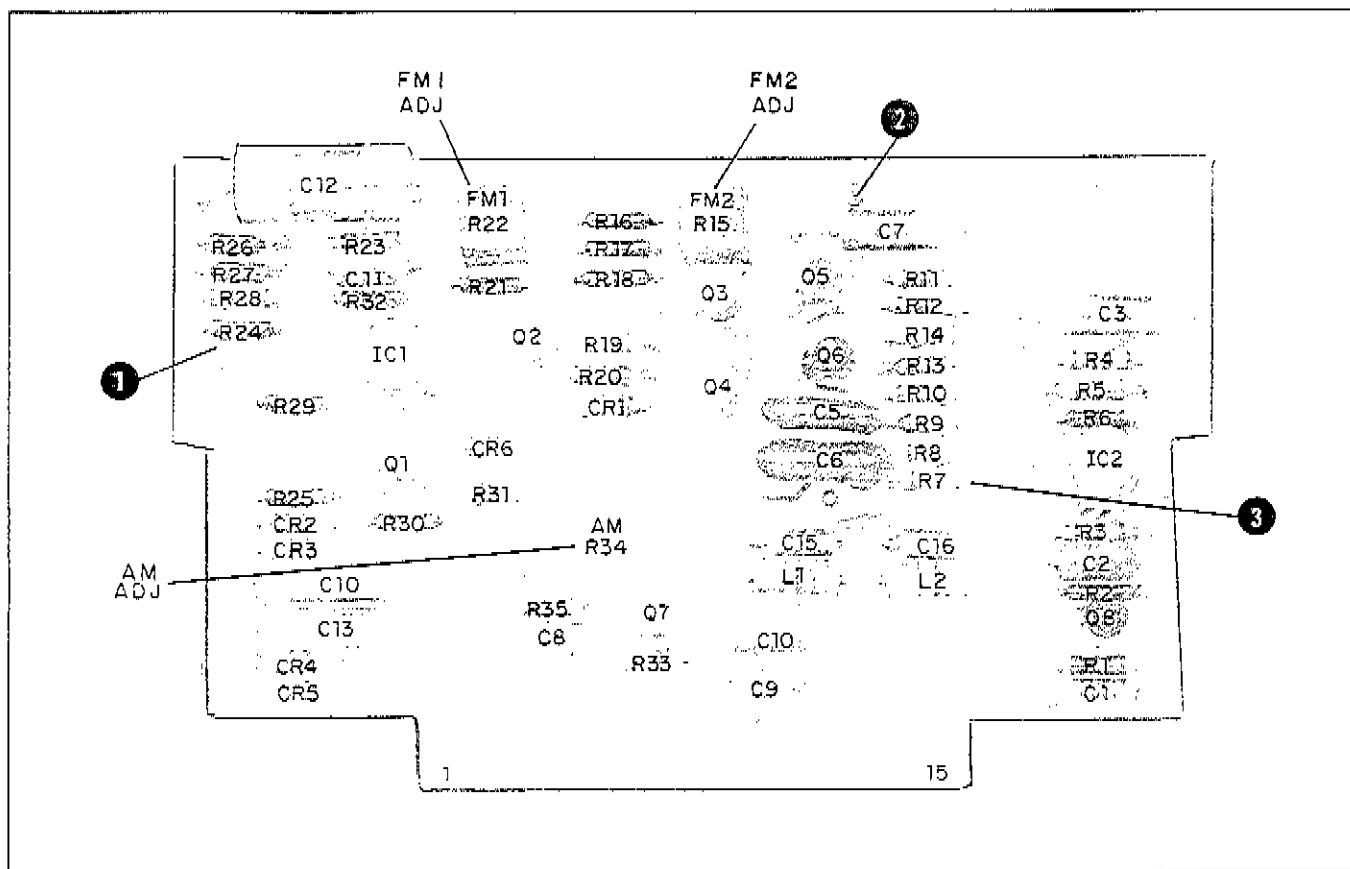
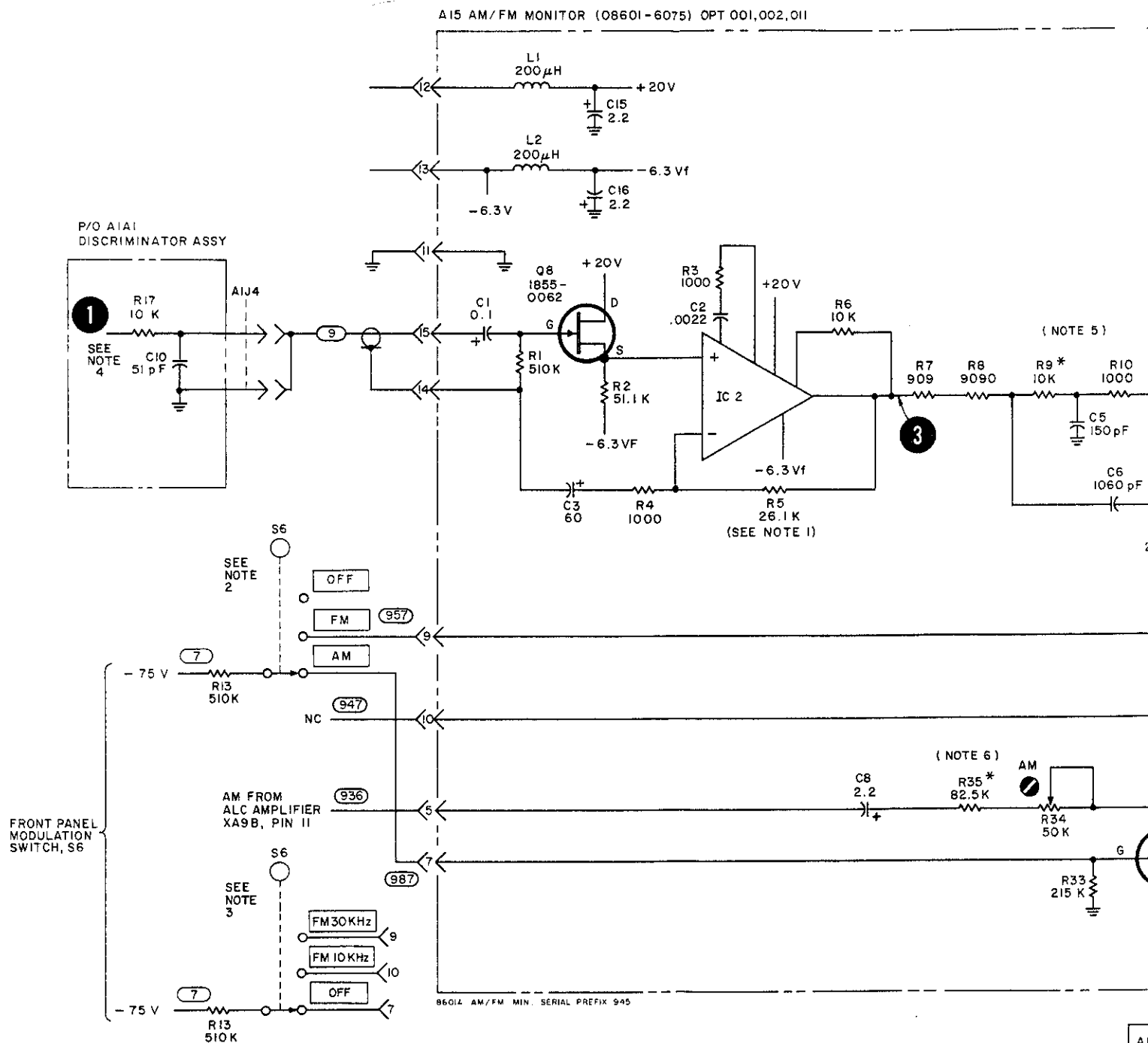


Figure 8-38. A15 AM/FM Monitor, Component Identification

FIG. 8-39  
SMT. 1 of 3



1) OPT 001,002,011



## NOTES

- Figure 8-3

FIG. 8-39  
SMT. 3 of 3

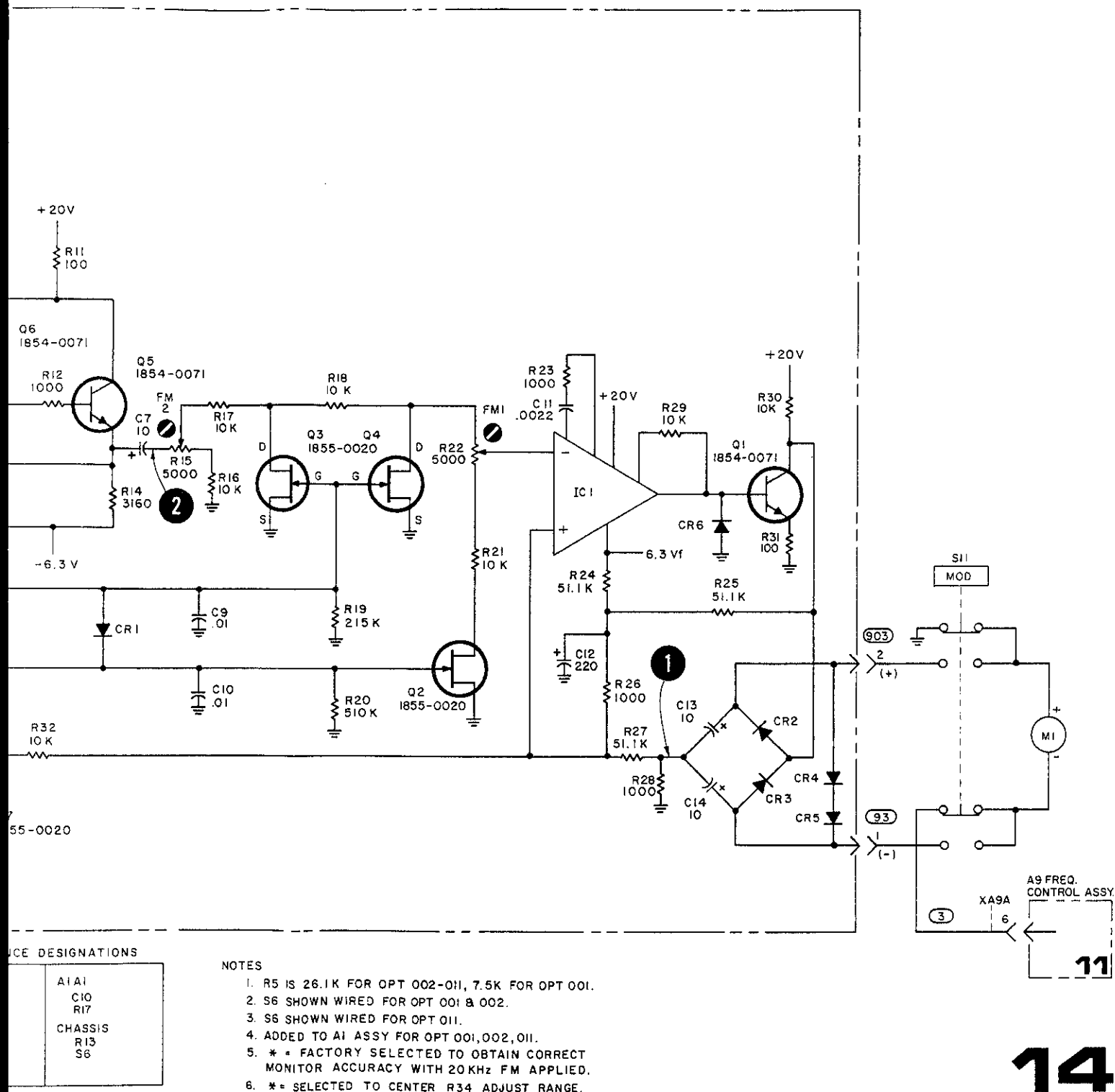


Figure 8-39. A15 AM/FM Monitor, Schematic Diagram  
(Options 001, 002 and 011 Only)

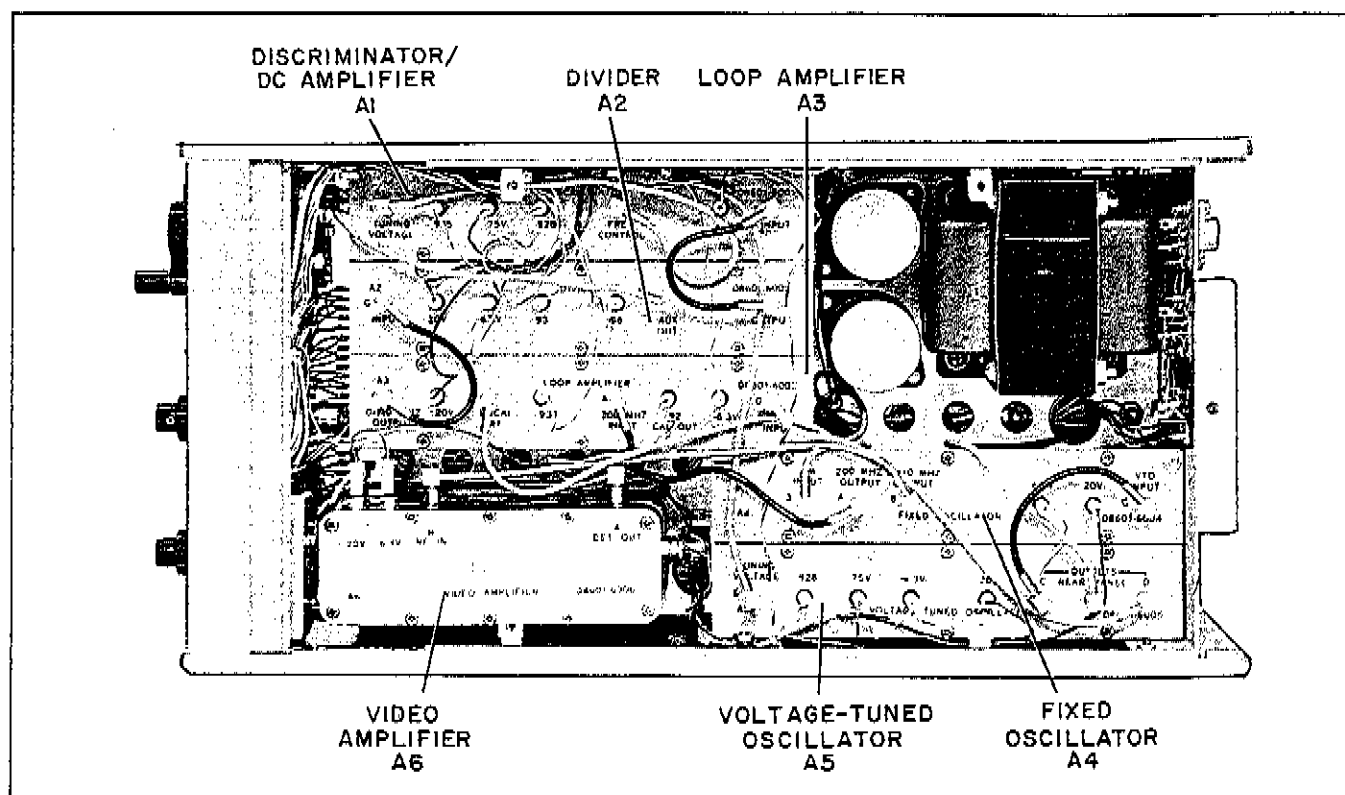


Figure 8-40. 8601A Top View

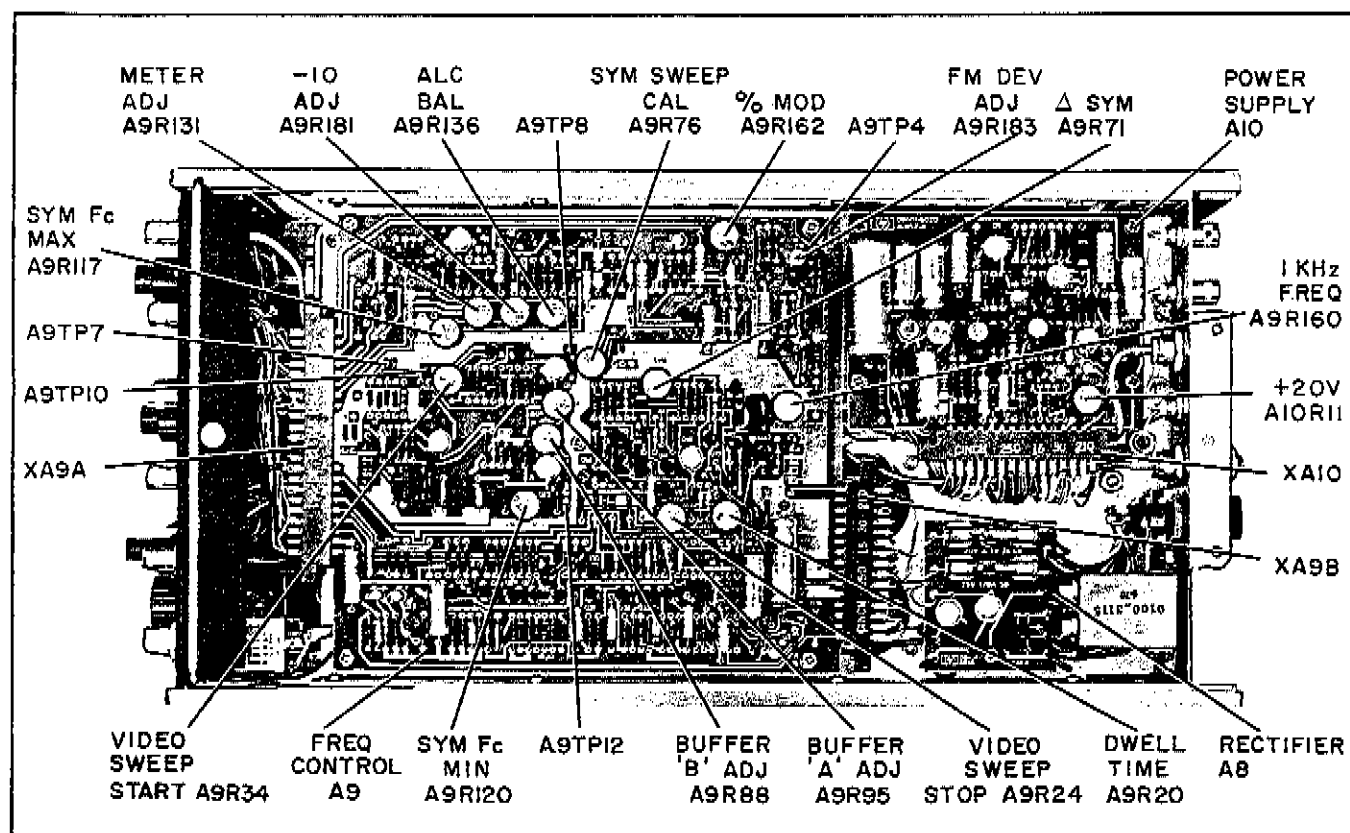


Figure 8-41. 8601A Bottom View

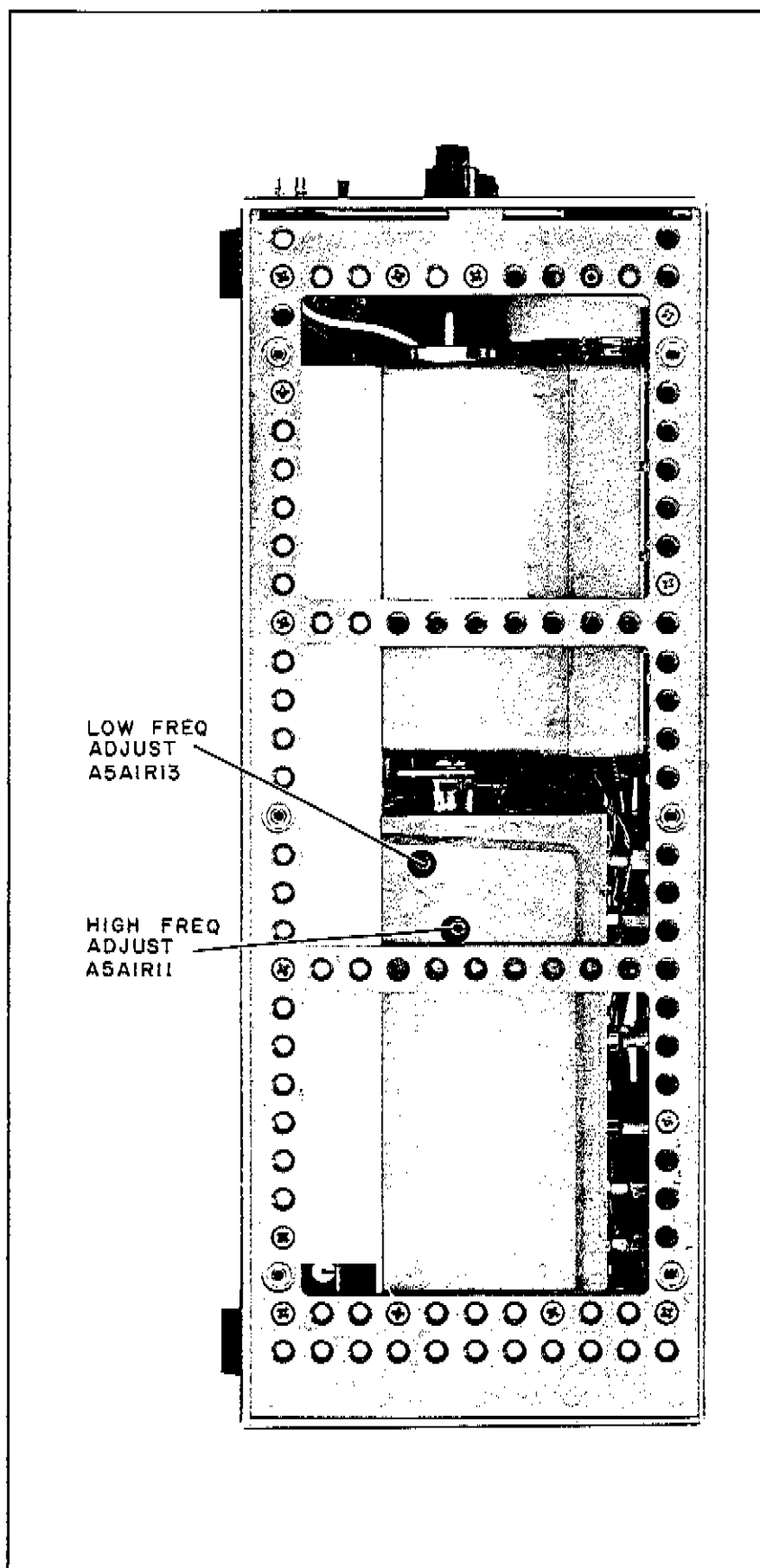


Figure 8-42. 8601A Right Side Adjustments

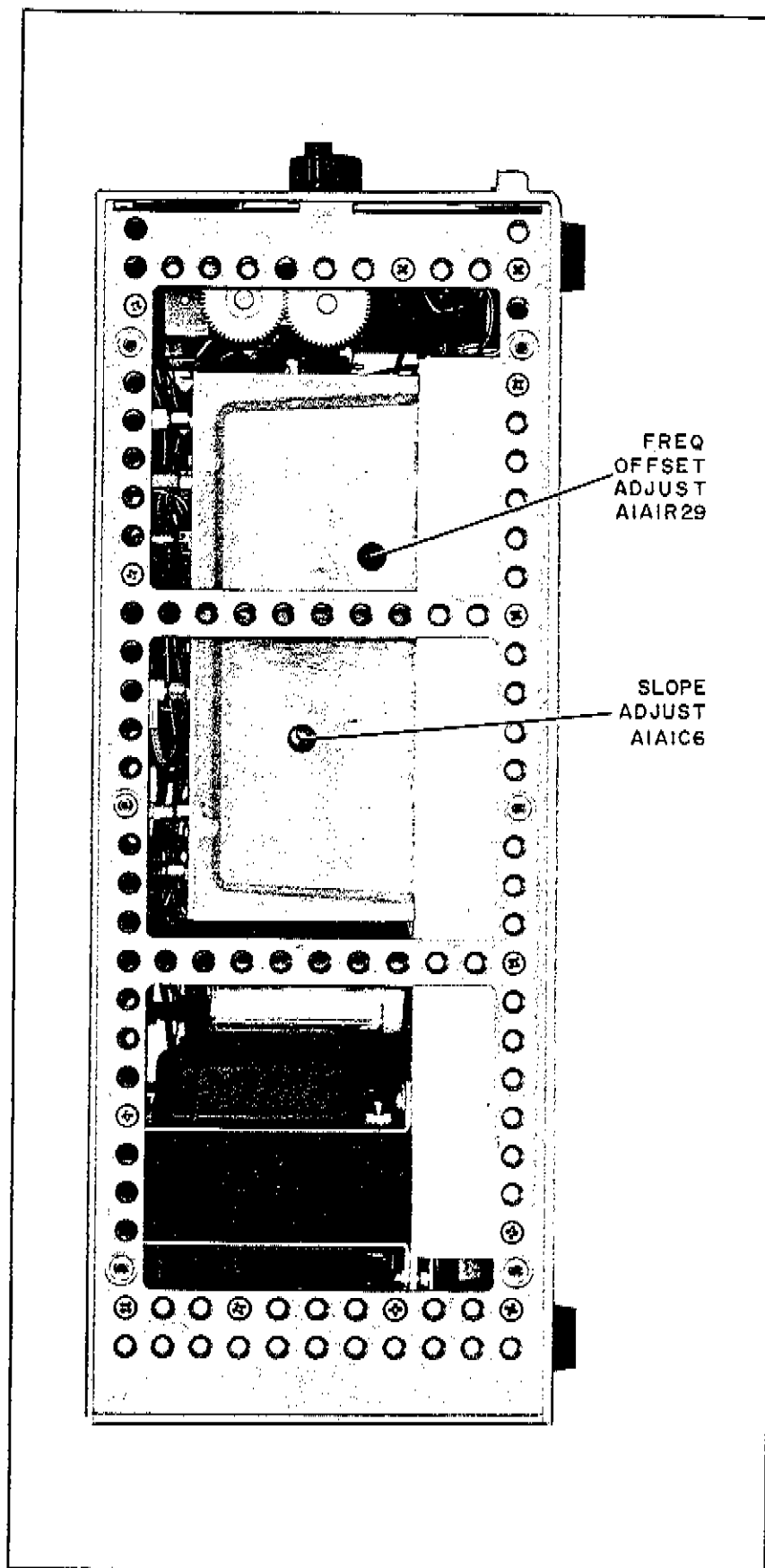


Figure 8-43. 8601A Left Side Adjustments

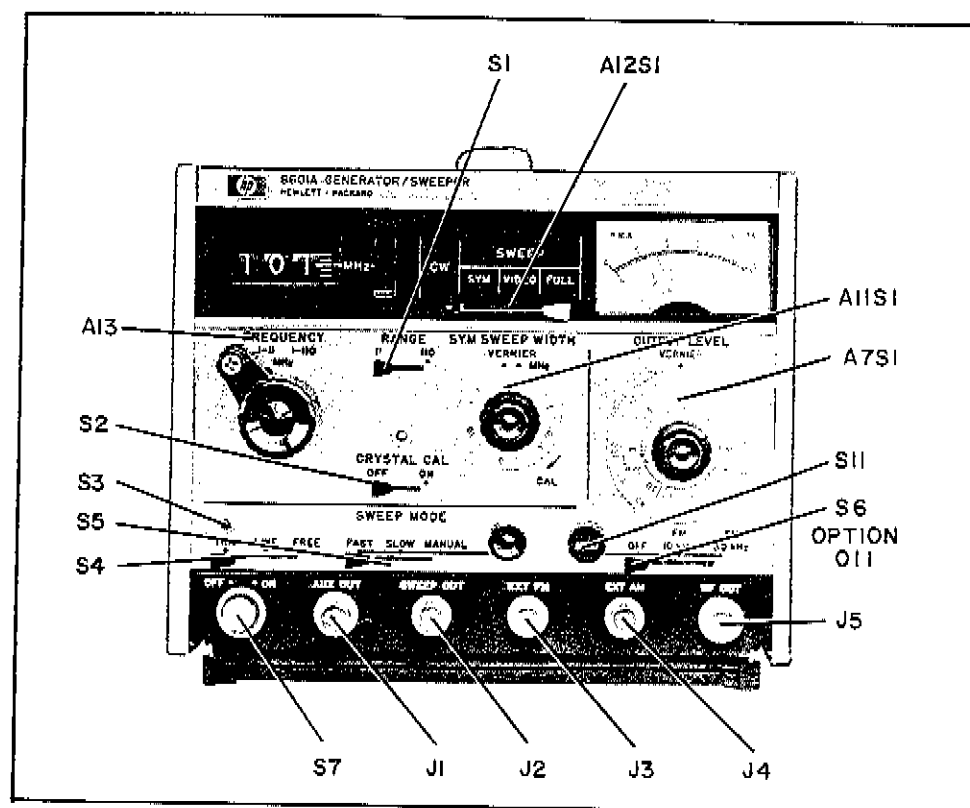


Figure 8-44. 8601A Front Panel, Assembly Location

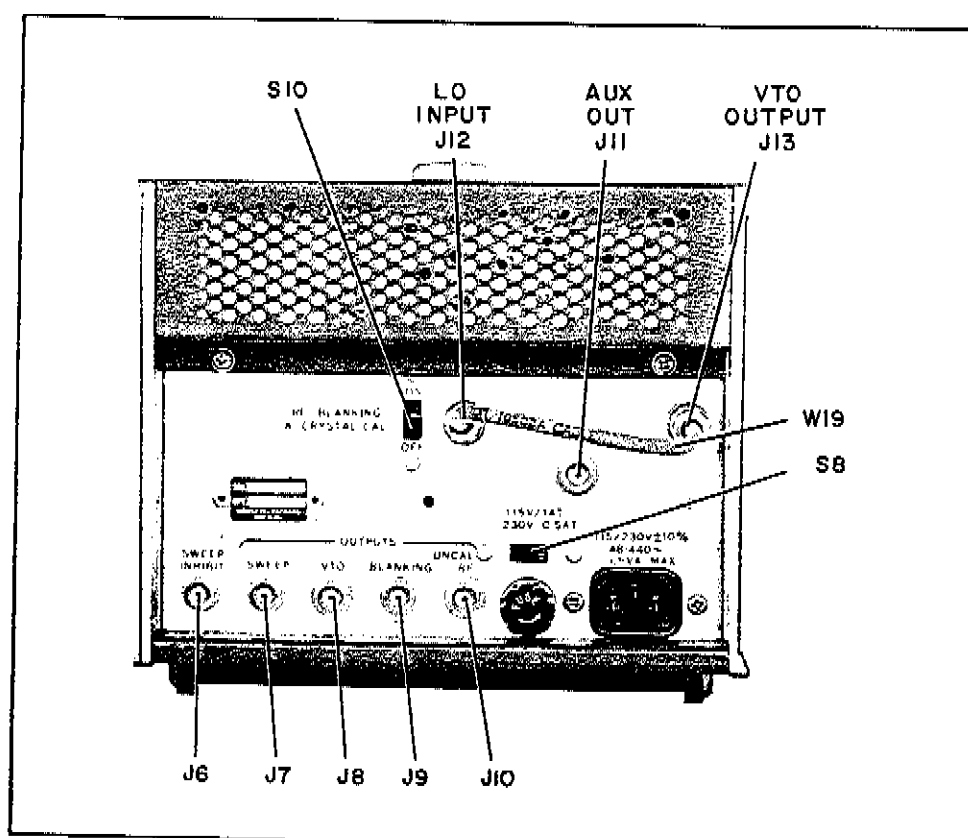


Figure 8-45. 8601A Rear Panel, Assembly Location