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# INSTRUCTION MANUAL
# FOR
# TYPE RS-111-1B-2 RECEIVING SYSTEM

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ADDENDA



The following changes are required on the schematic diagrams and parts lists for the RS-111-1B:

(1) Main Chassis Schematic:

(a) Change P1 to P5.

(2) Type 7164 60-300 mc Tuner, A2:

(a) Change C22 to 1.5 pf, 301-000-COKO-159C, Erie.

(3) Type 7930 Signal Monitor Chassis, A5:

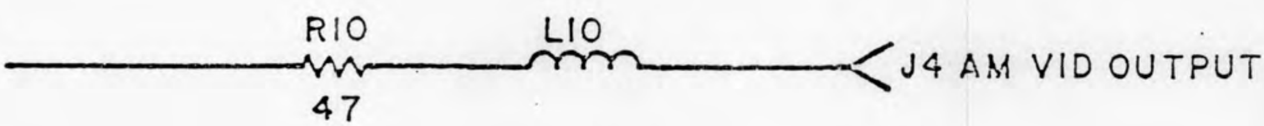
(a) Schematic: Change P1 to P5.

(b) Parts List:

(i) Change P2 to P1, P/O W1.
(ii) Change P3 to P2, P/O W1.
(iii) Change P4 to P3, P/O W2.
(iv) Change P5 to P4, P/O W2.
(v) Change P1 to P5 (MRE-7-aP-G).
(vi) Change W1 from 2126-127 to 30020-428.
(vii) Change W2 from 2126-127 to 30020-429.

(4) Type 7233 2-mc IF Amplifier, A7:

(a) Schematic: Change schematic to show L10 connected as shown below.




(b) Parts List:

(i) Add L10, 1131-37, CEI.
(ii) Change A2R7 from 10K to 12K (CB1235).
(iii) Change A2R8 from 2.2K to 470Ω (CB4715).

(5) Type 7631 Power Supply Regulator, A12:

(a) Add Radiator, Transistor, NP-201, Wakefield.
RA1 at Q3
RA2 at Q4
RA3 at Q5

## WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted. Extreme caution should be exercised in working with the equipment with any of the protective covers removed.

## INTRODUCTION

The type RS-111-1B-2 Receiving System consists of a type RS-111-1B Receiving System which contains the following modifications:

(1) The bandwidth of the 2-mc IF strip has been increased to 3-mc.

(2) A front-panel control has been added which allows either manual or automatic gain control of the 3-mc bandwidth IF strip.

This instruction manual for the RS-111-1B will be applicable to the RS-111-1B-2 with the following changes and additions:

(1) On Figure 6-10, page 6-21, make the following changes:

a. Change C7 and C15 to 6.2 pf.
b. Change C23 to 10 pf.
c. Change R5 and R11 to 2.7K.
d. Change R20 to 4.7K.
e. Change A1C8 and A1C9 to 24 pf.
f. Change A2R2 to 10K.
g. Break the connection between the emitter of A2Q2 and the junction of R1-C26.
h. Connect the emitter of A2Q2 to pin D of plug P1 through a 1000 pf feedthru capacitor. Designate this capacitor C40.
i. Connect the junction of R1-C26 to pin F of plug P1 through a 1000 pf feedthru capacitor. Designate this capacitor C39.

(2) In the parts list, paragraph 5.4.8, make the following changes:

a. Change C7 to: 6.2 pf, ±.5 pf, 301-000-COHO-629D.
b. Change C23 to: 10 pf, ±5 pf, 301-000-COHO-100D.
c. Add C39 and C40 same as C27.
d. Change R5 to: 2.7K, CB2725.
e. Change R20 to: 4.7K, CB4725.

(3) In the parts list, paragraph 5.4.8.1, make the following changes:

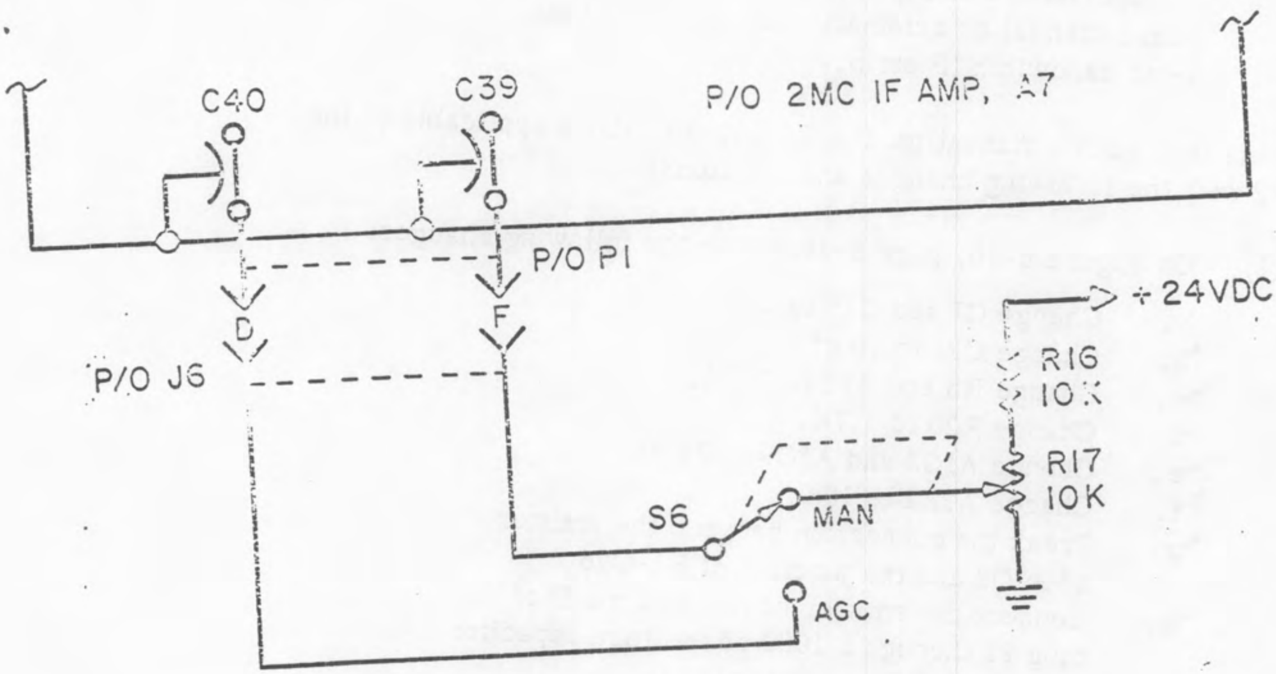
a. Change C8 to: 24 pf, DM10-240J.
b. Change T1 to: 3476-22.

(4) In the parts list, paragraph 5.4.8.2, change R2 to: 10K, CB1035.

(5) In the parts list, paragraph 5.4.1, add the following:

a. R16, Resistor, Fixed, Composition: 10K, 5%, CB1035, AB.
b. R17, Resistor, Variable, Composition: 10K, 20%, 1W, KB22141, CTS, (with SPDT switch).
c. S6, Switch, SPDT: p/o R17.

(6) Add the information shown in the sketch below to Figure 6-17, page 6-35.

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### SECTION V
### REPLACEMENT PARTS LIST

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Table 1-1. Type RS-111-1B Receiving System, Specifications

| | |
|---|---|
| Type of Reception | AM, FM, CW |
| Frequency Range | 30-1000 mc in four bands: Band A, 30-60 mc; Band B, 60-300 mc; Band C, 235-500 mc; Band D, 490-1000 mc |
| Input Impedance | To operate from 50-ohm source |
| Noise Figure | Band A, 4 db max; Band B, 6.5 db max; Band C, 10 db max; Band D, 12 db max |
| Image Rejection | Band A, 60 db min; Band B, 50 db min; Band C, 65 db min; Band D, 75 db min |
| IF Rejection | Band A, 54 db min; Band B, 80 db min; Band C, 80 db min; Band D, 90 db min |
| Oscillator to Antenna Conduction | Band A, 15 μv max; Band B, 15 μv max from 60-260 mc and 25 μv max from 260-300 mc; Band C, 8 μv max; Band D, 75 μv max |
| IF Bandwidths | Four total, two operating simultaneously: 2 mc and either 20 kc, 75 kc, or 300 kc selectable from front panel. |
| Band A and Band B Sensitivity | |
| 20-kc Bandwidth | AM: 1 μv input, modulated 50%, produces 10 db (s plus n)/n min<br>FM: 2 μv input, modulated at 1 kc with 7-kc deviation, produces 21 db (s plus n)/n min |
| 75-kc Bandwidth | AM: 2 μv input, modulated 50%, produces 10 db (s plus n)/n min<br>FM: 3 μv input, modulated at 1 kc with 25-kc deviation, produces 21 db (s plus n)/n min |
| 300-kc Bandwidth | AM: 4 μv input, modulated 50%, produces 11 db (s plus n)/n min<br>FM: 4 μv input, modulated at 1 kc with 100-kc deviation, produces 21 db (s plus n)/n min |
| 2-mc Bandwidth | AM: 11 μv input, modulated 50%, produces 10 db (s plus n)/n min<br>FM: 12 μv input, modulated at 1 kc with 750-kc deviation, produces 21 db (s plus n)/n min |
| Band C and Band D Sensitivity | |
| 20-kc Bandwidth | AM: 2 μv input, modulated 50%, produces 10 db (s plus n)/n min<br>FM: 4 μv input, modulated at 1 kc with 7-kc deviation, produces 21 db (s plus n)/n min |
| 75-kc Bandwidth | AM: 8 μv input, modulated 50%, produces 17 db (s plus n)/n min<br>FM: 6 μv input, modulated at 1 kc with 25-kc deviation, produces 21 db (s plus n)/n min |
| 300-kc Bandwidth | AM: 8 μv input, modulated 50%, produces 10 db (s plus n)/n min<br>FM: 8 μv input, modulated at 1 kc with 100-kc deviation, produces 21 db (s plus n)/n min |
| 2-mc Bandwidth | AM: 22 μv input, modulated 50%, produces 10 db (s plus n)/n min<br>FM: 24 μv input, modulated at 1 kc with 750-kc deviation, produces 21 db (s plus n)/n min |
| Band A and Band B Output Stability | |
| 20-kc/75-kc/300-kc Bandwidths | AM: Output varies less than 3 db for input range of 2 to 10,000 μv<br>FM: Output varies less than 2 db for input range of 1.5 to 10,000 μv |
| 2-mc Bandwidth | AM: Output varies less than 4 db for input range of 4 to 10,000 μv<br>FM: Output varies less than 4 db for input range of 4 to 10,000 μv |
| Band C and Band D Output Stability | |
| 20-kc/75-kc/300-kc Bandwidth | AM: Output varies less than 4 db for input range of 4 to 10,000 μv<br>FM: Output varies less than 2 db for input range of 3 to 10,000 μv |
| 2-mc Bandwidth | AM: Output varies less than 4 db for input range of 8 to 10,000 μv<br>FM: Output varies less than 4 db for input range of 8 to 10,000 μv |
| Outputs from 20-kc/75-kc/300-kc Bandwidth | |
| Audio Amplifier Response | Within 3 db from 100 cps to 40 kc |
| Audio Output Power | 0.1 watt, min, into 600-ohm load, balanced or unbalanced |
| Video Amplifier Response | Within 3 db from 50 cps to 150 kc |
| Video Output Level | 5 volts rms across a 10K unbalanced load |

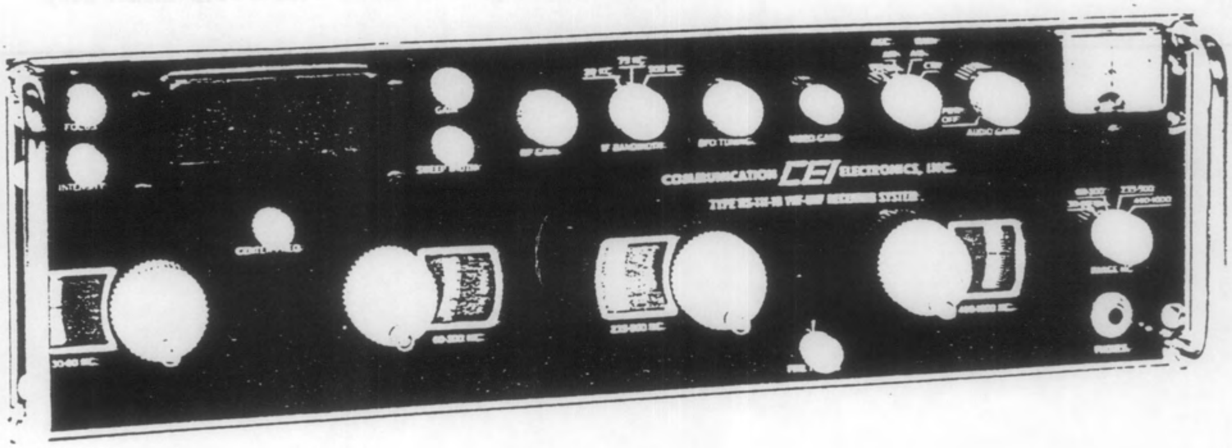


Figure 1-1. Type RS-111-13 Receiving System, Front View

Table 1-1. Type RS-111-1B Receiving System, Specifications - (Continued)

| | |
|---|---|
| Outputs from 2-mc Bandwidth | |
| FM Video Amplifier Response | Within 3 db from dc to 1 mc |
| AM Video Amplifier Response | Within 3 db from 30 cps to 1 mc |
| FM Video Output Level | 0.7 volt rms across a 93-ohm load |
| AM Video Output Level | 0.7 volt rms across a 93-ohm load |
| Fine Tuning | Operates on all bands |
| Beat Frequency Oscillator | Operates in CW mode on either 20-kc, 75-kc, or 300-kc IF bandwidths |
| Meter | Tuning |
| Frequency Display Section | |
| Sweep Linearity | Within 5% of sweep width |
| Sweep Width | Continuously adjustable from 0 to 3 mc |
| Sensitivity for Full Deflection | 2.5 μv input to receiver |
| Resolution | Using approximately 100-kc sweep width, two signals 20-kc apart will be displayed with at least a 6-db valley between the peaks |
| Power Input | 115/230 volts, 50-400 cps |
| Power Consumption | 45 watts, approximately |
| Weight | 35 lbs., approximately |
| Size | 5.25-inches high x 19-inches wide x 15.5-inches deep |

# SECTION I

## GENERAL DESCRIPTION

### 1.1 ELECTRICAL DESCRIPTION

The CEI type RS-111-1B Receiving System provides a visual display and AM, FM and CW reception over the 30 to 1000 mc frequency range in four bands: 30-60 mc, 60-300 mc, 235-500 mc, and 490-1000 mc. There are two IF bandwidths in operation at all times. One is a 2-mc bandwidth IF strip which is always in operation. Simultaneous AM video and FM video outputs are available from this strip. The other IF bandwidth is either 20 kc, 75 kc, or 300 kc, depending on the setting of the front-panel IF BANDWIDTH switch. A single AM video or FM video output from this strip is available depending on the setting of the front-panel function switch. The 20-kc/75-kc/300-kc bandwidth IF strip contains a beat frequency oscillator (BFO) which operates in the CW position of the function switch on all three bandwidths. A single FINE TUNING control provides vernier tuning on the tuner in operation; the switching of the four tuners is controlled by the RANGE switch on the front panel. The visual display of the signals is provided by a signal monitor which is an integral part of the unit. Pertinent specifications for the RS-111-1B are included in Table 1-1.

### 1.2 MECHANICAL DESCRIPTION

The entire RS-111-1B Receiving System is packaged in a cabinet which is 5.25-inches high, 19-inches wide, and 15.5-inches deep. The unit weighs approximately 35 pounds and operates from a 115/230 volt, 50-400 cps source; power consumption is approximately 50 watts.

1.2.1 As shown in Figure 1-1, the front panel of the RS-111-1B contains: four tuning dials and knobs; FINE TUNING, AUDIO GAIN, VIDEO GAIN, BFO TUNING, and RF GAIN controls; function, RANGE, and IF BANDWIDTH switches; PHONES jack; and a tuning meter. These controls, switches and indicators are primarily associated with the receiver functions of the unit. The front panel additionally contains GAIN, SWEEP WIDTH, CENTER FREQ., INTENSITY, and FOCUS controls which are associated with the signal monitor section of the RS-111-1B; the rectangular CRT screen is also installed in the front panel.

1.2.2 The input and output connections are made on the rear apron (see figure 1-2). The AUDIO OUTPUT is provided from terminal strip TB1. The 30-500 MC INPUT J1, 490-1000 MC INPUT, 30-300 MC LO OUTPUT A13J3, and 235-1000 MC LO OUTPUT A14J3 connectors are N-type. The remaining connectors are all BNC-type which are marked as follows: FM VID OUTPUT J3, AM/FM VID OUTPUT J4, and AM VID OUTPUT J5. The ac line fuses are installed on the rear apron along with the 115v/230v power switch S4.

1.2.3 The RS-111-1B contains 14 assemblies. Nine of these (the 30-60 mc tuner, 60-300 mc tuner, 235-500 mc tuner, 490-1000 mc tuner, 60-21.4-mc converter, 2-mc IF strip, local oscillator coupling networks, and 20/75/300-kc IF strip) are constructed on silver-plated gold-flashed brass chassis. Four of the assemblies are constructed on etched circuit boards: the video amplifier, audio amplifier, and low voltage power supply etched board assemblies mount plug-in fashion on top of the main chassis while the high voltage power supply etched board is mounted on the inside of the side panel. The fourteenth assembly contains the signal monitor circuitry and is constructed on a brass deck which is mounted above the main chassis. The signal monitor assembly contains the cathode ray tube and three etched circuit board subassemblies: the shaping amplifier and sweep oscillator; the IF output amplifier, and the horizontal sweep oscillator.

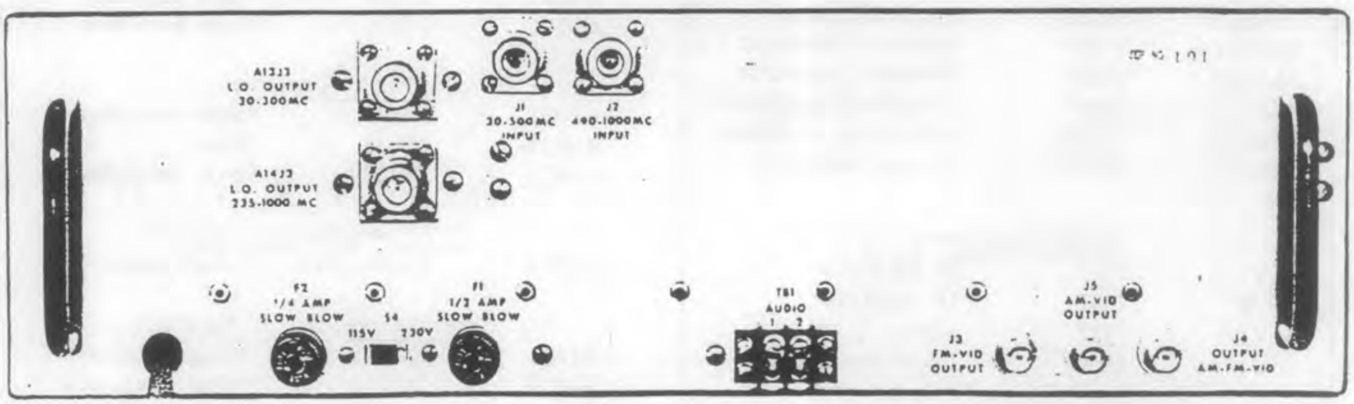


Figure 1-2. Type RS-111-1B Receiving System, Rear View

Table 1-2. Type RS-111-1B Receiving System, Tube and Transistor Complement

| Ref. Desig. | Type | Function |
|---|---|---|
| **Main Chassis** | | |
| Q1 | 2N1544 | Voltage Regulator |
| **30-60 mc Tuner** | | |
| A1V1 | 6CW4 | RF Amplifier |
| A1V2 | 6CW4 | RF Amplifier |
| A1V3 | 7587 | Mixer |
| A1V4 | 6CW4 | Local Oscillator |
| **60-300 mc Tuner** | | |
| A2V1 | 8058 | RF Amplifier |
| A2V2 | 8058 | RF Amplifier |
| A2V3 | 7587 | Mixer |
| A2V4 | 6CW4 | Local Oscillator |
| **235-500 mc Tuner** | | |
| A3V1 | 7077 | RF Amplifier |
| A3V2 | 7077 | RF Amplifier |
| A3V3 | 7587 | Mixer |
| A3V4 | 7486 | Local Oscillator |
| **490-1000 mc Tuner** | | |
| A4V1 | 7486 | Local Oscillator |
| A4V2 | 6CW4 | IF Amplifier |
| A4V3 | 6CW4 | IF Amplifier |
| **Signal Monitor Chassis** | | |
| A5V1 | 3XP1 | CRT |
| A5A1Q1 | 2N706 | Shaping Amplifier |
| A5A1Q2 | 2N706 | Shaping Amplifier |
| A5A1Q3 | 2N706 | Shaping Amplifier |
| A5A1Q4 | 2N706 | Shaping Amplifier |
| A5A1Q5 | 2N706 | Mixer |
| A5A1Q6 | 2N706 | Sweep Oscillator |
| A5A2Q1 | 2N706 | IF Amplifier |
| A5A2Q2 | 2N706 | Mixer |
| A5A2Q3 | 2N706 | IF Amplifier |
| A5A2Q4 | 2N706 | IF Amplifier |
| A5A2Q5 | 2N706 | Local Oscillator |
| A5A3Q1 | 2N489 | Sawtooth Generator |
| A5A3Q2 | 2N2270 | Sawtooth Generator |
| A5A3Q3 | 2N697 | Horizontal Amplifier |
| A5A3Q4 | 2N1925 | Horizontal Amplifier |
| A5A3Q5 | 2N2270 | Voltage Regulator |
| **60-21.4-mc Converter** | | |
| A6V1 | 7587 | IF Amplifier |
| A6V2 | 7587 | IF Amplifier |
| A6V3 | 7587 | Mixer |
| A6V4 | 6CW4 | Local Oscillator |
| **2-mc Bandwidth IF Amplifier** | | |
| A7Q1 | 2N2708 | IF Amplifier |
| A7Q2 | 2N2708 | IF Amplifier |
| **2-mc Bandwidth IF Amplifier (cont.)** | | |
| A7Q3 | 2N2708 | IF Amplifier |
| A7A1Q1 | 2N706 | 1st Limiter |
| A7A1Q2 | 2N706 | 1st Limiter |
| A7A1Q3 | 2N706 | 2nd Limiter |
| A7A1Q4 | 2N706 | 2nd Limiter |
| A7A1Q5 | 2N2270 | DC Amplifier |
| A7A1Q6 | 2N2270 | DC Amplifier |
| A7A1Q7 | 2N2270 | Emitter Follower |
| A7A2Q1 | 2N2270 | AGC Amplifier |
| A7A2Q2 | 2N2270 | AGC Amplifier |
| A7A2Q3 | 2N2270 | Emitter Follower |
| A7A2Q4 | 2N2270 | Emitter Follower |
| A7A2Q5 | 2N2270 | Emitter Follower |
| **20/75/300-kc Bandwidth IF Amplifier** | | |
| A8Q1 | 2N2708 | 300-kc BW IF Amp |
| A8Q2 | 2N2708 | 75-kc BW IF Amp |
| A8Q3 | 2N2708 | 20-kc BW IF Amp |
| A8Q4 | 2N2708 | 300-kc BW IF Amp |
| A8Q5 | 2N2708 | 75-kc BW IF Amp |
| A8Q6 | 2N2708 | 20-kc BW IF Amp |
| A8Q7 | 2N2708 | IF Amplifier |
| A8Q8 | 2N2708 | IF Amplifier |
| A8Q9 | 2N697 | Emitter Follower |
| A8Q10 | 2N697 | Emitter Follower |
| A8Q11 | 2N697 | AGC Amplifier |
| A8Q12 | 2N697 | DC Amplifier |
| A8Q13 | 2N1131 | AGC Regulator |
| A8A1Q1 | 2N706 | 1st Limiter |
| A8A1Q2 | 2N706 | 1st Limiter |
| A8A1Q3 | 2N706 | 2nd Limiter |
| A8A1Q4 | 2N706 | 2nd Limiter |
| A8A1Q5 | 2N697 | Emitter Follower |
| A8A1Q6 | 2N697 | Emitter Follower |
| A8A2Q1 | 2N706 | BFO |
| **Video Amplifier** | | |
| A9Q1 | 2N697 | Video Amplifier |
| A9Q2 | 2N526 | Video Amplifier |
| **Audio Amplifier** | | |
| A10Q1 | 2N335 | Audio Amplifier |
| A10Q2 | 2N335 | Driver |
| A10Q3 | 2N2270 | Power Amplifier |
| **CRT Power Supply Regulator** | | |
| A11V1 | GV3A-1200 | Voltage Regulator |
| **General Power Supply Regulator** | | |
| A12Q1 | 2N2270 | Voltage Regulator |
| A12Q2 | 2N1038 | Voltage Regulator |
| A12Q3 | 2N2270 | Voltage Regulator |
| A12Q4 | 2N2270 | Voltage Regulator |
| A12Q5 | 2N2270 | Voltage Regulator |

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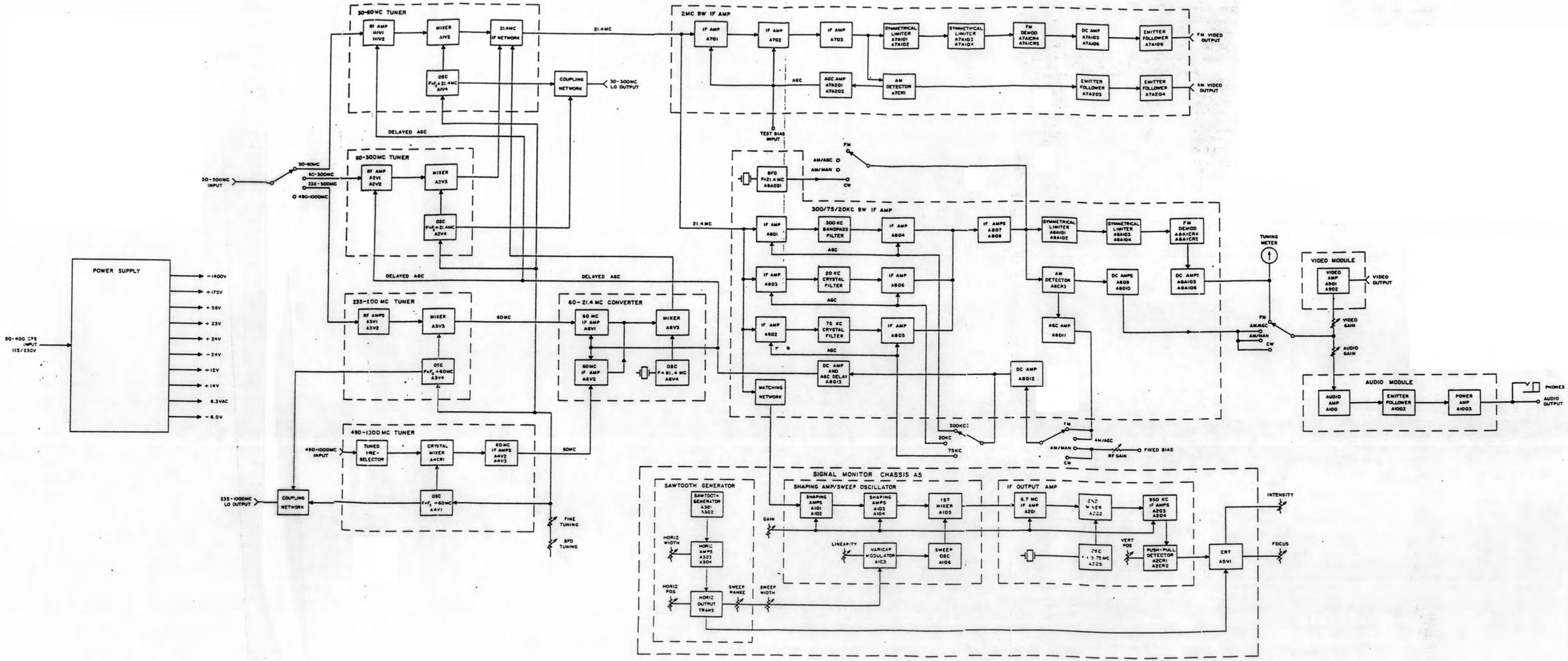


Figure 2-1. Type RS-111-1B Receiving System, Functional Block Diagram

# SECTION II

# CIRCUIT DESCRIPTION

## 2.1 GENERAL

An over-all description of the type RS-111-1B Receiving System is presented in the following paragraphs using the functional block diagram on the facing page and the schematic diagrams included at the back of the manual. Note that the unit numbering system is used for the electrical components, which means that parts on assemblies and subassemblies of the unit carry a prefix before the usual class letter and number of the item (such as A1R1 and A3C5). These prefixes are omitted on illustrations and in the text except in those cases where confusion might result from their omission.

## 2.2 FUNCTIONAL ANALYSIS

The RS-111-1B contains inputs for two antenna ranges: 30 to 500 mc and 490 to 1000 mc. The input to the tuner in operation is connected to the antenna input by means of coaxial relays under the control of the front panel RANGE switch (except for the 490-1000 mc tuner which is always connected to the 490-1000 mc antenna input). This same switch also removes source voltages to the three tuners which are not in operation.

2.2.1 The incoming RF signal to the 490-1000 mc tuner is applied to a tuned pre-selector. The local oscillator in this tuner operates at a frequency 60-mc higher than the incoming carrier. The oscillator signal is injected into the tuned preselector where a crystal mixer heterodynes it with the incoming signal. The 60-mc difference frequency from the crystal mixer is amplified and then connected to the converter.

2.2.2 When the 235-500 mc tuner is in operation, the RF signal is amplified by stages A3V1 and A3V2 and then coupled to the mixer stage, A3V3. The local oscillator, A3V4, operates at a frequency 60-mc higher than the incoming carrier; the output signal from the oscillator is also applied to the mixer. The 60-mc IF from the mixer is coupled to the converter.

2.2.3 The converter contains two 60-mc IF amplifier stages, A6V1 and A6V2; stage A6V1 is associated with the 60-mc output from the 235-500 mc tuner and A6V2 with the 60-mc output from the 490-1000 mc tuner. The RANGE switch disables one stage or the other (or the entire converter) depending on the tuner selected. The output of A6V1 (or A6V2 if the 490-1000 mc tuner is in operation) is coupled to the mixer stage, A6V3. The local oscillator in the converter is crystal controlled at 81.4 mc. The mixer combines the incoming signal and the oscillator signal to produce a second IF at 21.4 mc which is connected to a common 21.4-mc IF output network on the 30-60 mc tuner.

2.2.4 The 60-300 mc tuner contains a cascode RF amplifier, a mixer stage, and a local oscillator stage which operates at a frequency 21.4-mc higher than the incoming carrier. The output from this tuner is a 21.4-mc IF which is connected to the common 21.4-mc IF output network located in the 30-60 mc tuner.

2.2.5 When the 30-60 mc tuner is selected for operation, the incoming signal from the antenna is applied to a cascode RF amplifier formed by stages A1V1 and A1V2. The output of the RF amplifier is coupled to a mixer stage, A1V3. The local oscillator stage, A1V4, operates 21.4-mc higher than the carrier frequency; the output from the oscillator is applied to the mixer stage. The 21.4-mc IF from the mixer is coupled to the IF output network.

2.2.6 The IF output network, located in the 30-60 mc tuner, receives the output from the mixer stages in the 30-60 mc tuner, 60-300 mc tuner and 60-21.4 mc converter, depending on the setting of the RANGE switch. This network provides impedance transformation to match the output of the tuners to the input of the IF amplifiers.

2.2.7 The 21.4-mc IF from the low band tuner output network is simultaneously applied to the input of the 2-mc bandwidth IF amplifier, the input of the 300 kc/75 kc/20 kc bandwidth IF amplifier, and, through a resistive pad, to the input of the signal monitor assembly.

2.2.8 The 2-mc bandwidth IF strip contains three stages of amplification, A7Q1 through A7Q3. The signal at the output of the third IF amplifier is coupled to an AM detector and to symmetrical limiter stages. The output of the AM detector, through emitter followers, appears at the AM VID OUTPUT jack on the rear apron. The output from the symmetrical limiter stages is applied to an FM discriminator. A dc amplifier receives the video output from the discriminator. The signal out of the dc amplifier is applied through an emitter follower to the FM VID OUTPUT jack on the rear apron. A two stage AGC amplifier within the strip provides a gain control voltage which is applied to the first and second IF amplifier stages.

2.2.9 The 300 kc/75 kc/20 kc bandwidth IF strip contains three paths through which the signal can be conducted to subsequent stages in the unit. All three paths are similar, each containing two IF amplifiers separated by bandpass filters. The circuits in two paths are disabled by the IF BANDWIDTH switch while the circuits in the third path are activated, depending on whether this switch is placed in the 300 KC, 75 KC or 20 KC position. The bandpass filter in the 300-kc bandwidth path is a conventional LC circuit while crystal filters are used in the 75 kc and 20 kc paths. The signal out of the path in operation receives additional amplification in stages A8Q7 and A8Q8 before application to the limiters and the AM detector. From the detector, the AM video signal is connected to an AGC amplifier (A8Q11 and A8Q12) and to a dc amplifier (A8Q9 and A8Q10). The video signal out of the dc amplifier is applied through the function switch to the video amplifier module. The voltage at the output of the AGC amplifier is used to control the gain of several stages in the receiver when the function switch is in the FM or AM/AGC positions.

2.2.10 The output of the symmetrical limiter stages in the 300 kc/75 kc/20 kc bandwidth IF strip is applied to an FM discriminator circuit which includes A8A1CR4 and A8A1CR5. The output of the discriminator is amplifier and applied to an emitter follower. The FM video signal from the emitter follower is used to drive the TUNING meter and is also connected to the FM position on the function switch. The AM video signal from this IF strip is connected to the AM/AGC, AM/MAN, and CW positions of the function switch. Thus, the signal at the arm of the function switch is either the FM video output or the AM video output as determined by the switch setting.

2.2.11 The video signal from the arm of the function switch is applied through the VIDEO and AUDIO gain controls to the video and audio amplifiers, respectively. The output from the video amplifiers (A9Q1 and A9Q2) appears at the AM-FM VID OUTPUT jack on the rear apron.

2.2.12 The audio amplifier receives its input through the AUDIO GAIN control. The module contains an amplifier (A10Q1), emitter follower (A10Q2) and a power amplifier (A10Q3). The audio output from the module is available at the PHONES jack on the front panel and at the terminal strip on the rear apron.

2.2.13 The output of the local oscillator in the four tuners is connected to one of two coupling networks. One network couples the outputs of the 30-60 mc tuner local oscillator and the 60-300 mc tuner local oscillator to a rear-apron jack marked 30-300 MC LO OUTPUT. The outputs of the oscillators in the remaining two tuners are similarly coupled through a second coupling network to the 235-1000 MC LO OUTPUT jack.

2.2.14 The front-panel FINE TUNING and BFO TUNING controls are used to vary the frequency of the local oscillator in operation. The BFO stage (A8A2Q1) is crystal controlled at 21.4. The BFO is activated when the function switch is placed in the CW position; the 21.4 mc output of the BFO is injected into the AM detector in the multiple-bandwidth IF strip. Since the BFO is crystal controlled, it is necessary to vary the frequency of the local oscillator in the tuner in operation in order to vary the pitch of the CW-audio signal.

2.2.15 The signal monitor assembly contains the cathode ray tube (CRT), and the sweep generator, IF output amplifier, and shaping amplifier/sweep oscillator subassemblies. The sawtooth generator section provides the waveform which is used to control both the horizontal deflection on the CRT and the frequency excursions of the sweep oscillator. The fact that this single waveform controls the action in both of these circuits explains how synchronization is obtained between the various signals in the incoming RF spectrum and their position on the CRT trace.

2.2.16 The sawtooth waveform originates in A3Q1 and A3Q2 and associated circuitry. The sawtooth wave is amplified by stages A3Q3 and A3Q4 and then connected to the horizontal output transformer. Control of the CRT trace width is provided by a width potentiometer which operates in conjunction with the horizontal amplifiers. A horizontal position control, connected in the horizontal transformer circuit, provides a means of centering the trace on the CRT screen. The sawtooth waveform is connected from the horizontal transformer to the deflection plates in the CRT, and through the sweep range and sweep width controls to the sweep oscillator.

2.2.17 The input to the signal monitor is the 21.4-mc IF output from the tuner in operation. This signal is applied to the shaping amplifiers, A1Q1 through A1Q4. These shaping amplifiers provide a response curve which adds to the tuner response curve and provides an essentially flat 3-mc bandwidth. The signal from the shaping amplifiers is coupled to the mixer stage, A1Q5; this stage also receives the output of the sweep oscillator. The sweep oscillator, A1Q6, has a normal resting frequency of 28.1 mc, which is 6.7-mc higher than the incoming signal. However, using maximum sweep width, an incoming signal at 19.9 mc and an oscillator frequency of 26.6 mc combine in the mixer to produce 6.7 mc (the first IF), or an incoming 22.9 mc and an oscillator frequency of 29.6 mc also combine with 6.7 mc as a resultant. These two conditions are noted in order to explain the relationship between the signal monitor IF, the sweep oscillator frequency, and the position of a signal in the incoming spectrum.

2.2.18 The sawtooth waveform produced in the sawtooth generator section is applied to a varicap modulator (A1C3) in the shaping amplifier/sweep oscillator section. The varicap modulator reacts to the impressed sawtooth wave and causes the sweep oscillator to move up and down in frequency in conformance with the sawtooth waveform. Therefore, a 6.7-mc output is produced from the mixer as the sweep oscillator changes in frequency and differs from a signal in the input spectrum by exactly 6.7 mc. Since the horizontal movement of the trace on the CRT is controlled by this same sawtooth wave, the signals out of the first mixer ultimately appear as vertical pips across the face of the tube in a manner which corresponds to their original position in the input spectrum.

2.2.19 The IF output amplifier section of the signal monitor chassis contains a 6.7 mc IF amplifier (A2Q1) followed by a second mixer stage (A2Q2). A crystal-controlled oscillator in this section, A2Q5, produces a 5.75-mc output which is also applied to the second mixer. The 950-kc second IF from the mixer is amplified in A2Q3 and A2Q4 and then applied to a push-pull detector. The output from this detector consists of two equal signals of opposite polarity which are applied to the vertical deflection plates of the CRT.

2.2.20 The front-panel GAIN control, associated with the signal monitor, controls the gain of the shaping amplifiers and all IF amplifiers. Controlling the gain of these stages sets the amplitude of the pips on the screen, assuming a constant input signal level. The linearity control adjusts circuit parameters in the varicap modulator in order to provide a linear sweep on the CRT. The vertical position of the trace on the CRT screen is adjusted by the vertical position control, which functions in conjunction with the push-pull detector circuitry.

2.2.21 The power supply for the receiving system is self-contained and is designed to operate from a primary power source of 115/230 volts, 50-400 cps. All voltages required by the unit are developed in the power supply.

## 2.3 30-60 MC RF TUNER

The type 7165 tuner covers the 30 to 60 mc range. The tuner schematic is shown in Figure 6-1; the reference designation prefix is A1.

2.3.1 RF Amplifier. - The RF amplifier consists of two type 6CW4 Nuvistor triodes, V1 and V2, in cascode amplifier configuration. Input tuning is accomplished by inductor L2A, one section of a four-section inductuner, in the grid circuit of V1. Output tuning is accomplished by inductor L2B, another inductuner section in the plate circuit of V2. Neutralization is achieved by feeding a small out-of-phase signal from the plate to the grid of V1 through broadband transformer T1. To extend the dynamic range of the receiver, the RF amplifier signal handling capability is improved by applying a delayed gain control voltage derived in the multiple-bandwidth IF strip and fed to the grid of V1 through resistors R2 and R3.

2.3.2 Local Oscillator. - The local oscillator is a type 6CW4 Nuvistor triode, V4, operated in a Colpitts configuration with the plate at RF ground. The tank circuit is tuned by inductor L2D, a section of the inductuner. The frequency of operation is maintained 21.4-mc above the carrier. The output of the oscillator is coupled to the grid of the mixer through capacitor C18 and to the LO output jack through capacitor C44.

2.3.3 Mixer. - The mixer, V3, is a type 7587 Nuvistor tetrode with its input circuit tuned by inductuner section L2C. Both the signal from the RF amplifier and the output of the local oscillator are applied to its grid, and the two signals are mixed to produce a 21.4-mc IF. Test point TP1, decoupled from the grid, can be used to check oscillator injection and also to check RF alignment by means of an oscilloscope. The mixer output is a plate circuit pi-network formed by capacitor C22 as one leg, the variable inductor L5, and the mixer plate capacitances plus cable capacitance as the other leg. This network also serves as the mixer output network for the 60-21.4 mc converter mixer and the 60-300 mc tuner mixer. The common output to the IF strip is taken through blocking capacitor C24 and jack J3.

## 2.4 60-300 MC RF TUNER

The type 7164 tuner covers the frequency range of 60 to 300 mc. It contains an RF amplifier, mixer, and local oscillator stages. A schematic diagram of the tuner is included as Figure 6-2; prefix the parts in this assembly with A2.

2.4.1 RF Amplifier. - The tuner employs type 8058 Nuvistor triodes, V1 and V2, in a cascode configuration as the RF amplifier. The input to the tuner is applied through jack J1. The input is tuned by inductor L1A, one section of a four-section inductuner. The amplifier is neutralized by the use of a bridge arrangement which balances the plate-to-grid capacitance of V1. The arms of the bridge are: capacitor C3, the combination of capacitors C4 and C5, the input capacitance of V1, and the plate-to-grid capacitance of V1. The gain of the RF amplifier is varied by a delayed gain control voltage which is derived in the multiple-bandwidth IF strip and applied to the stage through resistor R3.

2.4.2 Local Oscillator. - The local oscillator stage, V4, employs a type 6CW4 Nuvistor triode in a Colpitts configuration. It is tuned by L1D, a section of the inductuner, and maintained at a frequency 21.4-mc higher than the incoming RF carrier. Tank circuit capacitors C25 and C26 have a negative temperature coefficient to compensate for frequency drift due to ambient temperature change. The output from the oscillator is coupled through capacitor 0 to the mixer control grid circuit, and from the divider formed by capacitors C22 and C42 to the LO output.

2.4.3 Mixer. - The mixer stage, V3, utilizes a type 7587 Nuvistor tetrode. The interstage coupling network between the RF amplifier second stage and the mixer input is tuned by inductors L1B and L1C, two sections of the inductuner. The mixer stage heterodynes the incoming RF signal and the local oscillator signal to produce a 21.4-mc IF signal in the plate circuit. The 21.4-mc signal in the plate circuit is coupled through blocking capacitor C39 and jack J2 to the common IF output network located in the 30-60 mc tuner.

2.5 235-500 MC RF TUNER

The operation of the type 7162 tuner is explained in the following paragraphs. Refer to the schematic diagram, Figure 6-3 and note that the reference designation prefix for this subassembly is A3.

2.5.1 RF Amplifier. - The RF Amplifier consists of two type 7077 ceramic triodes, V1 and V2, both in grounded-grid configuration. The nominal input impedance at jack J1 is 50 ohms. The input circuit is a pi-network matching the antenna to the input of the first stage, V1. Interstage coupling and coupling from the second stage to the mixer is by means of double-tuned circuits. Tuning within the RF amplifier is by inductors L3A, L3B, L3C, L3D, and L3E, five sections of a six-section inductuner. An improvement in stability is obtained by returning the cathode of V1 and V2 to a -6.3 volt regulated source through resistors R1 and R3.

2.5.2 Local Oscillator. - The local oscillator, V4, is a type 7486 ceramic triode operated in a Colpitts configuration. The tank circuit is tuned by inductor L3F, a section of the inductuner. The operating frequency is maintained 60 mc above the carrier. Increased frequency stabilization is obtained by the use of a regulated -6.3 volt filament supply. The oscillator's signal is coupled to the low band tuner mixer through capacitor C28. Fine tuning and BFO pitch control are accomplished by a voltage-variable capacitor, CR1, which varies the capacitance of the tank circuit. A voltage-variable capacitor is a semi-conductor device whose effective capacitance varies with the voltage across it. The capacitance of CR1 is controlled by a dc voltage applied through resistors R13 and R15. The level of this voltage is controlled by the FINE TUNING potentiometer and the BFO TUNING potentiometer.

2.5.3 Mixer. - The mixer, V3, is a type 7587 Nuvistor tetrode with its input circuit tuned by inductuner section L3E. Both the signal from the RF amplifier and the output of the local oscillator are applied to its grid and the two ials are mixed to produce a 60-mc IF. An oscilloscope can be connected at test point TP1 in the mixer grid circuit to check oscillator injection and also to check the RF response. The mixer output is taken from the tuner and applied to the converter through a double-tuned coupling whose primary is inductor L14 and whose secondary is inductor A6L1 in the converter. Capacitor A6C1 establishes the degree of coupling between L14 and A6L1.

2.6 490-1000 MC RF TUNER

The type 7163 tuner consists of a preselector, local oscillator, mixer, and two IF amplifiers. The reference designation prefix is A4; a schematic diagram of the tuner is presented in Figure 6-4.

2.6.1 Quadruple-Tuned Preselector. - The RF input circuit in the 490-1000 mc tuner presents an impedance designed for a 50-ohm antenna. The signal is coupled from the input to the quadruple-tuned preselector. Tuning is accomplished by four tuned cavities. The signal passes from cavity to cavity through coupling irises. The cavities are resonated to the carrier frequency by changing the capacitance between the inner conductor and ground. This action effectively produces quarter-wave tuning and is analagous to coaxial-line cavity tuning in which the resonant frequency is determined by the position of the plunger. From the fourth cavity, inductor L6 couples the signal to the crystal mixer.

2.6.2 Local Oscillator. - The local oscillator, V1, is a type 7586 ceramic triode operated as a modified Colpitts oscillator. The tank circuit is a length of transmission line. Capacitor C1E, ganged with the high band tuning control, loads the transmission line so as to make its effective length one-half wavelength at the desired frequency. The oscillator is operated at a frequency 60 mc above the carrier. Increased frequency stabilization is obtained by the use of a regulated -6.3 vdc filament supply. Fine tuning and BFO pitch control are accomplished by the use of a voltage-variable capacitor, CR2, in the same manner used for fine tuning of the other three tuners (see paragraph 2.5.2). The oscillator signal to the crystal mixer is picked up by the inductor L6 whose lower end reaches through a shield into the chamber where the oscillator stage is mounted.

2.6.3 Crystal Mixer. - The mixer, CR1, is a type 1N82A crystal diode. It receives both the incoming carrier and the oscillator injection signal through inductor L6. Jack J4 is present to facilitate checking the oscillator injection level. The mixer output, a 60-mc IF signal, is applied to the 60-mc IF low-noise amplifier within the tuner.

2.6.4 60-mc IF Amplifier. - To compensate for the lack of gain in the quadruple-tuned preselector, the high band tuner has a 60-mc IF amplifier consisting of two type 6CW4 triodes, V2 and V3, in cascode configuration. Coupling from the mixer is through inductors L13, L15, and capacitor C21. The first stage is neutralized by inductor L16. The output from the amplifier is through a double-tuned circuit, the primary of which is inductor L17 and the secondary of which is inductor A6L2 located in the 60-21.4 mc converter. Capacitor A6C2 fixes the degree of coupling between L17 and A6L2.

2.7 60-TO 21.4-MC CONVERTER

The type 7120 converter contains 60-mc IF buffer amplifiers, a mixer, and an 81.4-mc crystal-controlled oscillator. As shown on the schematic diagram (Figure 6-9) of the converter, A6 is used as the reference designation prefix.

2.7.1 60-mc IF Amplifiers. - The converter uses type 7587 Nuvistor tetrodes (V1 and V2) to amplify the incoming 60-mc signal from the 235-500 mc tuner or the 490-1000 mc tuner. V1 operates in conjunction with the 235-500 mc tuner and V2 with the 490-1000 mc tuner. As the RANGE control switches the source voltages to the tuners, it also switches B-plus to these two stages in the converter. Plate voltage for V3 and V4 is supplied through CR1 or CR2, one of which is forward biased by the voltage applied to C8 or C11. The output from the stage in operation is applied through a double-tuned coupling (L3 and L4) to the grid circuit of the mixer stage.

2.7.2 81.4-mc Oscillator. - The oscillator in the converter, V4, is a type 6CW4 Nuvistor triode. It is crystal controlled and operates at 81.4 mc.

2.7.3 Mixer and IF Output Network. - The mixer stage employs a type 7587 Nuvistor tetrode. The 81.4 mc output from the oscillator is coupled to the control grid of the mixer through capacitor C21. The mixer heterodynes this signal with the 60-mc incoming IF signal to produce a 21.4 mc second IF. The output from the plate of the mixer is taken through capacitor C29 to the common IF output network located in the 30-60 mc tuner.

2.8 BANDSWITCHING

Bandswitching is accomplished by switching the dc voltage sources to the tuners and the converter (see Figure 6-17). The RANGE switch, S1, is divided into four sections. These four sections control the lamps behind the tuning dials, the coaxial relays which switch the tuner inputs, and the regulated and unregulated power supply voltages to the tuners and the converter.

2.9 300 KC/75 KC/20 KC BANDWIDTH IF STRIP

The circuits in the 300 kc/75 kc/20 kc bandwidth IF strip are explained in the following paragraphs using the schematic diagram, Figure 6-11. Parts in this IF strip carry the reference designation prefix A8. The 21.4-mc input is connected to the IF strip through input jack J1. An impedance matching network consisting of resistors R1, R2, and R3 feeds the input signal to the SM output jack J2. The IF BANDWIDTH switch determines if the signal is passed through the 300 kc, 75 kc, or 20 kc bandpass amplifiers by supplying base bias from the AGC amplifier to the IF amplifiers for the selected bandwidth.

2.9.1 300-kc Bandwidth IF Amplifiers. - Transistors Q1 and Q4 are the first and second IF amplifiers for the 300-kc bandwidth. The bandwidth is determined by the interstage coupling between Q1 and Q4, a double-tuned, over-coupled network. The tuned circuit in the collector of Q1 consisting of C22, C23, and L4 has the junction of C22 and C23 grounded to provide a signal voltage at the junction of C23 and L4 which is out of phase with the input signal. This voltage is coupled back to the base of Q1 through C14 to neutralize the stage. This same method of neutralization is used by the second IF amplifier, Q4. The gain of both stages is controlled by the AGC amplifier when the function switch is in the FM or AM/AGC positions, and by the RF GAIN control when the function switch is in AM/MAN or CW positions. Placing the IF BANDWIDTH switch in the 75 KC position or the 20 KC position removes base bias from both Q1 and Q4, disabling these stages.

2.9.2 75-kc and 20-kc Bandwidth IF Amplifiers. - Transistors Q3 and Q6 are the first and second IF amplifiers for the 20-kc bandwidth. The 20-kc bandpass is determined by crystal filter FL2 in the coupling network between Q3 and Q6. The tuned collector load of Q6 is shared with Q5 and Q4. Neutralization of Q6 is accomplished by feeding back an out-of-phase signal from the junction of C43 and L9 through C44 to the transistor's base. Neutralization of Q3 is not necessary as the heavy loading of the crystal filter in the collector circuit insures that oscillation will not occur. Operation of the 75-kc bandwidth path is identical to the operation of the 20-kc path. The 75-kc path includes stages Q2 and Q5 and filter FL1.

2.9.3 Third and Fourth IF Amplifiers. - The third and fourth IF amplifiers, Q7 and Q8, are common to all three

IF bandwidths. Double-tuned, over-coupled networks are used to connect the stages and as the output circuit of Q8. Both transistors are neutralized using the same method described for the 300-kc IF amplifiers. The output of Q8 is fed to the AM detector, CR3, and through a capacitive voltage divider to the FM demodulator.

2.9.4 AM Detector and Output. - The 21.4 mc signal from the fourth IF amplifier is applied to the AM detector, CR3. Capacitors C65 and C68, and resistor R55 form a filter to eliminate the RF signal components from the output of the detector. The audio-video output from the detector is fed through cascaded emitter followers Q9 and Q10 to the AGC amplifier and to section S2B of the function switch. Series-connected silicon diodes CR1 and CR2 are used to compensate for the voltage drop across the base-emitter junction of silicon transistors Q9 and Q10. This refinement is included so that the AM video output will be zero volts with no signal input. Resistor R54 connects CR1 and CR2 to the plus 12-volt supply. Thus the junction of R54 and CR1 is clamped at 1.2 volt (0.6 volt drop across each diode). The base of Q9 is clamped at 1.2 volt through resistor R55 which compensates for the 0.6 volt drop across the base-emitter junction of each transistor. Note that the clamp voltage appears at both ends of the AM detector, CR3, so that its operation is not affected.

2.9.5 FM Limiters. - The 21.4-mc signal from the IF Amplifiers is fed to a symmetrical limiter stage formed by A1Q1 and A1Q2 from a capacitive voltage divider. The incoming signal swings about a dc level of approximately plus 3 volts established by base-bias resistors A1R1 and A1R2. Similar networks are in the base circuits of A1Q2, A1Q3, and A1Q4. Transistors A1Q1 and A1Q2 share a common emitter resistor, A1R3. Under no-signal conditions the combined emitter currents of the two transistors develops a voltage across A1R3 which approaches plus 3 volts. When a signal is applied to the base of A1Q1, the positive-going half cycle causes increased conduction through A1Q1 which increases the voltage drop across A1R3. This action causes the collector of A1Q2 to move rapidly toward the source voltage level. The negative-going half cycle of the incoming signal reverses the process, reducing the conduction through A1Q1, and increasing the conduction through A1Q2. The base of A1Q2 is held at RF ground potential by capacitor A1C2. Diodes A1CR1, A1CR2 and A1CR3 in the base circuit of A1Q1 prevent large positive-going signals from overloading the limiter, and large negative-going signals from back biasing the base-emitter junction of A1Q1. If the input signal exceeds approximately 7 volts peak-to-peak, Zener diode A1CR2 breaks down and clips positive-going excursions in excess of approximately 4 volts. Negative-going excursions in excess of approximately 4 volts forward bias A1CR3, shorting signal voltage greater than the clipping level to ground. Diode A1CR1 in series with A1CR2 blocks the Zener on negative excursions, preventing it from acting as an ordinary diode. The first limiter output is coupled to the second limiter through capacitor A1C3. Operation of the second limiter is identical to that of the first.

2.9.6 FM Discriminator and Output. - The FM discriminator is a modified Foster-Seeley circuit. Capacitor A1C5 couples the 21.4-mc signal from the second limiter to a resonant circuit consisting of capacitor A1C7, variable inductor A1L3, and the primary of the discriminator transformer, A1T1, which is tuned to the same frequency. An inductive voltage divider is formed by A1L3 and the primary of A1T1, with only a very small percentage of the limiter output appearing across the transformer primary. Capacitor A1C8 couples the reference voltage to the secondary of A1T1. Capacitive center-tapping of the secondary through A1C9 and A1C10 makes it possible to obtain a high degree of discriminator balance unaffected by coil characteristics or the position of the tuning slug. The FM video output from the discriminator is direct coupled to cascaded emitter followers A1Q5 and A1Q6. The output from A1Q6 is coupled to the tuning meter and, through section S2B of the function switch, to the AUDIO GAIN and VIDEO GAIN controls.

2.9.7 Beat Frequency Oscillator. - The BFO is a subassembly on the IF strip; its complete reference designation is A8A2. In the CW mode of operation a 21.4 mc signal from the BFO is injected into the AM detector through capacitor C64. This signal beats with the IF frequency to produce an audible note. The BFO is placed in operation by the application of plus 24 volts through switch section S2C on the main chassis. The plus 24 volts biases diode CR2 in the forward direction, which applies the dc voltage to the collector of transistor Q1. The BFO is a self-regulating Colpitts oscillator. The output signal is derived from the feedback divider circuit consisting of capacitors C1 and C3. With the BFO on, diode CR1 is back biased and has little effect upon the circuit. When switch S2C is moved to any position other than the CW position, minus 24 volts is applied to CR1 and CR2. Diode CR1 is now forward biased and CR2 is back biased. When CR1 is conducting, a short circuit is effectively placed across crystal Y1. If this action were not taken, the crystal would be coupled to the IF strip through capacitors C3 and C64. This could cause undesirable effects in the IF response curve. Back biasing CR2 protects transistor Q1 from having the negative voltage applied to its collector.

2.9.8 AGC Amplifier. - The AGC amplifier controls the gain of two of the RF tuners, the converter and the 300 kc 75 kc/20 kc IF strip when the function switch is in the FM or AM/AGC position.

2.9.8.1 Input to the AGC amplifier is the AM video output from the emitter of Q10. Resistor R58 and capacitor C69 form a modulation filter to remove audio variations from the dc component present at the AM detector output and at the emitter of Q10. A second modulation filter consists of resistor R62 and capacitor C70 in the collector circuit of Q11. Transistor Q11 is cut-off under no-signal conditions. As the output from the AM detector increases in the positive direction, Q11 begins to conduct. The negative-going voltage on the collector is fed to transistor Q12 through section S2A of the function switch. AGC voltage for the IF strip is obtained at the emitter of Q12. With no signal input this point is approximately plus 10 volts. As the base of Q12 goes less positive, as a result of the collector voltage of Q11 decreasing, the emitter also becomes less positive, thus decreasing the gain of the IF strip.

2.9.8.2 AGC voltage for the two tuners and the converter is obtained from the collector of Q13, a PNP transistor. This transistor is biased to saturation until the tuner signal-to-noise ratio reaches approximately 30 db, thus providing a delayed AGC voltage for the tuner. Until this signal level is reached, the tuner AGC output at the junction of resistors R66 and R67 is approximately zero and the tuner in use operates at maximum gain. This point is clamped by diode CR4 to prevent it from ever going more positive than 0.5 volt. When the signal-to-noise ratio reaches the proper level, the positive-going collector voltage of Q12 takes control of Q13, biasing it out of saturation. As the input signal strength increases, the collector of Q12 goes more positive, further decreasing the conduction through Q13. This results in the tuner AGC voltage increasing in the negative direction from zero volts towards the minus 24-volt supply. Once the tuner AGC voltage is obtained, the IF AGC voltage remains fairly constant so that the receiver gain is now controlled by the tuner AGC for stronger signals.

## 2.10 2 MC BANDWIDTH IF STRIP

Figure 6-10 is the schematic diagram for the 2-mc IF strip. Components in the strip carry the reference designation prefix A7. This IF strip contains its own AGC circuit, limiter stages, FM discriminator, and AM and FM output stages.

2.10.1 IF Amplifiers. - There are three stages of IF amplification: transistors Q1, Q2, and Q3. The 2-mc IF bandwidth is determined by interstage coupling. Each stage is overcoupled to produce a dip in the over-all IF response curve. This is to compensate for the peaked output from the tuners so that the over-all response will be essentially flat over the 2-mc bandwidth. The C4, C5, L2 tuned circuit in the collector of Q1 has the junction of C4 and C5 grounded to provide a signal voltage at the junction of C5 and L2 which is out of phase with that at the input. This voltage is coupled back to the base through capacitor C2 to neutralize the stage. Both the second and third IF amplifiers use this same method of neutralization. The gain of Q1 and Q2 is controlled by A2Q2, the AGC regulator transistor. Output from the third IF amplifier, Q3, is fed to the AM detector and, through a capacitive voltage divider, to the limiter stages.

2.10.2 AM Detector and Output. - Diode CR1 detects the AM signal and feeds it to emitter follower stage, A2Q3. The output of A2Q3 is ac coupled through capacitor A2C2 to a second emitter follower, A2Q4. Transistor A2Q4 provides a low-impedance output to the AM VIDEO output jack, J5, on the rear apron of the receiver.

2.10.3 FM Limiters and Discriminator. - The FM limiter and discriminator circuits are nearly identical to those in the 20/75/300-kc IF strip except for component values. For a discussion of the operation of these circuits refer to paragraphs 2.9.5 and 2.9.6. The video output from the Foster-Seeley discriminator is direct coupled to cascaded emitter followers A1Q5, A1Q6, and A1Q7 which provide high current amplification to drive a low-impedance load.

2.10.4 AGC Amplifier. - The AGC amplifier consists of a dc amplifier, A2Q1, and a series regulator, A2Q2. Input voltage to A2Q1 is obtained from the emitter of A2Q3. Resistor A2R1 and capacitor A2C1 form a filter which removes the modulation from the signal so that A2Q1 is supplied with a dc voltage which varies in proportion to the average level of the input carrier signal. This voltage is amplified by A2Q1 which, in turn, controls the current flow through A2Q2. The series regulator is connected between the plus 12-volt supply and the base-bias circuits of the first and second IF amplifier stages. If, for example, the detector output is increasing in the positive direction, the control voltage on the base of A2Q2 goes more negative, reducing the positive base bias on the first and second IF stages. This, in turn, decreases the gain of the IF strip. When the average detector output is increasing in the negative direction, the control voltage on the base of A2Q2 goes more positive, resulting in increased IF gain.

## 2.11 VIDEO AMPLIFIER

The type 7312 video module amplifies either the AM or the FM output of the multiple-bandwidth IF strip as determined by the setting of the function switch. The reference designation prefix for this assembly is A9; a schematic diagram of the amplifier is shown in Figure 6-12. If the function switch is in the FM position, the FM video signal is applied to the VIDEO GAIN and AUDIO GAIN controls. In any of the other three function switch positions, the AM video signal from the multiple-bandwidth IF strip is applied through switch section S2B to the gain ontrols. The AM or FM video signal from the arm of potentiometer R9 enters the video amplifier on pin 1 and is pplied to the base of Q1 through capacitor C1. The video signal is amplified by Q1 and Q2 and coupled to the output rough capacitor C2. This signal is present at the rear apron jack J4 marked AM/FM VID OUTPUT.

UDIO AMPLIFIER

The type 7400A audio amplifier (see Figure 6-13) is contained on a separate module and uses three-dc oupled transistors, Q1, Q2, and Q3. The first stage is a conventional voltage amplifier in a common emitter con-guration. The input signal from the AUDIO GAIN potentiometer, R10, is applied to this stage through capacitor C1 nd resistor R1. The second stage is an emitter follower used to match the high output impedance of the first stage o the low input impedance of the third stage, the power amplifier. An improvement in stability is obtained by a coupling network between the second and third stages. This coupling is made up of capacitor C2 and resistor R8 in arallel. Resistor R7 provides direct signal feedback from the third to the first stage. Resistor R10, in the emitter ead of the output stage, provides additional stability. The output is through transformer T1 which forms the third stage collector load.

2.13 GAIN CONTROL SYSTEM

The over-all system of gain control used within the receiver sections of the receiving system can be understood using the block diagram, Figure 2-1, or the main chassis schematic diagram, Figure 6-16.

2.13.1 Both delayed and undelayed gain control voltages are used in the receiver section of the unit. A delay network in the 300-kc/75-kc/20-kc bandwidth IF strip provides a delayed gain control voltage which is applied to the 30-60 mc tuner, the 60-300 mc tuner, and the converter (see paragraph 2.9.8). The undelayed gain control voltage present at the arm of function switch section S2A is used to control the gain of certain stages in the multiple bandwidth IF strip. The 2-mc bandwidth IF strip uses an AGC voltage derived in that strip to control the gain of its own first and second IF amplifiers.

2.13.2 In the FM or AM/AGC positions of the function switch, an AGC voltage derived in the multiple-bandwidth IF strip is used for gain control in all receiver sections except the 2-mc bandwidth IF strip. In the CW or AM/MAN settings of the function switch, this AGC voltage is replaced by a voltage from the arm of the RF GAIN potentiometer R7.

2.14 SIGNAL MONITOR

The type 7930 signal monitor section of the RS-111-1B Receiving System provides a visual display of the received signal. The input to the signal monitor is the 21.4-mc IF from the tuner in operation. This signal is connected through a resistive pad in the multiple-bandwidth IF strip to jack A5J1 on the signal monitor chassis. Refer to the main chassis schematic diagram, Figure 6-17, and the signal monitor chassis schematic diagram, Figure 6-5, in conjunction with the individual subassembly schematics as necessary during the following paragraphs.

2.14.1 Shaping Amplifier/Sweep Oscillator. - The shaping amplifier/sweep oscillator (see the schematic diagram, Figure 6-6) contains four shaping amplifier stages (Q1 through Q4), a sweep oscillator (Q6), and a mixer stage (Q5). The 21.4-mc input is connected through jack J1 to the primary of transformer T1. The signal at the secondary of T1 is applied to the base of Q1, the first shaping amplifier. The method of coupling used between the shaping amplifiers and between the shaping amplifier and the mixer consists of stagger-tuned transformers T2 through T5. Each transformer has its primary connected in the collector circuit of the preceding stage and one of the two secondary windings connected in the base circuit of the succeeding stage. The third winding is connected as a tuned circuit. In the first two transformers (T2 and T3) a resistance is added across the tank to lower the Q of the circuit. The gain of all four shaping amplifier stages is controlled by a voltage derived at the arm of the GAIN potentiometer (A5R1) and fed to the base circuits of these stages through the secondary windings of the transformers involved.

2.14.1.1 The mixer stage, Q5, receives the 21.4-mc center-frequency signal from the secondary of transformer T5. The output of the sweep oscillator is coupled through capacitor C27 and also appears on the base of Q5. The mixer collector circuit is connected through jack J2 to the input of the IF output amplifier, where the primary of the input transformer on this subassembly acts as the collector load for the mixer.

2.14.1.2 The sweep oscillator is a Colpitts type with the output taken from the feedback divider. The frequency of the local oscillator at any particular instant of time is under the control of a sawtooth waveform which is applied to the junction of diodes CR4 and CR5. This waveform originates in the horizontal sweep oscillator section of the signal monitor chassis. This general waveform is ultimately impressed across voltage-variable capacitor C32, which is in parallel with oscillator tank circuit. The voltage-variable capacitor is a semiconductor device whose effective capacitance varies with the amplitude of the voltage impressed across it. The sawtooth wave varies the capacitance of C32 which, in turn, varies the frequency of the sweep oscillator. Since the voltage-vs-capacitance curve of C32 is not linear, the waveform of the incoming sawtooth must be re-formed to provide a linear sweep. This reshaping is accomplished at higher amplitude levels of the sawtooth wave by Zener diodes CR4 and CR5 and associated series resistors, R23 and R24. These Zeners break-down at specific amplitude levels and tend to round-off the top of the wave. The lower portion of the wave is adjusted by the action of diode CR1 in series with the linearity control, R18. A fixed bias is applied to this network through resistor R19. The center frequency of the sweep oscillator is set by a dc voltage applied from the arm of the CENTER FREQ control, A5R3.

2.14.2 <u>IF Output Amplifier.</u> - The input to the IF output amplifier (see Figure 6-7) is a 6.7-mc signal from the first mixer. A double-tuned coupling is provided between the input and the base of the 6.7-mc IF amplifier stage, Q1. This double-tuned circuit is formed by the secondary of T1, capacitors C1, C2, and C3, and the primary of T2. Transformer action of T2 places the signal in the base circuit of Q1. The coupling between the IF amplifier and the second mixer is similar to the one previously described. An additional winding on T3 is used to provide a neutralizing voltage which is coupled by capacitor C37 to the base of Q1. The second stage in the IF output amplifier is the mixer Q2, which combines the 6.7-mc incoming signal with the 5.75-mc output of the oscillator (Q5) to produce a 950-kc second IF. The frequency of the oscillator is stabilized at 5.75-mc by crystal Y1. The output of the oscillator is coupled into the mixer base by C14. Stages Q3 and Q4 provide amplification at 950-kc and increased selectivity. The output of stage Q4 is applied to the detector (CR1 and CR2) circuits which provide equal but opposite outputs to the vertical deflection plates of the CRT. The gain of the 6.7-mc IF amplifier and the first 950-kc IF amplifier is controlled by the setting of the GAIN potentiometer which varies the base bias on these stages.

2.14.3 <u>Horizontal Sweep Oscillator.</u> - The horizontal sweep oscillator subassembly (see Figure 6-8) generates the waveform used to control the excursions of the first local oscillator (A5A1Q6) and the horizontal deflection of the trace on the CRT.

2.14.3.1 Capacitor C1 charges from the plus 24-volt source through resistor R1. When the voltage on C1 reaches a certain level, the unijunction transistor Q1 is fired. The firing of Q1 allows C1 to discharge through resistor R13 and the transistor. This action develops a pulse across R1 which is reflected through diode CR1 and turns stage Q2 on. Capacitor C2 has charged while Q2 was off through diode CR2, resistors R3 and R5, and potentiometer R4 to the plus 24-volt line. When Q2 goes on, capacitor C2 discharges quickly through this transistor. Since C2 is connected from the base of Q4 to ground, conduction through Q4 follows the charge and discharge of C2. Transistors Q3 and Q4 are arranged as complementary emitter followers with bootstrapping action provided by connecting the output back to the base of Q3 through capacitor C7. Diode CR2 is used to offset the base-bias on Q3.

2.14.3.2 The output waveform at the emitters of Q3 and Q4 is coupled by capacitor C3 to the horizontal output transformer T1. One output at the secondary of T1 is applied through the sweep range control (R11) to the sweep oscillator. Two other outputs, of equal but opposite polarity, are taken at each end of the secondary and coupled through capacitors C4 and C5 to the horizontal deflection plates in the CRT. The horizontal position control (R9) is used to center the trace horizontally on the CRT. This potentiometer allows the dc voltage applied to one of the horizontal plates to be varied from zero to plus 24 volts. The fixed voltage on the other plate is held at plus 12 volts by the voltage divider action of resistors R7 and R8.

2.15 POWER SUPPLY

The RS-111-1B power supply includes the ac input circuits (shown in Figure 6-17), the general power supply regulator (see Figure 6-15), and a regulator for the CRT voltages (see Figure 6-14).

2.15.1 <u>Input Circuit.</u> - The ac input to the unit is connected through the power plug, P26, the 1/2 ampere line fuse, F1, and the on-off switch which is ganged with the AUDIO GAIN control. The arrangement of the two primary windings on the power transformer is controlled by the 115V/230V switch, S4. In the 115V setting of S4, the windings are in parallel; in 230V, the windings are in series and the 1/4 ampere fuse, F2, is included in the circuit. Four of the six-secondary windings on the power transformer operate in conjunction with one of the regulators, and the functions of these windings will be explained in subsequent paragraphs. The other two windings, 7-8 and 15-16, provide 6.3 vac to filaments and lamps, and the filament voltage to the CRT, respectively.

2.15.2 <u>General Regulator.</u> - The ac voltage at the 5-6 winding of T1 enters the regulator on pins 9 and 10 and is applied to a full-wave rectifier formed by CR5 and CR6. The output of the rectifier is connected through pin 14 to a capacitance-input filter formed by C3A, R13, and C3B. The output of the filter is the plus 175 volt supply. The 175 volt source is connected back to the regulator through pin 12 where Zener diode CR20 and resistor R12 provide a regulated 56 volt source. The 13-14 winding on T1 is connected to full-wave rectifiers formed by CR1, CR2 and CR3, CR4. The output of one of these rectifiers is filtered by capacitor C1 on the main chassis and is used as the plus 14 volt source. The output of the other rectifier (through pin 15) operates into a series regulator circuit which includes transistor Q1. The voltage at the emitter of Q1 is minus 6 volts regulated. The 9-10 secondary winding on transformer T1 operates into three full-wave rectifiers located on the general power supply regulator module. One of these rectifiers consists of CR7 and CR8; the output of this rectifier is filtered by C1 and is the 23 volt supply used for relay operation. The output of the second rectifier (CR9, CR10) is connected to a regulator which includes stages Q1, Q3, and Q4. Zener diode CR16 sets the base bias on Q1 which, in turn, sets the base bias on Q3 and Q4. Resistors R7 and R8, in conjunction with diodes CR14, CR15, and CR17 provide short-circuit protection for the transistors. The output of this regulator is plus 24 volts. The regulator formed by Q5 and CR19 operates from the 24-volt source to provide a plus 12-volt supply. A similar regulator (Q2, CR13, and CR21) operates from the CR11-CR12 rectifier to supply minus 24 volts.

2.15.3 CRT Regulator. - The output of the 11-12 secondary winding of T1 is connected to the CRT regulator assembly where a full-wave rectifier formed by diodes CR1 and CR2 provide a negative high-voltage source. Tube V1, in series with resistor R1, provides a minus 1200 volt supply at the output of the rectifier. A voltage divider consisting of resistors R2, R4, R6, and R7, and potentiometers R3 and R5 is connected between the minus 1200 volt source and ground. The potential at the arm of R3 is connected to the cathode of the CRT; the potentiometer R3 functions as the INTENSITY control. Potentiometer R5 is the FOCUS control and the arm of this control is connected to the CRT first anode. The minus 1200 volt potential is connected to the CRT control grid.

# SECTION III

# INSTALLATION AND OPERATION

## 3.1 INSTALLATION

The RS-111-1B is designed for installation in a standard 19-inch rack. The unit requires 5.25-inches of vertical space and will project 15.5-inches back into the rack. Adequate ventilation should be provided.

CAUTION

Before placing the unit in a rack, first install one pair of shelf angles (Bud type SA-1350 or equivalent), or other hardware which will support the bottom of the chassis. Do not attempt to make an installation using the mounting holes in the front panel as the only means of support.

3.1.1 Power Connection. - Place the rear-apron slide switch in either 115V or 230V depending on the power source to be used. Connect the power cord to the ac outlet; the third pin of the plug grounds the unit. If a three pin receptacle is not available, use the three-to-two pin adapter provided.

3.1.2 Antenna Connections. - Connect the 30-500 mc antenna to the 30-500 MC INPUT jack J1 and the 490-1000 mc antenna to the 490-1000 MC INPUT jack J2 using N-type connectors and 50-ohm coaxial cable.

3.1.3 Audio Output Connection. - The 600-ohm audio output is available at terminals 1 and 2 of the terminal strip marked TB1 AUDIO on the rear apron, and at the PHONES jack on the front panel.

3.1.4 Video Outputs. - The FM video output from the 2-mc bandwidth IF strip is available at the FM VID OUTPUT jack J3; the AM video output from this strip is available at the AM VID OUTPUT jack J5. The video output from the 20/75/300-kc bandwidth IF strip is present at the AM-FM VID OUTPUT jack J4.

3.1.5 Local Oscillator Outputs. - The output of the local oscillator in operation is available at one of the two N-type connectors on the rear apron. The output of the oscillators in the 30-60 mc tuner or the 60-300 mc tuner is present at jack A13J3, LO OUTPUT 30-300 MC. The output of the oscillators in the 235-500 mc tuner or the 490-1000 mc tuner is present at jack A14J3, LO OUTPUT 235-1000 MC.

## 3.2 OPERATION

The front panel operating controls on the RS-111-1B are explained in the following paragraphs.

3.2.1 Range Switch. - The RANGE switch selects the proper tuner for use as determined by the frequency of the incoming signal. A lamp will light behind the tuning dial of the tuner selected.

3.2.2 Audio Gain Control and Power Switch. - The combination AUDIO GAIN control and ac power switch turns on the receiving system when rotated clockwise from the PWR OFF position. Once the unit is operating, this control sets the audio level at the PHONES jack and at the rear apron audio terminal strip.

3.2.3 Function Switch. - Set the function switch in one of the four positions before the receiver is tuned. This switch affects only the 20/75/300-kc bandwidth IF strip. When this switch is in the AM/MAN or CW positions, the gain of the receiver must be manually controlled using the RF GAIN potentiometer. The BFO is automatically activated when the switch is placed in the CW mode.

3.2.4 BFO Tuning Control. - The BFO TUNING control allows the operator to change the pitch of the CW audio signal from the 20/75/300-kc bandwidth strip when the function switch is placed in the CW position. Place the BFO TUNING control at mid-position when tuning; the audio pitch can then be increased or decreased as desired.

3.2.5 IF Bandwidth Switch. - The IF BANDWIDTH switch controls the bandwidth of the 20/75/300-kc IF strip. Set this switch as desired depending on the characteristics of the signal to be received. When searching for signals, it is advisable to use the widest bandwidth.

3.2.6 RF Gain Control. - The RF GAIN control is used to manually control the gain of the receiver sections (except the 2-mc bandwidth IF strip) when the function switch is in the AM/MAN or the CW position. In the other two function switch positions, the RF GAIN control is inoperative.

3.2.7 Tuning Meter. - The tuning meter indicates the relative position between the incoming signal and the center of the receiver.

3.2.8 Cathode Ray Tube. - The CRT displays the signals present at the output of the tuner in operation.

3.2.9 Gain Control. - Use the GAIN control to adjust the amplitude of the display on the CRT. Adjustment of this control does not affect the receiver sections of the unit.

3.2.10 Sweep Width Control. - The SWEEP WIDTH control varies the display bandwidth on the CRT. Clockwise rotation of the control increases the bandwidth. When searching for a signal, place the control at the maximum clockwise position and then reduce the bandwidth as desired by counter-clockwise rotation of the control after the signal has been located.

3.2.11 Center Frequency Control. - Use the CENTER FREQ control to move the displayed pips on the CRT either right or left as desired or to place a particular pip on the center marker before reducing the displayed bandwidth.

3.2.12 Focus and Intensity Controls. - Adjust the FOCUS and INTENSITY controls for maximum sharpness and the desired brightness of the CRT trace.

# SECTION IV

# MAINTENANCE

## 4.1 GENERAL

The type RS-111-1B Receiving System has been carefully designed so that it will operate for long periods of time with little more than routine maintenance. Should trouble occur, it is important that maintenance personnel be familiar with Section II, in which the circuits are described. In addition, they should refer to Figures 5-1 through 5-34 where the component locations are shown; to the schematic diagrams, Figures 6-1 through 6-17; and to Table 4-1, the tube and transistor element voltages.

CAUTION

All maintenance work within this unit should be kept to a minimum and performed only by trained and experienced personnel. The placement of components and the dress of leads in the equipment (especially within the RF tuners) have been carefully engineered to give optimum performance. In replacing any components, great care should be exercised to duplicate the exact physical layout of the original assembly.

## 4.2 MAINTENANCE OF GEAR TRAINS AND TUNING DIALS

If it should be necessary to align the RF tuners in the RS-111-1B, the gear trains and tuning dials must first be checked for mechanical alignment. The gear train mechanisms use friction drive and rely on the stops of the inductuner to halt the turning in the case of the 30-60 mc, 60-300 mc, 235-500 mc RF tuners, and on stops mounted on the gear train to halt the turning in the case of the 490-1000 mc tuner.

4.2.1 <u>30-60 mc RF Tuner</u>. - Proceed as follows:

(1) Release the Allen head set screws on each side of the coupling between the gear train shaft and the inductuner shaft.

(2) Rotate the inductuner shaft to maximum clockwise position.

(3) Turn the dial until the hairline is at the second mark above 62.

(4) Tighten the coupling between the gear train and the inductuner shaft.

(5) Check the operation by turning the tuning crank counterclockwise until the inductuner no longer turns. The dial should read at the mark just beyond 30.

4.2.2 <u>60-300 mc RF Tuner</u>. - Proceed as follows:

(1) Release the Allen head set screws on each side of the coupling between the gear train and the inductuner shaft.

(2) Rotate the inductuner shaft to maximum clockwise position.

(3) Turn the dial until the hairline is at the first mark above 300.

(4) Tighten the coupling between the gear train and the inductuner shaft.

(5) Check the operation by turning the tuning crank counterclockwise until the inductuner no longer turns. The dial should read at the mark just beyond 60.

4.2.3 <u>235-500 mc RF Tuner</u>. - Proceed as follows:

(1) Release the Allen head set screws on each side of the coupling between the gear train shaft and the inductuner shaft.

(2) Rotate the inductuner shaft to maximum clockwise position.

(3) Turn the dial until the hairline is at the mark above 500.

(4) Tighten the coupling between the gear train and the inductuner shaft.

(5) Check the operation by turning the tuning crank counterclockwise until the inductuner no longer turns. The dial should read at the fifth mark beyond 235 mc.

4.2.4 490-1000 mc RF Tuner. - Proceed as follows:

(1) Release the Allen head set screws on each side of the coupling between the gear train shaft and the RF tuner shaft.

(2) Rotate the RF tuner shaft to maximum counterclockwise position.

(3) Turn the dial until the hairline is at the mark below 490. The gear train should be stopped at the low end gear train stop at this point.

(4) Tighten the coupling between the gear train and the RF tuner shaft.

(5) Check the operation by turning the tuning crank clockwise until the RF tuner shaft no longer turns. The dial should read between 1000 and the mark beyond 1000.

## 4.3 PLUG-IN MODULES

The plug-in modules can be easily removed by pulling them out of the receptacles into which they are fitted. The numbers on the pins coming out of the modules correspond to the numbers indicated on the main chassis schematic diagram, Figure 6-17, at the points where the connecting leads pass through the line outlining each module on the schematic. For example, the output from the audio amplifier to the PHONES jack is through pins 11 and 13 of the receptacle into which the audio amplifier module is plugged.

## 4.4 TROUBLESHOOTING

Most troubles will be caused by failures of the fuse, tubes, diodes, or relays. The proper functioning of all these parts should be assured either by test or by replacement with parts known to be good before any further troubleshooting is carried out. After the above measure has been carried out, initial troubleshooting should be directed toward localizing the problem to a specific portion of the receiving system. In the case of the plug-in modules, a quick check can be made by simply plugging in a new module known to be good. Another procedure which should be considered for localizing troubles is to feed in a signal at the antenna jack and then check the signals present at each test point. To this end, it is desirable that all maintenance personnel familiarize themselves with the alignment procedures, even if an alignment is not required, because those procedures include methods of checking performance which may help in analyzing the cause of the trouble. In addition, be certain that the power supply is functioning normally before any other circuit is suspected.

## 4.5 ALIGNMENT INSTRUCTIONS

The alignment procedures in this book are suitable for performance in the field when making periodic performance checks, or when making adjustments after replacing tubes or components. Only those controls specifically referred to within a series of steps given for aligning a particular circuit affect the work in that circuit. Those controls not mentioned in any one series of steps may be left in any position. The alignment of this receiver should be performed only with suitable equipments by technicians thoroughly familiar with the receiver. If the limits and tolerances specified in the following steps cannot be obtained during a field alignment, a factory alignment is necessary.

4.5.1 Use of Marker During Alignment. - A post-detection type of marker adder is recommended, and the alignment procedures in this book assume that one is to be used. However, if such a marker adder is not available, the marker generator output should be loosely coupled to the sweep generator output. This can be done by connecting the marker signal source to a turn or two of insulated wire wrapped around the sweep generator lead near the point of connection to the circuit under test, or by coupling to the sweep generator lead through a small capacitor. To insure that the addition of the marker is not affecting the response curve, disconnect the marker generator and observe that no change in the curve's shape or symmetry occurs.

4.5.2 Use of Oscilloscope During Alignment. - The vertical and horizontal amplifier inputs on the oscilloscope should be set in the dc coupled mode. The dc component of the signal on the vertical input should be cancelled out by applying an equal voltage to the unused vertical differential scope input, since the dc component sometimes makes it impossible to center the signal vertically. Otherwise it will sometimes be necessary to use the ac coupled mode.

A low-capacity shielded cable should be used to connect to the oscilloscope, and the shield should be grounded as closely as possible to the point to which the center conductor is connected.

4.5.3 Equipments Required. - The following equipments, or their equivalents, are required to perform the complete receiving system alignment.

(1) Signal Generator, Hewlett-Packard 612A

(2) Signal Generator, Hewlett-Packard 608D

(3) Signal Generator, Hewlett-Packard 606A

(4) Sweep Generator, Telonic, Model SM-2000 with Type L-4 plug-in head

(5) Sweep Generator, Jerrold 900A

(6) VTVM, RCA Type WV-98B

(7) Power Supply, Eico 1020

(8) Oscilloscope, Tektronix 503

(9) Marker, 21.4 mc, Type C, for Telonic SM-2000

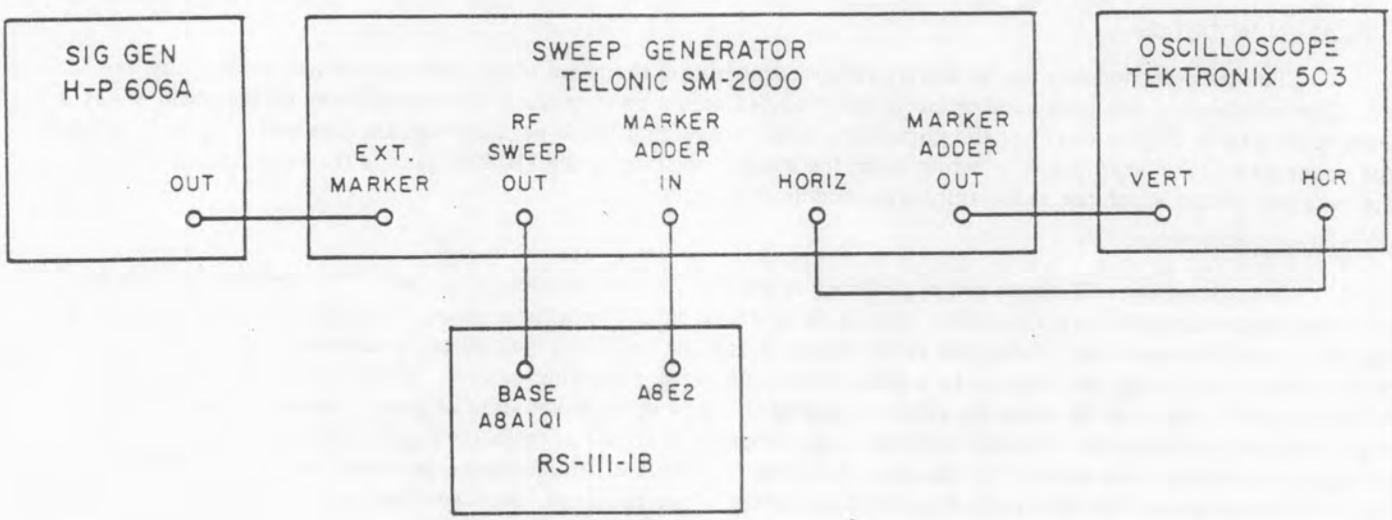


Figure 4-1. Equipment Setup, 20-kc/75-kc/300-kc IF Alignment

## 4.6 20/75/300 KC IF ALIGNMENT

The alignment procedure for the multiple bandwidth IF strip is presented in the following paragraphs. It will be necessary to remove the IF chassis to perform the alignment.

4.6.1 Initial Settings. - The following steps should be performed before beginning alignment:

(1) Set the receiver function switch to FM position; bandwidth switch to 300 kc.

(2) Disconnect IF strip from RF tuners by removing P21 from A8J1.

(3) Set oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 0.2 volt per cm.

(4) Install the L4 plug-in head in the sweep generator.

(5) Set the sweep generator sweep rate to line frequency.

(6) Calibrate signal generator to produce a 21.4-mc marker.

4.6.2 Discriminator Alignment. - Proceed as follows:

(1) Remove Q8.

(2) Remove bottom cover from the IF strip.

(3) Set up equipment as shown in Figure 4-1.

(4) Adjust sweep generator output to display an S-curve response on the oscilloscope.

(5) Adjust A1L3 for amplitude symmetry of the S-curve and A1T1 for zero crossing of the S-curve at 21.4 mc. A typical response is shown in Figure 4-2.

(6) Replace Q8.

4.6.3 300-kc IF Alignment. - Proceed as follows:

(1) Set up the equipment as shown in Figure 4-1, except that the sweep output is connected to the junction of L13 and C55.

(2) Adjust L16 and L15 for a maximum amplitude response centered on the 21.4-mc marker.

(3) Change the sweep generator output to A8J1.

(4) Adjust L13, L12, L10, L9, L5, and L4 (in that order), for a maximum amplitude response.

(5) Replace bottom cover.

(6) Readjust L5 and L4 for a symmetrical, single-peak response, centered at 21.4 mc, with a 3-db bandwidth of 300 kc. Readjust L10 and L9 if necessary. A typical response is shown in Figure 4-3.

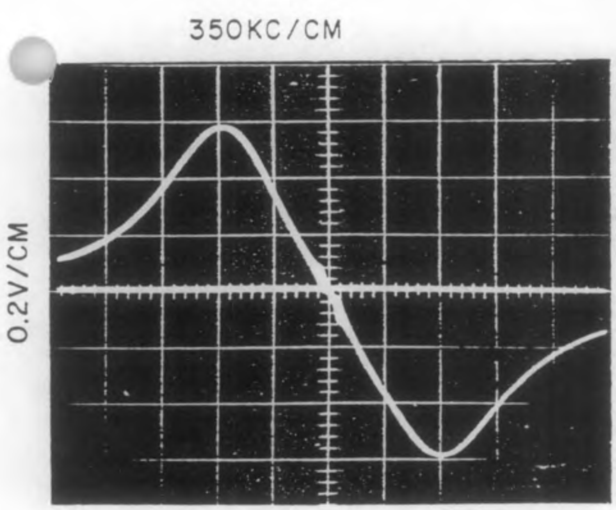


Figure 4-2. Typical Response Curve, 300-kc Discriminator Alignment

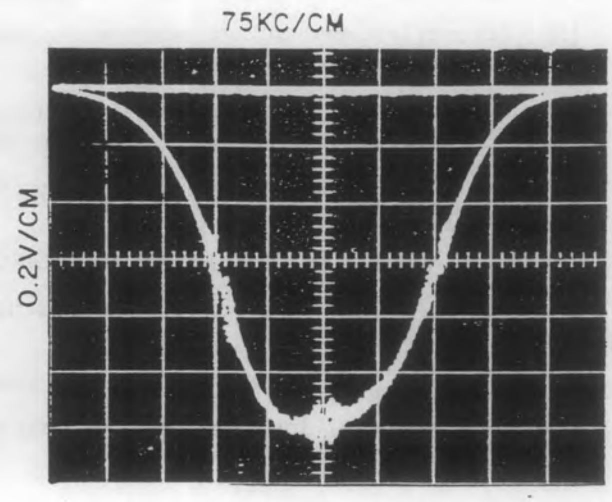


Figure 4-3. Typical Response Curve, 300-kc Bandwidth IF Alignment

4.6.4 20-kc IF Alignment. - Proceed as follows:

(1) Leave equipment set up as in paragraph 4.6.3, step (6).

(2) Set the bandwidth switch to the 20 KC position.

(3) Set oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 0.2 volt per cm.

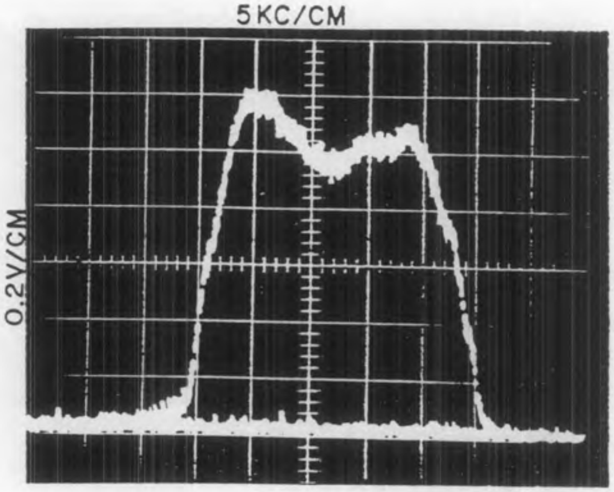


Figure 4-4. Typical Response Curve, 20-kc Bandwidth IF Alignment

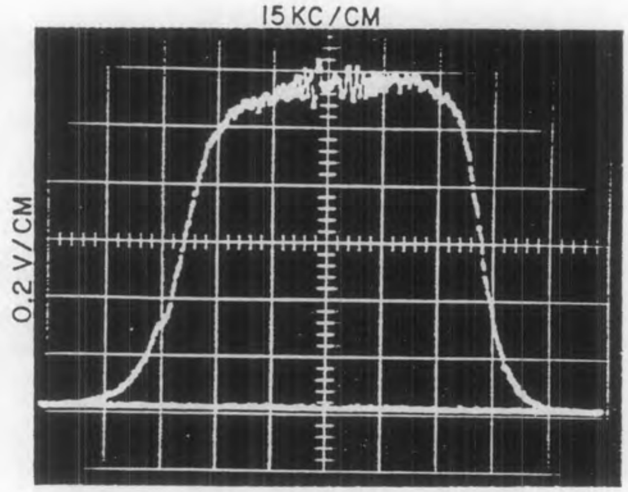


Figure 4-5. Typical Response Curve, 75-kc Bandwidth IF Alignment

(4) Set the sweep generator sweep rate to 5 cps; adjust frequency and output level until a response curve is displayed on the oscilloscope.

(5) Adjust L7 and L3 for a symmetrical response similar to the response shown in Figure 4-4.

4.6.5 75-kc IF Alignment. - Proceed as follows:

(1) Leave the equipment set up as in paragraph 4.6.4, step (5).

(2) Set the bandwidth switch to the 75 KC position.

(3) Set oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 0.2 volt per cm.

(4) Set the sweep generator sweep rate to 5 cps; adjust frequency and output level until a response curve is displayed on the oscilloscope.

(5) Adjust L6 and L2 for a symmetrical response similar to the response shown in Figure 4-5.

4.7 2-MC IF PARTIAL ALIGNMENT AND ALIGNMENT CHECK

The three IF stages in the 2-mc bandwidth IF strip have been factory aligned; a field alignment of these three stages should not be attempted.

4.7.1 Preliminary Steps. - Perform the following steps prior to the alignment:

(1) Remove the 20/75/300 kc IF strip from the unit.

(2) Remove the cover from the 2-mc IF strip.

(3) Set the bandswitch to 490-1000 MC position.

(4) Set the function switch to FM.

(5) Remove the third IF amplifier, Q3.

4.7.2 Discriminator Alignment. - Proceed as follows:

(1) Set up equipment as shown in Figure 4-6. Adjust the power supply for a plus 4 volt output.

(2) Set the sweep generator to 21.4 mc and line frequency sweep; turn internal 21.4-mc marker on.

(3) Calibrate the 608D signal generator to 19.9 mc; calibrate the 606A signal generator to 22.9 mc.

(4) Set oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 0.2 volt per cm.

(5) Adjust the sweep generator sweep rate to line frequency, and adjust the sweep generator frequency until a response curve is displayed on the oscilloscope.

(6) Adjust L3 and T1 for a symmetrical response at the 21.4 mc marker. The 3-mc markers should appear at the peaks of the response curve; a typical response is shown in Figure 4-7.

(7) Replace Q3.

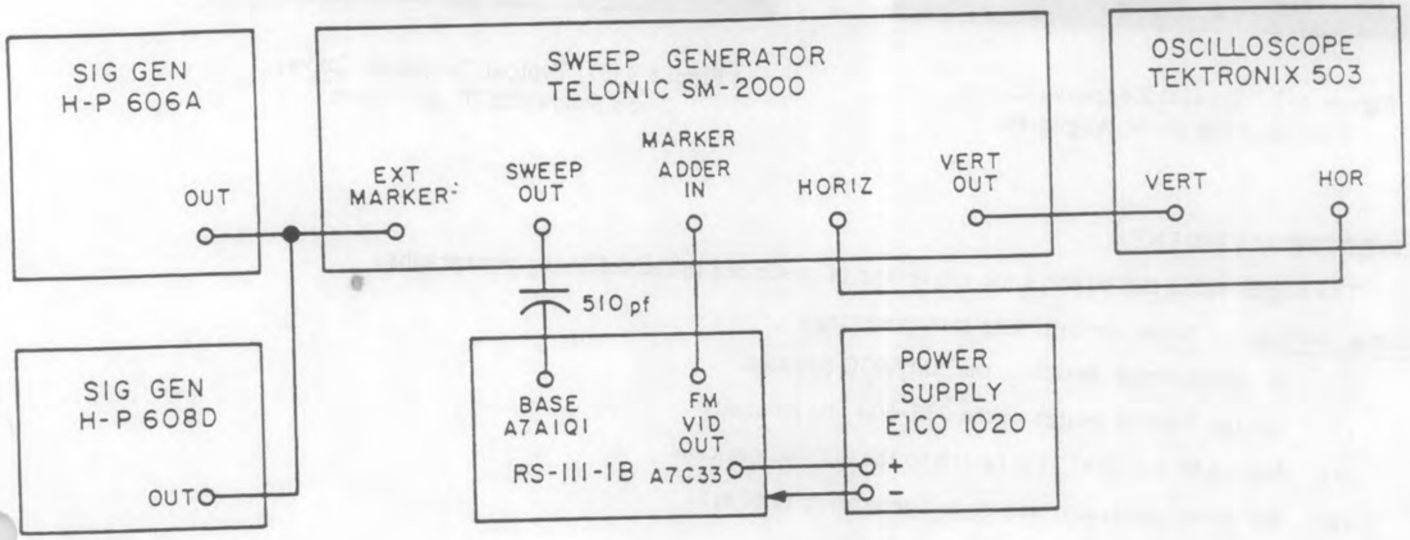


Figure 4-6. Equipment Setup, 2-mc IF Alignment

4.7.3 IF Alignment Check. - Although alignment of the 2-mc bandwidth is not possible in the field, the alignment may be checked as follows:

(1) Set the oscilloscope vertical sensitivity to 0.2 volt per cm, and horizontal sensitivity to sweep 10 cm.

(2) Set one signal generator to 19.4 mc and the other to 22.4 mc.

(3) Set the sweep generator to 21.4 mc; turn internal 21.4-mc marker on.

(4) Connect the equipment as shown in Figure 4-6 except the sweep output is connected to A7J1 and the marker adder input is connected to the emitter of A7Q3.

(5) Adjust the power supply output to plus 6.5 volts.

(6) Adjust the sweep generator and the scope until a response curve is displayed on the scope. The 21.4 mc marker should be centered and the 2-mc markers should be three db down on the side slopes; a typical response is shown in Figure 4-8.

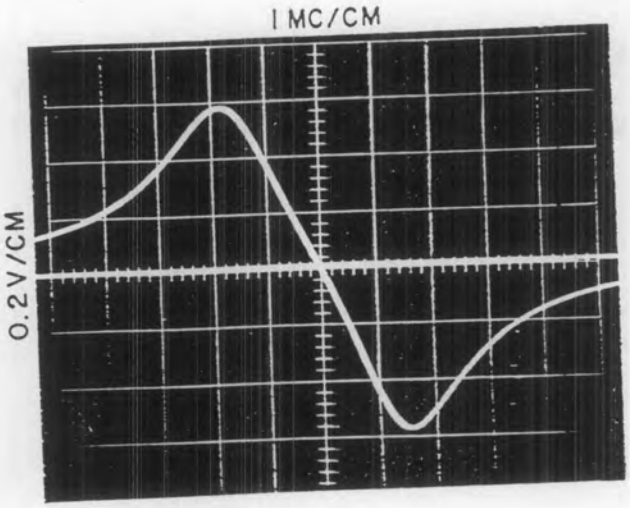


Figure 4-7. Typical Response Curve, 2-mc Discriminator Alignment

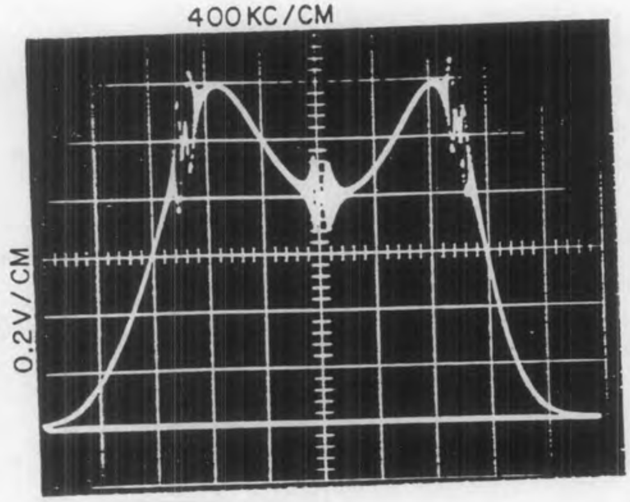


Figure 4-8. Typical Response Curve, 2-mc Bandwidth IF Alignment

4.8 CONVERTER ALIGNMENT

The alignment of the 60-21.4 mc converter is described in the following paragraphs.

4.8.1 Initial Settings. - Make the following initial settings:

(1) Set the function switch to the AM/AGC position.

(2) Set the RANGE switch to the 235-500 MC position.

(3) Set the IF BANDWIDTH switch to the 300 KC position.

(4) Set sweep generator and signal generator to 60 mc.

4.8.2 V1 to V3 Interstage Alignment. - Proceed as follows:

(1) At A6C7, ground the AGC line.

(2) Connect equipment as shown in Figure 4-9.

(3) Set sweep generator and signal generator to 60 mc.

(4) Adjust oscilloscope until a response curve is displayed on the scope.

(5) Adjust A6L1 for a peak response.

(6) Adjust A6L3 and A6L4 for a maximum double-tuned response centered at 60 mc.

4.8.3 A3V3 to A6V1 Interstage Alignment. - Proceed as follows:

(1) At A6C7, ground the AGC line.

(2) Set the signal generator to exactly 325 mc.

(3) Connect signal generator to J1 rear panel and tune the RS-111-1B to the signal generator using the tuning meter to indicate proper tuning.

(4) Set equipment as shown in Figure 4-10.

(5) Set the sweep generator to 325 mc.

(6) Calibrate the signal generator to produce a 60-mc marker.

(7) Set oscilloscope vertical sensitivity at 50 millivolts per cm and adjust sweep generator sweep width until a response curve is displayed on the oscilloscope.

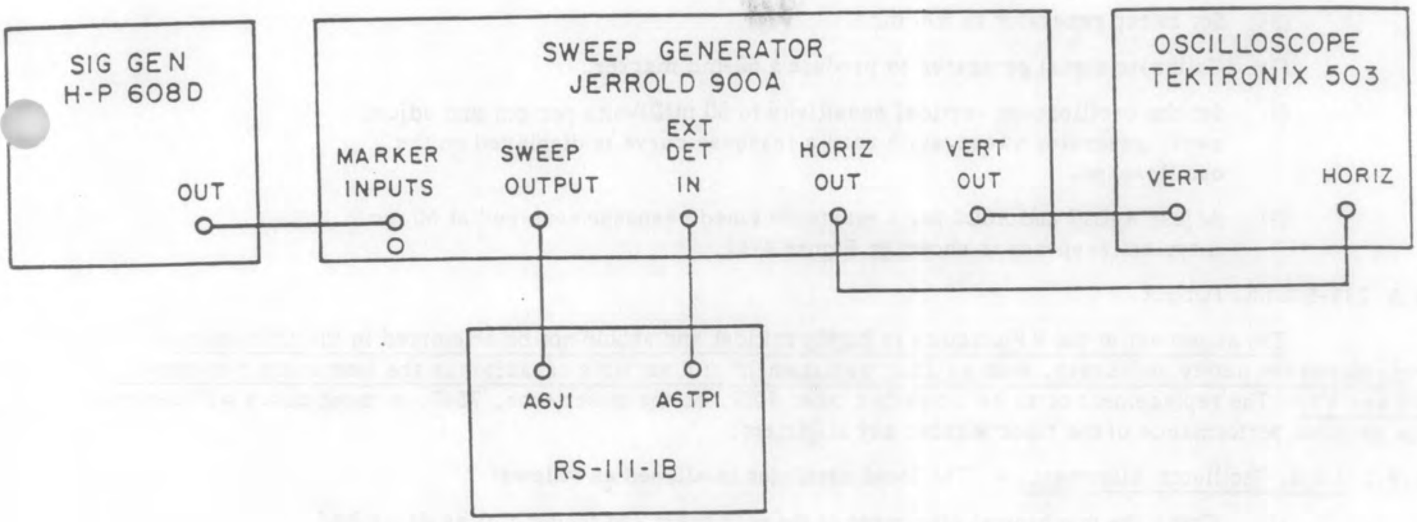


Figure 4-9. Equipment Setup, Converter Alignment

(8) Adjust A3L14 and A6L1 for a maximum tuned response centered at 60 mc.

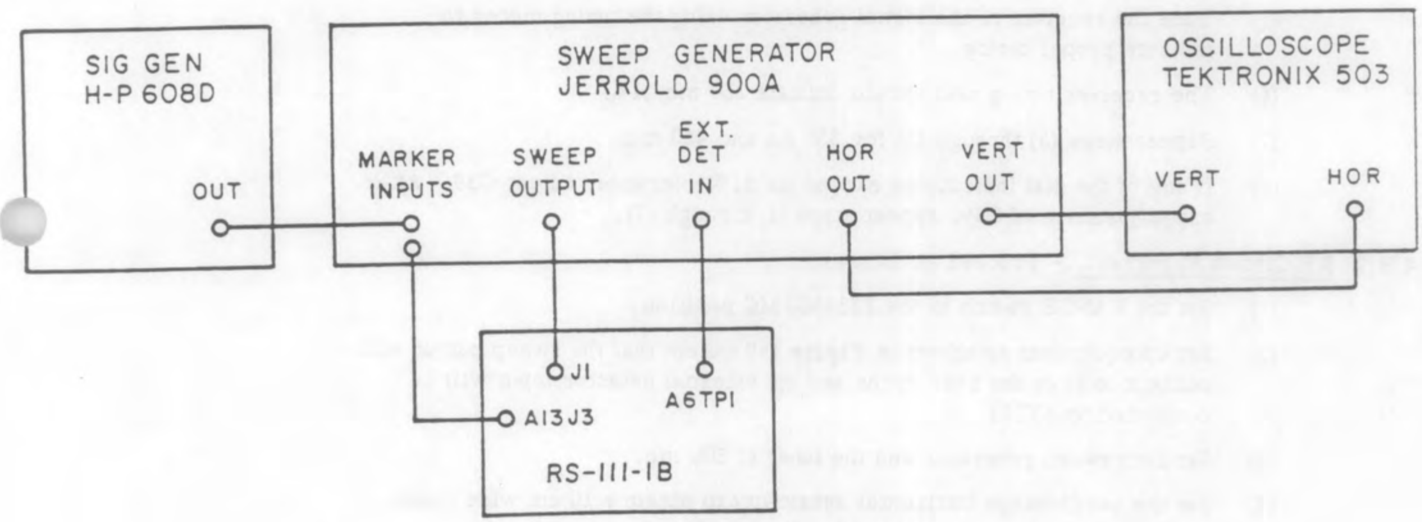


Figure 4-10. Equipment Setup, Converter and Tuner Alignment

4.8.4 A4V3 to A6V2 Interstage Alignment. - Proceed as follows:

(1) Ground the AGC line at A6C7.

(2) Set the signal generator to exactly 500 mc.

(3) Set the receiver RANGE switch to 490-1000 MC position.

(4) Connect signal generator to J2 rear panel and tune the receiver to the signal generator using the tuning meter to indicate proper tuning.

(5) Set up equipment as shown in Figure 4-10, except the sweep output will connect to J2 on the rear apron.

(6) Set sweep generator to 500 mc.

(7) Calibrate signal generator to produce a 60-mc marker.

(8) Set the oscilloscope vertical sensitivity to 50 millivolts per cm and adjust sweep generator sweep width until a response curve is displayed on the oscilloscope.

(9) Adjust A4L17 and A6L2 for a maximum tuned response centered at 60 mc. A typical response is shown in Figure 4-11.

4.9 235-500 MC TUNER

The alignment of the RF circuits is highly critical and should not be attempted in the field unless considered absolutely necessary, such as after replacement of a variable capacitor in the interstage between V1, V2 and V3. The replacement of an RF amplifier tube, 7077, or the mixer tube, 7587, in most cases will restore the original performance of the tuner without any alignment.

4.9.1 Local Oscillator Alignment. - The local oscillator is aligned as follows:

(1) Check the mechanical alignment of the gear train and tuning dial as described in paragraph 4.2.3 prior to electrical alignment.

(2) Connect the signal generator to jack J1 on the rear apron.

(3) Calibrate the signal generator to 250 mc.

(4) Set the receiver RANGE switch to 235-500 MC, IF BANDWIDTH switch to 300 kc, and function switch to AM/AGC.

(5) Tune the receiver to the signal generator using the tuning meter to indicate proper tuning.

(6) The receiver tuning dial should indicate 250 mc ±1%.

(7) Repeat steps (3) through (6) for 350 mc and 450 mc.

(8) If any of the dial indications exceed the ±1% tolerance, adjust C39. After any adjustment of C39, repeat steps (3) through (7).

4.9.2 RF Circuit Alignment. - Proceed as follows:

(1) Set the RANGE switch in the 235-500 MC position.

(2) Set up equipment as shown in Figure 4-9 except that the sweep output will connect to J1 on the rear apron and the external detector input will be connected to A3TP1.

(3) Set both sweep generator and the tuner at 500 mc.

(4) Set the oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 50 millivolts per cm.

(5) Adjust the sweep generator sweep width and frequency until a re se curve is displayed on the oscilloscope.

(6) Adjust C6, C13, C17 and C24 for a maximum tuned response centered at 500 mc. A typical response is shown in Figure 4-12. If the alignment is being performed after the replacement of one of these four capacitors, adjust only the one that has been replaced.

(7) Adjust C1 for maximum gain at 500 mc.

(8) Inductor L14 is aligned in conjunction with the converter; see paragraph 4.8.3.

4.10 490-1000 MC TUNER

Under no circumstances should adjustment be made in the high band RF tuner section. The tuned circuits are factory aligned, and will need no further adjustment. If the receiver is unusually noisy, check all cable connections. The most likely cause of trouble in the RF section will be a damaged crystal mixer, and its replacement will usually restore the original performance. The local oscillator adjustments are made using an accurately aligned IF strip. Before alignment of the tuner is attempted, check the 300 kc IF alignment as described in paragraph 4.6. Inductor L17 is aligned in conjunction with the converter as described in paragraph 4.8.4.

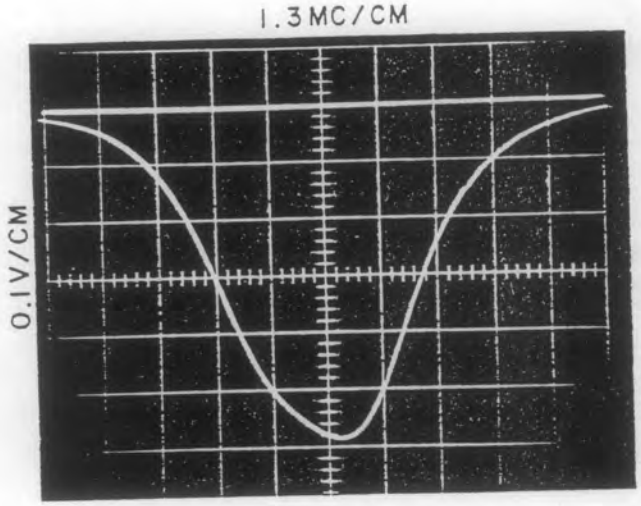

Figure 4-11. Typical Response Curve, A4V3 to A6V2 Interstage Alignment

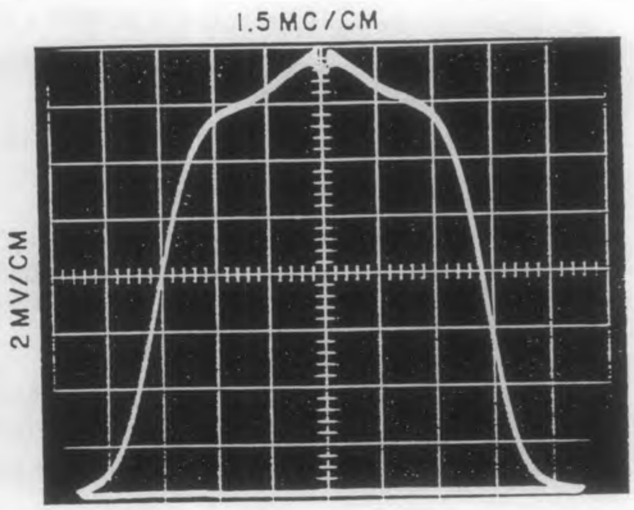

Figure 4-12. Typical Response Curve, 235-500 mc Tuner Alignment

4.10.1 Local Oscillator Alignment. - Proceed as follows:

(1) Check the mechanical alignment of the gear train and tuning dial as described in paragraph 4.2.4 prior to electrical alignment.

(2) Connect the signal generator to jack J2 at the rear apron.

(3) Calibrate the signal generator to 500 mc.

(4) Set the receiver RANGE switch to 490-1000 MC, IF BANDWIDTH switch to 300 KC, and function switch to AM/AGC.

(5) Tune the receiver to the signal generator frequency using the tuning meter to indicate the proper tuning.

(6) The receiver tuning dial should indicate 500 mc ±1%.

(7) If this dial indication exceeds the tolerance, adjust C7.

(8) Repeat steps (3) through (5) for 1000 mc.

(9) If the dial reading exceeds the ±1% tolerance, adjust C6.

4.10.2 Checking High Band Tuner Oscillator Injection Current. - To check the high band local oscillator injection current, connect a milliammeter to the mating plug provided for jack J4 and insert the plug into the jack. This places the meter in series with the crystal mixer dc ground return. The normal current reading is greater than 0.5 ma and less than 2.5 ma.

4.11 60-300 MC TUNER

The tuner is aligned in part using an accurately aligned IF strip. Before an alignment of the tuner is attempted, check the 300 kc IF alignment as described in paragraph 4.6. Check the mechanical alignment of the gear train and tuning dial as described in paragraph 4.2.2 prior to electrical alignment.

4.11.1 Initial Settings. - Make the following initial settings:

(1) Set the function switch in the AM/MAN position.

(2) Adjust the RF GAIN control fully clockwise.

(3) Set the RANGE switch in the 60-300 MC position.

(4) Set the IF BANDWIDTH switch to the 300 KC position.

4.11.2 Local Oscillator Alignment. - Proceed as follows:

(1) Connect the output of the signal generator to the jack J1 on the rear apron.

(2) Calibrate the signal generator to produce a 100 mc signal.

(3) Tune the receiver to the signal generator frequency using the tuning meter to indicate proper tuning.

(4) The tuning dial should indicate 100.0 mc ±1%.

(5) Repeat steps (2) through (5) for 60 mc.

(6) Repeat steps (2) through (5) for 290 mc.

(7) If any of the tuning dial indication exceed the ±1% tolerance, adjust C29. If C29 is adjusted, repeat steps (2) through (7).

4.11.3 RF Circuit Alignment. - Proceed as follows:

(1) Set up equipment as shown in Figure 4-9 except the sweep output will connect to J1, and the external detector will be connected to A2TP1.

(2) Set the receiver tuning dial to 100 mc and the sweep generator to 100 mc.

(3) Calibrate the signal generator to produce a 100-mc marker.

(4) Remove the local oscillator tube V4.

(5) Set the oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 50 millivolts per cm.

(6) Adjust sweep generator sweep width and frequency until a response curve is displayed on the oscilloscope screen.

(7) Adjust C11 and C18 for a symmetrical, double-tuned response, with the 100 mc marker appearing between the center of the response and the low frequency peak. Adjust C15 for a peak-to-peak bandwidth of 3.5 mc. A typical response is shown in Figure 4-13.

(8) Adjust C5 for a maximum amplitude of the response at 100 mc.

(9) Check the response at 60 mc and 300 mc. The response shape will vary but the marker should still be on or between the peaks of the response curve.

(10) Re-install the local oscillator tube, V4.

4.12 30-60 MC TUNER

The tuner is aligned in part using an accurately aligned IF strip. Before an alignment of the tuner is attempted, check the 300 KC IF alignment as described in paragraph 4.6. Check the mechanical alignment of the gear train and tuning dial as described in paragraph 4.2.1 prior to electrical alignment.

4.12.1 Initial Settings. - Make the following initial settings:

(1) Set the IF BANDWIDTH switch to 300 KC.

(2) Set the RANGE switch in the 30-60 MC position.

(3) Set the function switch in the AM/MAN position.

4.12.2 Local Oscillator Alignment. - Proceed as follows:

(1) Connect the output of the signal generator to the input jack J1 on the rear apron.

(2) Calibrate the signal generator to produce a 30 mc signal.

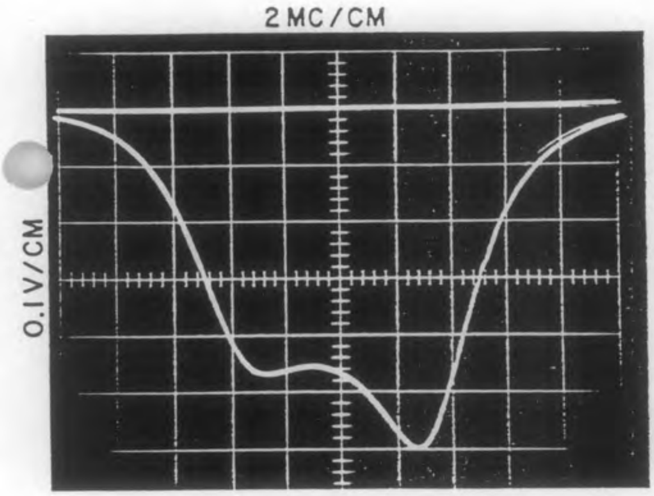


Figure 4-13. Typical Response Curve, 60-300 mc Tuner Alignment

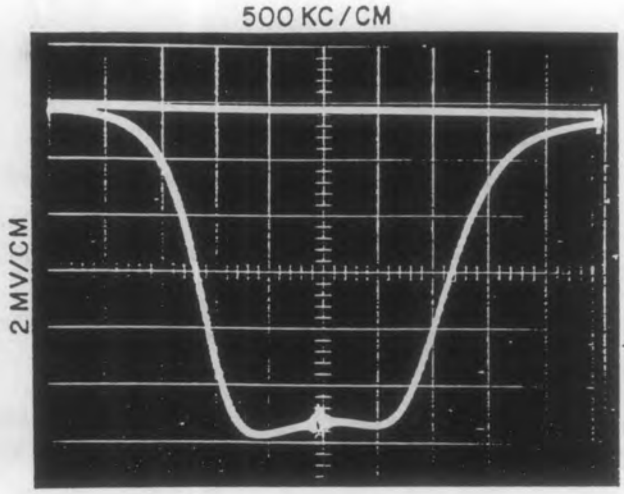


Figure 4-14. Typical Response Curve, 30-60 mc Tuner Alignment

(3) Tune the receiver to the signal generator frequency using the tuning meter to indicate proper tuning.

(4) The receiver tuning dial should indicate 30.0 mc ±1%.

(5) Repeat steps (2) through (5) for 40 mc, 50 mc and 60 mc.

(6) If any of the tuning dial indications exceed the ±1% tolerance, adjust C27. After any adjustment of C27, repeat steps (2) through (6).

4.12.3 RF Circuit Alignment. - Proceed as follows:

(1) Set up the equipment as shown in Figure 4-9, except the sweep output is connected to J1 on the rear apron and the external detector is connected to A1TP1.

(2) Adjust RF GAIN for a -1.5 volt reading at A1C38.

(3) Set the receiver tuning dial to 30 mc and the sweep generator to 30 mc.

(4) Remove the local oscillator tube, V4.

(5) Set the oscilloscope horizontal sensitivity to obtain a 10 cm wide sweep, and the vertical sensitivity to 50 millivolts per cm.

(6) Adjust sweep generator sweep width and frequency until a response curve is displayed on the oscilloscope.

(7) Using a calibrated 30-mc marker from the signal generator, adjust C3 for maximum amplitude of the response at 30 mc.

(8) Adjust C13 and C15 for a symmetrical response centered at 30 mc. A typical response is shown in Figure 4-14.

(9) Check the response at 40 mc, 50 mc and 60 mc. The response shape will vary but the markers should still be on or between the peaks of the response curve.

(10) Re-install the local oscillator tube, V4.

4.12.4 Mixer Plate Coil Alignment. - Proceed as follows:

(1) Set IF BANDWIDTH switch to the 20 KC position.

(2) Set function switch to AM/MAN position.

(3) Set RF Gain fully cw.

(4) Set receiver tuning dial to 30.0 mc.

(5) From the signal generator, feed a calibrated 21.4-mc signal to the input jack J1.

(6) Connect the VTVM to A8E2 and adjust signal generator output level until a -3.5 volt indication is obtained.

(7) Adjust L5 for a maximum indication on the VTVM.

4.13 SIGNAL MONITOR

The alignment procedure for the signal monitor section of the receiving system is presented in the following paragraphs. Throughout the alignment, adjust the gain, focus and intensity controls as necessary.

4.13.1 IF Output Amplifier Alignment. - Proceed as follows:

(1) Set the center frequency control to mid-range.

(2) Connect the output of the signal generator through a 1000 pf capacitor to A5A1TP1.

(3) Calibrate the signal generator to 6.7 mc.

(4) Adjust A5A2T1 through A5A2T9 for a maximum deflection on the CRT, decreasing the signal generator output level as needed to keep the base line on the CRT.

4.13.2 Shaping Amplifier Alignment. - Proceed as follows:

(1) Set the center frequency control to mid-range.

(2) Set sweep width control to maximum cw position.

(3) Connect the output of the signal generator calibrated to 21.4 mc through a 1000 pf capacitor to A5A1TP1.

(4) Adjust A5A1T6 until the pip is centered horizontally.

(5) Decrease sweep width, and note whether or not the pip has moved from its position while moving sweep width.

(6) If the pip has moved appreciably, adjust A5A1T6 for best centering consistent with minimum pip movement with changes in sweep width.

(7) The response should now be in the center of the signal monitor with the center frequency adjust set at mid-range. If this is not the case, A5A3R9 (Horizontal Position adjust) may be adjusted to center the response.

(8) It may be necessary to repeat steps (2) through (5) until no adjustment of A5A1T6 or A5A3R9 is necessary.

(9) Set the signal generator to 22.9 mc.

(10) Set the sweep width control to maximum cw position.

(11) Adjust A5A3R11 to center this signal on the far left reticule mark; adjust A5A1T5 for peak signal amplitude.

(12) Change the signal generator to 19.9 mc; adjust A5A1T4 for a peak signal indication.

(13) Adjust A5A1R18 until this signal is centered on the far right side reticule mark. A5A3R11 may interact with A5A1R18, so it will be necessary to recheck these adjustments.

(14) Move the signal generator to A5A1J1.

(15) Calibrate the signal generator to 20.4 mc.

(16) Adjust A5A1T2 for a peak indication on the signal monitor.

(17) Calibrate the signal generator to 22.4 mc.

(18) Adjust A5A1T3 for a peak indication on the signal monitor.

4.13.3 Horizontal Width Adjustment. - The horizontal width control, A5A3R4, should be set so that the horizontal sweep just starts to wrap around the edges of the tube.

4.13.4 Vertical Position Adjustment. - The vertical position control, A5A3R6, should be set so that the horizontal sweep is vertically positioned on the horizontal reticule, with no signal input and the gain control set maximum ccw.

Table 4-1. Type RS-111-1B Receiving System, Tube and Transistor Element Voltages

| Ref. Desig. | Type | 2 | 4 | 8 | 10 | 12 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Grid | Cathode | Heater | Heater | Plate | Emitter | Base | Collector |
| A1V1 | 6CW4 | 82.0 | 0.14 | 0.72 | 6.3ac | 0 | | | | |
| A1V2 | 6CW4 | 144.0 | 76.0 | 82.0 | 6.3ac | 0 | | | | |
| A1V3 | 7587 | 66.0 | | 0 | 0 | 6.3ac | 110 | | | |
| A1V4 | 6CW4 | 92.0 | 46.0*# | 46.0*# | 6.3ac | 0 | | | | |
| A2V1 | 8058 | 0 | 0 | 0 | 0 | 6.3ac | 102 | | | |
| A2V2 | 8058 | 0.5 | 0.5 | 0.5 | 0 | 6.3ac | 108 | | | |
| A2V3 | 7587 | 20.0 | -0.9 | 0 | 0 | 6.3ac | 110 | | | |
| A2V4 | 6CW4 | 73.0 | 10.9*# | 11.8*# | 0 | 6.3ac | | | | |
| A3V1 | 7077 | | 0 | 0 | 0 | 6.3ac | 118.0 | | | |
| A3V2 | 7077 | | 0 | 0.6 | 0 | 6.3ac | 118.0 | | | |
| A3V3 | 7587 | 14.0 | -0.96 | 0 | 6.3ac | 0 | 180.0 | | | |
| A3V4 | 7486 | | -1.6*# | 0 | 0 | 6.3ac | 86.0 | | | |
| A4V1 | 7486 | | -0.5*# | 0 | 0 | 6.3ac | 100.0 | | | |
| A4V2 | 6CW4 | 92.0 | 0 | 0.5 | 0 | 6.3ac | | | | |
| A4V3 | 6CW4 | 170 | 83.0 | 92.0 | 0 | 6.3ac | | | | |
| A5A1Q1 | 2N706 | | | | | | | 2.3 | 3.0 | 11.0 |
| A5A1Q2 | 2N706 | | | | | | | 2.3 | 2.9 | 11.6 |
| A5A1Q3 | 2N706 | | | | | | | 2.3 | 2.9 | 11.6 |
| A5A1Q4 | 2N706 | | | | | | | 2.3 | 2.9 | 11.6 |
| A5A1Q5 | 2N706 | | | | | | | 1.0 | 1.5 | 0.35 |
| A5A1Q6 | 2N706 | | | | | | | 5.0 | 5.3 | 14.7 |
| A5A2Q1 | 2N706 | | | | | | | 2.3 | 3 | 12.4 |
| A5A2Q2 | 2N706 | | | | | | | 0.95 | 1.6 | 14.2 |
| A5A2Q3 | 2N706 | | | | | | | 2.3 | 1.1 | 13.4 |
| A5A2Q4 | 2N706 | | | | | | | 13.8 | 5.0 | 12.2 |
| A5A2Q5 | 2N706 | | | | | | | 5.2 | 2.2 | 14.7 |
| A5A3Q1 | 2N489 | | | | | | | 8.2 | 21.5 (1) | 0.28 (2) |
| A5A3Q2 | 2N2270 | | | | | | | 0 | 0 | 10.6 |
| A5A3Q3 | 2N697 | | | | | | | 10.6 | 11.2 | 24 |
| A5A3Q4 | 2N1925 | | | | | | | 10.6 | 10.6 | 0 |
| A5A3Q5 | 2N2270 | | | | | | | 14.6 | 15.0 | 24.0 |
| A6V1 | 7587 | 1.38 | 0.9 | 0 | 0 | 6.3ac | 180 | | | |
| A6V2 | 7587 | 36 | -0.94 | 0.24 | 0 | 6.3ac | 180 | | | |
| A6V3 | 7587 | 21.0 | -0.7 | 0 | 0 | 6.3ac | 130 | | | |
| A6V4 | 6CW4 | 84.0 | -4.4 | 0 | 0 | 6.3ac | | | | |
| A7Q1 | 2N2708 | | | | | | | 2.5 | 3.1 | 12.0 |
| A7Q2 | 2N2708 | | | | | | | 2.3 | 3.0 | 11.2 |
| A7Q3 | 2N2708 | | | | | | | 2.0 | 2.8 | 10.4 |
| A7A1Q1 | 2N706 | | | | | | | 2.7 | 3.3 | 11.2 |
| A7A1Q2 | 2N706 | | | | | | | 2.7 | 3.4 | 11.4 |
| A7A1Q3 | 2N706 | | | | | | | 2.7 | 10.2 | 11.6 |
| A7A1Q4 | 2N706 | | | | | | | 2.7 | 3.2 | 11.6 |
| A7A1Q5 | 2N2270 | | | | | | | 1.6 | 2.1 | 12.0 |
| A7A1Q6 | 2N2270 | | | | | | | 1.4 | 1.6 | 12.0 |
| A7A1Q7 | 2N2270 | | | | | | | 0.1 | 0.5 | 9.7 |
| A7A2Q1 | 2N2270 | | | | | | | 11.0 | 11.7 | 12.0 |
| A7A2Q2 | 2N2270 | | | | | | | 0 | -0.44 | 11.7 |
| A7A2Q3 | 2N2270 | | | | | | | -0.46 | 0.14 | 13.8 |
| A7A2Q4 | 2N2270 | | | | | | | 0.48 | 1.1 | 11.4 |
| A7A2Q5 | 2N2270 | | | | | | | 0.11 | 0.94 | 11.3 |
| A8Q1 | 2N2708 | | | | | | | 2.0 | 2.8 | 11.9 |

? NOT THERE

Table 4-1. Type RS-111-1B Receiving System, Tube and Transistor Element Voltages (Cont.)

| Ref. Desig. | Type | 2 | 4 | 8 | 10 | 12 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grid | | Cathode | Heater | Heater | Plate | Emitter | Base | Collector |
| A8Q2 | 2N2708 | | | | | | | 1.9 | 2.7 | 11.8 |
| A8Q3 | 2N2708 | | | | | | | 2.0 | 2.8 | 11.7 |
| A8Q4 | 2N2708 | | | | | | | 2.0 | 2.8 | 11.9 |
| A8Q5 | 2N2708 | | | | | | | 1.8 | 2.6 | 11.8 |
| A8Q6 | 2N2708 | | | | | | | 1.9 | 2.7 | 11.8 |
| A8Q7 | 2N2708 | | | | | | | 2.1 | 2.8 | 10.9 |
| A8Q8 | 2N2708 | | | | | | | 2.6 | 3.4 | 11.6 |
| A8Q9 | 2N697 | | | | | | | 0.7 | 1.2 | 12.2 |
| A8Q10 | 2N697 | | | | | | | 0 | 0.6 | 12.2 |
| A8Q11 | 2N697 | | | | | | | 1.44 | -.04 | 12.2 |
| A8Q12 | 2N697 | | | | | | | 10.8 | 11.4 | 11.0 |
| A8Q13 | 2N1131 | | | | | | | 11.7 | 11.0 | 11.6 |
| A8A1Q1 | 2N706 | | | | | | | 2.7 | 3.2 | 11.4 |
| A8A1Q2 | 2N706 | | | | | | | 2.7 | 3.3 | 11.3 |
| A8A1Q3 | 2N706 | | | | | | | 3.0 | 3.1 | 11.5 |
| A8A1Q4 | 2N706 | | | | | | | 3.0 | 3.1 | 11.5 |
| A8A1Q5 | 2N697 | | | | | | | 0.68 | 1.2 | 12 |
| A8A1Q6 | 2N697 | | | | | | | -24 | 0.68 | 12 |
| A8A2Q1 | 2N706 | | | | | | | 17.0 | 16.0 | 23.0 |
| A9Q1 | 2N697 | | | | | | | 1.37 | 2.0 | 25.0 |
| A9Q2 | 2N526 | | | | | | | 25.0 | 25.0 | 16.0 |
| A10Q1 | 2N335 | | | | | | | 0.6 | 1.25 | 6.0 |
| A10Q2 | 2N335 | | | | | | | 4.7 | 5.4 | 24.0 |
| A10Q3 | 2N2270 | | | | | | | 1.2 | 1.5 | 22.5 |
| A11V1 | GV3A1200 | | | | | | 1100 | | | |
| A12Q1 | 2N2270 | | | | | | | 24.5 | 25.0 | 31.0 |
| A12Q2 | 2N2270 | | | | | | | 24.5 | 25.0 | 31.0 |
| A12Q3 | 2N1038 | | | | | | | -25.0 | -24.5 | -33.0 |

Test Conditions: All voltages are positive dc with respect to chassis unless otherwise indicated. Readings taken with RCA WV-98B VTVM with 115 vac applied to the receiving system. Control settings as follows: FOCUS, INTENSITY, and CENTER FREQ for normal operation; GAIN, SWEEP WIDTH, RF GAIN, BFO TUNING, VIDEO GAIN, AUDIO GAIN, and FINE TUNING at max cw; RANGE switch set to tuner being measured; IF BANDWIDTH to IF strip being measured; function switch in CW.

NOTES:

* - indicates 1 meg resistor used in series with probe.

# - indicates reading which may vary with tuning.

(1) - Base one.

(2) - Base two.

# SECTION V

# REPLACEMENT PARTS LIST

## 5.1 UNIT NUMBERING METHOD

The unit numbering method of assigning reference designations (electrical symbol numbers) has been used to identify assemblies, subassemblies (and modules), and parts. An example of the unit method follows:

A1R1

Subassembly Designation — Class and No. of Item

Read from right to left as: First (1) resistor (R) of first (1) subassembly (A)

As shown on the main chassis schematic, components which are an integral part of the main chassis have no subassembly designation.

## 5.2 REFERENCE DESIGNATION PREFIX

Partial reference designations have been used on the equipment and on the illustrations in this manual. The partial reference designations consist of the class letter(s) and identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Prefixes are provided on drawings and illustrations following the notation "REF DESIG PREFIX".

## 5.3 LIST OF MANUFACTURERS

| Abbreviation | Name and Address |
|---|---|
| A-B | Allen-Bradley Co.<br>136 West Greenfield Avenue<br>Milwaukee, Wisconsin |
| FXR | Amphenol-Borg Electronics<br>33 East Franklin Street<br>Danbury, Connecticut |
| Arco | Arco Electronics, Inc.<br>Community Drive<br>Great Neck, New York |
| Astron | Astron Division<br>255 Grant Avenue<br>East Newark, New Jersey |
| Buss | Bussman Manufacturing Co.<br>University at Jefferson Street<br>St. Louis, Missouri |
| CTC | Cambridge Thermionic Corp.<br>445 Concord Avenue<br>Cambridge, Massachusetts |
| CRL | Centralab<br>900 East Keefe Avenue<br>Milwaukee, Wisconsin |

| Abbreviation | Name and Address |
|---|---|
| Motorola | Motorola Semiconductor Products, Inc.<br>5005 East McDowell Road<br>Phoenix, Arizona |
| PSI | Pacific Semiconductors, Inc.<br>10451 West Jefferson Boulevard<br>Culver City, California |
| Piezo | Piezo Crystal Co.<br>265 East Pomfret Street<br>Carlisle, Pennsylvania |
| QC | Quality Components, Inc.<br>St. Marys<br>Pennsylvania |
| RCA | Radio Corp. of America<br>415 South Fifth Street<br>Harrison, New Jersey |
| RMC | Radio Materials Corp.<br>4242 West Bryn Mawr Avenue<br>Chicago 46, Illinois |
| Roanwell | Roanwell Corp.<br>180 Varick Street<br>New York 14, New York |

| Abbreviation | Name and Address | Abbreviation | Name and Address |
|---|---|---|---|
| [illegible]I | Chicago Miniature Lamp Works<br>1500 North Ogden Avenue<br>Chicago 10, Illinois | Semtech | Semtech Corp.<br>652 Mitchell Road<br>Newbury Park, California |
| Cinch | Cinch-Jones Manufacturing Co.<br>1026 South Homan Avenue<br>Chicago, Illinois | Sickles | F. W. Sickles Division<br>Post Office Box 330<br>Chicopee, Massachusetts |
| CEI | Communication Electronics, Inc.<br>6006 Executive Boulevard<br>Rockville, Maryland | Sprague | Sprague Electric Co.<br>91 Marshall Street<br>North Adams, Massachusetts |
| CD | Continental Devices Corp.<br>12515 Chadion Avenue<br>Hawthorne, California | Switch | Switchcraft, Inc.<br>5555 North Elston Avenue<br>Chicago, Illinois |
| C-W | Continental-Wirt Electronics Co.<br>Philadelphia<br>Pennsylvania | Sylvania | Sylvania Electric Products, Inc.<br>1740 Broadway<br>New York, New York |
| Cornish | Cornish Wire Co.<br>50 Church Street<br>New York, New York | Taurus | Taurus Corp.<br>8 Coryell Street<br>Lambertville, New Jersey |
| Electra | Electra Manufacturing Co.<br>4051 Broadway<br>Kansas City, Missouri | TI | Texas Instruments, Inc.<br>6000 Lemmon Avenue<br>Dallas, Texas |
| Erie | Erie Technological Products, Inc.<br>644 West 12th Street<br>Erie, Pennsylvania | Victoreen | The Victoreen Instrument Co.<br>5806 Hough Avenue<br>Cleveland 3, Ohio |
| Ferroxcube | Ferroxcube Corp. of America<br>Saugerties<br>New York | Wakefield | Wakefield Engineering, Inc.<br>139 Foundry Street<br>Wakefield, Massachusetts |
| GE | General Electric Co.<br>777 14th Street, N.W.<br>Washington, D. C. | Waterman | Waterman Products Co.<br>2445-63 Emerald Street<br>Philadelphia, Pennsylvania |
| Mallory | P. R. Mallory and Co.<br>80 South Gray Street<br>Indianapolis, Indiana | Wilco | Wilco Corp.<br>546 Drover Street<br>Indianapolis, Indiana |
| McCoy | McCoy Electronics Co.<br>Mt. Holly Spring<br>Pennsylvania | Winchester | Winchester Electronics, Inc.<br>1218 Fifth Street<br>Santa Monica, California |

## 5.4 PARTS LIST

When ordering replacement parts from CEI, specify the type and serial number of the equipment, and the reference designations and descriptions of each part ordered. The Vendors and Vendor Part Numbers listed are included as a guide to the user of the equipment in the field and do not necessarily agree with the parts installed in the equipment. Except in those cases specifically noted, the replacement part may be obtained from any vendor as long as the physical and electrical parameters of the part selected agree with the original part.

5.4.1 Main Chassis

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| A1 | 30-60 MC TUNER | 7165 | CEI |
| A2 | 60-300 MC TUNER | 7164 | CEI |
| A3 | 235-500 MC TUNER | 7162 | CEI |
| A4 | 490-1000 MC TUNER | 7163 | CEI |
| A5 | SIGNAL MONITOR | 7930 | CEI |
| A6 | 60-21.4 MC CONVERTER | 7120 | CEI |
| A7 | IF AMPLIFIER, 2 MC BANDWIDTH | 7233 | CEI |
| A8 | IF AMPLIFIER, 20/75/300 KC BANDWIDTH | 7245 | CEI |
| A9 | VIDEO AMPLIFIER | 7312 | CEI |
| A10 | AUDIO AMPLIFIER | 7400A | CEI |
| A11 | POWER SUPPLY REGULATOR (CRT) | 7633 | CEI |
| A12 | POWER SUPPLY REGULATOR (GEN.) | 7631 | CEI |
| A13 | COUPLING NETWORK | 7917 | CEI |
| A14 | Same as A13 | | |
| C1 | CAPACITOR, ELECTROLYTIC, COMPULYTIC: 500 μf, 15V | 34D507H015GJ4 | Sprague |
| C2 | CAPACITOR, ELECTROLYTIC, LITTL-LYTIC: 50 μf, 12V | 30D506G012DB4 | Sprague |
| C3A, B | CAPACITOR, ELECTROLYTIC, TWISTLOCK: 40/40 μf, 250V | EYD-530 | Astron |
| C4 | CAPACITOR, ELECTROLYTIC, COMPULYTIC: 250 μf, 40V | 34D257H040GL4 | Sprague |
| C5 | CAPACITOR, ELECTROLYTIC, COMPULYTIC: 1000 μf, 15V | 34D108H015HL4 | Sprague |
| C6 | CAPACITOR, CERAMIC DISC: .01 μf, GMV, 1400V | U | RMC |
| C7 | Same as C6 | | |
| C8 | CAPACITOR, CERAMIC DISC: .01 μf, 20%, 500V | SM | RMC |
| C9 | Same as C8 | | |
| CR1 | DIODE, ZENER | 1N753A | Motorola |
| DS1 | LAMP: 6-8V, 150 ma | 47 | CM |
| DS2 | Same as DS1 | | |
| DS3 | Same as DS1 | | |
| DS4 | Same as DS1 | | |
| F1 | FUSE, 3AG, SLOW-BLOW: 1/2 amp | MDL-1/2 | Buss |
| F2 | FUSE, 3AG, SLOW-BLOW: 1/4 amp | MDL-1/4 | Buss |
| J1 | RECEPTACLE, TYPE "N", p/o W16 | UG-1052/U | FXR |
| J2 | Same as J1 | | |
| J3 | RECEPTACLE, TYPE BNC, p/o W12 | 17825 | FXR |
| J4 | Same as J3 | | |
| J5 | Same as J3, p/o W13 | | |

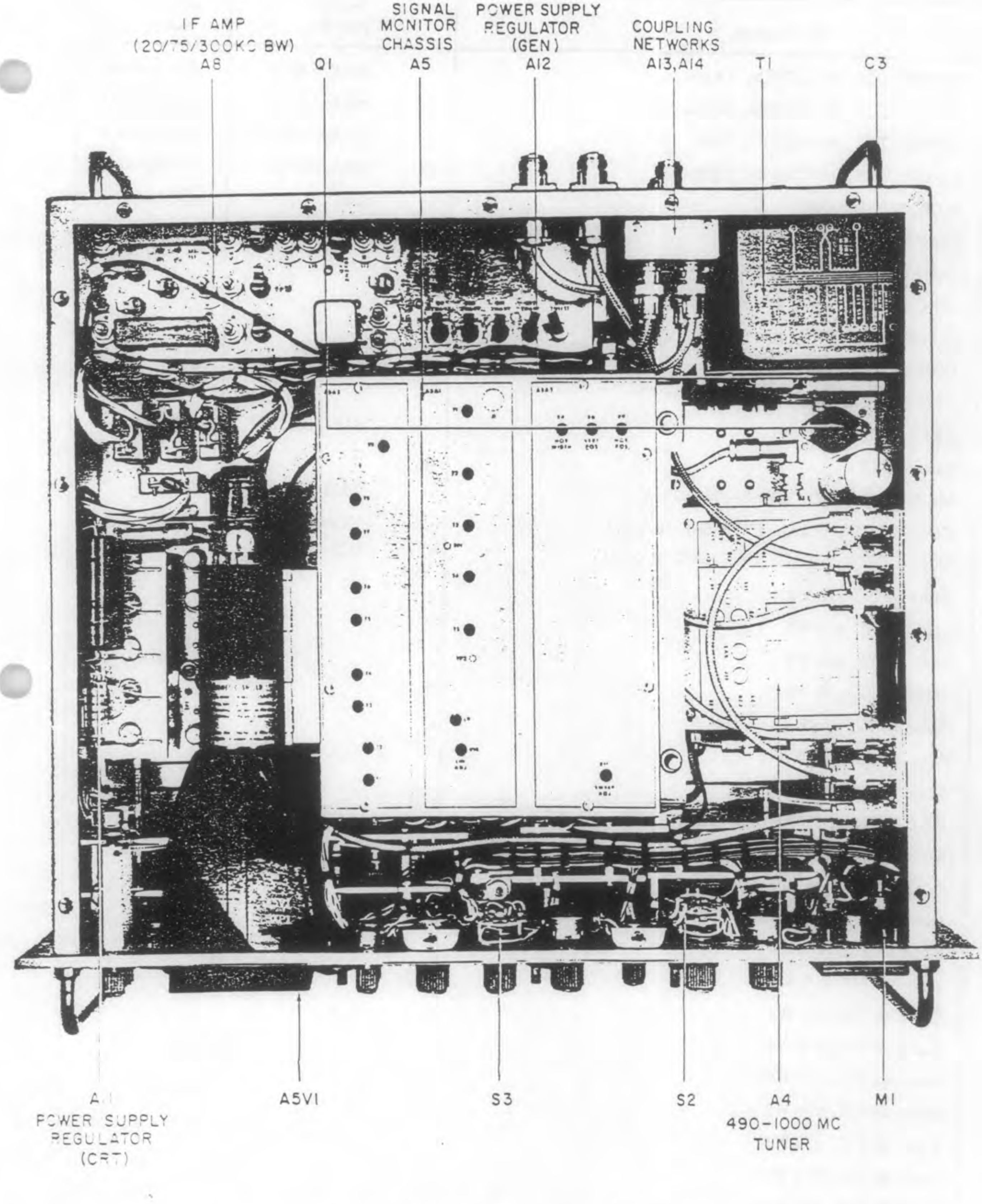


Figure 5-1. Type RS-111-1B Receiving System, Top View

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| J6 | CONNECTOR, MULTIPIN, 14 pin | MRE-14S-G | Winchester |
| J7 | CONNECTOR, MULTIPIN, 18 pin | MRE-18S-G | Winchester |
| J8 | CONNECTOR, MULTIPIN, 9 pin | MRE-7-2S-G | Winchester |
| J9 | CONNECTOR, MULTIPIN, 9 pin | MRE-9S-G | Winchester |
| J10 | JACK, TELEPHONE | C11 | Switch |
| J11 | CONNECTOR, BNC, p/o K1 | | |
| J12 | CONNECTOR, BNC, p/o K1 | | |
| J13 | CONNECTOR, BNC, p/o K1 | | |
| J14 | CONNECTOR, BNC, p/o K1 | | |
| J15 | CONNECTOR, BNC, p/o K1 | | |
| J16 | CONNECTOR, BNC, p/o K1 | | |
| K1 | RELAY | 318-010382-3 | FXR |
| K2 | Same as K1 | | |
| M1 | METER, TUNING: 100-0-100 DC UA | 1633 | CEI |
| P1 | CONNECTOR, PLUG, TYPE BNC, p/o W1 | UG88/U | FXR |
| P2 | CONNECTOR, PLUG, TYPE BNC, p/o W1 | UG913/U | FXR |
| P3 | Same as P1, p/o W2 | | |
| P4 | Same as P1, p/o W2 | | |
| P5 | Same as P1, p/o W3 | | |
| P6 | Same as P2, p/o W3 | | |
| P7 | Same as P1, p/o W4 | | |
| P8 | Same as P1, p/o W4 | | |
| P9 | Same as P2, p/o W5 | | |
| P10 | CONNECTOR, PLUG, SUB-MINIATURE, p/o W7 | 27-26 | FXR |
| P11 | Same as P10, p/o W7 | | |
| P12 | CONNECTOR, PLUG, SUB-MINIATURE, p/o W10 | 27-7 | FXR |
| P13 | Same as P12, p/o W10 | | |
| P14 | Same as P12, p/o W6 | | |
| P15 | Same as P12, p/o W6 | | |
| P16 | Same as P10, p/o W8 | | |
| P17 | Same as P12, p/o W8 | | |
| P18 | Same as P12, p/o W9 | | |
| P19 | Same as P12, p/o W9 | | |
| P20 | Same as P10, p/o W11 | | |
| P21 | Same as P10, p/o W11 | | |
| P22 | Same as P12, p/o W14 | | |

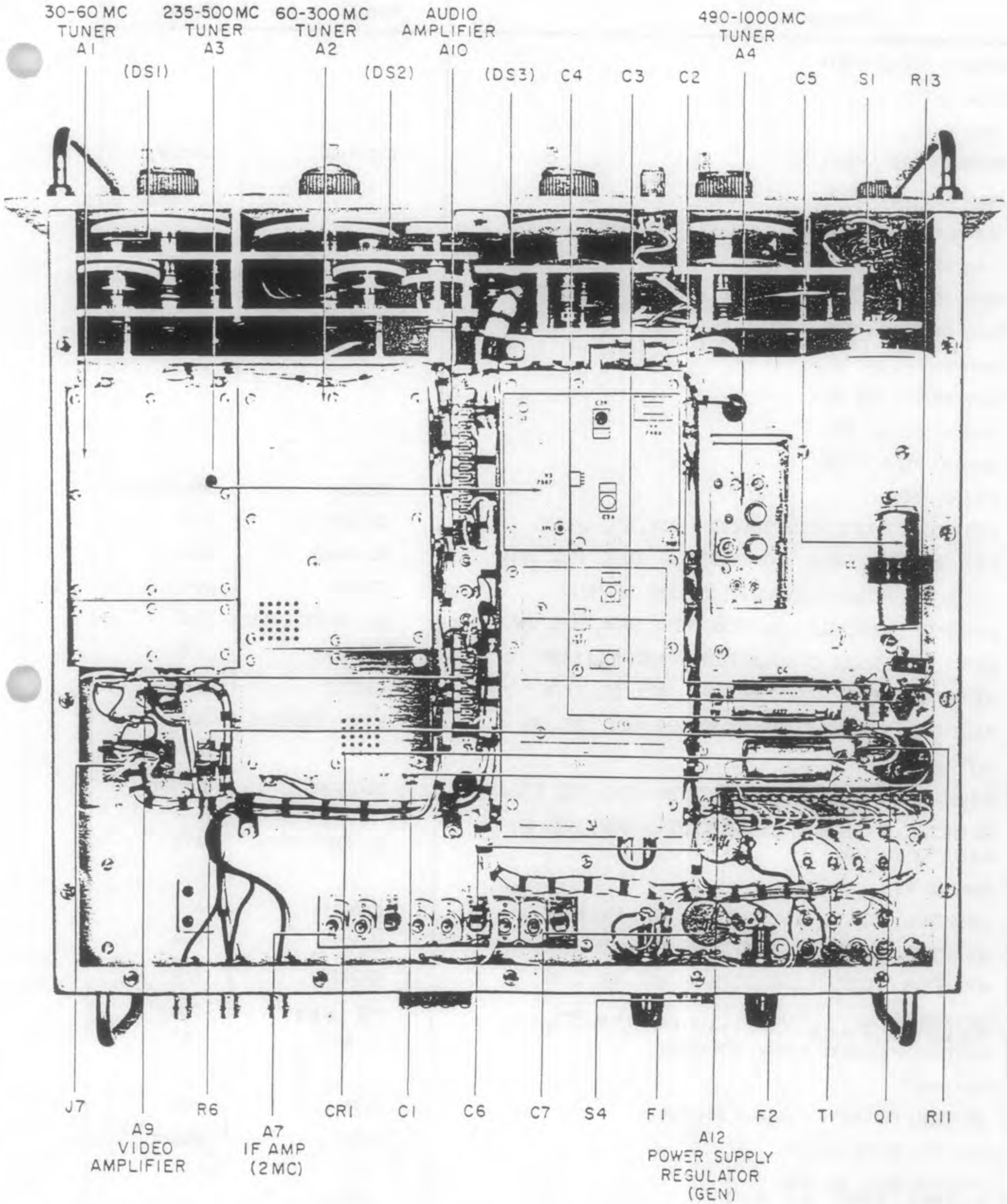


Figure 5-2. Type RS-111-1B Receiving System, Bottom View

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| P23 | Same as P10, p/o W14 | | |
| P24 | Same as P10 | | |
| P25 | Same as P1 | | |
| P26 | POWER CORD AND PLUG | 01753-001 | Cornish |
| P27 | Same as P1, p/o W18 | | |
| P28 | Same as P1, p/o W18 | | |
| P29 | Same as P1, p/o W19 | | |
| P30 | Same as P1, p/o W19 | | |
| P31 | Same as P1, p/o W16 | | |
| P32 | Same as P10, p/o W12 | | |
| P33 | Same as P10, p/o W13 | | |
| P34 | Same as P1, p/o W20 | | |
| P35 | Same as P1, p/o W20 | | |
| Q1 | TRANSISTOR | 2N1544 | Motorola |
| R1 | RESISTOR, FIXED, COMPOSITION: 51K, 5%, 1/4W | CB5135 | A-B |
| R2 | RESISTOR, VARIABLE, COMPOSITION: 100K, 10%, 1/4W | 70-08460 | Mallory |
| R3 | RESISTOR, FIXED, COMPOSITION: 1M, 5%, 1/4W | CB1055 | A-B |
| R4 | RESISTOR, VARIABLE, COMPOSITION: 500K, 10%, 2W | RV4NAYSD504A | A-B |
| R5 | RESISTOR, FIXED, COMPOSITION: 180K, 5%, 1/4W | CB1845 | A-B |
| R6 | RESISTOR, FIXED, COMPOSITION: 150Ω, 5%, 1/4W | CB1515 | A-B |
| R7 | RESISTOR, VARIABLE, COMPOSITION: 10K, 10%, 2W | RV4NAYSD103C | A-B |
| R8 | NOT USED | | |
| R9 | RESISTOR, VARIABLE, COMPOSITION: 10K, 10%, 1/4W | 70-08461 | Mallory |
| R10 | RESISTOR, VARIABLE, COMPOSITION: 100K, 10%, 2W with SPST SWITCH | JS1N056P104UA | A-B |
| R11 | Same as R6 | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 62K, 5%, 1/4W | CB6235 | A-B |
| R13 | RESISTOR, FIXED, COMPOSITION: 470Ω, 5%, 2W | HB4715 | A-B |
| R14 | RESISTOR, FIXED, COMPOSITION: 22K, 5%, 1/4W | CB2235 | A-B |
| R15 | Same as R1 | | |
| R16 | RESISTOR, FIXED, COMPOSITION 10K 5% | CB1035 | A-B |
| S1 | SWITCH, ROTARY: 4 pole, 4 position | 1128-20 | CEI |
| S2 | Same as S1 | | |
| S3 | SWITCH, ROTARY: 1 pole, 3 position | 1128-22 | CEI |
| S4 | SWITCH, SLIDE: DPDT | 4633 | Muter |
| S5 | SWITCH, SPST, p/o R10 | | |
| S6 | SWITCH, SPST P/O R17 | | |
| T1 | TRANSFORMER | 10775 | CEI |
| TB1 | TERMINAL BOARD | 2-140-Y | Cinch |
| R17 | RESISTOR, VARIABLE, COMPOSITION: 10K 20% 1W WITH SPST SWITCH. | KB22141 | CTS |

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| W1 | CABLE AND CONNECTOR ASSEMBLY | 2126-235 | CEI |
| W2 | CABLE AND CONNECTOR ASSEMBLY | 2126-236 | CEI |
| W3 | CABLE AND CONNECTOR ASSEMBLY | 2126-237 | CEI |
| W4 | CABLE AND CONNECTOR ASSEMBLY | 2126-238 | CEI |
| W5 | CABLE AND CONNECTOR ASSEMBLY | 2126-239 | CEI |
| W6 | CABLE AND CONNECTOR ASSEMBLY | 2126-240 | CEI |
| W7 | CABLE AND CONNECTOR ASSEMBLY | 2126-241 | CEI |
| W8 | CABLE AND CONNECTOR ASSEMBLY | 2126-242 | CEI |
| W9 | CABLE AND CONNECTOR ASSEMBLY | 2126-243 | CEI |
| W10 | CABLE AND CONNECTOR ASSEMBLY | 2126-244 | CEI |
| W11 | CABLE AND CONNECTOR ASSEMBLY | 2126-245 | CEI |
| W12 | CABLE AND CONNECTOR ASSEMBLY | 2126-246 | CEI |
| W13 | CABLE AND CONNECTOR ASSEMBLY | 2126-247 | CEI |
| W15 | CABLE AND CONNECTOR ASSEMBLY | 2126-248 | CEI |
| W15 | NOT USED | | |
| W16 | CABLE AND CONNECTOR ASSEMBLY | 2126-249 | CEI |
| W17 | CABLE AND CONNECTOR ASSEMBLY | 2126-250 | CEI |
| W18 | CABLE AND CONNECTOR ASSEMBLY | 2126-251 | CEI |
| W19 | CABLE AND CONNECTOR ASSEMBLY | 2126-252 | CEI |
| W20 | CABLE AND CONNECTOR ASSEMBLY | 2126-253 | CEI |

5.4.2 Type 7165 30-60 mc Tuner

REF. DESIG. PREFIX A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, FIXED, MICA: 15 pf, ±5% | DM10-150J | Arco |
| C2 | CAPACITOR, FIXED, MICA: 22 pf, ±5% | DM10-220J | Arco |
| C3 | CAPACITOR, VARIABLE, TRIMMER: 0.7-9.0 pf | MG11016 | Roanwell |
| C4 | CAPACITOR, FIXED, MICA: 270 pf, ±5% | DM15-271J | Arco |
| C5 | CAPACITOR, FIXED, DISC, CERAMIC: 1000 pf, GMV | SM | RMC |
| C6 | CAPACITOR, FIXED, COMPOSITION, TUBULAR: 0.33 pf, ±10% | QC | QC |
| C7 | CAPACITOR, FIXED, CERAMIC,TUBULAR: 1.5 pf, ±.25 | 301-000-COKO-159C | Erie |
| C8 | Same as C5 | | |
| C9 | Same as C5 | | |
| C10 | Same as C5 | | |
| C11 | Same as C4 | | |
| C12 | CAPACITOR, FIXED, MICA: 18 pf, ±5% | DM10-180J | Arco |
| C13 | Same as C3 | | |
| C14 | CAPACITOR, FIXED, CERAMIC, TUBULAR: 2.2 pf, ±.25 pf | 301-000-COJO-229C | Erie |
| C15 | Same as C3 | | |
| C16 | CAPACITOR, FIXED, MICA: 12 pf, ±5% | DM10-120J | Arco |
| C17 | CAPACITOR, FIXED, MICA: 47 pf, ±5% | DM10-470J | Arco |
| C18 | CAPACITOR, FIXED, CERAMIC, TUBULAR: 1.2 pf, ±.25 pf | 301-000-COKO-129C | Erie |
| C19 | Same as C5 | | |
| C20 | Same as C5 | | |
| C21 | CAPACITOR, FIXED, CERAMIC, STANDOFF: 1000 pf, GMV | SS5A-102W | A-B |
| C22 | CAPACITOR, FIXED, CERAMIC, FEEDTHRU: 330 pf, 10% | FA5C-3311 | A-B |
| C23 | Same as C5 | | |
| C24 | Same as C5 | | |
| C25 | Same as C21 | | |
| C26 | Same as C5 | | |
| C27 | Same as C3 | | |
| C28 | CAPACITOR, FIXED, MICA: 10 pf, ±5% | DM10-100J | Arco |
| C29 | Same as C2 | | |
| C30 | Same as C28 | | |
| C31 | Same as C5 | | |
| C32 | Same as C5 | | |
| C33 | Same as C5 | | |

REF DESIG PREFIX A1

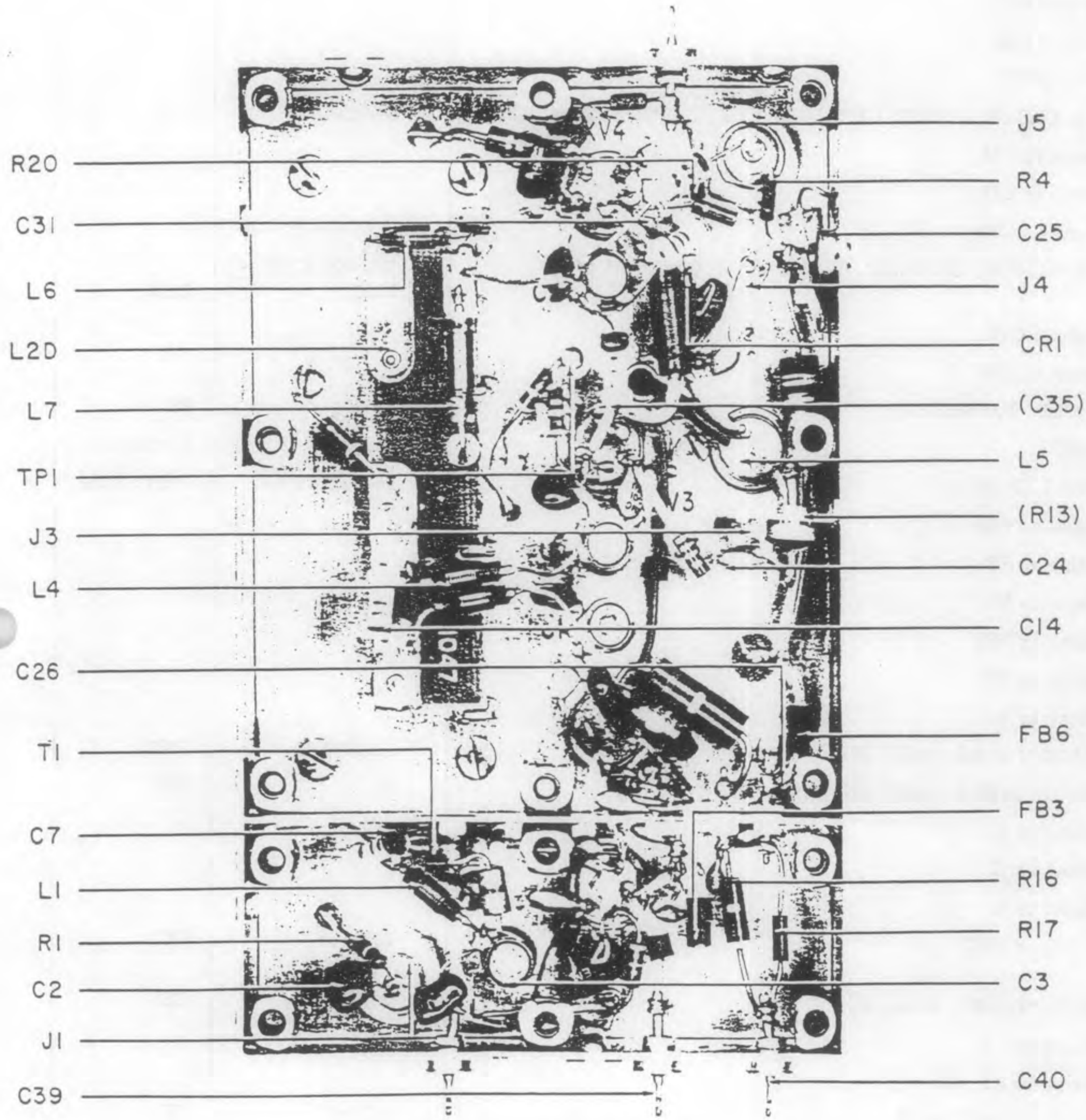


Figure 5-3. Type 7165 30-60 mc Tuner, Component Locations

REF. DESIG. PREFIX A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C34 | Same as C5 | | |
| C35 | Same as C5 | | |
| C36 | Same as C5 | | |
| C37 | NOT USED | | |
| C38 | CAPACITOR, FIXED, CERAMIC, FEEDTHRU: 1000 pf, GMV | FA5C-102W | A-B |
| C39 | Same as C38 | | |
| C40 | Same as C38 | | |
| C41 | Same as C38 | | |
| C42 | CAPACITOR, CERAMIC, TUBULAR: 2.0 pf, ±.25 pf | 301-000-COKO-209C | Erie |
| C43 | Same as C16 | | |
| C44 | Same as C42 | | |
| CR1 | DIODE, VARACTOR | V27E | PSI |
| CR2 | DIODE | 1N3044B | Motorola |
| FB1 | FERRITE BEAD | 56-590-65/4A | Ferroxcube |
| FB2 | Same as FB1 | | |
| FB3 | Same as FB1 | | |
| FB4 | Same as FB1 | | |
| FB5 | Same as FB1 | | |
| FB6 | Same as FB1 | | |
| FB7 | Same as FB1 | | |
| J1 | RECEPTACLE, JACK, BNC | UG1094/U | FXR |
| J2 | RECEPTACLE, JACK, SUB-MINIATURE | 27-9 | FXR |
| J3 | Same as J2 | | |
| J4 | Same as J2 | | |
| J5 | Same as J1 | | |
| L1 | COIL, FIXED | 1131-06 | CEI |
| L2A, B, C, D | INDUCTUNER, 4-section | 2026 | CEI |
| L3 | Same as L1 | | |
| L4 | Same as L1 | | |
| L5 | COIL, ADJUSTABLE | 1472-3 | CEI |
| L6 | COIL, FIXED | 1131-07 | CEI |
| L7 | COIL, FIXED | 1131-08 | CEI |
| L8 | COIL, FIXED: 3.3 $\mu$h | 211-11 | Wilco |
| R1 | RESISTOR, FIXED, COMPOSITION: 100K, ±5%, 1/4W | CB1045 | A-B |

REF DESIG PREFIX A1

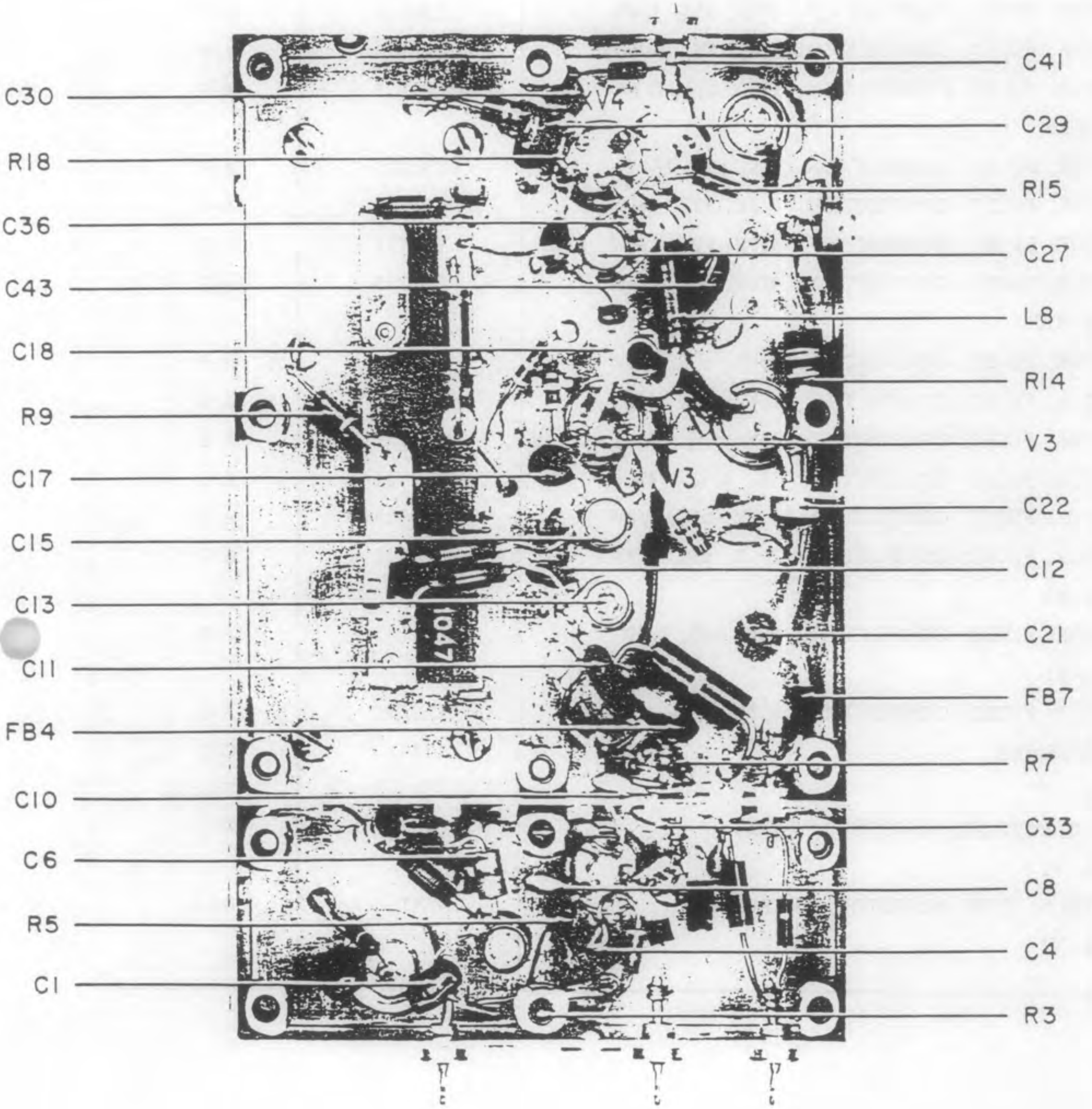


Figure 5-4. Type 7165 30-60 mc Tuner, Component Locations

REF. DESIG. PREFIX A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| R2 | RESISTOR, FIXED, COMPOSITION: 47K, ±5%, 1/4W | CB4735 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 270K, ±5%, 1/4W | CB2745 | A-B |
| R4 | RESISTOR, FIXED, COMPOSITION: 51Ω, ±5%, 1/4W | CB5105 | A-B |
| R5 | RESISTOR, FIXED, COMPOSITION: 150Ω, ±5%, 1/4W | CB1515 | A-B |
| R6 | Same as R2 | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 10Ω, ±5%, 1/4W | CB1005 | A-B |
| R8 | RESISTOR, FIXED, COMPOSITION: 6.8K, ±5%, 1W | GB6825 | A-B |
| R9 | RESISTOR, FIXED, COMPOSITION: 4.7K, ±5%, 1/4W | CB4725 | A-B |
| R10 | RESISTOR, FIXED, COMPOSITION: 470K, ±5%, 1/4W | CB4745 | A-B |
| R11 | Same as R10 | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 330K, ±5%, 1/4W | CB3345 | A-B |
| R13 | RESISTOR, FIXED, COMPOSITION: 33K, ±5%, 1/4W | CB3335 | A-B |
| R14 | RESISTOR, FIXED, COMPOSITION: 13K, ±5%, 1W | GB1335 | A-B |
| R15 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R16 | RESISTOR, FIXED, COMPOSITION: 4.7K, ±5%, 1/2W | EB4725 | A-B |
| R17 | RESISTOR, FIXED, COMPOSITION: 2.2K, ±5%, 1/4W | CB2225 | A-B |
| R18 | Same as R2 | | |
| R19 | RESISTOR, FIXED, COMPOSITION: 22K, ±5%, 1/2W | EB2235 | A-B |
| R20 | Same as R1 | | |
| R21 | RESISTOR, FIXED, COMPOSITION: 1.5M, ±5%, 1/4W | CB1555 | A-B |
| T1 | TRANSFORMER | 1134 | CEI |
| TP1 | TEST POINT | TJ6 | Taurus |
| V1 | TUBE, ELECTRON, NUVISTOR, TRIODE | 6CW4 | RCA |
| V2 | Same as V1 | | |
| V3 | ELECTRON, TUBE, NUVISTOR, TETRODE | 7587 | RCA |
| V4 | Same as V1 | | |

REF DESIG PREFIX A5A2

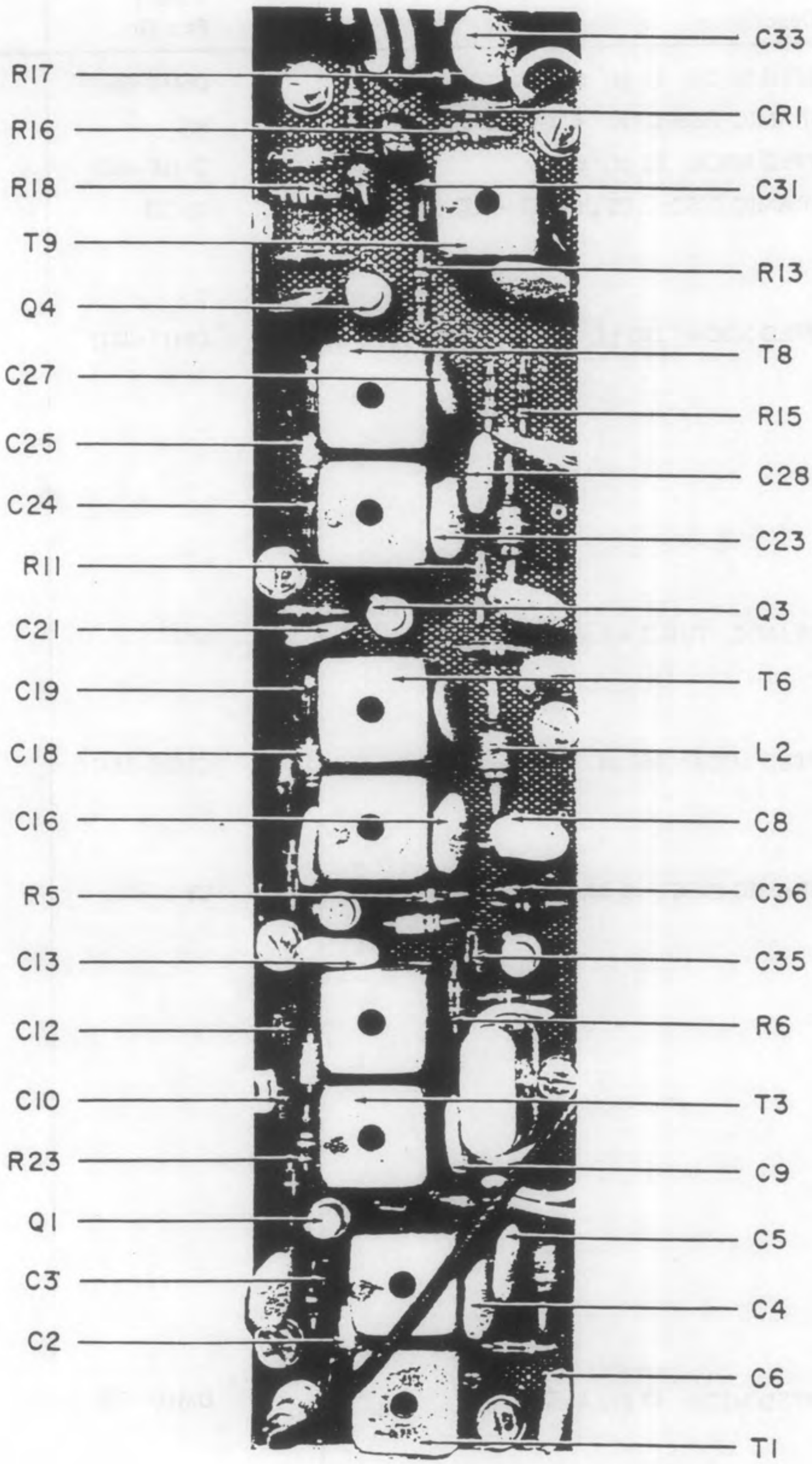


Figure 5-15. Type 8101 IF Output Amplifier, Component Locations

5.4.6.2 Type 8101 IF Output Amplifier REF. DESIG. PREFIX A5A2

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, DIPPED MICA: 56 pf, ±5% | DM10-560J | Arco |
| C2 | CAPACITOR, CERAMIC TUBULAR: 4.3 pf, ±10% | MC | QC |
| C3 | CAPACITOR, DIPPED MICA: 82 pf, ±5% | DM10-820J | Arco |
| C4 | CAPACITOR, CERAMIC DISC: .05 µf, +80 -20%, 50V | 55C23 | Sprague |
| C5 | Same as C4 | | |
| C6 | Same as C4 | | |
| C7 | CAPACITOR, DIPPED MICA: 220 pf, 5% | DM15-221J | Arco |
| C8 | Same as C4 | | |
| C9 | Same as C4 | | |
| C10 | Same as C3 | | |
| C11 | Same as C2 | | |
| C12 | Same as C1 | | |
| C13 | Same as C4 | | |
| C14 | CAPACITOR, CERAMIC, TUBULAR: 2.2 pf, ±10% | MC | QC |
| C15 | Same as C4 | | |
| C16 | Same as C4 | | |
| C17 | CAPACITOR, DIPPED MICA: 360 pf, ±5% | DM10-361J | Arco |
| C18 | Same as C14 | | |
| C19 | Same as C17 | | |
| C20 | CAPACITOR, CERAMIC DISC: .1 µf, 10V | UK10-104 | CRL |
| C21 | Same as C20 | | |
| C22 | Same as C4 | | |
| C23 | Same as C4 | | |
| C24 | Same as C17 | | |
| C25 | Same as C14 | | |
| C26 | Same as C17 | | |
| C27 | Same as C20 | | |
| C28 | Same as C4 | | |
| C29 | Same as C20 | | |
| C30 | Same as C4 | | |
| C31 | Same as C17 | | |
| C32 | CAPACITOR, DIPPED MICA: 47 pf, ±5% | DM10-470J | Arco |
| C33 | Same as C4 | | |
| C34 | Same as C32 | | |
| C35 | CAPACITOR, DIPPED MICA: 68 pf, ±5% | DM10-680J | Arco |

REF DESIG PREFIX A5A2

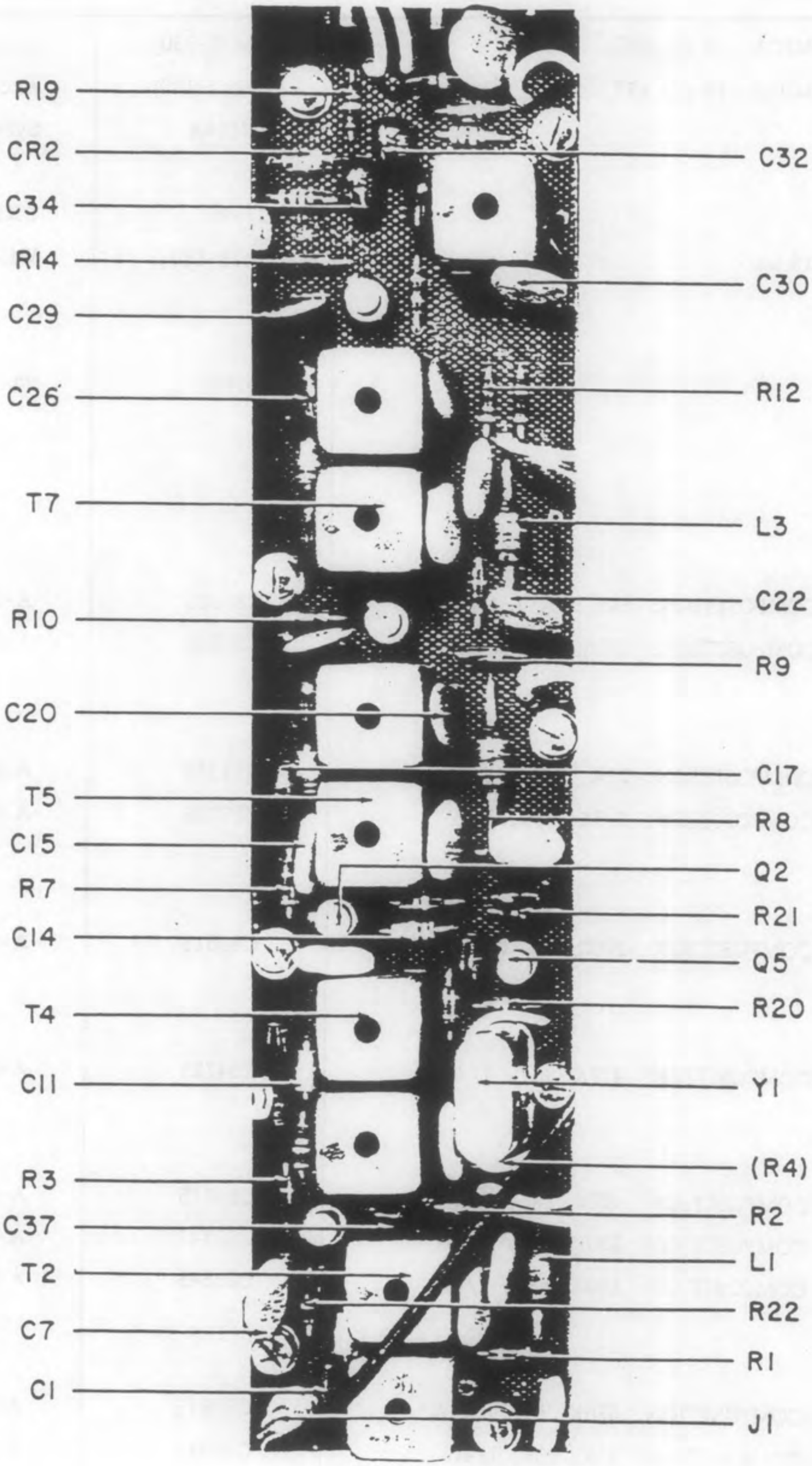


Figure 5-16. Type 8101 IF Output Amplifier, Component Locations

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C36 | CAPACITOR, DIPPED MICA: 33 pf, ±5% | DM10-330J | Arco |
| C37 | CAPACITOR, DIPPED MICA: 18 pf, ±5% | DM10-180J | Arco |
| CR1 | DIODE | 1N198A | Sylvania |
| CR2 | Same as CR1 | | |
| J1 | CONNECTOR | 27-9 | FXR |
| L1 | INDUCTOR, FIXED: 15 μh | 1015-150 | Wilco |
| L2 | Same as L1 | | |
| L3 | Same as L1 | | |
| Q1 | TRANSISTOR | 2N706 | TI |
| Q2 | Same as Q1 | | |
| Q3 | Same as Q1 | | |
| Q4 | Same as Q1 | | |
| Q5 | Same as Q1 | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 100Ω, ±5%, 1/4W | CB1015 | A-B |
| R3 | Same as R1 | | |
| R4 | Same as R1 | | |
| R5 | RESISTOR, FIXED, COMPOSITION: 22K, 5%, 1/4W | CB2235 | A-B |
| R6 | RESISTOR, FIXED, COMPOSITION: 2.7K, ±5%, 1/4W | CB2725 | A-B |
| R7 | Same as R1 | | |
| R8 | Same as R1 | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 100Ω, 5%, 1/4W | CB1015 | A-B |
| R10 | Same as R1 | | |
| R11 | Same as R1 | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 4.7K, ±5%, 1/4W | CB4725 | A-B |
| R13 | Same as R6 | | |
| R14 | Same as R1 | | |
| R15 | RESISTOR, FIXED, COMPOSITION: 470Ω, 5%, 1/4W | CB4715 | A-B |
| R16 | RESISTOR, FIXED, COMPOSITION: 330K, ±5%, 1/4W | CB3345 | A-B |
| R17 | RESISTOR, FIXED, COMPOSITION: 150K, ±5%, 1/4W | CB1545 | A-B |
| R18 | Same as R16 | | |
| R19 | Same as R17 | | |
| R20 | RESISTOR, FIXED, COMPOSITION: 680K, ±5%, 1/4W | CB6845 | A-B |
| R21 | RESISTOR, FIXED, COMPOSITION: 10K, ±5%, 1/4W | CB1035 | A-B |
| R22 | Same as R21 | | |

REF. DESIG. PREFIX A5A2

| ef. es | Description | | Vendor Part No. | Vendor Name |
|---|---|---|---|---|
| 23 | Same as R21 | | | |
| 24 | RESISTOR, COMPOSITION: 47Ω, 5%, 1/4W | | CB4705 | A-B |
| 1 | TRANSFORMER, RF | | 3476-4 | CEI |
| 2 | TRANSFORMER, RF | | 3476-5 | CEI |
| 3 | TRANSFORMER, RF | | 3476-6 | CEI |
| 4 | Same as T2 | | | |
| 5 | TRANSFORMER, RF | | 3476-7 | CEI |
| 6 | TRANSFORMER, RF | | 3476-8 | CEI |
| 7 | Same as T5 | | | |
| 8 | Same as T6 | | | |
| 9 | Same as T5 | | | |
| 1 | CRYSTAL, QUARTZ: 5.750 MC | | CR-18/U | Piezo |

5.4.6.3 Type 8202 Horizontal Sweep Oscillator REF. DESIG. PREFIX A5A3

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, TANTALYTIC: 1.0 µf, 20%, 35V | 150D105X0035A2 | Sprague |
| C2 | CAPACITOR, TANTALYTIC: 2.2 µf, 20%, 35V | 150D225X0035B2 | Sprague |
| C3 | CAPACITOR, ELECTROLYTIC: 50 µf, 50V | TE 11307 | Sprague |
| C4 | Same as C1 | | |
| C5 | Same as C1 | | |
| C6 | CAPACITOR, TANTALYTIC: 22 µf, 20%, 15V | 150D226X0015B2 | Sprague |
| C7 | Same as C3 | | |
| CR1 | DIODE | 1N462 | CD |
| CR2 | Same as CR1 | | |
| CR3 | DIODE, ZENER | 1N965B | CD |
| CR4 | DIODE, ZENER | 1N970B | CD |
| Q1 | TRANSISTOR | 2N489 | GE |
| Q2 | TRANSISTOR | 2N2270 | RCA |
| Q3 | TRANSISTOR | 2N697 | TI |
| Q4 | TRANSISTOR | 2N1925 | TI |
| Q5 | TRANSISTOR | 2N2270 | RCA |
| R1 | RESISTOR, FIXED, COMPOSITION: 56K, 5%, 1/4W | CB5635 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 470Ω, 5%, 1/4W | CB4715 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 4.7K, 5%, 1/4W | CB4725 | A-B |
| R4 | RESISTOR, VARIABLE, COMPOSITION: 10K, ±20% | FR103M | A-B |
| R5 | RESISTOR, FIXED, COMPOSITION: 2.7K, 5%, 1/4W | CB2725 | A-B |
| R6 | RESISTOR, VARIABLE, COMPOSITION: 20K, ±20% | FR203M | A-B |
| R7 | RESISTOR, FIXED, COMPOSITION: 470K, 5%, 1/4W | CB4745 | A-B |
| R8 | Same as R7 | | |
| R9 | Same as R6 | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 240K, 5%, 1/4W | CB2445 | A-B |
| R11 | RESISTOR, VARIABLE, COMPOSITION: 100K, ±20% | FR104M | A-B |
| R12 | RESISTOR, FIXED, COMPOSITION: 820Ω, 5%, 1/4W | CB8215 | A-B |
| R13 | RESISTOR, FIXED, COMPOSITION: 100Ω, 5%, 1/4W | CB1015 | A-B |
| R14 | Same as R3 | | |
| R15* | NOMINAL VALUE 10K, 5%, 1/4W | CB1035 | A-B |
| R16 | RESISTOR, FIXED, COMPOSITION: 680Ω, 5%, 1/4W | CB6815 | A-B |
| R17 | RESISTOR, FIXED, COMPOSITION: 1.5K, 5%, 1/4W | CB1525 | A-B |
| R18 | RESISTOR, FIXED, COMPOSITION: 18K, 5%, 1/4W | CB1835 | A-B |
| R19 | RESISTOR, FIXED, COMPOSITION: 15K, ±5%, 1/4W | CB1535 | A-B |
| R20 | RESISTOR, FIXED, COMPOSITION: 5.1K, 5%, 1/4W | CB5125 | A-B |
| T1 | TRANSFORMER, FLYBACK | 10272 | CEI |

* ACTUAL VALUE TO BE FACTORY SELECTED.

REF DESIG PREFIX A5A3

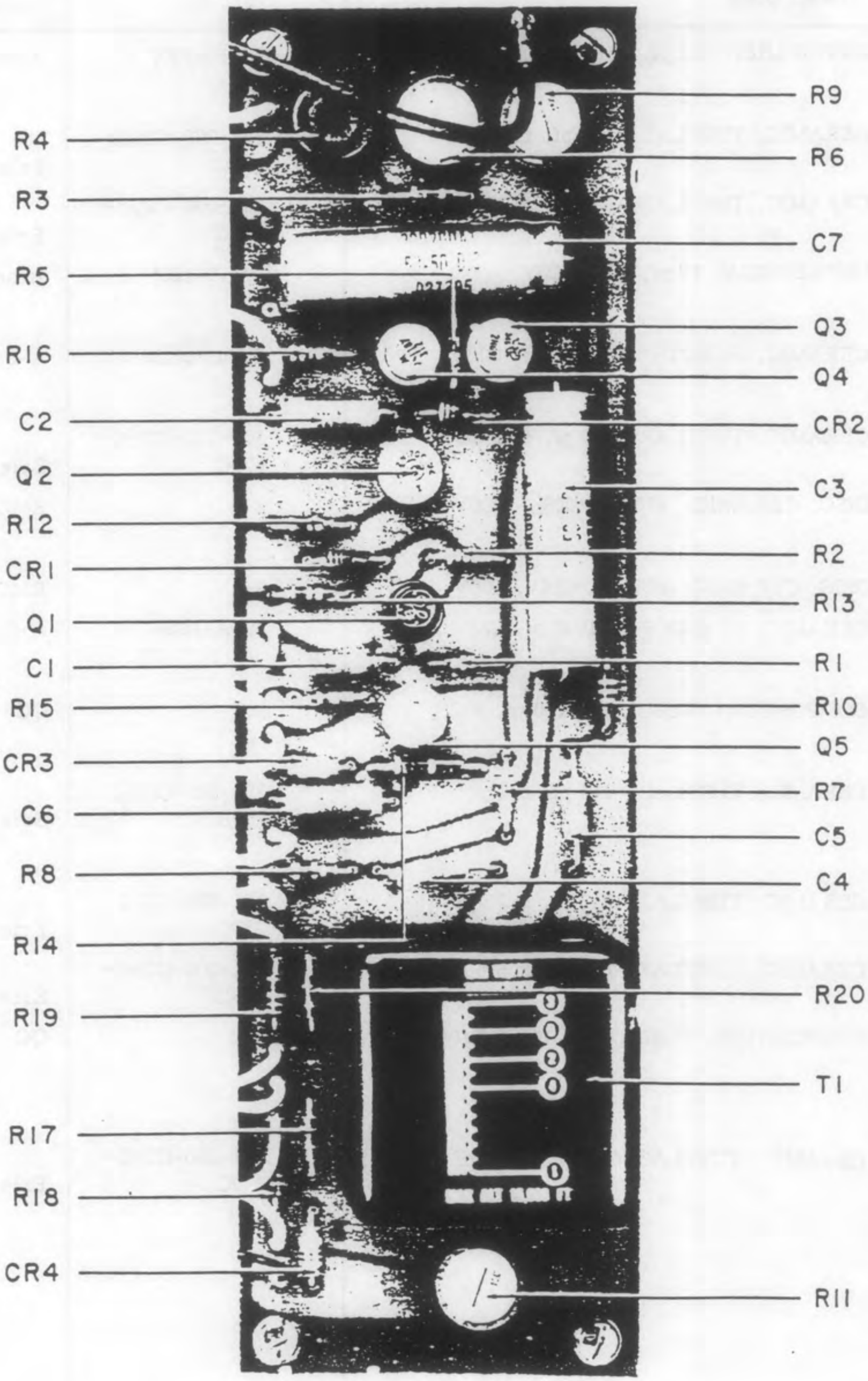


Figure 5-17. Type 8202 Horizontal Sweep Oscillator, Component Locations

5.4.7 Type 7120 60-21.4 mc Converter

REF. DESIG. PREFIX A6

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, DIPPED MICA: 82 pf, ±5% | DM10-820J | Arco |
| C2 | Same as C1 | | |
| C3 | CAPACITOR, CERAMIC, TUBULAR: 1.0 pf, ±.25 pf | 301-000-COKO-109C | Erie |
| C4 | CAPACITOR, CERAMIC, TUBULAR: 2.2 pf, ±.25 pf | 301-000-COJO-229C | Erie |
| C5 | CAPACITOR, DIPPED MICA: 12 pf, ±5%, 500V | DM10-120J | Arco |
| C6 | Same as C5 | | |
| C7 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pf, GMV | FA5C-102W | A-B |
| C8 | Same as C7 | | |
| C9 | CAPACITOR, CERAMIC, TUBULAR: 4.7 pf, ±.25 pf | 301-000-COHO-479C | Erie |
| C10 | CAPACITOR, DISC, CERAMIC: 470 pf, ±20%, 1000V | B | RMC |
| C11 | Same as C7 | | |
| C12 | CAPACITOR, DISC, CERAMIC: 1000 pf, GMV, 500V | SM | RMC |
| C13 | CAPACITOR, CERAMIC, STANDOFF: 1000 pf, GMV | SS5A-102W | A-B |
| C14 | Same as C12 | | |
| C15 | CAPACITOR, COMPOSITION, TUBULAR: 1.0 pf, ±10% | MC | QC |
| C16 | Same as C12 | | |
| C17 | CAPACITOR, CERAMIC, TUBULAR: 1.5 pf, ±.1 pf | 301-000-COKO-159B | Erie |
| C18 | Same as C7 | | |
| C19 | CAPACITOR, CERAMIC, TUBULAR: 3.3 pf, ±.25 pf | 301-000-COJO-339C | Erie |
| C20 | CAPACITOR, CERAMIC, TUBULAR: 6.8 pf, ±.5 pf | 301-000-COHO-689D | Erie |
| C21 | CAPACITOR, COMPOSITION, TUBULAR: .82 pf, ±10% | MC | QC |
| C22 | Same as C12 | | |
| C23 | Same as C12 | | |
| C24 | CAPACITOR, CERAMIC, TUBULAR: 2.7 pf, ±.25 pf | 301-000-COJO-279C | Erie |
| C25 | Same as C12 | | |
| C26 | Same as C12 | | |
| C27 | Same as C12 | | |
| C28 | NOT USED | | |
| C29 | Same as C12 | | |
| C30 | NOT USED | | |
| C31 | Same as C13 | | |

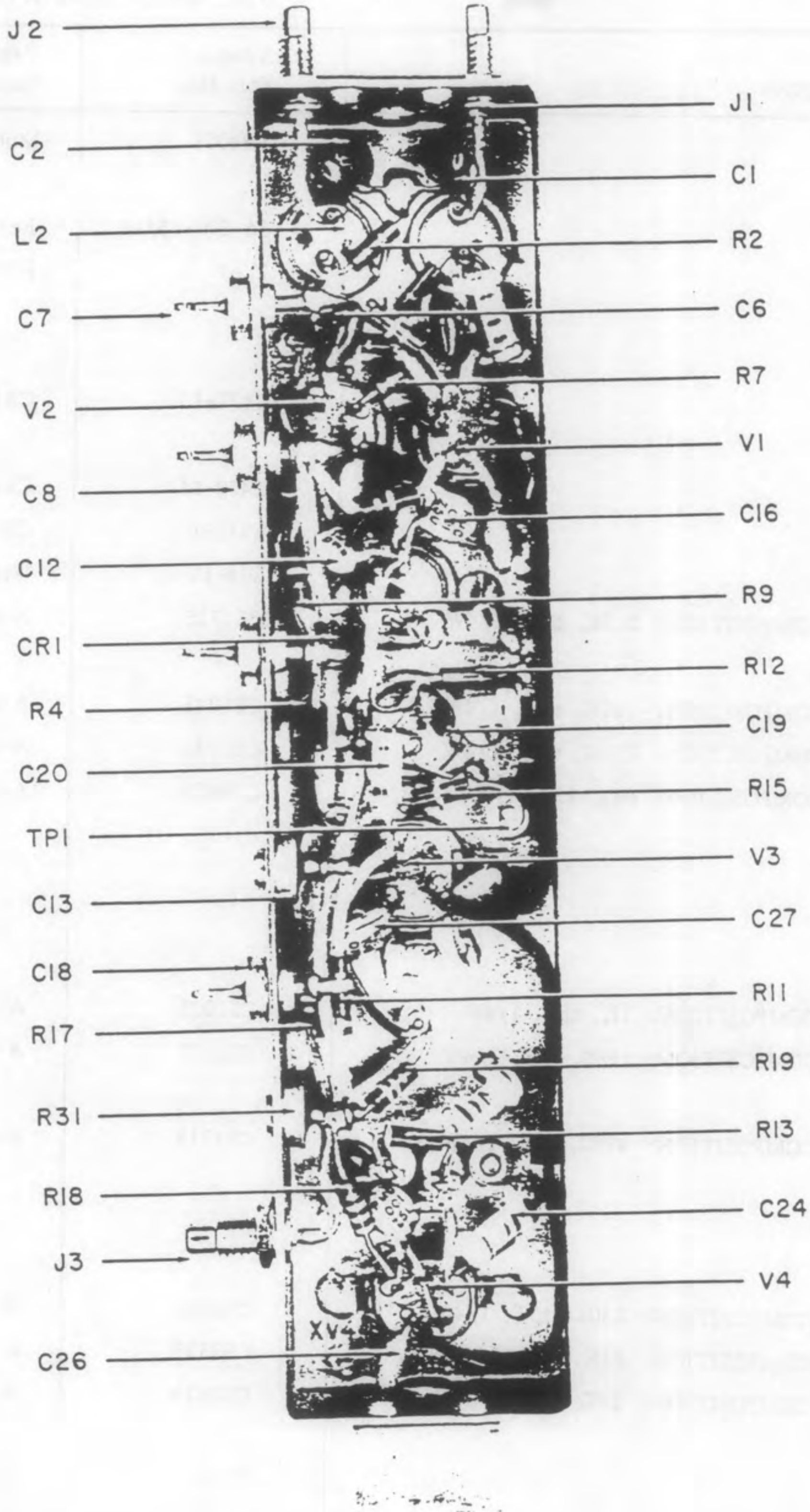


Figure 5-18. Type 7120 60-21.4 mc Converter, Component Locations

REF. DESIG. PREFIX A6

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| CR1 | DIODE | 1N4003 | Motorola |
| CR2 | Same as CR1 | | |
| FB1 | FERRITE BEAD | 56-590-65/4A | Ferroxcube |
| J1 | JACK | 27-9 | FXR |
| J2 | Same as J1 | | |
| J3 | Same as J1 | | |
| L1 | COIL, VARIABLE | 1472-13 | CEI |
| L2 | Same as L1 | | |
| L3 | COIL, VARIABLE | 1472-11 | CEI |
| L4 | COIL, VARIABLE | 1472-1 | CEI |
| L5 | COIL, FIXED: .82 µh | 204-11 | Wilco |
| R1 | RESISTOR, FIXED, COMPOSITION: 2.7K, ±5%, 1/4W | CB2725 | A-B |
| R2 | Same as R1 | | |
| R3 | RESISTOR, FIXED, COMPOSITION: 100K, ±5%, 1/4W | CB1045 | A-B |
| R4 | RESISTOR, FIXED, COMPOSITION: 220K, ±5%, 1/4W | CB2245 | A-B |
| R5 | RESISTOR, FIXED, COMPOSITION: 68Ω, ±5%, 1/4W | CB6805 | A-B |
| R6 | Same as R3 | | |
| R7 | Same as R5 | | |
| R8 | Same as R4 | | |
| R9 | Same as R4 | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R11 | RESISTOR, FIXED, COMPOSITION: 100Ω, ±5%, 1/4W | CB1015 | A-B |
| R12 | Same as R1 | | |
| R13 | RESISTOR, FIXED, COMPOSITION: 470Ω, ±5%, 1/4W | CB4715 | A-B |
| R14 | Same as R4 | | |
| R15 | Same as R4 | | |
| R16 | Same as R3 | | |
| R17 | RESISTOR, FIXED, COMPOSITION: 330K, ±5%, 1/4W | CB3345 | A-B |
| R18 | RESISTOR, FIXED, COMPOSITION: 33K, ±5%, 1/4W | CB3335 | A-B |
| R19 | RESISTOR, FIXED, COMPOSITION: 24K, ±5%, 1/4W | CB2435 | A-B |
| R20 | Same as R4 | | |
| TP1 | TEST POINT | TJ-6 | Taurus |
| V1 | TUBE, ELECTRON, NUVISTOR | 7587 | RCA |
| V2 | Same as V1 | | |
| V3 | Same as V1 | | |

REF DESIG PREFIX A6

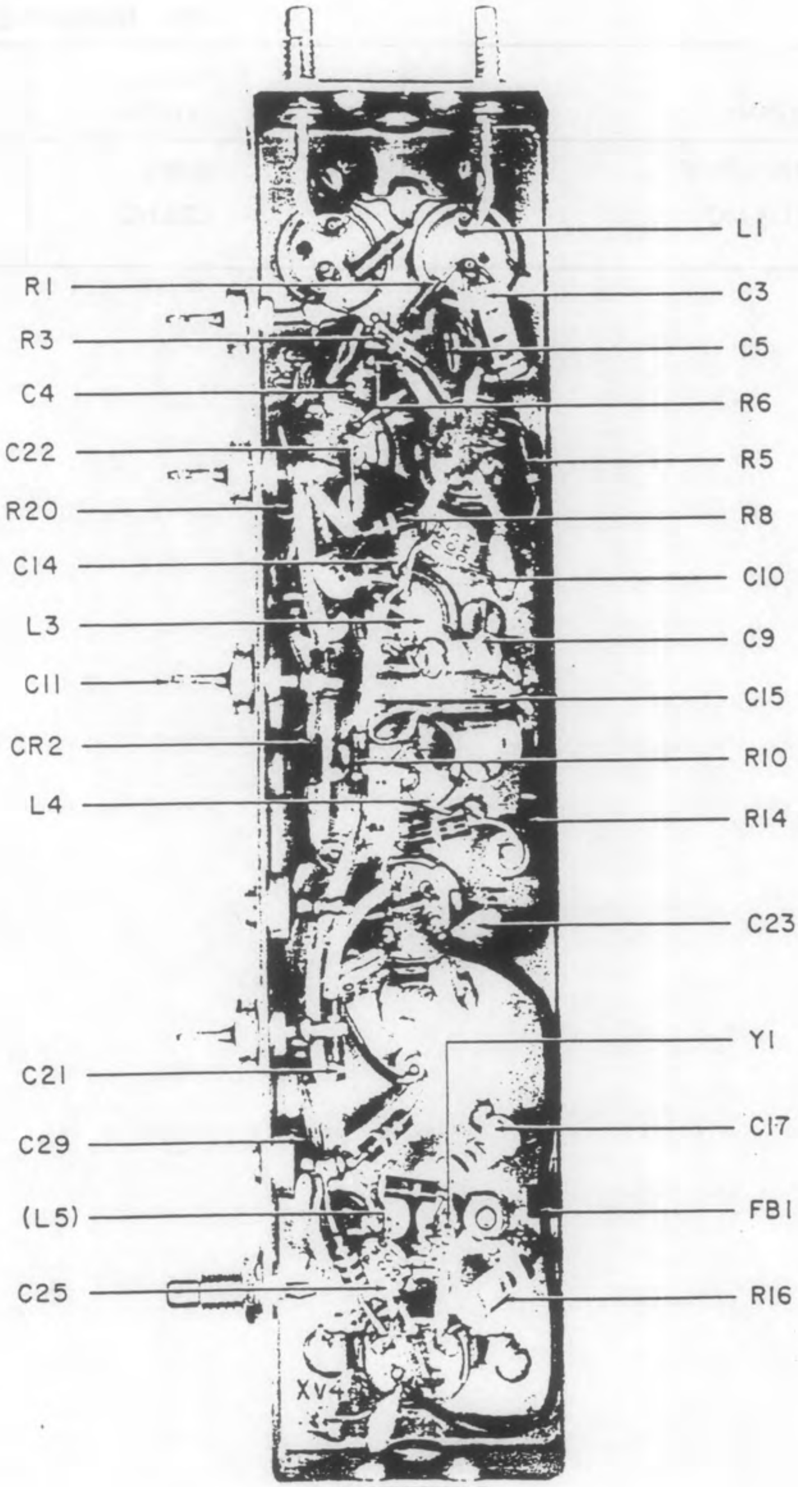


Figure 5-19. Type 7120 [illegible]ter, Component Locations

REF. DESIG. PREFIX A6

| Ref. Desig. | Description | | Vendor Part No. | Vendor Name |
|---|---|---|---|---|
| V4 | TUBE, ELECTRON, NUVISTOR | | 6CW4 | RCA |
| Y1 | CRYSTAL, PIEZO: 81.4 MC | | CR82/U | Piezo |

REF DESIG PREFIX A7

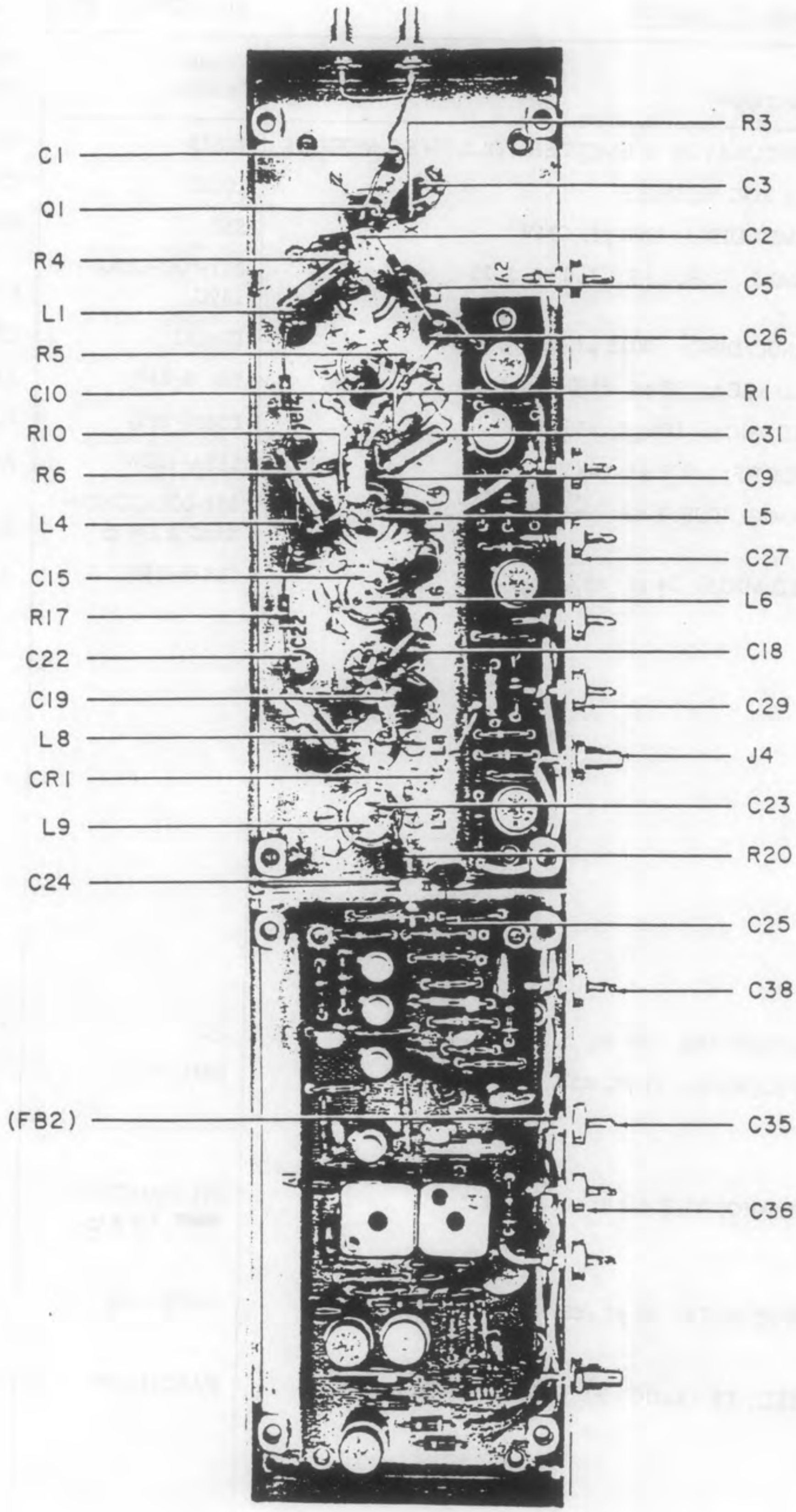


Figure 5-20. Type 7233 2-mc Bandwidth IF Strip, Component Locations

5.4.8 Type 7233 2-mc Bandwidth IF Amplifier

REF. DESIG. PREFIX A7

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| A1 | FM LIMITERS/DEMODULATOR & EMITTER FOLLOWER MODULE | 10523 | CEI |
| A2 | VIDEO AMPLIFIER & AGC MODULE | 10527 | CEI |
| C1 | CAPACITOR, CERAMIC DISC: 1000 pf, GMV | SM | RMC |
| C2 | CAPACITOR, CERAMIC, TUBULAR: 1.8 pf, ±.25 | 301-000-COKO-189C | Erie |
| C3 | CAPACITOR, CERAMIC DISC: .0015 μf, ±10%, 500V | ID-152 | CRL |
| C4 | CAPACITOR, DIPPED MICA: 33 pf, ±5% | DM10-330J | Arco |
| C5 | CAPACITOR, DIPPED MICA: 100 pf, ±5% | DM10-101J | Arco |
| C6 | CAPACITOR, STANDOFF: .001 μf, GMV | SS5A-102W | A-B |
| C7 | CAPACITOR, CERAMIC, TUBULAR: ~~3.9~~ 6.2 pf, ±~~.25~~ .5 pf | 301-000-COHO-~~[illegible]~~ 629D | Erie |
| C8 | CAPACITOR, DIPPED MICA: 24 pf, ±5% | DM10-240J | Arco |
| C9 | Same as C5 | | |
| C10 | Same as C1 | | |
| C11 | Same as C2 | | |
| C12 | Same as C4 | | |
| C13 | Same as C5 | | |
| C14 | Same as C6 | | |
| C15 | Same as C7 | | |
| C16 | Same as C8 | | |
| C17 | Same as C5 | | |
| C18 | Same as C3 | | |
| C19 | CAPACITOR, COMPOSITION: .68 pf, ±10% | QC | QC |
| C20 | CAPACITOR, DIPPED MICA: 47 pf, ±5% | DM10-470J | Arco |
| C21 | Same as C20 | | |
| C22 | Same as C6 | | |
| C23 | CAPACITOR, CERAMIC, TUBULAR: ~~6.2~~ 10 pf, ±.5 | 301-000-COHO-~~[illegible]~~ 100D | Erie |
| C24 | Same as C8 | | |
| C25 | CAPACITOR, DIPPED MICA: 68 pf, ±5% | DM10-680J | Arco |
| C26 | Same as C6 | | |
| C27 | CAPACITOR, FIXED, CERAMIC, FEEDTHRU: 1000 pf, GMV | FA5C-102W | A-B |
| C28 | Same as C27 | | |
| C29 | Same as C27 | | |
| C30 | NOT USED | | |
| C31 | CAPACITOR, ELECTROLYTIC: 47 μf, ±20%, 6V | 150D476X006B2 | Sprague |

REF DESIG PREFIX A7

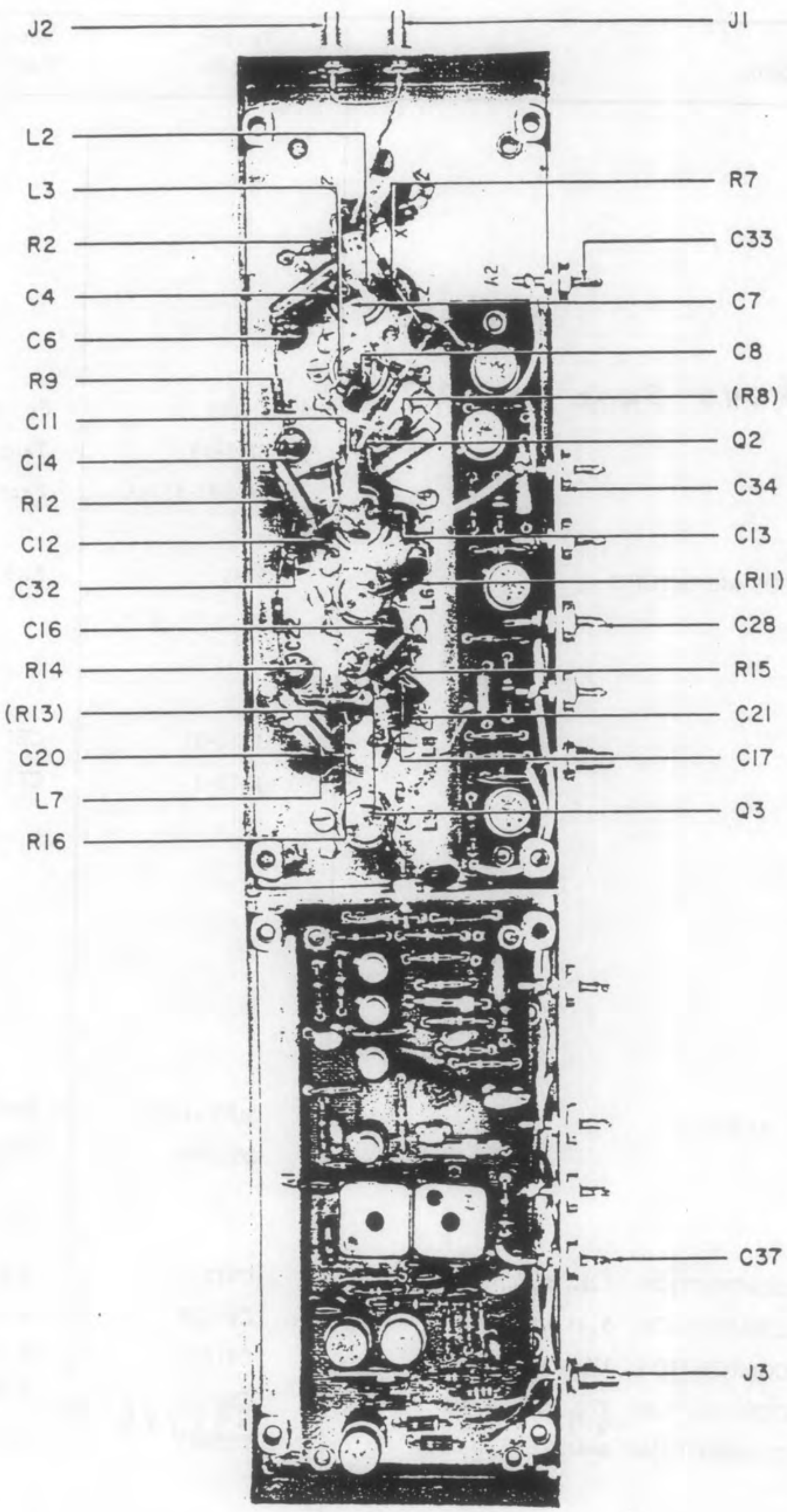


Figure 5-21. Type 7233 2-mc Bandwidth IF Strip, Component Locations

REF. DESIG. PREFIX A7

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C32 | Same as C6 | | |
| C33 | Same as C27 | | |
| C34 | Same as C27 | | |
| C35 | Same as C27 | | |
| C36 | Same as C27 | | |
| C37 | Same as C27 | | |
| C38 | Same as C27 C39 + C40 Same as C27 | | |
| CR1 | DIODE | 1N198 | Sylvania |
| E1 | FEEDTHRU, TEFLON | SFU-16 | Taurus |
| FB1 | FERRITE BEAD | 56-590-65/4A | Ferroxcube |
| FB2 | Same as FB1 | | |
| J1 | CONNECTOR, JACK, SUB-MINIATURE | 27-9 | FXR |
| J2 | Same as J1 | | |
| J3 | Same as J1 | | |
| J4 | Same as J1 | | |
| L1 | COIL, FIXED | 1131-37 | CEI |
| L2 | COIL, VARIABLE | 1472-3 | CEI |
| L3 | Same as L2 | | |
| L4 | Same as L1 | | |
| L5 | Same as L2 | | |
| L6 | Same as L2 | | |
| L7 | Same as L1 | | |
| L8 | Same as L2 | | |
| L9 | Same as L2 | | |
| P1 | CONNECTOR, PLUG: 14 pin | MRE-14P-G | Winchester |
| Q1 | TRANSISTOR | 2N2708 | RCA |
| Q2 | Same as Q1 | | |
| Q3 | Same as Q1 | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 12K, ±5%, 1/4W | CB1235 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 5.1K, ±5%, 1/4W | CB5125 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R4 | RESISTOR, FIXED, COMPOSITION: 47Ω, ±5%, 1/4W | CB4705 | A-B |
| R5 | RESISTOR, FIXED, COMPOSITION: ~~5.6K~~ 2.7K, ±5%, 1/4W | ~~CB5625~~ CB2725 | A-B |
| R6 | Same as R2 | | |
| R7 | Same as R1 | | |

REF. DESIG. PREFIX A7

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| R8 | Same as R3 | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 100Ω, ±5%, 1/4W | CB1015 | A-B |
| R10 | Same as R4 | | |
| R11 | Same as R5 | | |
| R12 | Same as R9 | | |
| R13 | Same as R2 | | |
| R14 | Same as R1 | | |
| R15 | RESISTOR, FIXED, COMPOSITION: 470Ω, ±5%, 1/4W | CB4715 | A-B |
| R16 | Same as R4 | | |
| R17 | Same as R4 | | |
| R18 | NOT USED | | |
| R19 | NOT USED | | |
| R20 | RESISTOR, FIXED, COMPOSITION: ~~6.8K~~ 4.7K, ±5%, 1/4W | ~~CB6825~~ 4725 | A-B |

5.4.8.1 Part 10523 FM Limiter/Demodulator

REF. DESIG. PREFIX A7A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, CERAMIC DISC: .005 µf, 20% | SM | RMC |
| C2 | CAPACITOR, CERAMIC DISC: .001 µf, GMV | SM | RMC |
| C3 | Same as C1 | | |
| C4 | Same as C2 | | |
| C5 | Same as C2 | | |
| C6 | CAPACITOR, DIPPED MICA: 15 pf, 5% | DM10-150J | Arco |
| C7 | CAPACITOR, DIPPED MICA: 10 pf, 5% | DM10-100J | Arco |
| C8 | CAPACITOR, DIPPED MICA: 24 pf, 5% | DM10-240J | Arco |
| C9 | Same as C8 | | |
| C10 | CAPACITOR, DIPPED MICA: 20 pf, 5% | DM10-200J | Arco |
| C11 | Same as C1 | | |
| C12 | Same as C2 | | |
| C13 | NOT USED | | |
| C14 | Same as C2 | | |
| CR1 | DIODE | 1N198 | Sylvania |
| CR2 | DIODE, ZENER | 1N753A | Motorola |
| CR3 | Same as CR1 | | |
| CR4 | Same as CR1 | | |
| CR5 | Same as CR1 | | |
| L1 | COIL, FIXED | 1131-41 | CEI |
| L2 | COIL, FIXED | 1131-37 | CEI |
| L3 | COIL, VARIABLE | 3476-19 | CEI |
| L4 | Same as L2 | | |
| Q1 | TRANSISTOR | 2N706 | TI |
| Q2 | Same as Q1 | | |
| Q3 | Same as Q1 | | |
| Q4 | Same as Q1 | | |
| Q5 | TRANSISTOR | 2N2270 | RCA |
| Q6 | Same as Q5 | | |
| Q7 | Same as Q5 | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 12K, 5%, 1/4W | CB1235 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 5.1K, 5%, 1/4W | CB5125 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 1K, 5%, 1/4W | CB1025 | A-B |
| R4 | Same as R2 | | |
| R5 | ~~Same as R1~~ 0K [redacted] | [redacted] | |

REF DESIG PREFIX A7A1

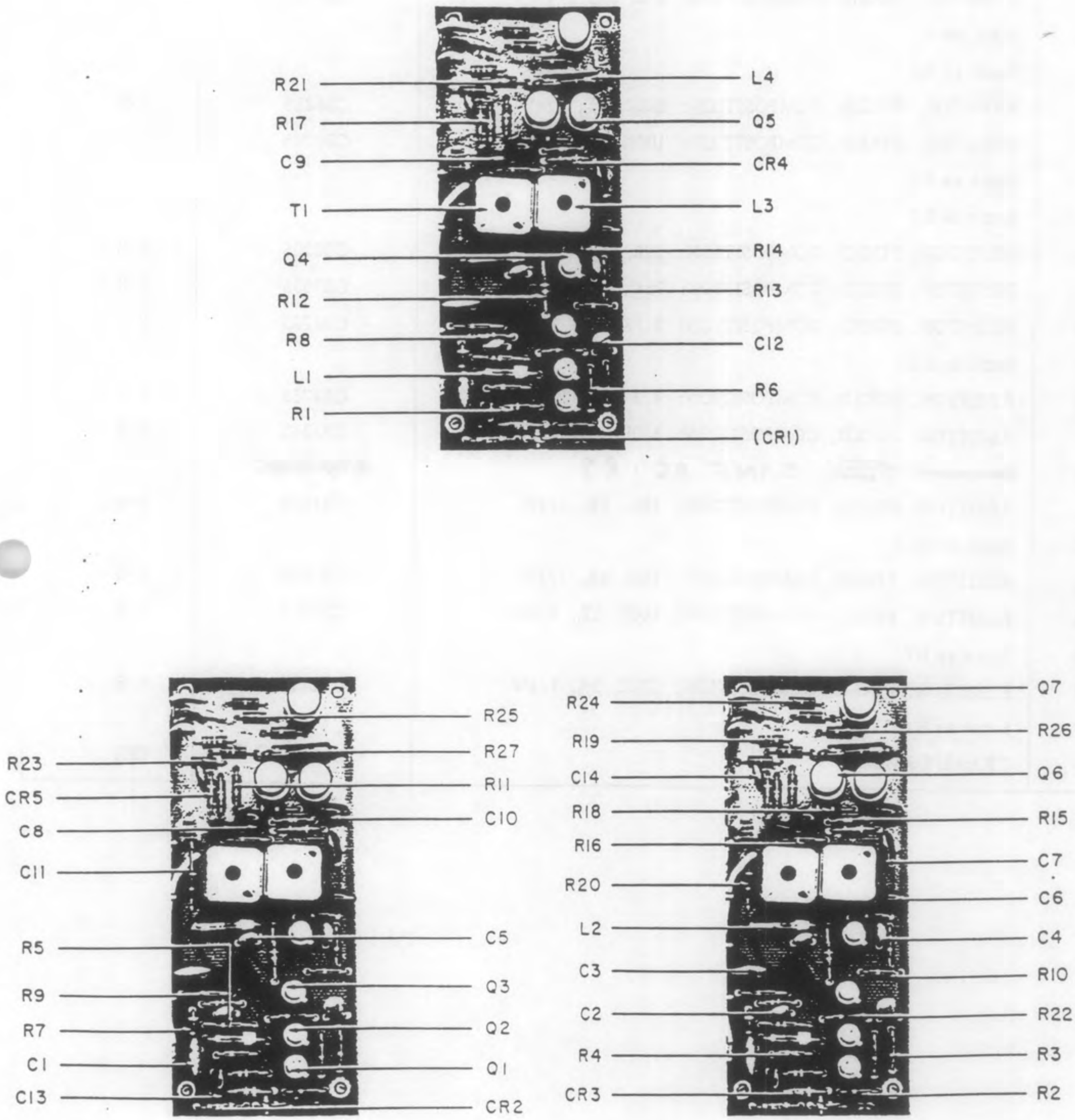


Figure 5-22. Part 10523 Limiter/Demodulator, Component Locations

REF. DESIG. PREFIX A7A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| R6 | Same as R2 | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 47Ω, 5%, 1/4W | CB4705 | A-B |
| R8 | Same as R1 | | |
| R9 | Same as R2 | | |
| R10 | RESISTOR, FIXED, COMPOSITION: 620Ω, 5%, 1/4W | CB6215 | A-B |
| R11 | RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/4W | CB1045 | A-B |
| R12 | Same as R1 | | |
| R13 | Same as R2 | | |
| R14 | RESISTOR, FIXED, COMPOSITION: 22Ω, 5%, 1/4W | CB2205 | A-B |
| R15 | RESISTOR, FIXED, COMPOSITION: 75K, 5%, 1/4W | CB7535 | A-B |
| R16 | RESISTOR, FIXED, COMPOSITION: 2.7K, 5%, 1/4W | CB2725 | A-B |
| R17 | Same as R15 | | |
| R18 | RESISTOR, FIXED, COMPOSITION: 4.7 meg, 5%, 1/4W | CB4755 | A-B |
| R19 | RESISTOR, FIXED, COMPOSITION: 330K, ±5%, 1/4W | CB3345 | A-B |
| R20 | ~~Same as R7~~ SAME AS R7 | ~~[illegible]~~ | |
| R21 | RESISTOR, FIXED, COMPOSITION: 10K, 5%, 1/4W | CB1035 | A-B |
| R22 | Same as R14 | | |
| R23 | RESISTOR, FIXED, COMPOSITION: 18K, 5%, 1/4W | CB1835 | A-B |
| R24 | RESISTOR, FIXED, COMPOSITION: 100Ω, 5%, 1/4W | CB1015 | A-B |
| R25 | Same as R7 | | |
| R26 | RESISTOR, FIXED, COMPOSITION: 270Ω, 5%, 1/4W | CB2715 | A-B |
| R27 | Same as R16 | | |
| T1 | TRANSFORMER | 3476-B22 | CEI |

5.4.8.2 Part 10527 Video/AGC Amplifier REF. DESIG. PREFIX A7A2

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, FIXED, ELECTROLYTIC: 4.7 µf, 20%, 35V | 150D475X0035B2 | Sprague |
| C2 | CAPACITOR, FIXED, ELECTROLYTIC: 1.0 µf, 20%, 35V | 150D105X0035A2 | Sprague |
| C3 | CAPACITOR, DIPPED MICA: 33 pf, 5% | DM10-330J | Arco |
| Q1 | TRANSISTOR | 2N2270 | RCA |
| Q2 | Same as Q1 | | |
| Q3 | Same as Q1 | | |
| Q4 | Same as Q1 | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/4W | CB1035 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 10K, 1/4W, 5% | CB2235 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 1K, 5%, 1/4W | CB1025 | A-B |
| R4 | RESISTOR, FIXED, COMPOSITION: 33K, 5%, 1/4W | CB3335 | A-B |
| R5 | NOT USED | | |
| R6 | RESISTOR, FIXED, COMPOSITION: 10K, 5%, 1/4W | CB1035 | A-B |
| R7 | Same as R6 | | |
| R8 | RESISTOR, FIXED, COMPOSITION: 2.2K, 5%, 1/4W | CB2225 | A-B |
| R9 | RESISTOR, FIXED, COMPOSITION: 51K, 5%, 1/4W | CB5135 | A-B |
| R10 | RESISTOR, FIXED, COMPOSITION: 47Ω, 5%, 1/4W | CB4705 | A-B |
| R11 | RESISTOR, FIXED, COMPOSITION: 270Ω, 5%, 1/4W | CB2715 | A-B |
| R12 | RESISTOR, FIXED, COMPOSITION: 100Ω, 5%, 1/4W | CB1015 | A-B |

REF DESIG PREFIX A7A2

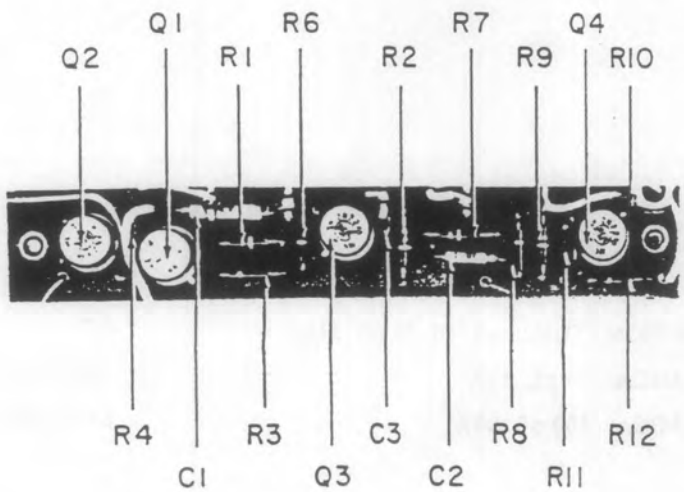


Figure 5-23. Part 10527 Video/AGC Amplifier, Component Locations

5.4.9 Type 7245 300 kc/75 kc/ 20 kc Bandwidth IF Amplifier REF. DESIG. PREFIX A8

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| A1 | LIMITER/DEMODULATOR | 10710 | CEI |
| A2 | BFO MODULE | 1769-3 | CEI |
| C1 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pf, GMV | FA5C-102W | A-B |
| C2 | Same as C1 | | |
| C3 | Same as C1 | | |
| C4 | Same as C1 | | |
| C5 | CAPACITOR, CERAMIC, DISC: 1000 pf, GMV | SM | RMC |
| C6 | CAPACITOR, CERAMIC, STANDOFF: 1000 pf, GMV | SS5A-102W | A-B |
| C7 | Same as C5 | | |
| C8 | Same as C5 | | |
| C9 | CAPACITOR, CERAMIC, DISC: .005 μf, 20% | SM | RMC |
| C10 | Same as C1 | | |
| C11 | Same as C1 | | |
| C12 | Same as C6 | | |
| C13 | Same as C5 | | |
| C14 | CAPACITOR, COMPOSITION, TUBULAR: 0.68 pf, ±10% | QC | QC |
| C15 | Same as C9 | | |
| C16 | CAPACITOR, DIPPED MICA: 47 pf, ±5% | DM10-470J | Arco |
| C17 | Same as C5 | | |
| C18 | Same as C9 | | |
| C19 | CAPACITOR, DIPPED MICA: 39 pf, ±5% | DM10-390J | Arco |
| C20 | Same as C5 | | |
| C21 | Same as C6 | | |
| C22 | Same as C16 | | |
| C23 | Same as C16 | | |
| C24 | Same as C19 | | |
| C25 | Same as C19 | | |
| C26 | Same as C1 | | |
| C27 | CAPACITOR, COMPOSITION, TUBULAR: 0.75 pf, ±10% | QC | QC |
| C28 | CAPACITOR, DIPPED MICA: 24 pf, ±5% | DM10-240J | Arco |
| C29 | CAPACITOR, DIPPED MICA: 360 pf, ±5% | DM15-361J | Arco |
| C30 | Same as C19 | | |
| C31 | Same as C6 | | |
| C32 | Same as C19 | | |
| C33 | Same as C19 | | |

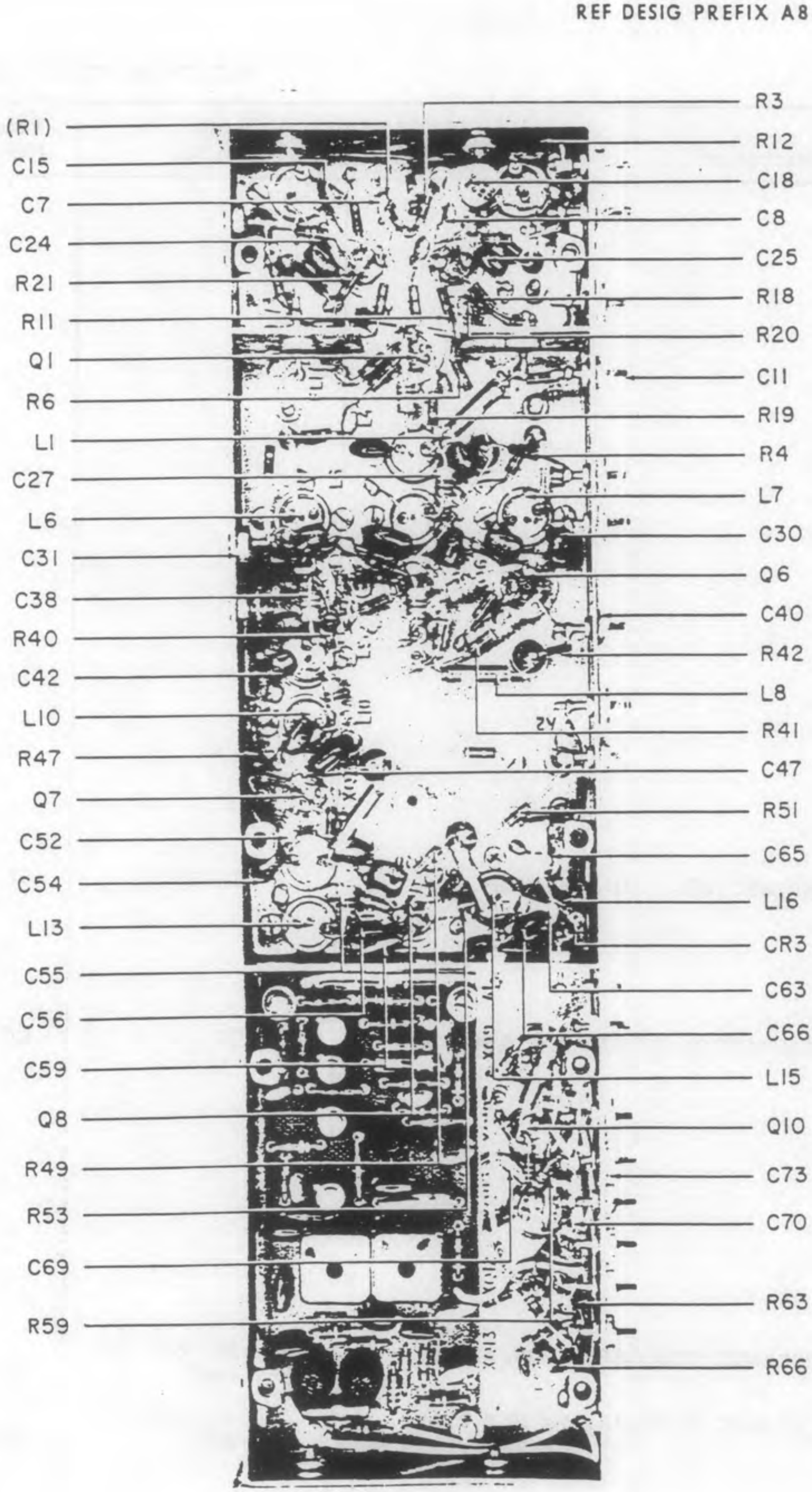


Figure 5-24. Type 7245 20/75/300 kc Bandwidth IF Strip, Component Locations

REF. DESIG. PREFIX A8

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C34 | NOT USED | | |
| C35 | Same as C5 | | |
| C36 | Same as C14 | | |
| C37 | Same as C5 | | |
| C38 | Same as C14 | | |
| C39 | Same as C5 | | |
| C40 | Same as C1 | | |
| C41 | Same as C6 | | |
| C42 | Same as C16 | | |
| C43 | Same as C16 | | |
| C44 | Same as C14 | | |
| C45 | Same as C27 | | |
| C46 | Same as C28 | | |
| C47 | Same as C29 | | |
| C48 | Same as C1 | | |
| C49 | Same as C1 | | |
| C50 | Same as C6 | | |
| C51 | CAPACITOR, CERAMIC DISC: .0015 µf, ±10% | ID-152 | CRL |
| C52 | Same as C14 | | |
| C53 | Same as C16 | | |
| C54 | Same as C16 | | |
| C55 | CAPACITOR, COMPOSITION, TUBULAR: 1.0 pf, ±10% | QC | QC |
| C56 | Same as C28 | | |
| C57 | Same as C29 | | |
| C58 | Same as C6 | | |
| C59 | Same as C9 | | |
| C60 | Same as C14 | | |
| C61 | Same as C16 | | |
| C62 | Same as C16 | | |
| C63 | CAPACITOR, CERAMIC, TUBULAR: 2.4 pf, ±.25 pf | 301-000-COJO-249C | Erie |
| C64 | CAPACITOR, CERAMIC, TUBULAR: 3.3 pf, ±.25 pf | 301-000-COJO-339C | Erie |
| C65 | Same as C9 | | |
| C66 | Same as C28 | | |
| C67 | CAPACITOR, DIPPED MICA: 68 pf, ±5% | DM10-680J | Arco |

REF DESIG PREFIX A8

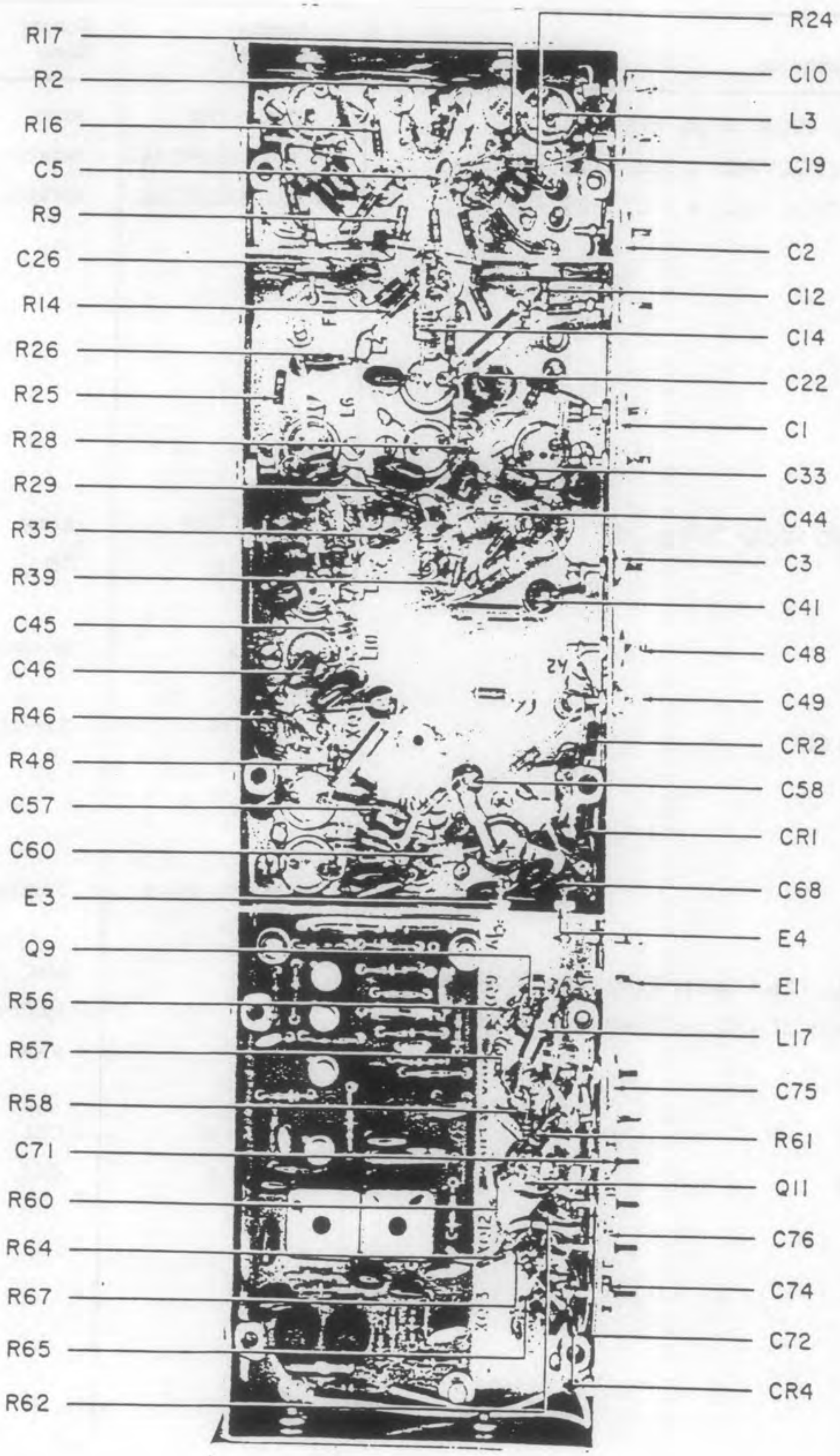


Figure 5-25. Type 7245 20/75/300 kc Bandwidth IF Strip, Component Locations

REF. DESIG. PREFIX A8

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C68 | CAPACITOR, DIPPED MICA: 33 pf, ±5% | DM10-330J | Arco |
| C69 | CAPACITOR, ELECTROLYTIC: 2.2 μf, ±10%, 20V | 150D225X9020A2 | Sprague |
| C70 | CAPACITOR, ELECTROLYTIC: 4.7 μf, ±20%, 35V | 150D475X0035B2 | Sprague |
| C71 | Same as C1 | | |
| C72 | Same as C1 | | |
| C73 | Same as C1 | | |
| C74 | Same as C1 | | |
| C75 | Same as C1 | | |
| C76 | Same as C1 | | |
| C77 | Same as C19 | | |
| C78 | CAPACITOR, DIPPED MICA: 2000 pf, ±5% | DM19-202J | Arco |
| CR1 | DIODE | 1N462A | CD |
| CR2 | Same as CR1 | | |
| CR3 | DIODE | 1N198 | Sylvania |
| CR4 | Same as CR1 | | |
| E1 | FEEDTHRU, TEFLON | SFU-16 | Taurus |
| E2 | Same as E1 | | |
| E3 | Same as E1 | | |
| E4 | Same as E1 | | |
| FB1 | FERRITE BEAD | 56-590-65/4A | Ferroxcube |
| FB2 | Same as FB1 | | |
| FL1 | FILTER, CRYSTAL: 21.4 Center Frequency, 75 KC Bandwidth | 40B4 | McCoy |
| FL2 | FILTER, CRYSTAL: 21.4 Center Frequency, 20 KC Bandwidth | 40B1 | McCoy |
| J1 | RECEPTACLE | 27-9 | FXR |
| J2 | Same as J1 | | |
| L1 | COIL, FIXED | 1131-37 | CEI |
| L2 | COIL, VARIABLE | 1472-3 | CEI |
| L3 | Same as L2 | | |
| L4 | Same as L2 | | |
| L5 | Same as L2 | | |
| L6 | Same as L2 | | |
| L7 | Same as L2 | | |
| L8 | Same as L1 | | |
| L9 | Same as L2 | | |
| L10 | Same as L2 | | |
| L11 | Same as L1 | | |

REF DESIG PREFIX A8

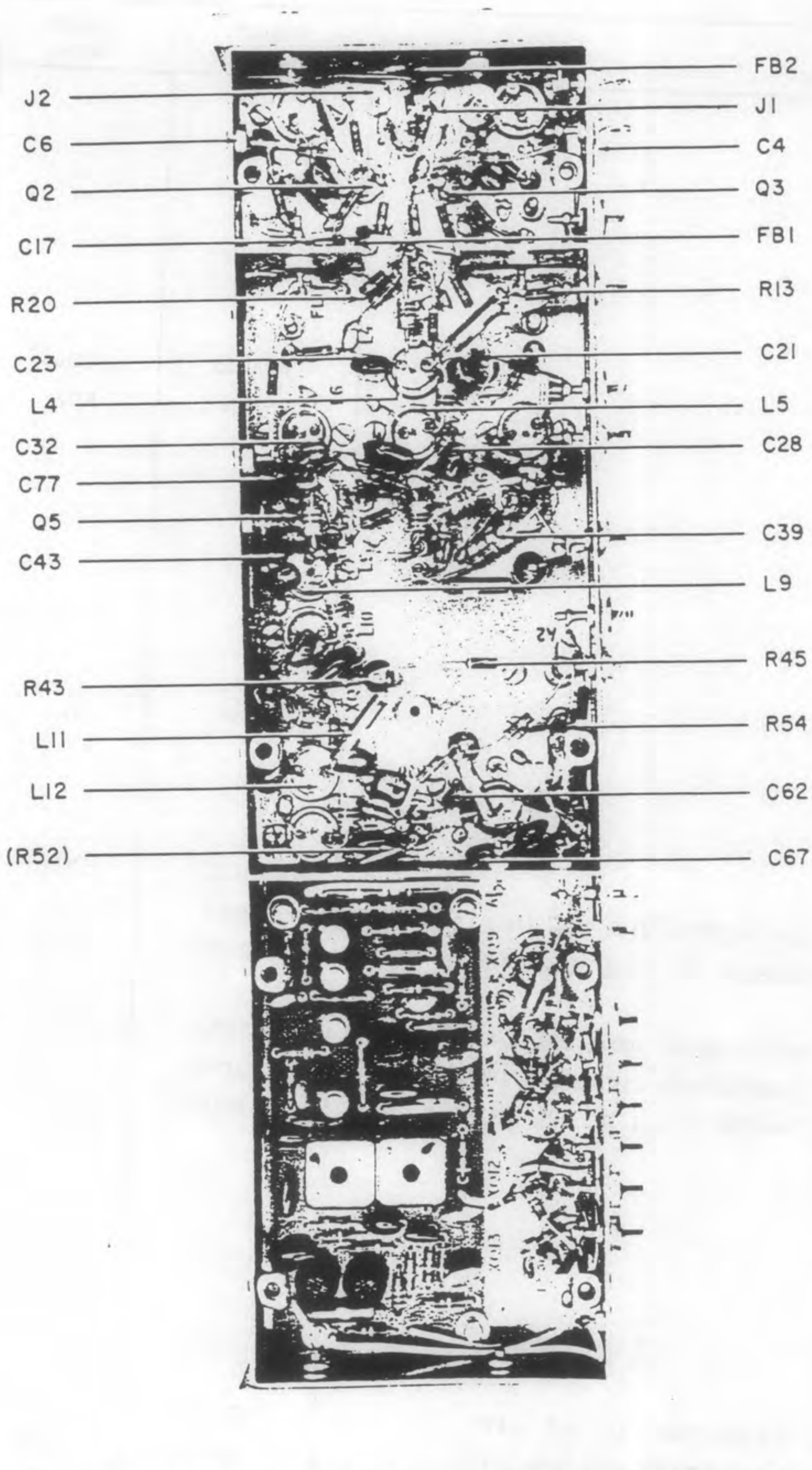


Figure 5-26. Type 7245 20/75/300 kc Bandwidth IF Strip, Component Locations

REF. DESIG. PREFIX A8

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| L12 | Same as L2 | | |
| L13 | Same as L2 | | |
| L14 | Same as L1 | | |
| L15 | Same as L2 | | |
| L16 | Same as L2 | | |
| L17 | Same as L1 | | |
| L18 | Same as L1 | | |
| L19 | COIL, FIXED: 500 µh | 1500-15 | Wilco |
| Q1 | TRANSISTOR | 2N2708 | RCA |
| Q2 | Same as Q1 | | |
| Q3 | Same as Q1 | | |
| Q4 | Same as Q1 | | |
| Q5 | Same as Q1 | | |
| Q6 | Same as Q1 | | |
| Q7 | Same as Q1 | | |
| Q8 | Same as Q1 | | |
| Q9 | TRANSISTOR | 2N697 | TI |
| Q10 | Same as Q9 | | |
| Q11 | Same as Q9 | | |
| Q12 | Same as Q9 | | |
| Q13 | TRANSISTOR | 2N1131 | TI |
| R1 | RESISTOR, FIXED, COMPOSITION: 24 Ω, ±5%, 1/4W | CB2405 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 33 Ω, ±5%, 1/4W | CB3305 | A-B |
| R3 | Same as R1 | | |
| R4 | RESISTOR, FIXED, COMPOSITION: 100 Ω, ±5%, 1/4W | CB1015 | A-B |
| R5 | RESISTOR, FIXED, COMPOSITION: 15K, ±5%, 1/4W | CB1535 | A-B |
| R6 | RESISTOR, FIXED, COMPOSITION: 5.1K, ±5%, 1/4W | CB5125 | A-B |
| R7 | Same as R4 | | |
| R8 | Same as R5 | | |
| R9 | Same as R6 | | |
| R10 | Same as R5 | | |
| R11 | Same as R6 | | |
| R12 | Same as R4 | | |
| R13 | Same as R4 | | |
| R14 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R15 | RESISTOR, FIXED, COMPOSITION: 47 Ω, ±5%, 1/4W | CB4705 | A-B |



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8/4/65

REF DESIG PREFIX A8

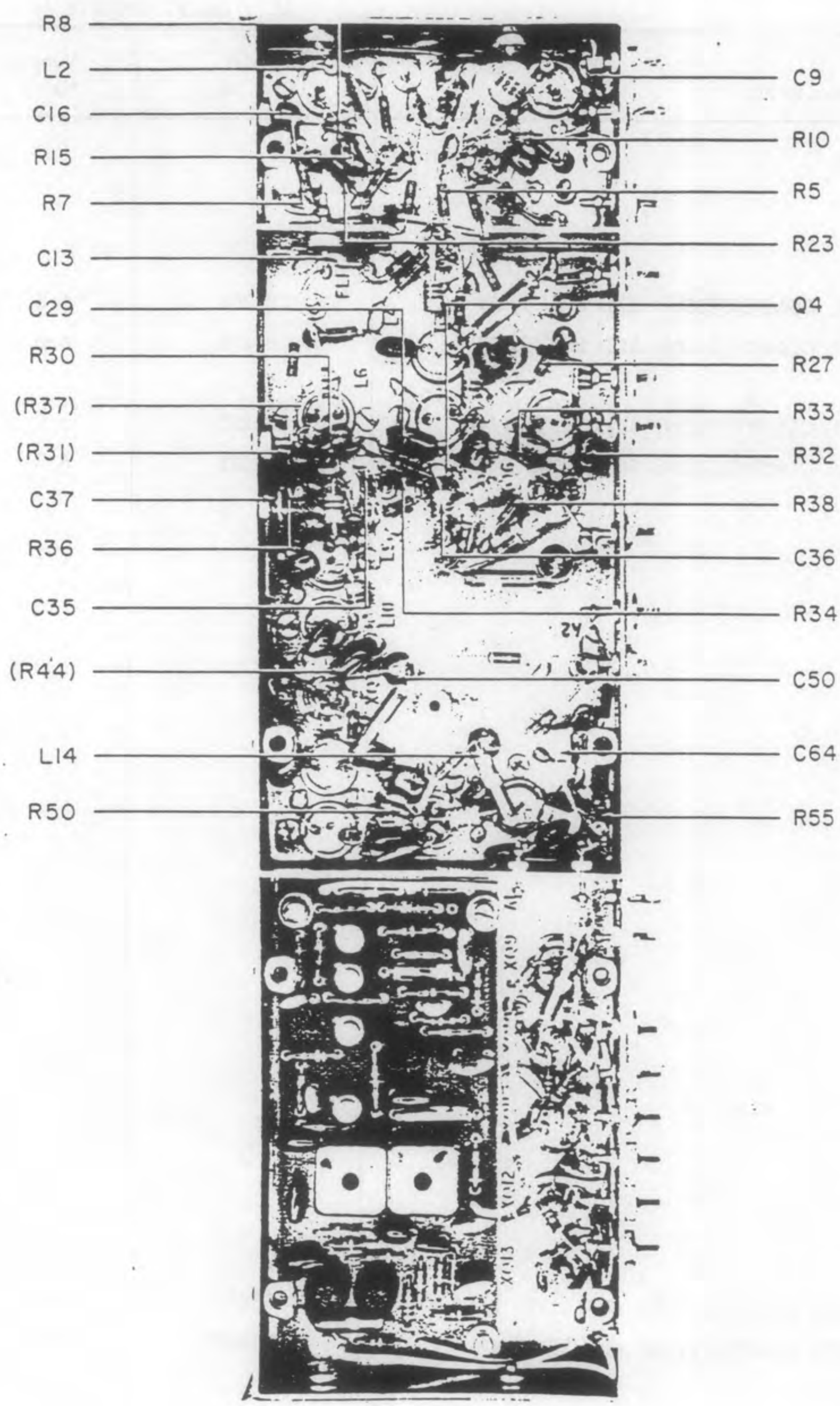



Figure 5-27. Type 7245 20/75/300 kc Bandwidth IF Strip, Component Locations

REF. DESIG. PREFIX A8

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| R16 | Same as R14 | | |
| R17 | Same as R15 | | |
| R18 | Same as R14 | | |
| R19 | Same as R15 | | |
| R20 | RESISTOR, FIXED, COMPOSITION: 22Ω, ±5%, 1/4W | CB2205 | A-B |
| R21 | RESISTOR, FIXED, COMPOSITION: 51Ω, ±5%, 1/4W | CB5105 | A-B |
| R22 | NOT USED | | |
| R23 | RESISTOR, FIXED, COMPOSITION: 8.2K, ±5%, 1/4W | CB8225 | A-B |
| R24 | RESISTOR, FIXED, COMPOSITION: 750Ω, ±5%, 1/4W | CB7515 | A-B |
| R25 | Same as R4 | | |
| R26 | Same as R6 | | |
| R27 | Same as R24 | | |
| R28 | Same as R5 | | |
| R29 | Same as R6 | | |
| R30 | Same as R5 | | |
| R31 | Same as R6 | | |
| R32 | Same as R5 | | |
| R33 | Same as R6 | | |
| R34 | Same as R20 | | |
| R35 | Same as R14 | | |
| R36 | Same as R20 | | |
| R37 | Same as R14 | | |
| R38 | Same as R14 | | |
| R39 | Same as R15 | | |
| R40 | Same as R15 | | |
| R41 | Same as R15 | | |
| R42 | Same as R4 | | |
| R43 | Same as R5 | | |
| R44 | Same as R6 | | |
| R45 | RESISTOR, FIXED, COMPOSITION: 470Ω, ±5%, 1/4W | CB4715 | A-B |
| R46 | RESISTOR, FIXED, COMPOSITION: 10Ω, 5%, 1/4W | CB1005 | A-B |
| R47 | Same as R14 | | |
| R48 | Same as R15 | | |
| R49 | RESISTOR, FIXED, COMPOSITION: 12K, ±5%, 1/4W | CB1235 | A-B |
| R50 | Same as R6 | | |

REF. DESIG. PREFIX A8

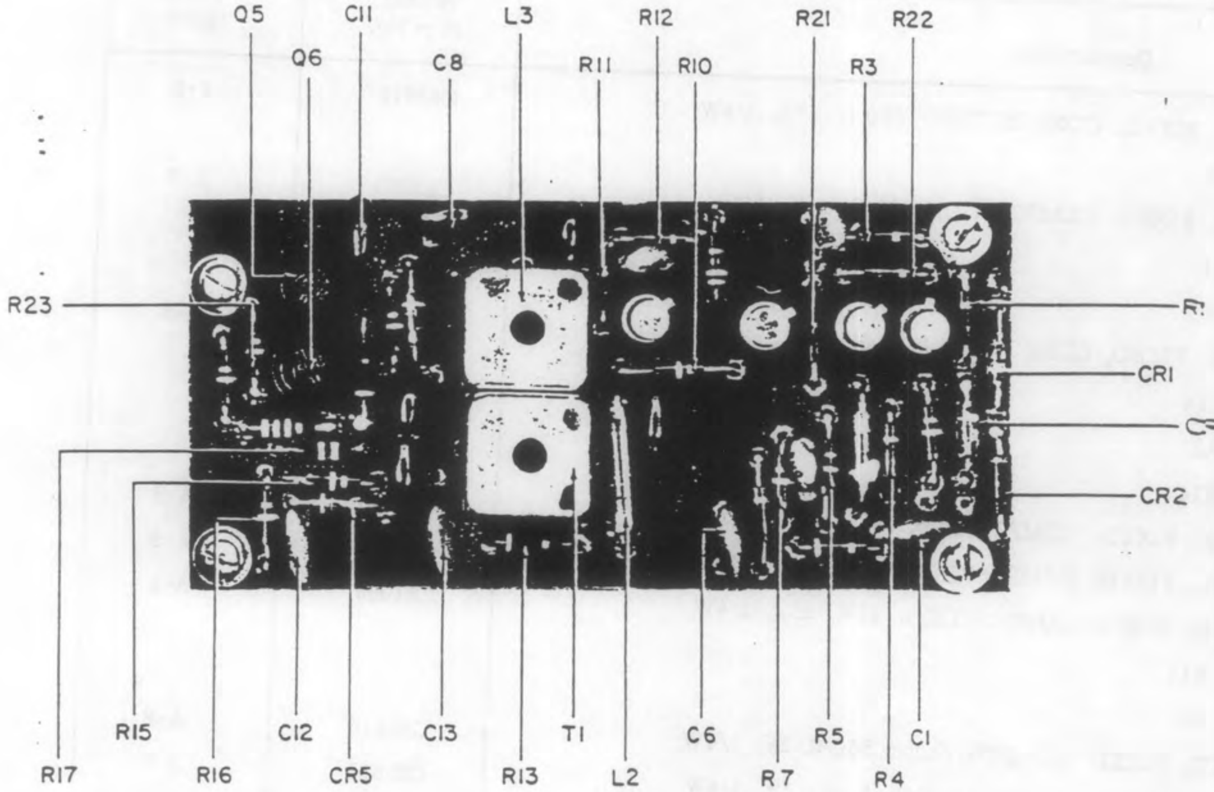
| ef esig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| .51 | Same as R15 | | |
| .52 | Same as R45 | | |
| .53 | Same as R15 | | |
| .54 | RESISTOR, FIXED, COMPOSITION: 22K, ±5%, 1/4W | CB2235 | A-B |
| .55 | RESISTOR, FIXED, COMPOSITION: 47K, ±5%, 1/4W | CB4735 | A-B |
| .56 | RESISTOR, FIXED, COMPOSITION: 330K, ±5%, 1/4W | CB3345 | A-B |
| .57 | RESISTOR, FIXED, COMPOSITION: 10K, ±5%, 1/4W | CB1035 | A-B |
| .58 | RESISTOR, FIXED, COMPOSITION: 33K, 5%, 1/4W | CB3335 | A-B |
| .59 | Same as R58 | | |
| .60 | RESISTOR, FIXED, COMPOSITION: 1.5K, 5%, 1/4W | CB1525 | A-B |
| R61 | RESISTOR, FIXED, COMPOSITION: 11K, 5%, 1/4W | CB1135 | A-B |
| .62 | RESISTOR, FIXED, COMPOSITION: 910Ω, 5%, 1/4W | CB9115 | A-B |
| .63 | RESISTOR, FIXED, COMPOSITION: 2.7K, 5%, 1/4W | CB2725 | A-B |
| R64 | RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/4W | CB1045 | A-B |
| R65 | RESISTOR, FIXED, COMPOSITION: 220Ω, 5%, 1/4W | CB2215 | A-B |
| R66 | Same as R61 | | |
| R67 | RESISTOR, FIXED, COMPOSITION: 24K, 5%, 1/4W | CB2435 | A-B |

5.4.9.1 Part 10710 FM Limiter/Demodulator

REF. DESIG. PREFIX A8A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, CERAMIC, DISC: .005 μf, ±20% | SM | RMC |
| C2 | CAPACITOR, CERAMIC, DISC: 1000 pf, GMV | SM | RMC |
| C3 | Same as C2 | | |
| C4 | Same as C2 | | |
| C5 | Same as C2 | | |
| C6 | Same as C1 | | |
| C7 | CAPACITOR, DIPPED MICA: 15 pf, ±5% | DM10-150J | Arco |
| C8 | Same as C5 | | |
| C9 | CAPACITOR, DIPPED MICA: 75 pf, ±5% | DM10-750J | Arco |
| C10 | Same as C9 | | |
| C11 | CAPACITOR, DIPPED MICA: 33 pf, ±5% | DM10-330J | Arco |
| C12 | Same as C1 | | |
| C13 | Same as C1 | | |
| CR1 | DIODE | 1N198 | Sylvania |
| CR2 | DIODE, ZENER | 1N753A | Motorola |
| CR3 | Same as CR1 | | |
| CR4 | Same as CR1 | | |
| CR5 | Same as CR1 | | |
| L1 | INDUCTOR, FIXED | 1131-41 | CEI |
| L2 | INDUCTOR, FIXED | 1131-37 | CEI |
| L3 | INDUCTOR, VARIABLE | 3476-20 | CEI |
| Q1 | TRANSISTOR | 2N706 | TI |
| Q2 | Same as Q1 | | |
| Q3 | Same as Q1 | | |
| Q4 | Same as Q1 | | |
| Q5 | TRANSISTOR | 2N697 | TI |
| Q6 | Same as Q5 | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 5.1K, ±5%, 1/4W | CB5125 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 12K, ±5%, 1/4W | CB1235 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R4 | Same as R1 | | |
| R5 | Same as R2 | | |
| R6 | RESISTOR, FIXED, COMPOSITION: 47Ω, ±5%, 1/4W | CB4705 | A-B |
| R7 | Same as R2 | | |
| R8 | Same as R1 | | |

REF DESIG PREFIX A8A1



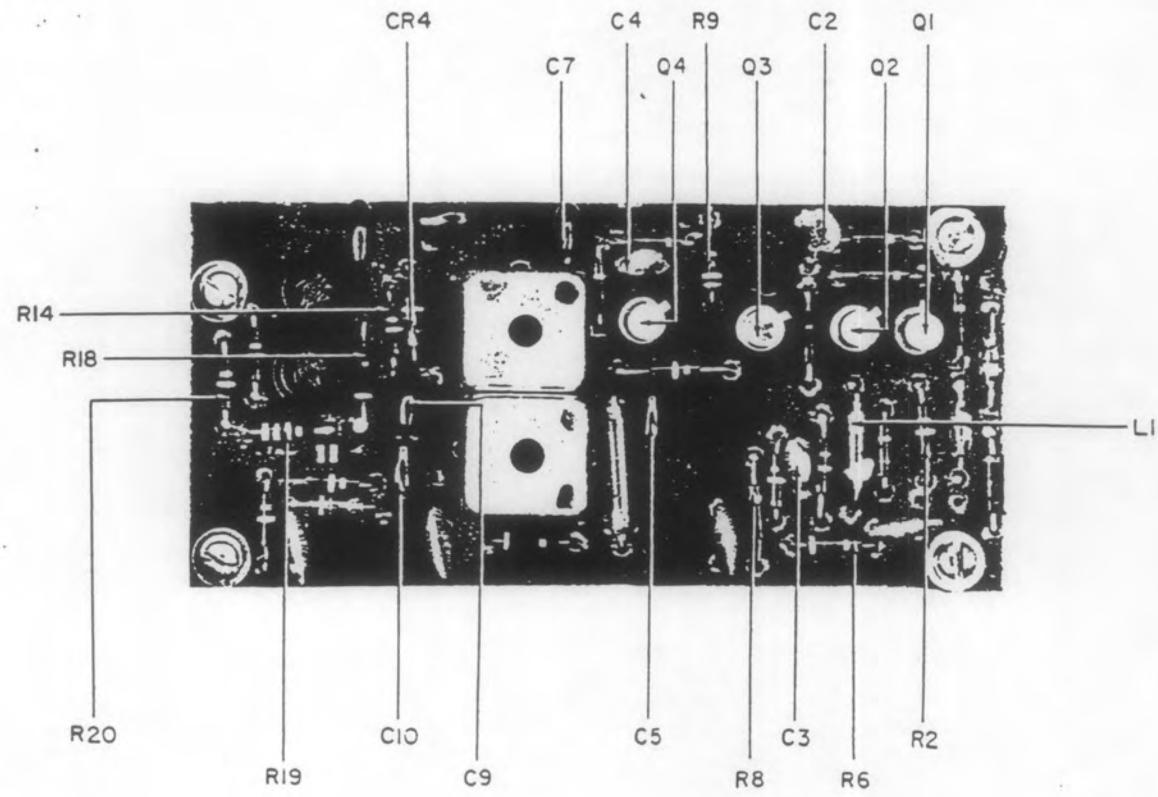




Figure 5-28. Part 10710 Limiter/Demodulator, Component Locations

REF. DESIG. PREFIX A8A1

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| R9 | RESISTOR, FIXED, COMPOSITION: 390 Ω, ±5%, 1/4W | CB3915 | A-B |
| R10 | Same as R2 | | |
| R11 | RESISTOR, FIXED, COMPOSITION: 22 Ω, ±5%, 1/4W | CB2205 | A-B |
| R12 | Same as R1 | | |
| R13 | Same as R6 | | |
| R14 | RESISTOR, FIXED, COMPOSITION: 100K, ±5%, 1/4W | CB1045 | A-B |
| R15 | Same as R14 | | |
| R16 | Same as R2 | | |
| R17 | Same as R14 | | |
| R18 | RESISTOR, FIXED, COMPOSITION: 4.7M, ±5%, 1/4W | CB4755 | A-B |
| R19 | RESISTOR, FIXED, COMPOSITION: 330K, ±5%, 1/4W | CB3345 | A-B |
| R20 | RESISTOR, FIXED, COMPOSITION: 10K, ±5%, 1/4W | CB1035 | A-B |
| R21 | Same as R11 | | |
| R22 | Same as R1 | | |
| R23 | RESISTOR, FIXED, COMPOSITION: 560 Ω, 5%, 1/4W | CB5615 | A-B |
| R24 | RESISTOR, FIXED, COMPOSITION: 5.6K, 5%, 1/4W | CB5625 | A-B |
| T1 | TRANSFORMER | 3476-21 | CEI |

?.9.2 Part 1769-3 Beat Frequency Oscillator REF. DESIG. PREFIX A8A2

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, DIPPED MICA: 43 pf, ±5% | DM10-430J | Arco |
| C2 | CAPACITOR, CERAMIC, DISC: 1000 pf, GMV | SM | RMC |
| C3 | CAPACITOR, DIPPED MICA: 68 pf, ±5% | DM10-680J | Arco |
| C4 | CAPACITOR, CERAMIC, FEEDTHRU: 1000 pf, GMV | FA5C-102W | A-B |
| CR1 | DIODE | 1N462A | CD |
| CR2 | Same as CR1 | | |
| Q1 | TRANSISTOR | 2N706 | TI |
| R1 | RESISTOR, FIXED, COMPOSITION: 47K, ±5%, 1/4W | CB4735 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 240K, ±5%, 1/4W | CB2445 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 10K, ±5%, 1/4W | CB1035 | A-B |
| Y1 | CRYSTAL, QUARTZ: 21.4 MC, Except must have wire leads. | CR-18/U | Piezo |

REF DESIG PREFIX A8A2

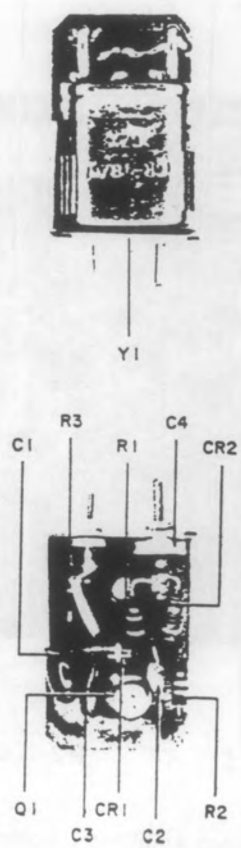



Figure 5-29. Part 1769-3 Beat Frequency Oscillator, Component Locations

REF. DESIG. PREFIX A9

5.4.10 Type 7312 Video Amplifier

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, ELECTROLYTIC: 1.0 μf, ±20%, 35V | 150D105X0035A2 | Sprague |
| C2 | CAPACITOR, ELECTROLYTIC: 10 μf, ±20%, 20V | 150D106X0020B2 | Sprague |
| Q1 | TRANSISTOR | 2N697 | TI |
| Q2 | TRANSISTOR | 2N526 | GE |
| R1 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 220K, ±5%, 1/4W | CB2245 | A-B |
| R3 | RESISTOR, FIXED, COMPOSITION: 20K, ±5%, 1/4W | CB2035 | A-B |
| R4 | Same as R1 | | |
| R5 | RESISTOR, FIXED, COMPOSITION: 160Ω, ±5%, 1/4W | CB1615 | A-B |
| R6 | RESISTOR, FIXED, COMPOSITION: 2K, ±5%, 1/4W | CB2025 | A-B |
| R7 | Same as R5 | | |
| R8 | RESISTOR, FIXED, COMPOSITION: 47Ω, ±5%, 1/4W | CB4705 | A-B |
| R9 | RESISTOR, FIXED, COMPOSITION: 100K, ±5%, 1/4W | CB1045 | A-B |

REF DESIG PREFIX A9

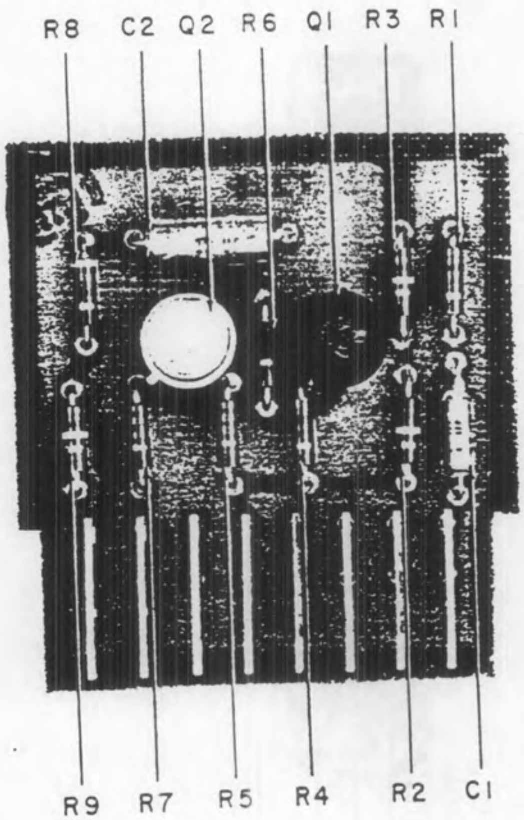



Figure 5-30. Type 7312 Video Amplifier, Component Locations

5.4.11 Type 7400A Audio Amplifier

REF. DESIG. PREFIX A10

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, ELECTROLYTIC, TANTALUM: 0.47 µf | 150D474X0035A2 | Sprague |
| C2 | CAPACITOR, ELECTROLYTIC, TANTALUM: 10 µf, 10%, 20V | 150D106X9020B2 | Sprague |
| CR1 | DIODE, ZENER | 1N759A | CD |
| Q1 | TRANSISTOR, SILICON | 2N335 | TI |
| Q2 | Same as Q1 | | |
| Q3 | TRANSISTOR, SILICON | 2N2270 | RCA |
| R1 | RESISTOR, FIXED, COMPOSITION: 10K, 5%, 1/4W | CB1035 | A-B |
| R2 | RESISTOR, FIXED, CARBON FILM: 68.1K, 1%, 1/4W | RN60D6812F | Electra |
| R3 | RESISTOR, FIXED, CARBON FILM: 10K, 1%, 1/4W | RN60D1002F | Electra |
| R4 | RESISTOR, FIXED, CARBON FILM: 6.81K, 1%, 1/4W | RN60D6811F | Electra |
| R5 | RESISTOR, FIXED, CARBON FILM: 619Ω, 1%, 1/4W | RN60D6190F | Electra |
| R6 | RESISTOR, FIXED, COMPOSITION: 3.9K, 5%, 1/4W | CB3925 | A-B |
| R7 | RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/4W | CB1045 | A-B |
| R8 | RESISTOR, FIXED, COMPOSITION: 820Ω, 5%, 1/4W | CB8215 | A-B |
| R9 | RESISTOR, FIXED, COMPOSITION: 620Ω, 5%, 1/4W | CB6215 | A-B |
| R10 | RESISTOR, FIXED, CARBON FILM: 68.1Ω, 1%, 1/4W | RN60D68R1F | Electra |
| RA1 | RADIATOR, TRANSISTOR | NF207 | Wakefield |
| T1 | TRANSFORMER, AUDIO OUTPUT | 1170 | CEI |

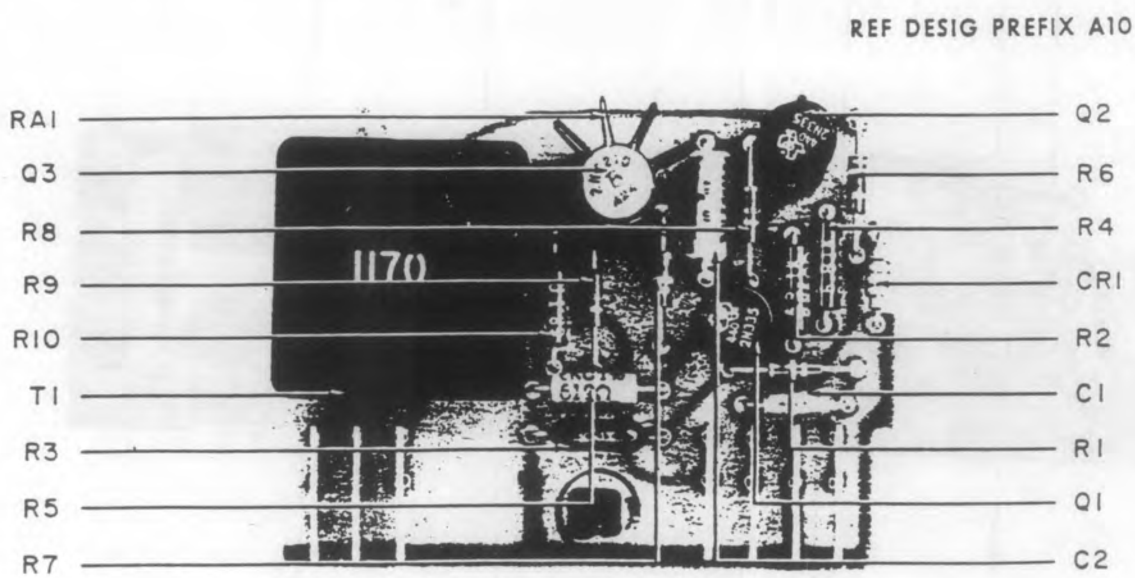



Figure 5-31. Type 7400A Audio Amplifier, Component Locations

5.4.12 Type 7633 Power Supply Regulator (CRT)

REF. DESIG. PREFIX A11

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, PAPER, TUBULAR: 0.1 μf, 10%, 1000V | 10TM-P10 | Sprague |
| C2 | Same as C1 | | |
| C3 | CAPACITOR, CERAMIC, DISC: 0.1 μf, +80 -20%, 100V | TA | RMC |
| CR1 | DIODE, RECTIFIER | SC20 | Semtech |
| CR2 | Same as CR1 | | |
| P1 | CONNECTOR, PLUG: 9 pin | MRE-9P-G | Winchester |
| R1 | RESISTOR, FIXED, COMPOSITION: 750K, 5%, 1/2W | EB7545 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 100K, 5%, 1/2W | EB1045 | A-B |
| R3 | RESISTOR, VARIABLE, COMPOSITION: 500K, 1/2W | 70-08459 | Mallory |
| R4 | RESISTOR, FIXED, COMPOSITION: 4.7 meg, 5%, 1/2W | EB4755 | A-B |
| R5 | RESISTOR, VARIABLE, COMPOSITION: 2.5 meg, 1/2W | 70-08458 | Mallory |
| R6 | RESISTOR, FIXED, COMPOSITION: 6.8 meg, 5%, 1/2W | EB6855 | A-B |
| R7 | Same as R6 | | |
| V1 | TUBE, ELECTRON: gas | GV3A-1200 | Victoreen |

REF DESIG PREFIX A11

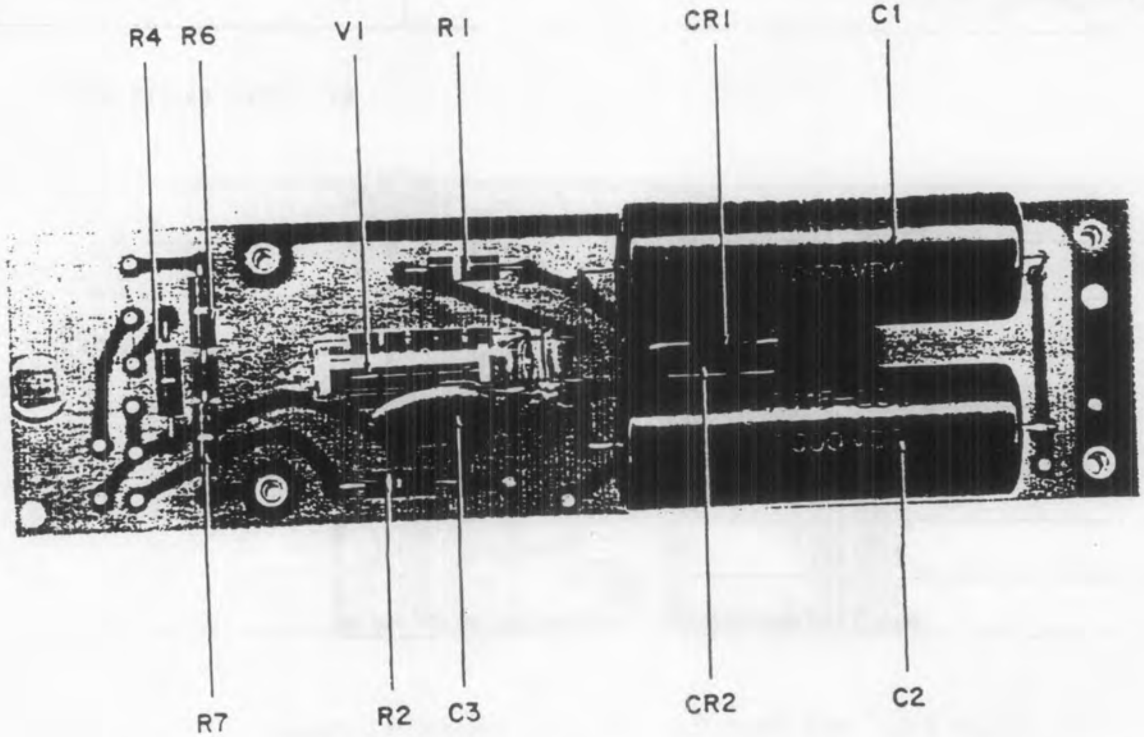
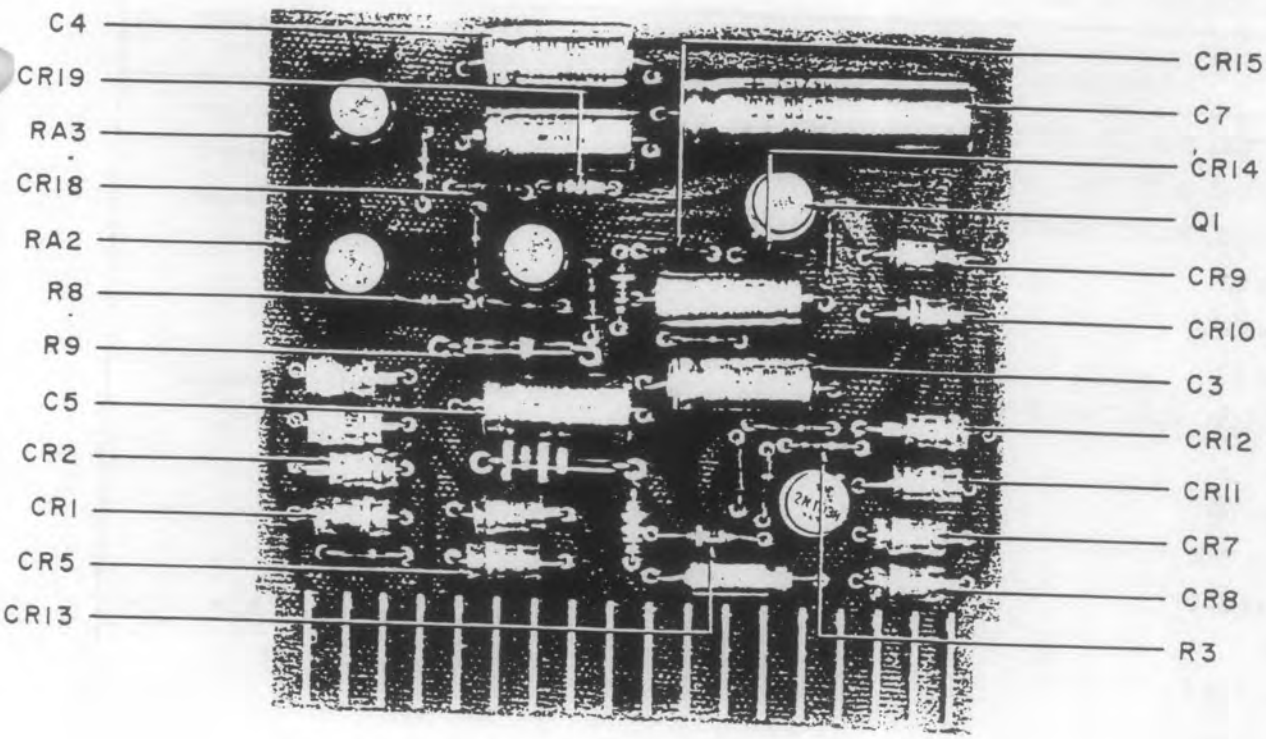



Figure 5-32. Type 7633 Power Supply Regulator (CRT), Component Locations

REF DESIG PREFIX A12



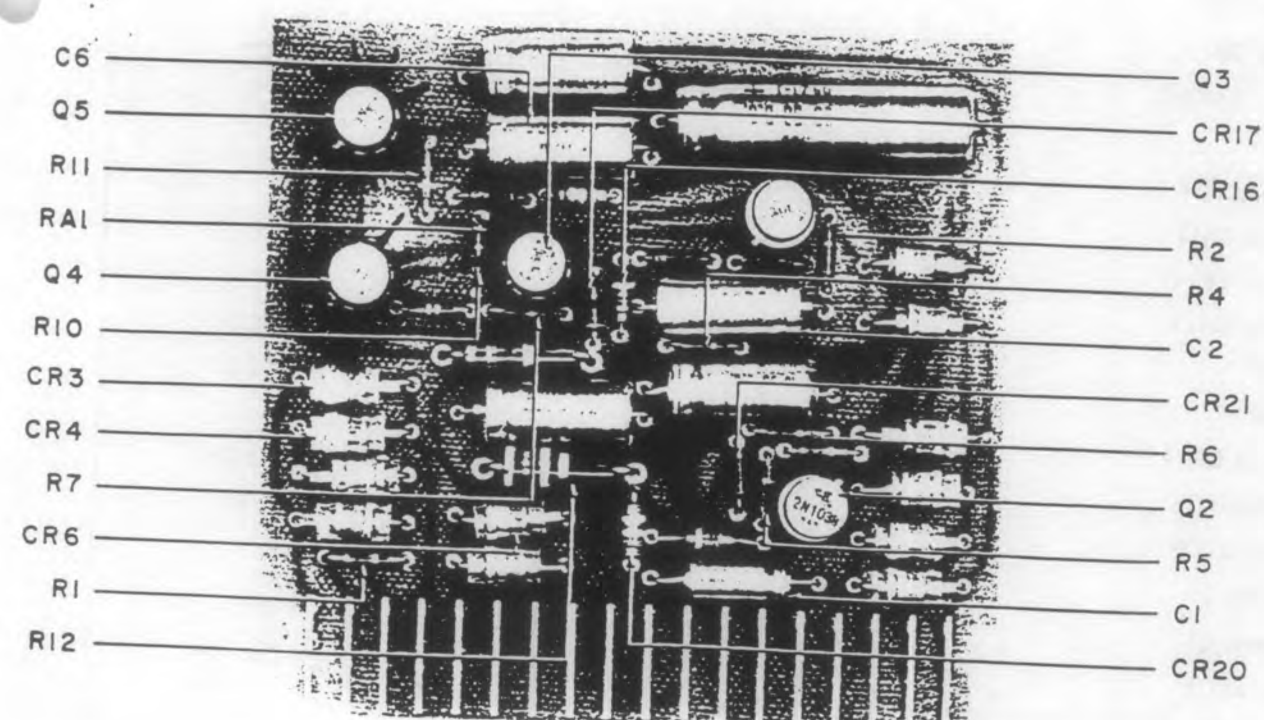




Figure 5-33. Type 7631 Power Supply Regulator (Gen.), Component Locations

REF. DESIG. PREFIX A12

5.4.13 Type 7631 Power Supply Regulator (Gen.)

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| C1 | CAPACITOR, ELECTROLYTIC, LITTL-LYTIC: 1 µf, 50V | 30D105G050AA4 | Sprague |
| C2 | CAPACITOR, ELECTROLYTIC, TANTALUM: 47 µf, ±20%, 35V | 150D476X0035S2 | Sprague |
| C3 | CAPACITOR, ELECTROLYTIC, LITTL-LYTIC: 10 µf, 50V | 30D106XG050CB4 | Sprague |
| C4 | Same as C3 | | |
| C5 | Same as C2 | | |
| C6 | Same as C2 | | |
| C7 | CAPACITOR, ELECTROLYTIC, LITTL-LYTIC: 50 µf, 50V | 30D506G050DH4 | Sprague |
| CR1 | DIODE | 1N3253 | RCA |
| CR2 | Same as CR1 | | |
| CR3 | Same as CR1 | | |
| CR4 | Same as CR1 | | |
| CR5 | DIODE | 1N3255 | RCA |
| CR6 | Same as CR5 | | |
| CR7 | Same as CR1 | | |
| CR8 | Same as CR1 | | |
| CR9 | Same as CR1 | | |
| CR10 | Same as CR1 | | |
| CR11 | Same as CR1 | | |
| CR12 | Same as CR1 | | |
| CR13 | DIODE, ZENER | 1N970B | CD |
| CR14 | DIODE | 1N462A | CD |
| CR15 | Same as CR14 | | |
| CR16 | Same as CR13 | | |
| CR17 | Same as CR14 | | |
| CR18 | Same as CR14 | | |
| CR19 | DIODE | 1N759A | CD |
| CR20 | DIODE | 1N979B | CD |
| CR21 | Same as CR14 | | |
| Q1 | TRANSISTOR | 2N2270 | RCA |
| Q2 | TRANSISTOR | 2N1038 | TI |
| Q3 | Same as Q1 | | |
| Q4 | Same as Q1 | | |
| Q5 | Same as Q1 | | |
| R1 | RESISTOR, FIXED, COMPOSITION: 10Ω, ±5%, 1/4W | CB1005 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 1K, ±5%, 1/4W | CB1025 | A-B |

REF. DESIG. PREFIX A12

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| R3 | Same as R2 | | |
| R4 | Same as R2 | | |
| R5 | Same as R2 | | |
| R6 | Same as R1 | | |
| R7 | RESISTOR, FIXED, COMPOSITION: 5.1Ω, ±5%, 1/4W | CB51G5 | A-B |
| R8 | Same as R7 | | |
| R9 | RESISTOR, FIXED, COMPOSITION: 62Ω, ±5%, 1W | GB6205 | A-B |
| R10 | RESISTOR, FIXED, COMPOSITION: 2.4K, ±5%, 1/4W | CB2425 | A-B |
| R11 | Same as R10 | | |
| R12 | RESISTOR, FIXED, COMPOSITION: 36K, ±5%, 1W | GB3635 | A-B |

5.4.14 Type 7917 Coupling Network

REF. DESIG. PREFIX A13, A14

| Ref. Desig. | Description | Vendor Part No. | Vendor Name |
|---|---|---|---|
| J1 | CONNECTOR, RECEPTACLE, BNC | UG1094/U | FXR |
| J2 | Same as J1 | | |
| J3 | CONNECTOR, RECEPTACLE, TYPE "N" | UG58A/U | FXR |
| R1 | RESISTOR, FIXED, COMPOSITION: 100Ω, ±5%, 1/4W | CB1015 | A-B |
| R2 | RESISTOR, FIXED, COMPOSITION: 68Ω, ±5%, 1/4W | CB6805 | A-B |
| R3 | NOT USED | | |
| R4 | Same as R2 | | |
| R5 | Same as R1 | | |

REF DESIG PREFIX A13, A14

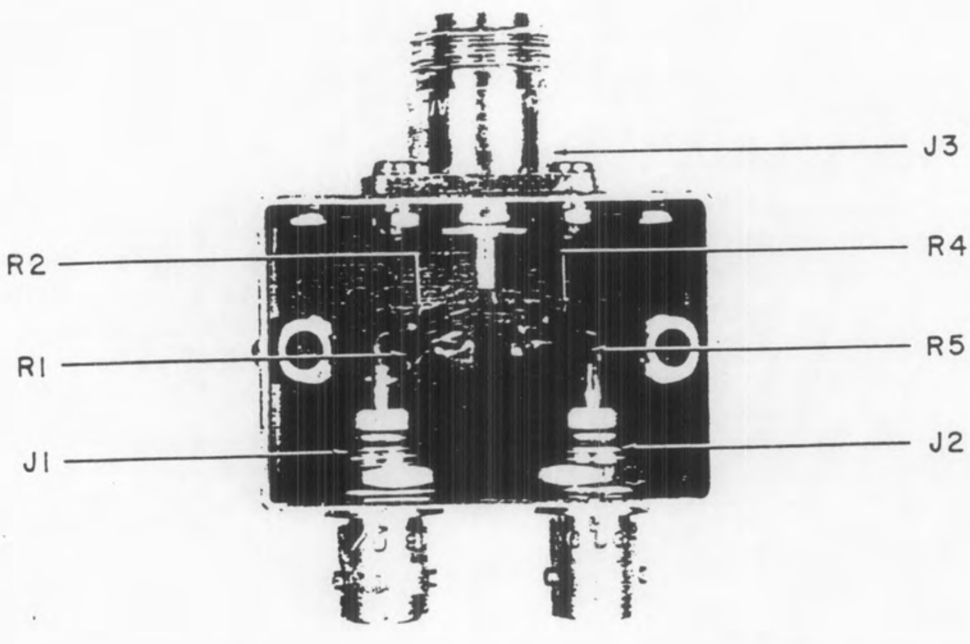
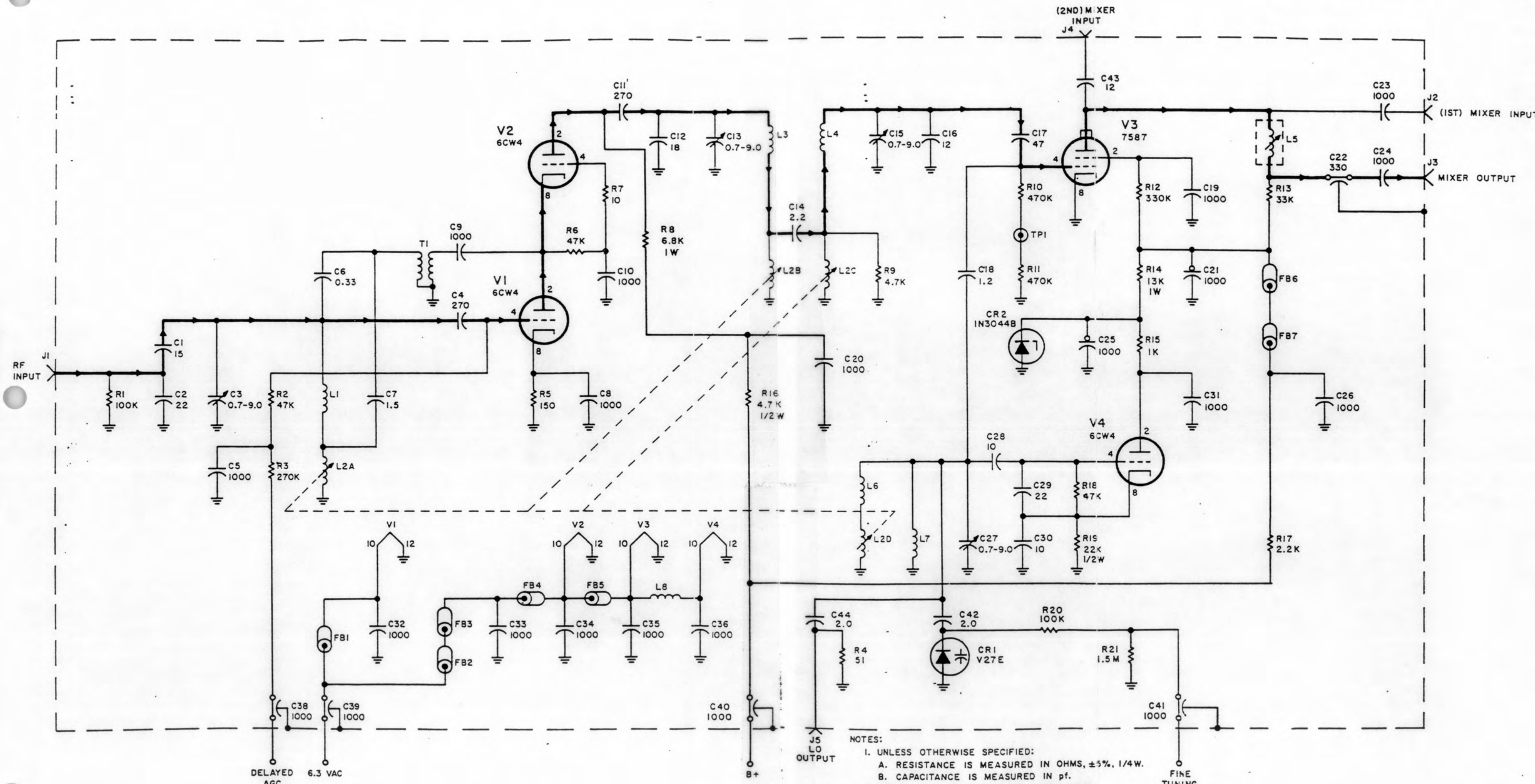



Figure 5-34. Type 7917 Coupling Network, Component Locations

# SECTION VI

## SCHEMATIC DIAGRAMS

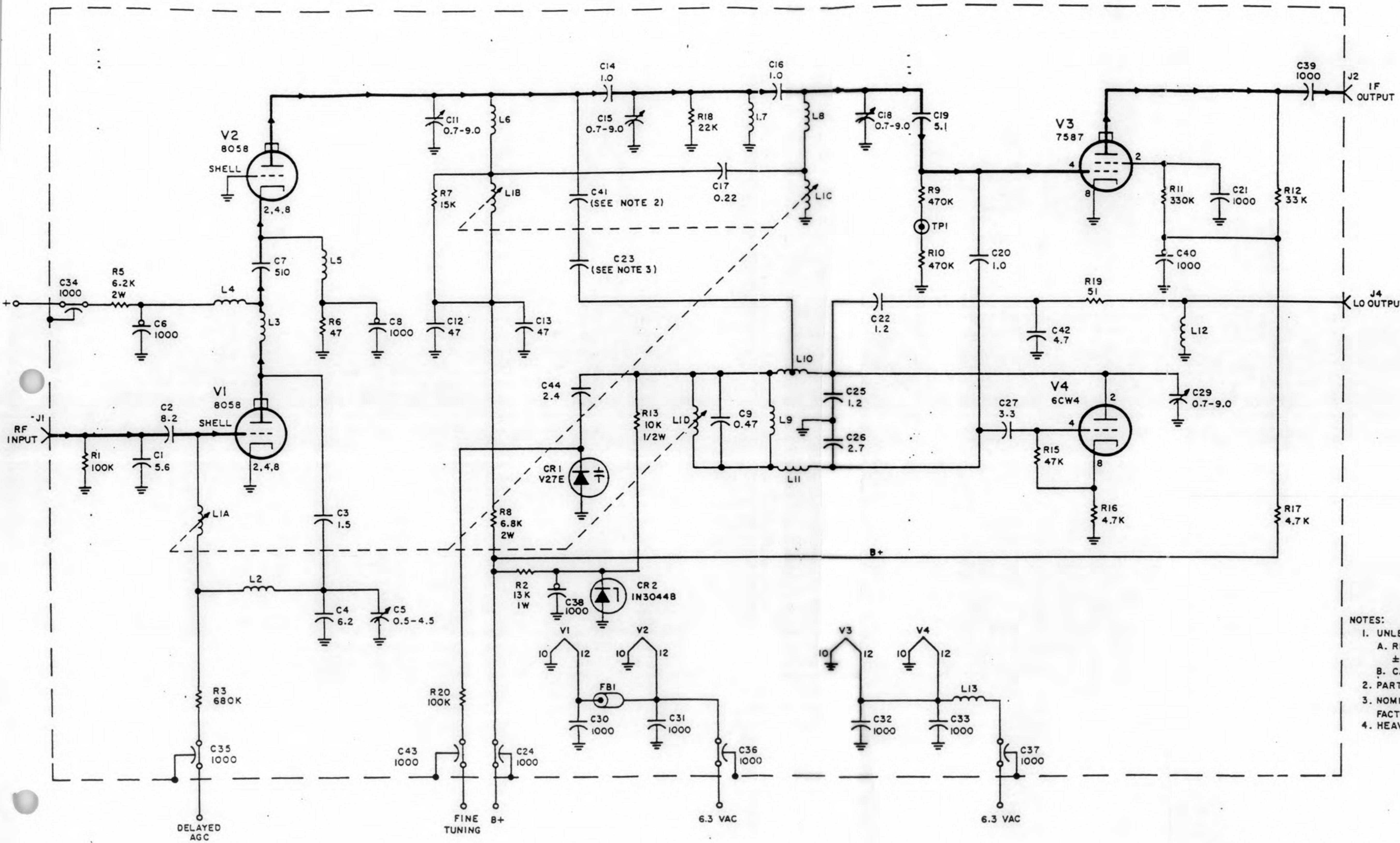
REF DESIG PREFIX A1




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   B. CAPACITANCE IS MEASURED IN pf.
2. HEAVY LINE DENOTES MAIN SIGNAL PATH.

Figure 6-1. Type 7165 30-60 mc Tuner, Schematic Diagram

REF DESIG PREFIX A2

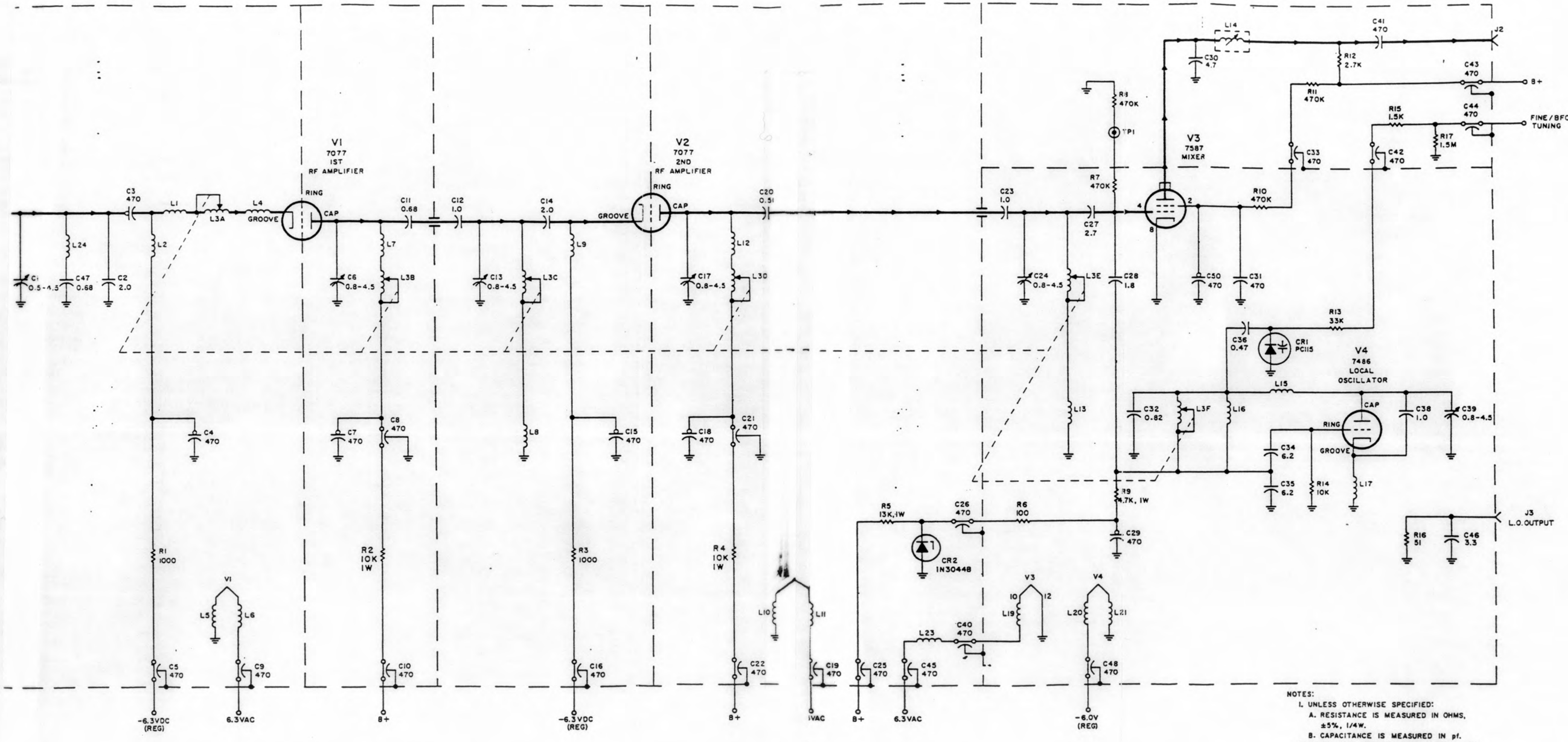



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   B. CAPACITANCE IS MEASURED IN pf.
2. PART OF CIRCUIT BOARD, CEI #1101.
3. NOMINAL VALUE 2.7 pf; FINAL VALUE FACTORY SELECTED.
4. HEAVY LINE DENOTES MAIN SIGNAL PATH.

Figure 6-2. Type 7164 60-300 mc Tuner, Schematic Diagram
Change 1 - 8/4/65

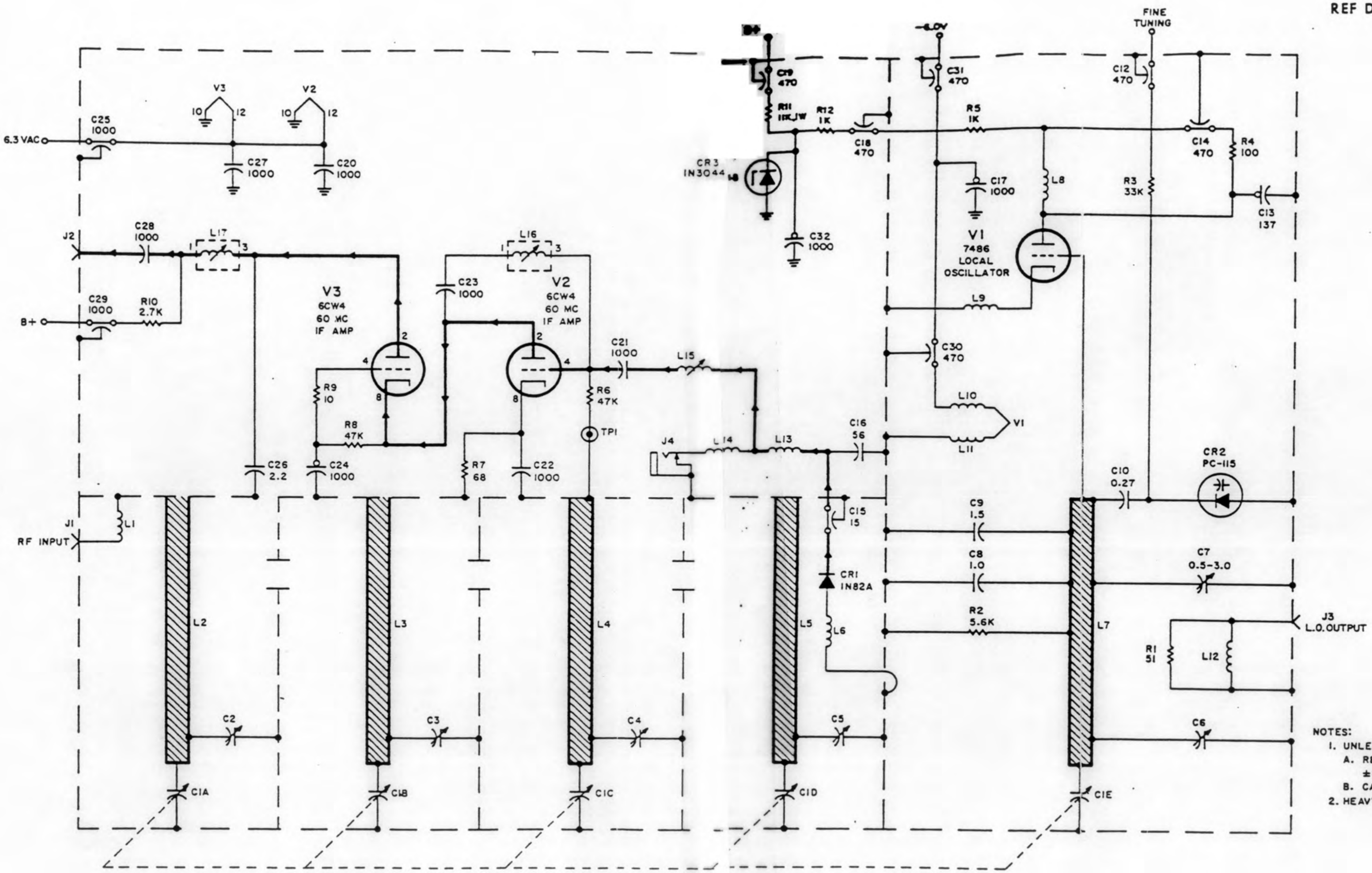
REF DESIG PREFIX A3




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
B. CAPACITANCE IS MEASURED IN pf.
2. HEAVY LINE DENOTES MAIN SIGNAL PATH.

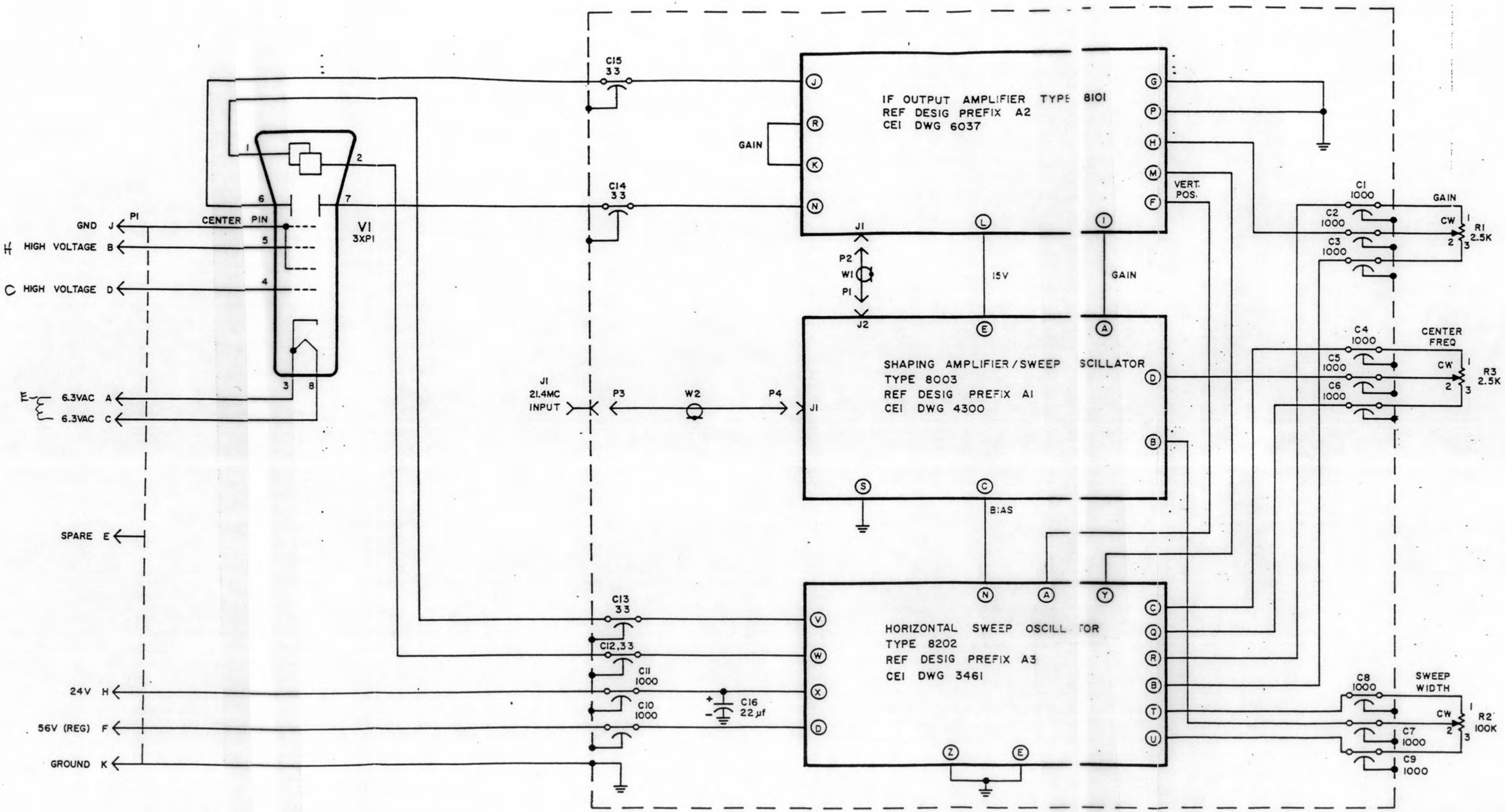
Figure 6-3. Type 7162 235-500 mc Tuner, Schematic Diagram

**REF DESIG PREFIX A4**




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A. RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   B. CAPACITANCE IS MEASURED IN pf.
2. HEAVY LINE DENOTES MAIN SIGNAL PATH.

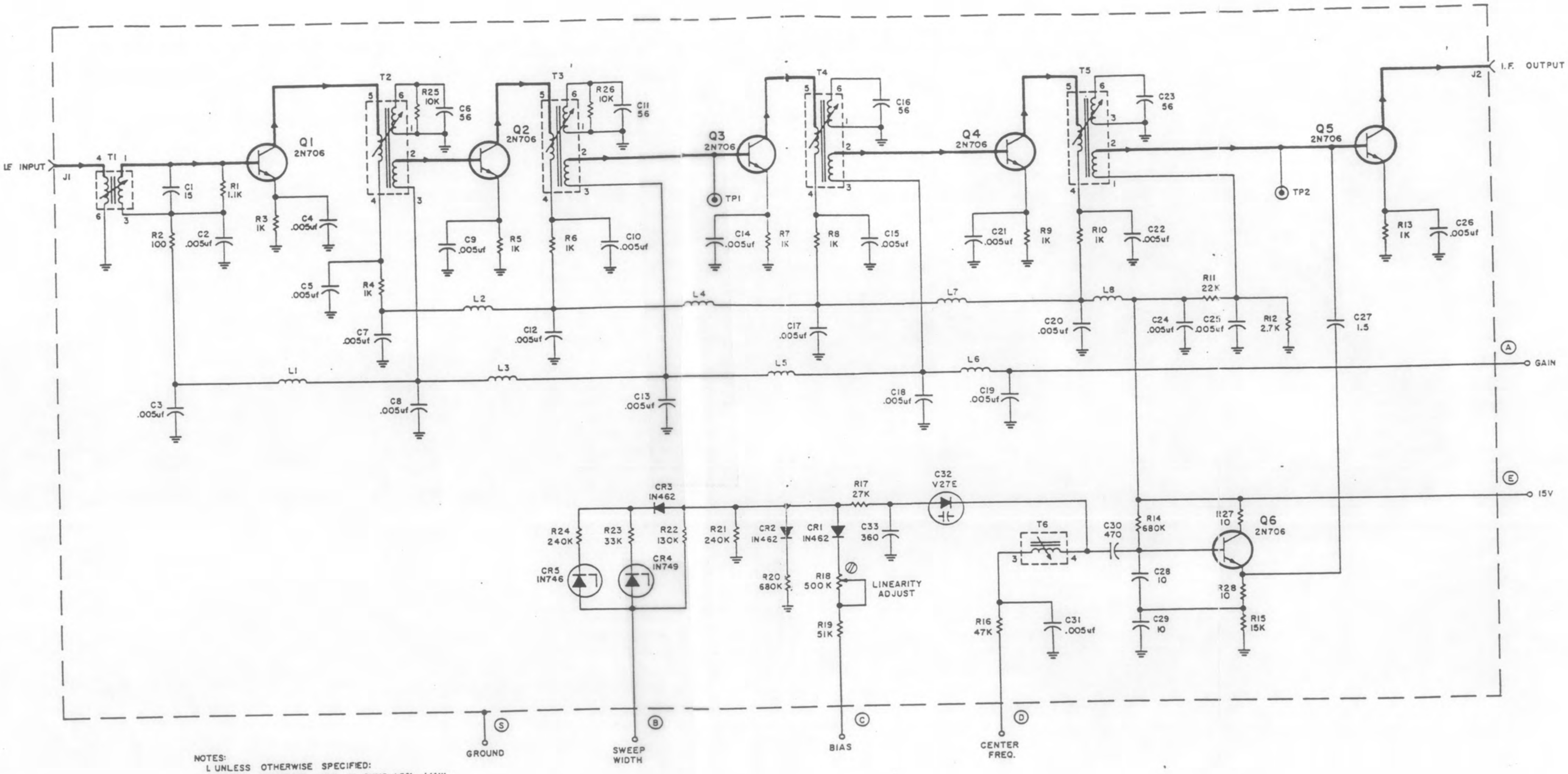
Figure 6-4. Type 7163 490-1000 mc Tuner, Schematic Diagram




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   A) RESISTORS ARE IN OHMS ±5%, 1/4W.
   B) CAPACITORS ARE IN pf.
2. ENCIRCLED LETTERS ARE FOR REFERENCE ONLY.

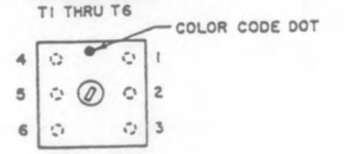
Figure 6-5. Type 7930 Signal Monitor, Schematic Diagram

REF DESIG PREFIX A5A1




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) ALL RESISTORS ARE IN OHMS ±5%, 1/4W.
   b) ALL CAPACITORS ARE IN pf.
2. ENCIRCLED LETTERS ARE FOR REFERENCE ONLY.
3. PRINTED CKT. ASSEMBLY REF. 10184.

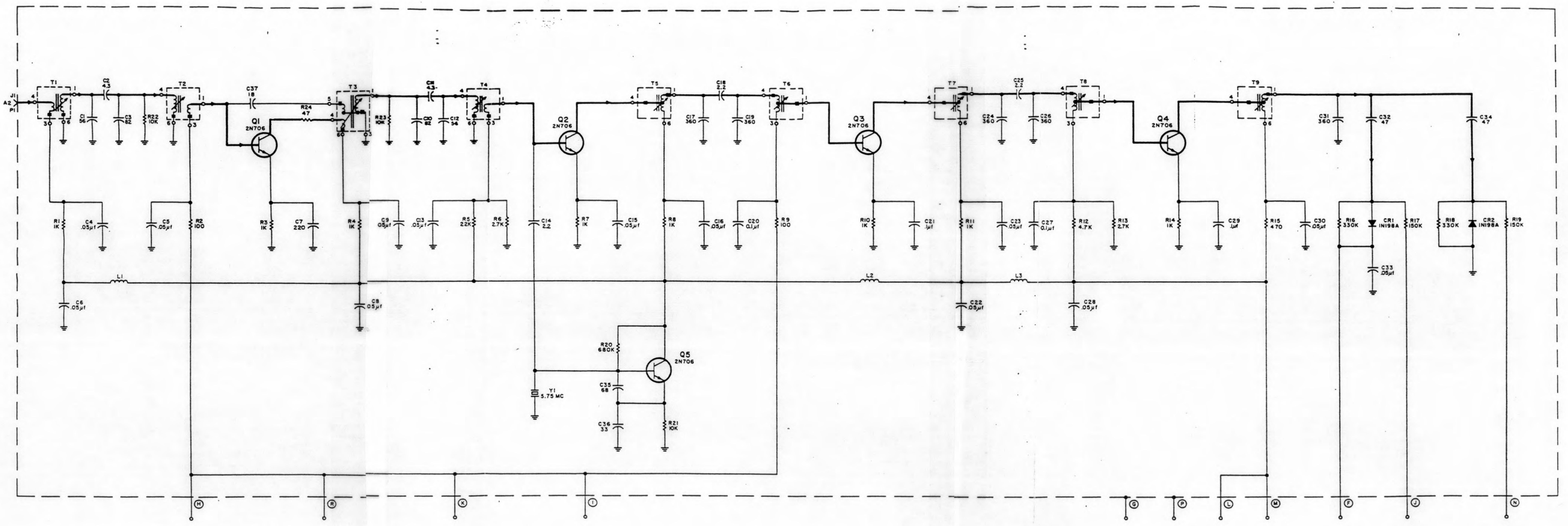
TRANSFORMERS
T1 THRU T6




(TOP VIEW)

Figure 6-6. Type 8003 Shaping Amplifier/Sweep Oscillator, Schematic Diagram

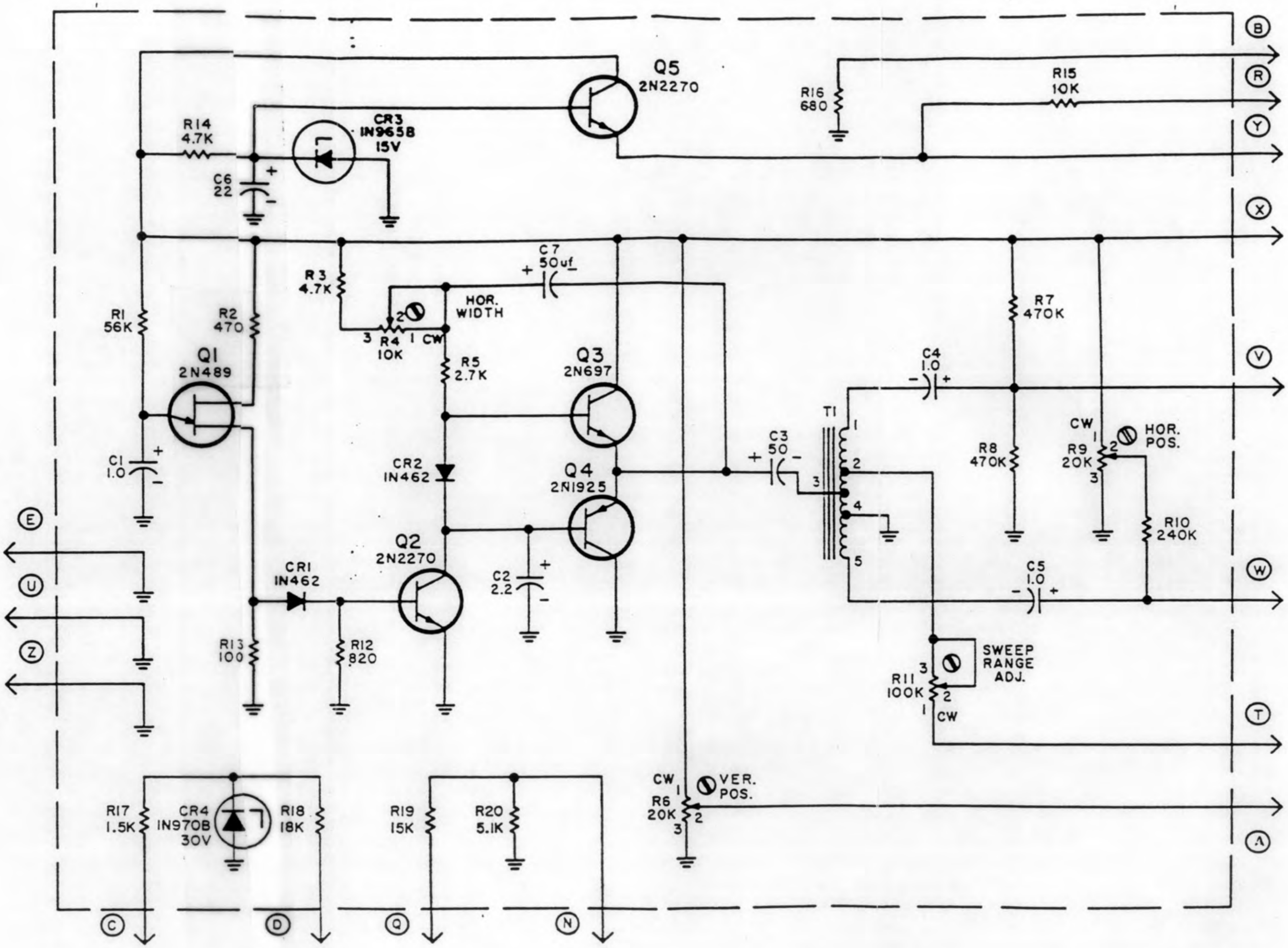
REF DESIG PREFIX A5A2




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. RESISTORS ARE MEASURED IN OHMS, ±5%, 1/4W.
B. CAPACITORS ARE MEASURED IN µµf.
2. ENCIRCLED LETTERS ARE FOR REFERENCE ONLY.
3. PRINTED CKT. ASSEMBLY REF. 10250.

Figure 6-7. Type 8101 IF Output Amplifier, Schematic Diagram

REF DESIG PREFIX A5A3




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. RESISTORS ARE MEASURED IN OHMS, 5%, 1/4W.
B. CAPACITORS ARE MEASURED IN $\mu f$.

Figure 6-8. Type 8202 Horizontal Sweep Oscillator, Schematic Diagram

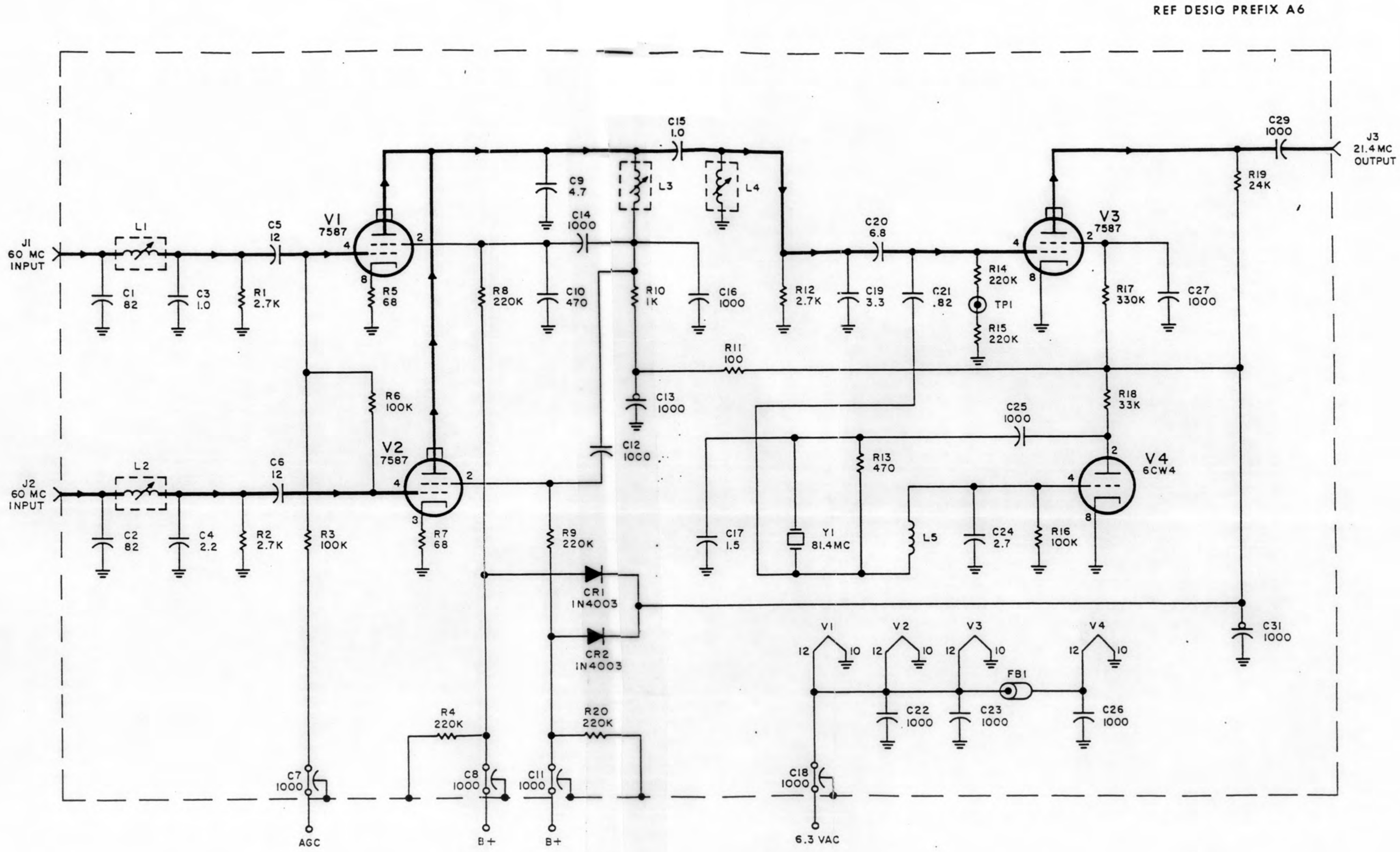



Figure 6-9. Type 7120 60-21.4 mc Converter, Schematic Diagram

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W.
b) CAPACITANCE IS MEASURED IN pf.

REF DESIG PREFIX A7

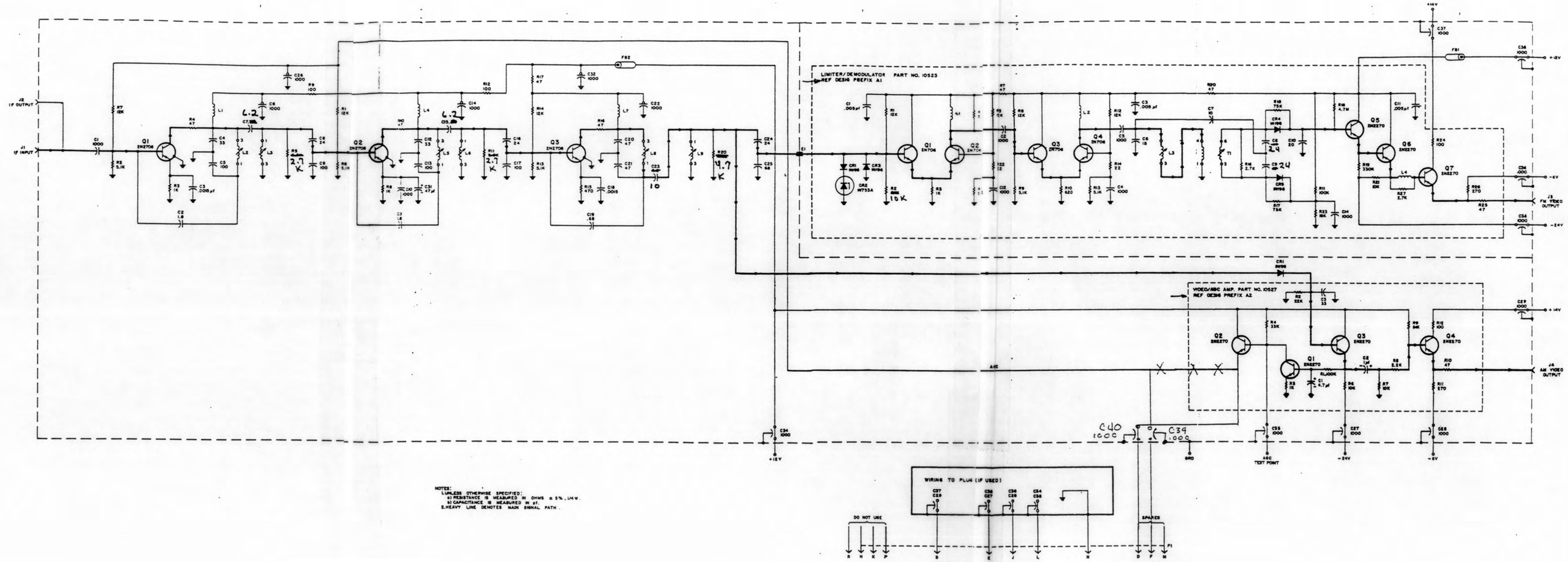
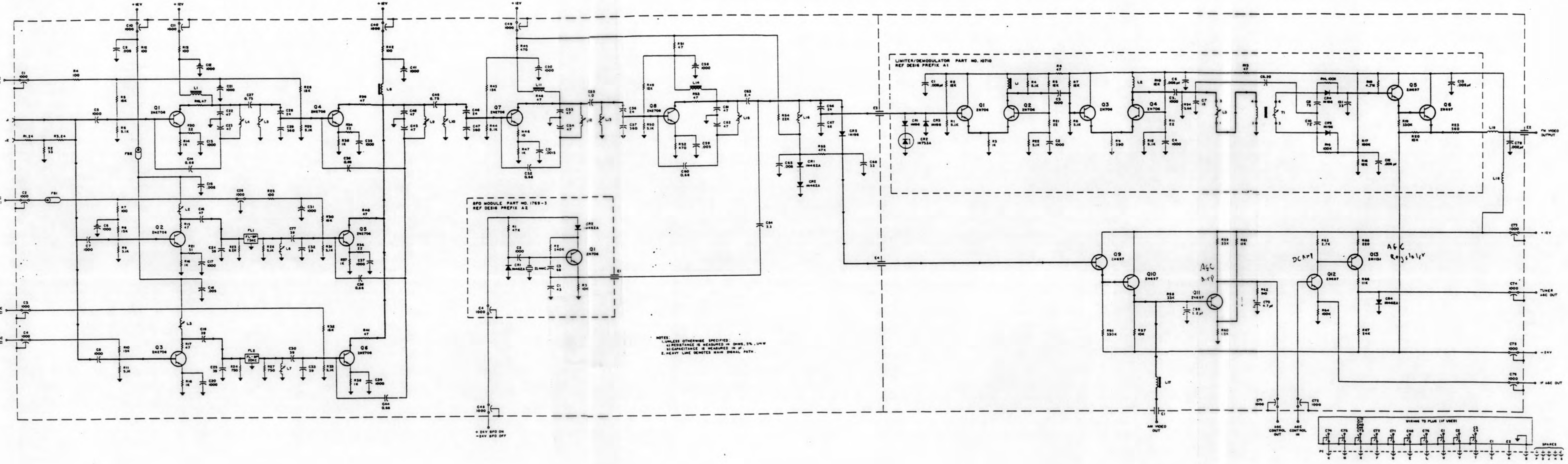


Figure 6-10. Type 7233 2-mc Bandwidth IF Strip, Schematic Diagram

REF DESIG PREFIX A8



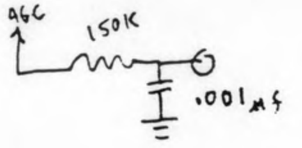
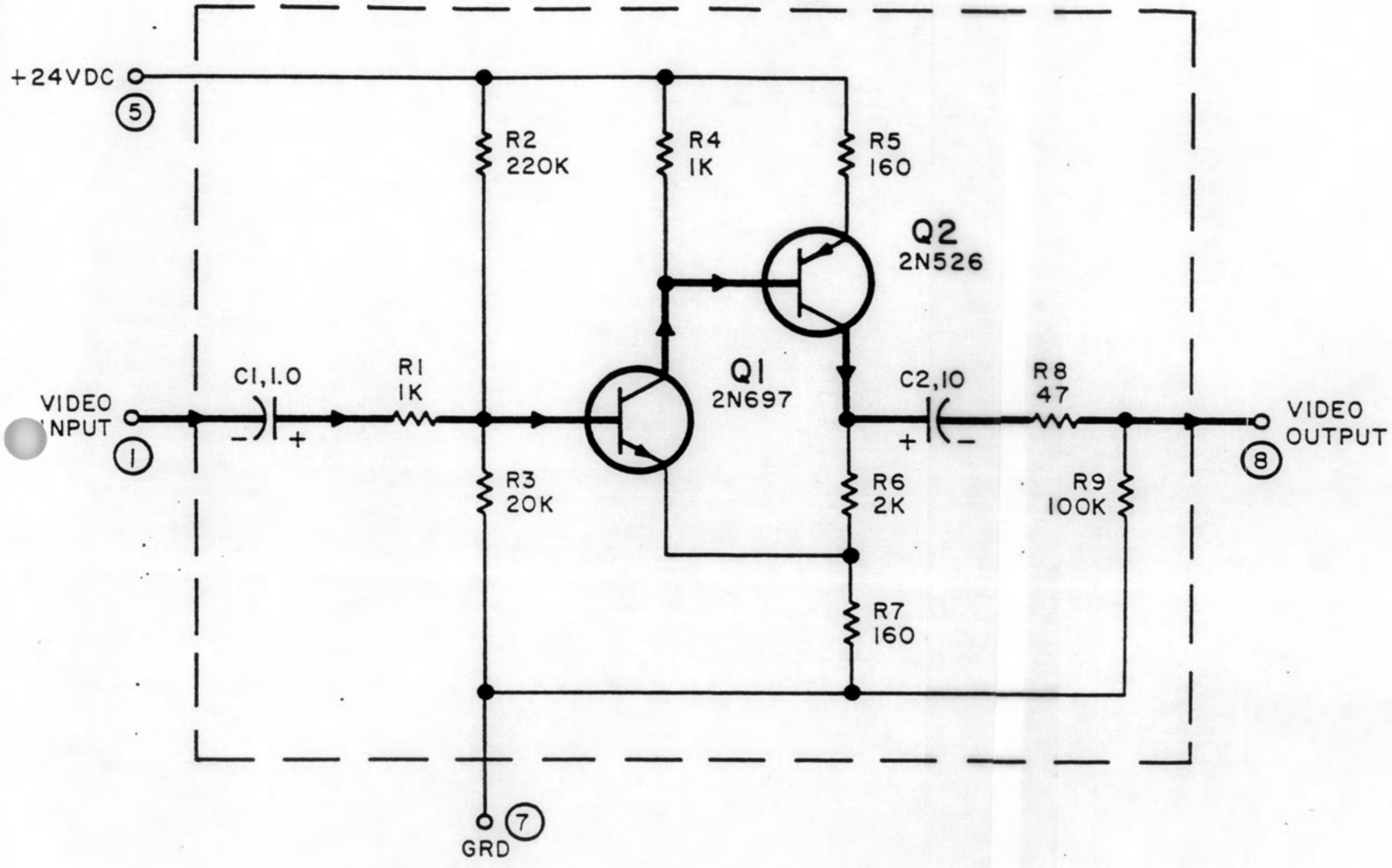


Figure 6-11. Type 7245 20/75/300-kc Bandwidth IF Strip, Schematic Diagram
Change 1 - 8/4/65

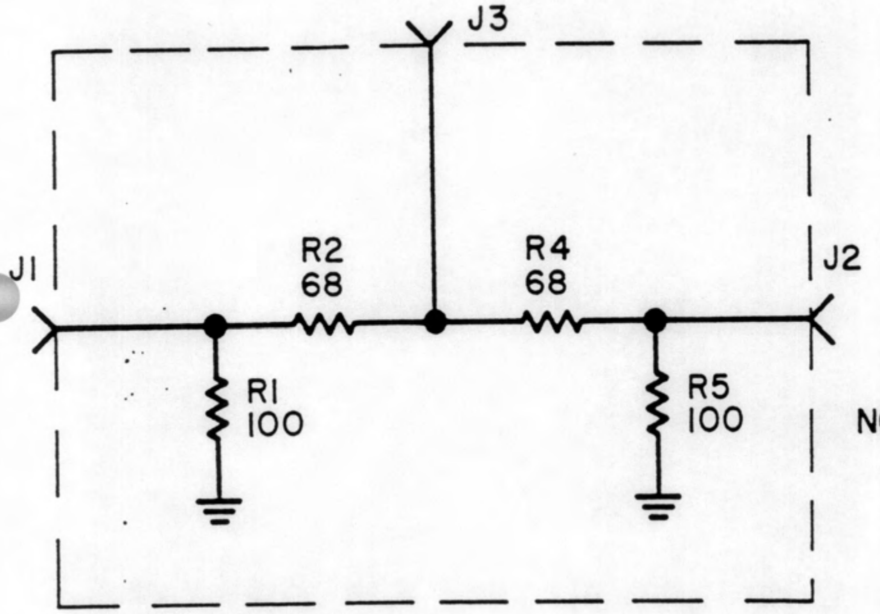
REF DESIG PREFIX A9




NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ±5%, 1/4W.
   b) CAPACITANCE IS MEASURED IN μf.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.
3. HEAVY LINE DENOTES MAIN SIGNAL PATH.

Figure 6-12. Type 7312 Video Amplifier, Schematic Diagram

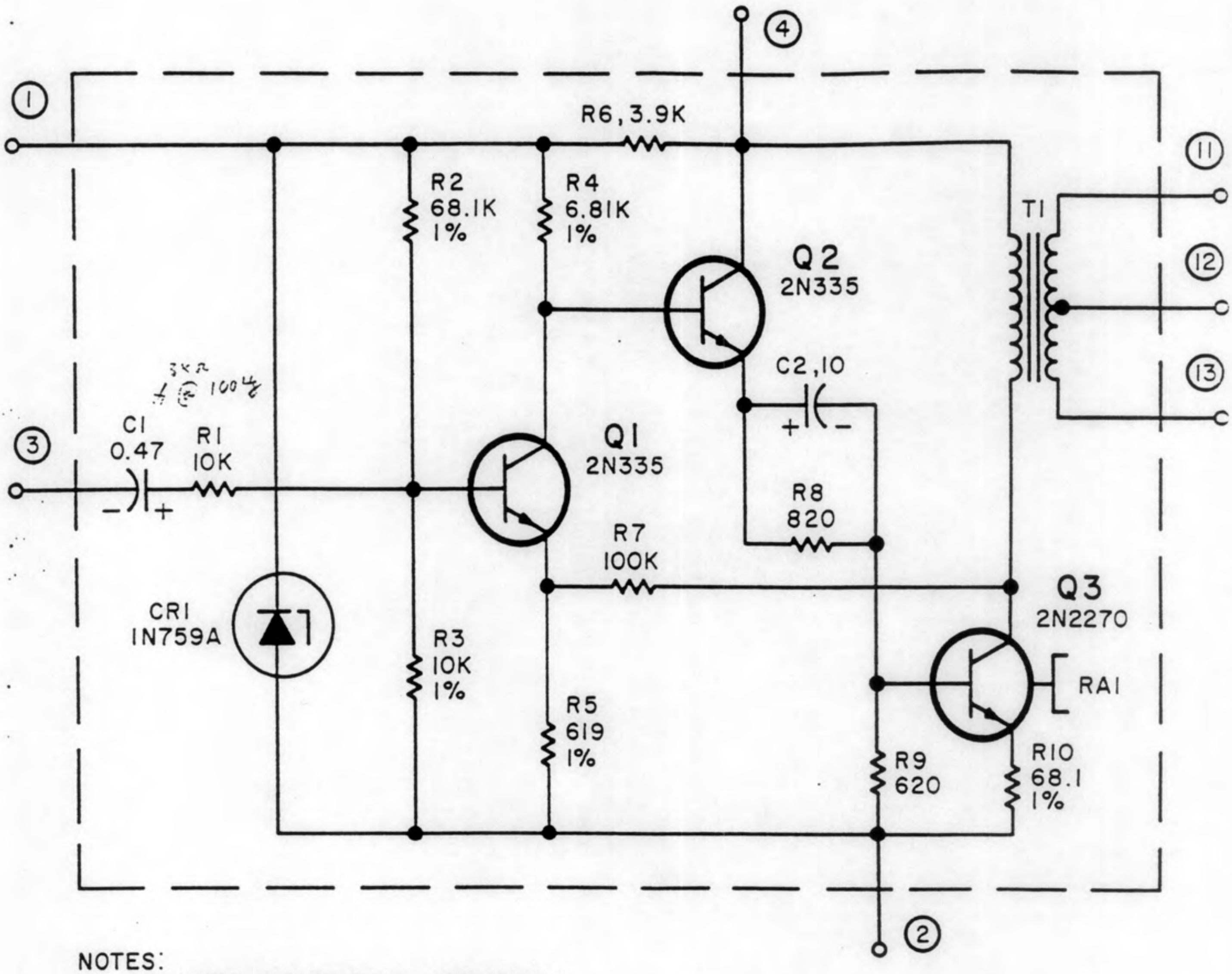
REF DESIG PREFIX A13, A14




NOTE:
1. UNLESS OTHERWISE SPECIFIED:
A) RESISTANCE IS MEASURED IN OHMS ±5%, 1/4W.

Figure 6-16. Type 7917 Coupling Network, Schematic Diagram

REF DESIG PREFIX A10

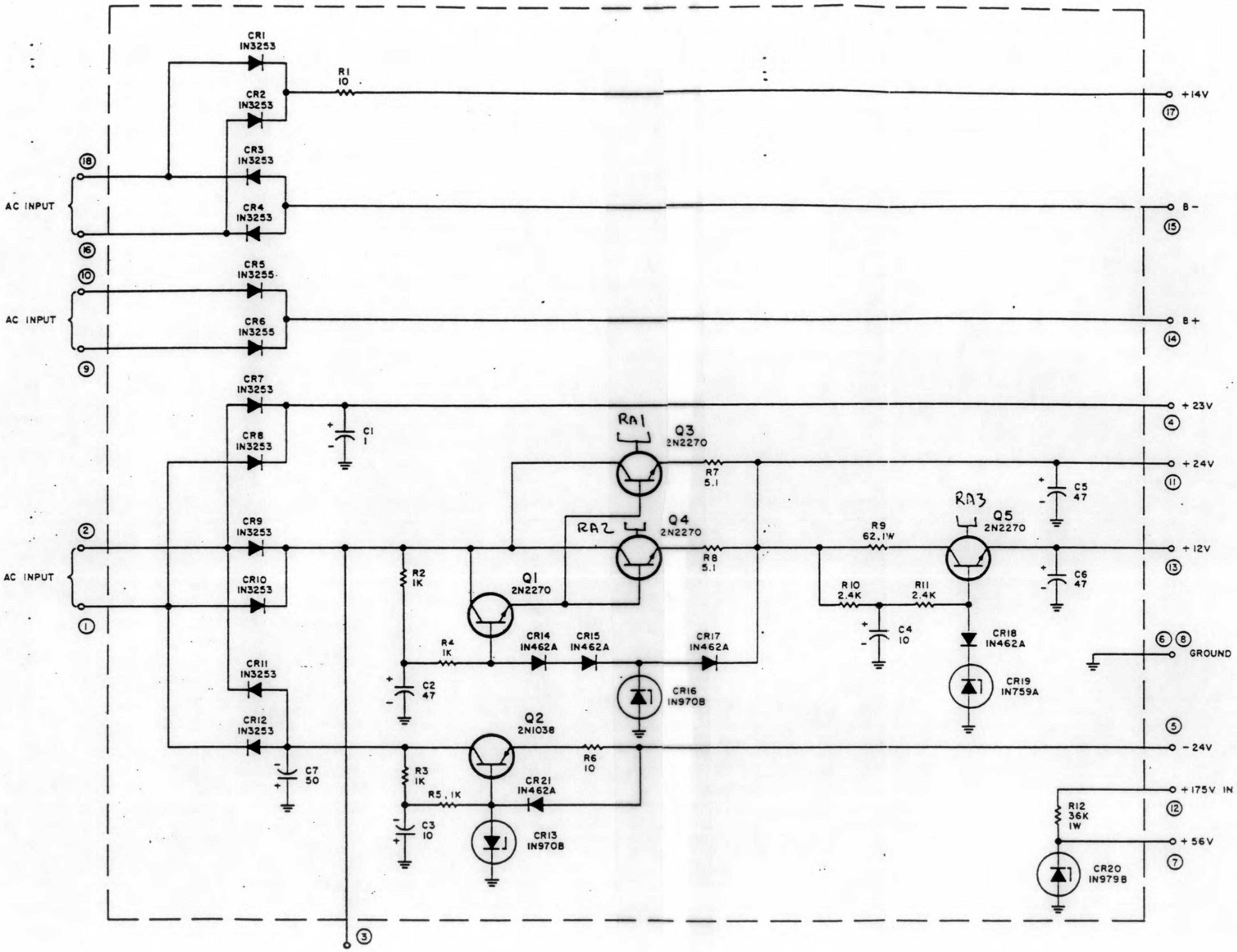



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a) RESISTANCE IS MEASURED IN OHMS, ± 5%, 1/4W
   b) CAPACITANCE IS MEASURED IN µf
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS

Figure 6-13. Type 7400A Audio Ampli
Schematic Diagram

REF DESIG PREFIX A12

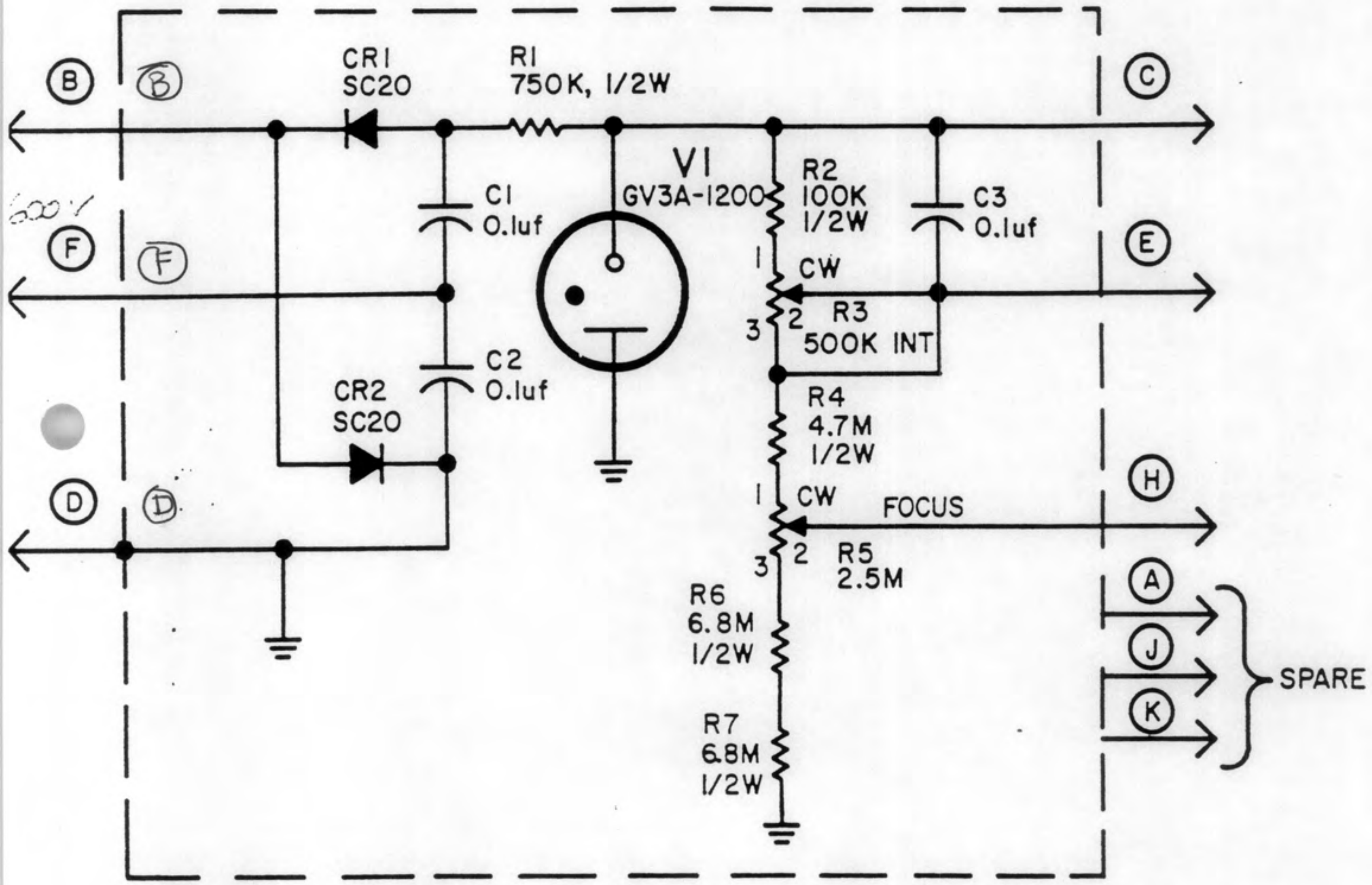



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
a) RESISTANCE IS MEASURED IN OHMS ± 5%, 1/4W
b) CAPACITANCE IS MEASURED IN μf.
2. ENCIRCLED NUMBERS ARE MODULE PIN NUMBERS.

Figure 6-15. Type 7631 Power Supply Regulator (Gen.), Schematic Diagram

Fig

REF DESIG PREFIX A11




NOTES:
1. RESISTORS ARE MEASURED IN OHMS ±5%, 1/4W.
2. ENCIRCLED NUMBERS ARE PIN NUMBERS IN PLUG P1.

Figure 6-14. Type 7633 Power Supply Regulator (CRT), Schematic Diagram

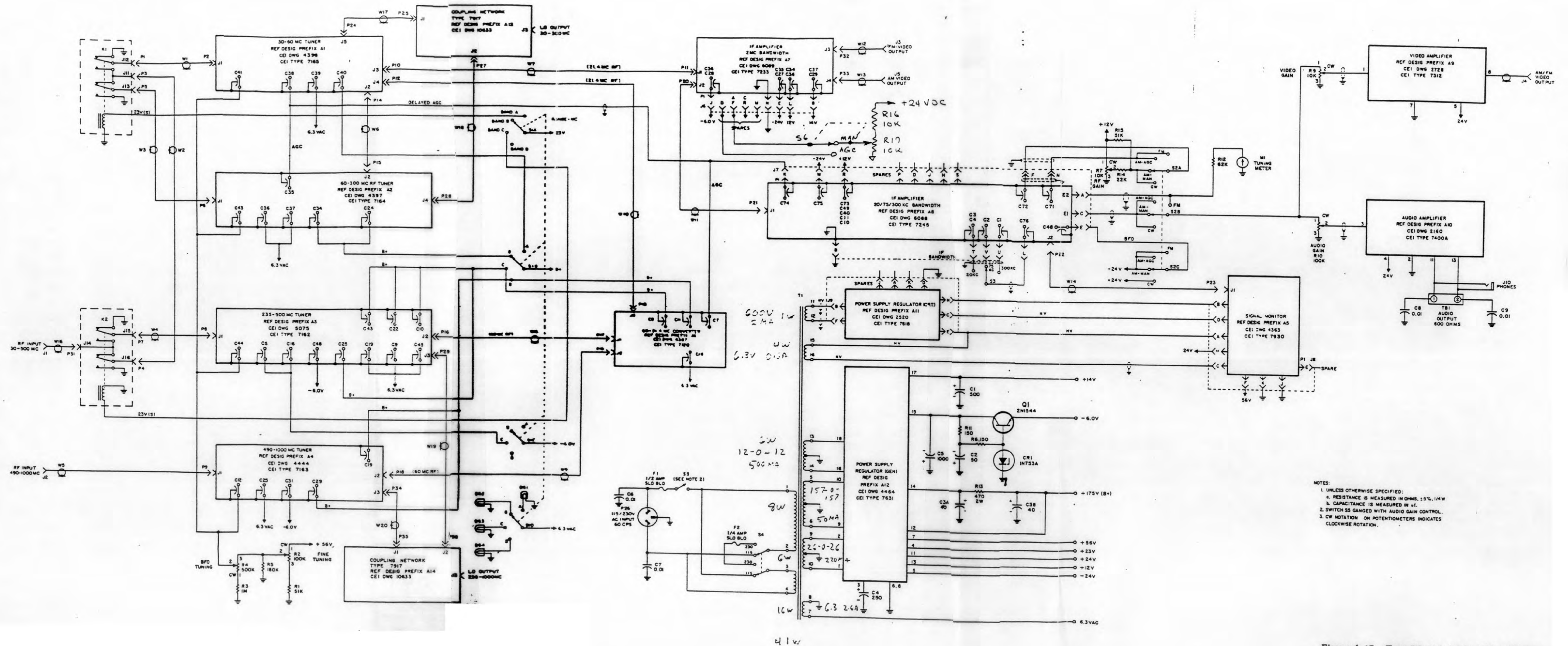



Figure 6-17. Type RS-111-1B Receiving System, Main Chassis Schematic Diagram