INSTRUCTION BOOK
for

FM TELEMETRY RECEIVER
Types 11B1-BN-2/BN-3

G T Lee

GEL GENERAL ELECTRONIC LABORATORIES, INC.
Research Development Manufacturing

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FM TELEMETRY RECEIVER

TYPES 11B1-BN-2/BN-3

GENERAL ELECTRONIC LABORATORIES, INC.
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Nashua, New Hampshire

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1.0 INTRODUCTION

The GEL Type 11B1-BN-2, -3 FM Telemetry Receiver has been designed specifically for use in FM/FM, PDM/FM, and PCM/FM systems. Noise figures of not greater than 8 db are obtained over the entire band from 215 to 265 megacycles through the use of two 5842/417A's in a cascode circuit. A tuned circuit at the input of the cascode amplifier reduces the intermodulation problems frequently encountered in receivers without input preselection. In addition, AGC is applied to the RF amplifier which greatly increases the linear operating range of the receiver front end. A video output isolated from ground is provided at the back panel. In Model 11B1-BN-3 (Fig. 1-1), a playback-up converter of pre-detected recorded signals is provided. This is the only difference between 11B1-BN-2 and 11B1-BN-3. Reduced interference susceptibility has received considerable attention in the design of the 11B1-BN-2, -3 as evidenced by image rejection not less than 60 db. At the same time, interference from the receiver such as oscillator radiation has been minimized.

Fig. 1-1. Type 11B1-BN-3 Receiver

2.0 DESCRIPTION

2.1 GENERAL

The 11B1-BN-2, -3 receiver is an FM Telemetry Receiver operating in the frequency range from 215 to 265 megacycles continuously tunable. This receiver employs both vacuum tubes and transistors.

2.2 ELECTRICAL

The 11B1-BN-2, -3 utilizes the double superheterodyne principle to convert the input signal frequency to an intermediate frequency of 10 megacycles. An FM demodulator is used to feed the deviation meter, tuning meter and audio circuits. The input to the audio circuit also works in conjunction with an AM output from the 2nd. IF. An isolated video output is provided at the rear of the receiver. This is accomplished by isolating a second FM demodulator, a video amplifier and their power supply from ground. In addition, a 10 mc IF and an FDU output are provided at the back panel. In Model 11B1-BN-3 only a playback-up converter output is provided. The associated circuitry is included only in this particular model. Electrical performance specifications are given in Table 2-1.

Table 2-1. Performance Specifications

Frequency Range	215 to 265 megacycles
Type Receiver	Double Superheterodyne
First Local Oscillator	Selectable from front panel: (1) Crystal-controlled: Drift not greater than 0.005%. (2) Continuously tunable oscillator: Drift not greater than 0.001% per °C.

Table 2-1. Performance Specifications (Cont.)

Detection	Greater than 0.5% linearity over ± 150 kc.
Second Local Oscillator	Tunable over ± 150 kc with front panel control.
Input Impedance	Operates from 50 ohm source.
Noise Figure	Not greater than 8 db.
IF Rejection	Not less than 60 db.
Image Rejection	Not less than 60 db.
Oscillator Radiation	Meets MIL-I-6181.
IF Frequencies	30 mc, first IF 10 mc, second IF
IF Bandwidth	300 kc at 3 db points, capable of being converted to 100, 200 or 500 kc by plug-in modules.
Selectivity	60 to 6 db bandwidth ratio is not greater than 2.5:1.
Discrimination	1% linearity over ± 500 kc. 5% linearity over ± 700 kc.
FM Video Output	Sensitivity -0.075 peak volts per kc deviation up to 10 v p-p.
	Output Adjustment - Front panel control.
	Output Load - Will work into 180 ohms shunted by 2000 pf.
	Source Impedance - Less than 10 ohms midband.
	Low Frequency Response - 5 cps at 3 db down.
Video Amplifier	Frequency Response - 5 cps to 250 kc (within 3 db).
	Output Load - 180 k ohms shunted by 2000 pf.

Table 2-1. Performance Specifications (Cont.)

Output for Frequency Display Unit	Provisions for 30 mc. Frequency Display Unit (GEL Type 14D1)
Signal Strength Recording	AGC Voltage
Output for Predetection Recorder	10 mc IF
Aural Monitoring	Built-in audio amplifier, gain control, control and speaker.
Metering Facilities	(a) Tuning Meter (b) Signal Strength Meter (c) Frequency Deviation Meter; 25, 75, and 150 kc full scale. Frequency response 400 cps to 300 kc.
Power Input	105 to 125 vac, 60 cycles, 1 Ø, ± 5%.

2.3 MECHANICAL

The 11B1-BN-2 is mechanically different from the 11B1-BN-3 in that the cover of the -3 is hinged and contains the playback-up converter module and associated relays. The two models are physically the same otherwise. They are capable of being mounted in a standard 19-inch relay rack. Components are mounted on the main chassis as well as on removable modules located on the side gussets. The solid-state modules (video amp and isolated from demodulator) are mounted on an isolated bracket which is hinged to provide access for servicing of components located beneath it on the main deck. An illustration of the unit is shown in Fig. 2-1. Mechanical specifications are given in Table 2-2.

Table 2-2. Mechanical Specification

Height	10 1/2 inches
Width	19 inches
Depth	15-5 inches
Weight:	
11B1-BN-2	48 pounds
11B1-BN-3	50 pounds

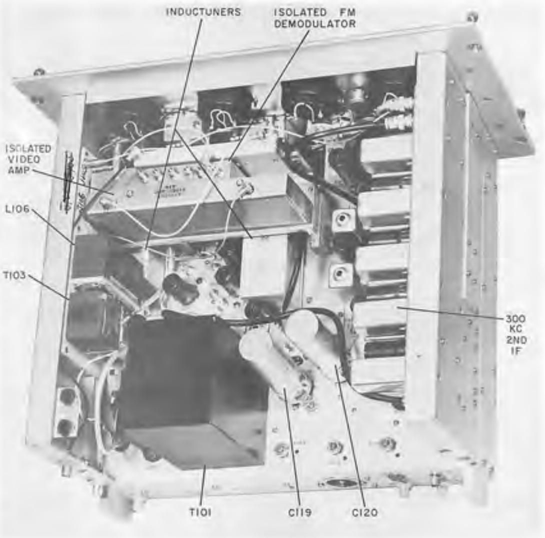


Fig. 2-1. Receiver with Cover Removed

3.0 OPERATION

3.1 GENERAL

The 11B1-BN-2, -3 receiver is capable of continuous coverage in the frequency range of 215 to 265 megacycles with single knob tuning and without band switching. All controls and indicators required for operating the receiver are located on the front panel. See Fig. 3-1.

3.2 CONTROLS AND INDICATORS

The front panel controls and indicators used by the operator are listed in table 3-1 below.

Table 3-1. Controls & Indicators

Control or Indicator	Functional Description	Ref Desig.
POWER-ON Switch	Energizes the receiver	S102
Power Lamp	Indicates that the receiver has been energized	I101
DEVIATION RANGE Switch	Adjusts the range of the DEVIATION meter	S104
VIDEO GAIN	Adjusts the level of the video output signal	R122
VIDEO BANDWIDTH Switch	Selects the desired signal bandwidth to the video amplifier	S105
VU-SET	Adjusts the OUTPUT VU meter to desired indication	R128
AUDIO GAIN	Adjusts the level of the audio output	R105
TUNING	Tunes RF head to desired frequency as indicated on tuning dial	

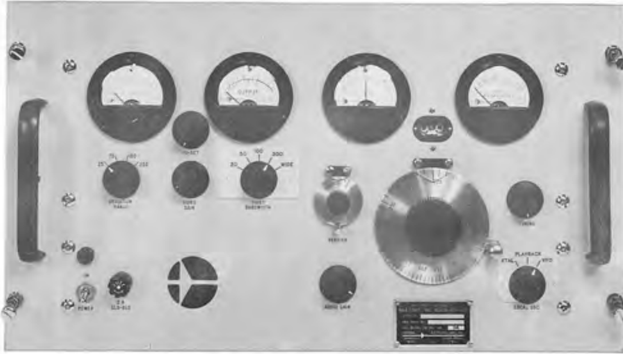


Fig. 3-1. Front Panel Controls and Indicators

Table 3-1. Controls & Indicators (Cont.)

Control or Indicator	Functional Description	Ref Desig.
VERNIER	Provides a more precise adjustment by varying the second local oscillator by ± 150 kc.	C131
LOCAL OSC	Selects mode of operation of the receiver. XTAL-PLAYBACK-VFO for 11B1-BN-3 (XTAL-OFF-VFO for 11B1-BN-2)	S101
SIGNAL LEVEL Meter	Indicates the approximate antenna input signal level	M101
TUNING Meter	Indicates the center of the IF passband.	M102
DEVIATION Meter	Indicates the peak F.M. deviation of incoming signals.	M103
OUTPUT VU Meter	Indicates the relative video output of the receiver	M104
Loudspeaker	Provides an audio indication of the signal	LS101

3.3 OPERATING PROCEDURE

Make the necessary connections to the receiver to prepare for operation. Refer to Fig. 3-2. Connect a suitable antenna (50 ohm) to J101 and connect the monitoring equipment to the isolated video output J113. In model 11B1-BN-3 only a PLAYBACK connector J114 is provided to receive pre-detection recorded signals at a 600 kc input.

In addition to the above mentioned output connectors, these connectors are also provided; FREQUENCY DISPLAY OUT, AM OUT, REMOTE, AGC OUT and a 10 MC IF OUT for predetection recording. If crystal operation is to be utilized, the slection of the desired crystal can be made with the aid of Table 3-3.

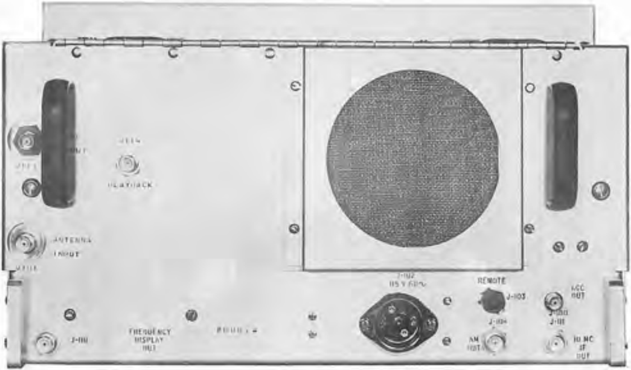


Fig. 3-2. Rear Panel Connectors

Table 3-2. Operating Procedures

Step	Procedure	Normal Indication
1	Place the POWER ON switch to the ON position	Power Lamp Lights
2	Place the VIDEO BANDWIDTH switch to the WIDE position	
3	Turn the AUDIO GAIN Control in a clockwise direction	Noise should be heard over the loudspeaker
4	Unlock VERNIER control lock and set VERNIER control to zero	
5	Set the LOCAL OSC switch to XTAL or VFO depending on the mode of operation desired. If XTAL operation is desired plug in the crystal above the Main Tuning Dial. The crystal to be used can be determined from Table 3-3.	
5a	PLAYBACK mode (used on 11B1-BN-3 only) is accomplished by placing the LOCAL OSC switch to the PLAYBACK position	SIGNAL LEVEL meter becomes disabled and B+ is removed from the front end
6	Unlock the Main Tuning Dial and turn the TUNING control until the Main Tuning Dial indicates the desired frequency. (Note: The TUNING meter will dip and return to zero as the center of the frequency is neared. Continue turning the TUNING control in the same direction to cause the meter deflection to pass through zero toward the other end of the scale. This will insure that the signal is still present and that the meter did not return to zero due to loss of signal)	The TUNING meter will approach zero when the center frequency is approached. The SIGNAL LEVEL meter will peak.

Table 3-2. Operating Procedures (Cont.)

Step	Procedure	Normal Indication
7	Adjust the VERNIER control (if necessary) to obtain fine tune. Can also be used to compensate for drift.	If fine tuning was necessary the TUNING and SIGNAL LEVEL meters will deflect slightly
8	Set the VIDEO BANDWIDTH switch to the appropriate bandwidth position. (maximum expected modulating frequency)	
9	Set the DEVIATION RANGE switch to the highest position that does not cause the meter to deflect to its limit.	DEVIATION METER will indicate the amount of carrier deviation
10	Adjust the VU-SET control to its approximate mid-range	
11	Adjust the VIDEO GAIN control until the desired output level is acquired as indicated on the unit connected to the VIDEO OUTPUT J113. Note: (The OUTPUT meter measures relative FM video output. The zero level output is arbitrary and is used as a reference only)	The OUTPUT meter will deflect
12	Adjust the VU-SET control to cause the OUTPUT meter to read zero. Note: (Any change in video output can now be measured in db and the VIDEO GAIN control can be used to maintain a constant video output)	The OUTPUT meter will read zero.

Table 3-3. Crystal Frequencies MIL CR33/U

IRIG Channel Freq.	Crystal Freq.	IRIG Channel Freq.	Crystal Freq.
216.0	20.50000	232.9	21.90833
216.5	20.54167	234.0	22.00000
217.0	20.58333	235.0	22.08333
217.5	20.62500	235.5	22.12500
218.0	20.66667	236.2	22.18333
218.5	20.70833	237.0	22.25000
219.0	20.75000	237.8	22.31667
219.5	20.79167	240.2	22.51667
220.0	20.83333	241.5	22.62500
220.5	20.87500	242.0	22.66667
221.0	20.91667	243.8	22.81667
221.5	20.95833	244.3	22.85833
222.0	21.00000	244.8	22.90000
222.5	21.04167	245.3	22.94167
223.0	21.08333	245.8	22.98333
223.5	21.12500	246.3	23.02500
224.0	21.16667	246.8	23.06667
224.5	21.20833	247.3	23.10833
225.0	21.25000	247.8	23.15000
225.7	21.30833	248.6	23.21667
226.2	21.35000	249.1	23.25833
226.7	21.39167	249.9	23.32500
227.2	21.43333	250.7	23.39167
227.7	21.47500	251.5	23.41667
228.2	21.51667	252.4	23.53333
229.9	21.65833	253.1	23.59167
230.4	21.70000	253.8	23.65000
230.9	21.74167	255.1	23.75833
231.4	21.78333	256.2	23.85000
231.9	21.82500	257.3	23.94167
232.4	21.86667	258.5	24.04167
		259.7	24.14167

4.0 THEORY OF OPERATION

4.1 RF SECTION

Mallory UHF inductuners are used as tuning elements for the RF amplifier and the local oscillator multiplier chain. A three-section inductuner tunes the RF amplifier. A Four-section unit tunes the local oscillator and two multiplier stages.

The RF amplifier is a cascode using a pair of 5842/417A, V201 and V202, low-noise, triode tubes. The cascode amplifier is ideally suited for this purpose because of its inherent low noise characteristics and because the input-tuned circuit provides selectivity ahead of the first tube. An additional advantage of the cascode is that it can be easily gain-controlled. Selectivity ahead of the first tube is particularly important because of the attenuation it provides to undersired signals outside the band. Gain control of the first stage is important because it provides a considerable increase in the signal handling capability of the receiver.

The input network is a single-tuned circuit with the antenna connection tapped down to provide optimum source resistance at the grid of the first tube. The output-tuned circuit of the cascode is a double-tuned circuit. The combination of the single-tuned input circuit and the double-tuned output circuit produce a response that is greater than 60 db down at the image frequency. The gain of the cascode is great enough that the mixer does not contribute to the noise figure of the receiver and the gain control characteristics are such that the RF amplifier gain is not decreased until the signal level is large enough that noise figure is no longer important.

4.1.1 First Mixer

The first mixer, V203, is a pentode mixer using a 5654/6AK5W tube. Both the local oscillator and signal voltages are applied to grid number one. A test point is provided at the mixer grid to monitor oscillator injection to facilitate alignment of the RF amplifier. A transitionally coupled, double-tuned circuit in the plate of the mixer is tuned to the first IF frequency of 30 mc. The FDU output is taken from a capacity voltage divider in the secondary side of this double-tuned circuit.

4.1.2 Local Oscillator Multiplier Chain

The first local oscillator is a high-beat oscillator. In VFO operation, the basic oscillator operates at one-fourth the first-local oscillator frequency and is tuned by one inductuner section. The VFO (V204) is an electron-coupled, Colpitts type, with its output at the fundamental frequency.

In crystal-controlled operation, the basic oscillator operates at one-twelfth the first local oscillator frequency. The crystal oscillator is an electron-coupled, Colpitts type with its output taken at the third harmonic of the crystal frequency. The crystals used are standard MIL type CR-33/U parallel-mode crystals. C227 is adjusted to provide the 32 $\mu\mu$f load capacity specified for this type of crystal.

In VFO operation, the crystal oscillator is disabled by removing the screen voltage of V205 and in crystal operation the VFO is disabled by removing the screen voltage of V204. Since the plate circuit of the VFO and the plate circuit of the crystal oscillator operate at the same frequency, (for a given signal frequency) they are tied in parallel and are tuned by one inductuner section.

V206 operates as a frequency doubler with its output circuit tuned by one inductuner section and V207 operates as a doubler with its plate circuit tuned by one inductuner section. The local oscillator signal is taken from the plate circuit of V207.

The frequency determining circuit of the VFO and all the tuned circuits associated with the multiplier chain have both low end and high end adjustments and test points are provided to facilitate alignment.

4.1.3 First IF Section

The first IF section including the mixer output circuit has the response shape of slightly overcoupled double-tuned circuit (peak-to-valley ratio approximately 1.03) and is centered at 30 mc. The transformers are capacitively coupled using "top" or high impedance coupling. With this configuration, the primary is in one can and the secondary is in another can with coupling in the form of small capacitors.

The amplifier is nominally 1.1 mc wide across the top of the response in order that the first IF amplifier does not affect the selectivity of the receiver (as determined by the second IF amplifier) with any combination of second local oscillator tuning and second IF amplifier bandwidth.

AGC is applied to V208. A suitable value of unbypassed cathode resistor compensates for input capacity variations that occur with changes in tube transconductance minimizing IF response shape change with gain control. Screen-grid neutralization is also used to improve shape stability.

4.1.4 Second Mixer

The second mixer (V209) is of the pentode type with the oscillator and signal voltages applied to separate grids. This type of mixer was chosen because its use minimizes the spurious responses associated with double superheterodyne receivers.

The signal voltage is applied to grid number one which is biased for Class A operation. The oscillator voltage is applied to grid number three and develops self bias.

A double-tuned circuit in the plate of the mixer is tuned to the second IF frequency of 10 mc.

4.1.5 Second Local Oscillator

The second local oscillator is an electron-coupled, Hartley-type with output taken at the fundamental frequency. The Vernier Tuning control of the receiver (C131) tunes this oscillator plus or minus 150 kc around its normal operating frequency of 40 mc.

The oscillator coil, L237, is a metallized glass inductance chosen for its low-temperature coefficient. The oscillator frequency is set by a powdered-iron core having a tuning range of approximately ± 1%.

The plate circuit has a high C to L ratio to minimize harmonic output and the circuit design is such that plate-circuit tuning has a minimum effect on oscillator frequency. A schematic of the RF Head is shown in section 7.

4.2 300 KC BANDWIDTH SECOND IF

The second IF amplifier has a response shape resulting from five slightly overcoupled, double-tuned circuits (peak-to-valley ratio approximately 1.01 to 1.05) and is centered at 10 mc. AGC is applied to the first three stages. The output stage drives an AM detector, an AGC detector, and the first limiter.

A suitable value of unbypassed cathode resistor is provided for each gain-controlled stage to compensate for input capacity variations that occur with changes in tube transconductance, minimizing IF response shape change with gain control. Screen grid neutralization is also employed for all stages to improve shape stability.

All of the IF strips are similar, the major differences being the capacities associated with the tuned circuits and the degree of decoupling of the tubes from these circuits. These capacities and the amount of decoupling are adjusted to give the desired nominal gain for the various bandwidth strips.

All of the IF transformers are capacitively coupled using "top" or high impedance coupling. With this configuration the primary is in one can and the secondary is in another can, with coupling in the form of small capacitors.

B plus, heater, and AGC decoupling is provided as required to prevent regeneration. This decoupling, in combination with input capacity compensation and neutralization, produces a response that is extremely stable from the condition of maximum gain to minimum gain.

The antenna-tracking output is taken from a suitable voltage divider in the secondary of the last IF transformer. The AGC output (for signal strength recording) is taken as a separate feed from the AGC detector. R332 and R337 are adjusted to set up the signal level meter for the 300 kc bandwidth amplifier.

4.3 FM DEMODULATOR - METERING

As a compromise between the various factors affecting limiter-discriminator operation and good capture performance, a peak separation of 2 mc was chosen for the discriminator. The limiter stage is a double-tuned, overcoupled transformer, with a nominal bandwidth of 2 mc between the points on the response curve where the amplitude is equal to that at center frequency. The receiver has sufficient gain to saturate the limiter on noise.

Type 6BN6 gated-beam tube was selected for limiting because the unique characteristics of this tube type approach those of the ideal limiter.

The characteristics of a 6BN6 are such that a relatively small change in limiter-grid voltage (grid number 1) changes the plate current from a condition of saturation to cut-off while the cathode current remains essentially constant. This allows the operating point of the tube to be set by cathode bias such that plate-current saturation and cut-off occur symmetrically about the zero-crossings of the input signal. Furthermore, the limiter grid draws essentially no current when it is driven positive so the loading on the tuned circuit connected to the limiter is essentially constant.

Since the grid time constants associated with grid-leak type of limiting is not required for the gated-beam limiter, the AM rejection characteristics of the limiter are not deteriorated for high AM frequencies.

The discriminator used is a form of ratio-detector employing a pair of single-tuned circuits and fixed bias instead of the more conventional balanced phase-shift type of circuit with self bias. In addition, the time constants associated with the more conventional ratio detector or discriminator have been avoided and the required damping of the tuned circuits is accomplished by current flow into the Zener diodes used as a bias source.

C631 is used to adjust the LC ratio of Z601 and C626 is used to adjust the LC ratio of Z602 as required to give the most linear discriminator curve.

The dc voltage across C623 is approximately equal to one-half the bias (-5.9 volts) for a signal input at center frequency and goes more positive as frequency is decreased.

The discriminator output is direct-coupled to the tuning meter amplifier and is RC coupled to the deviation meter amplifier.

4.4 FM DEMODULATOR-DATA (part No. A18-147, schematic R18-179)

Note: Module A18-147 used in 11B1-BN-2 serial Nos. 1 through 5 and 11B1-BN-3 serial Nos. 1 and 2 is not interchangeable with module A18-314 used in subsequent receivers.

The 10 mc signal from the 2nd IF amplifier is applied to two limiter stages (Q1 and Q2). The collector output of Q1 is amplitude limited by the diodes CR1 and CR2 and applied to the base of limiter Q2. The collector output of Q2 is amplitude limited by diodes CR3 and CR4 and applied to buffer amplifier Q3. The collector circuit of Q3 contains a 10 mc tank circuit consisting of L3 and C7. The collector output is coupled by C8 to Q4 which drives a Granlund type discriminator. The discriminator output is filtered by C13 and applied to emitter-follower Q5. The output of Q5 is amplified by Q6 and coupled through emitter-follower Q7 to pin E of J3.

The demodulated output signal is applied to the video amp.

4.4a FM DEMODULATOR - DATA (part No. A18-314, schematic R18-313)

The 10 mc signal from the 2nd IF amplifier is applied to two limiter stages (Q1 and Q2). The collector output of Q1 is amplitude limited by the diodes CR1 and CR2 and applied to the base of limiter Q2. The collector output of Q2 is amplitude limited by diodes CR3 and CR4 and applied to buffer amplifier Q3. The collector circuit of Q3 contains a 10 mc tank circuit consisting of L5 and C11. The collector output is coupled by C12 to Q4 which drives a Granlund type discriminator. The discriminator output is filtered by C22 and applied to emitter-follower Q5. The output of Q5 is amplified by Q7 and coupled through emitter-follower Q8, to pin b of J3.

The demodulated output signal is applied to the video amp.

4.5 ISOLATED VIDEO AMPLIFIER

The video amplifier is of the wide band design with the input signal bandwidth controlled from front panel control S105 (VIDEO BANDWIDTH). The input signal to the amplifier is applied to connector J1. The level of the input signal is set by the VIDEO GAIN control R123 also located on the front panel. The input at connector J1 is applied to emitter follower Q1. The output of Q1 is coupled through capacitor C2 to amplifier Q2 which in turn drives amplifier Q3. The output of Q3 is taken from the emitter and collector as separate signals out of phase with each other and applied to emitter followers Q4 and Q5. The final two stages Q6 and Q7 are connected in such a manner as to reverse the phase of one leg bringing the two legs back in phase with each other

The combined output at this point is fed to connector J2 as the isolated video output signal. Also a degenerative feedback loop is fed to amplifier Q2. This, in effect, provides for stability and better frequency response.

The video amplifier also drives an output -VU meter(M104 located on the front panel). See R18-180

The video amplifier being a solid state amplifier is powered by a separate power supply along with the Isolated FM Demodulator.

4.6 PLAYBACK-UP CONVERTER

The Playback-Up Converter is used only in model 11B1-BN-3. The module is located on the hinged cover of the receiver. It is capable of recording or playing back, although in this application it is used only for playback purposes. The input to the module must be a 600 kc signal applied to connector J114 located on the rear panel. (See Fig. 3-2). The 600 kc signal is converted up to 10 mc and then applied to the 2nd IF strip. To operate the receiver in the playback mode the local oscillator switch located on the front panel must be placed in the playback position. The receiver can also be made to operate in the playback mode from a remote location regardless of which position the local oscillator switch is in. Refer to the Main Chassis schematic. When the local oscillator switch is placed in the playback position relays K101 and K102 energize. Coaxial relay K101 transfers the 10 mc output signal from the Playback-Up Converter to the 300 kc bandwidth IF strip. Relay K102 upon energizing grounds the input to the signal level meter M101 and removes the 150 VDC B+ line from the RF section disabling the front end. As mentioned earlier the receiver can be put into the playback mode from a remote location. This is accomplished by supplying the relay solenoid return line to the remote location through J103. This method of operation (remote) is independent of front panel control position.

Refer to the Playback-Up Converter. When the 600 kc signal is applied to J1102 it is amplified by paraphase amplifier V1103-B. The output is combined with a 9.4 mc signal from crystal controlled oscillator V1101. The 600 kc signal is then converted up to 10 mc and coupled to output J1101 through transformers T1102 and T1101. Tube stages V1102-A, V1102-B and V1103-A are for recording only and not used in this application.

4.7 MAIN CHASSIS

The main chassis contains the following mentioned components and circuits. Refer to the schematic diagram in section 7.

4.7.1 Deviation Meter

The deviation meter (M103) is peak-to-peak voltmeter calibrated to read peak deviation. The meter will indicate the peak deviation (one-half the peak-to-peak deviation of PDM/FM or PCM signals).

Deviation Range Switch (S104) selects the full-scale range of the deviation meter. Pentode amplifier (V106) is RC coupled to triode amplifier V107A, which in turn, is direct coupled to a cathode follower V107B. Flat frequency response is maintained in this amplifier by partially bypassing the cathode resistors. The bypass capacity for V107A is adjusted by C114 to give the desired frequency response characteristics.

CR103 and CR104 operate as a voltage doubler charging C116 to a dc voltage very nearly equal to the peak-to-peak voltage appearing at the cathode of V107B. R141 is adjusted as required to calibrate the deviation meter.

4.7.2 Tuning Meter

The tuning meter (M102) circuit is designed to operate on CW, FM/FM, PDM/FM or PCM signals and reads zero when the signal is centered in the IF passband. The tuning meter reading is essentially independent of pulse width for PDM/FM signals or of pulse coding for PCM signals.

The discriminator output is direct coupled to triode amplifier, V102A, which is in turn, direct coupled to cathode follower, V103A; V102B and V103 are not part of the signal circuit but function to stabilize the amplifier by reducing the effects of B+ supply and heater voltage variations on tuning-meter indication.

The tuning meter is connected between the signal cathode and the non-signal cathode of V103. A DC voltage taken from the bias regulators for the discriminator is applied to the non-signal grid of V102. This voltage is set by R114 for zero current through the tuning meter when a CW signal at center frequency is fed to the discriminator.

When a video signal is present at the signal cathode, C104 is charged through CR101 to the maximum voltage at the cathode and C105 is charged through CR102 to the minimum voltage at the cathode. As a result, there is a current flow from the non-signal cathode through the tuning meter and R118 toward C104, and there is a current flow from C105 through R117 and the tuning meter (in the opposite direction) toward the non-signal cathode. If the received signal is centered in the IF passband the deviation is symmetrical about the center frequency of the discriminator and the voltage differences between C104 and C105 (with respect to the voltage at the non-signal cathode) are equal and opposite. The net current through the tuning meter therefore is zero, the indication for proper tuning.

4.7.3 Signal Level Meter

The signal level meter (M101) is driven from the 300 kc bandwidth 2nd IF. Resistor R332 in conjunction with R337 are adjusted to calibrate the meter.

4.7.4 VU Meter

The VU meter (M104) is driven from the video amplifier. The output to the meter is taken from pin J. A 5 k ohm variable resistor R128 is used to adjust the meter.

4.7.5 AM Output Cathode Follower

The signal from the AM detector incorporated in each second IF strip is capacitively coupled to the grid of the AM cathode follower (half of V101). R101 and R102 set the DC level at the grid of the follower. The ratio of these two resistances is set by DC voltage required for proper operation as a cathode follower and the values of the resistances are determined by the ratio of AC to DC impedance required at this point.

C103 couples the video to the output jack J104. R107 is a bleeder to avoid charge build-up on C103.

4.7.6 Audio Amplifier

The discriminator output is direct coupled to triode amplifier, V102a, which is in turn, direct coupled to the grid of the audio amplifier (half of V101) through the audio gain control. The output of this amplifier drives a speaker mounted behind the panel of the receiver through a high-quality audio transformer.

4.7.7 Power Supply

The power supply furnishes operating voltages of -300 vdc, -170 vdc both unregulated and -150 vdc regulated by an OA2 WA regulator (V108). The two unregulated voltages are obtained from a center tapped transformer driving four diodes in a full wave bridge. The grounded pair of diodes are used in conjunction with the center tap as a split-phase, full wave circuit. Resistors are used to control the peak current in the diodes.

Three separate filaments are provided. Filament #1 is isolated from the chassis and raised above ground to bring the four cathode follower's filaments closer to their cathode voltage. The other two filaments are the two halves of a center tapped winding. The center tap is grounded and the load distributed equally between the two sections.

The AC input is shielded and bypassed for the RF frequencies involved.

A cooling fan with a cleanable filter is provided. This fan is thermostatically controlled, the thermostat having a turn-on temperature of approximately 80°F at the chassis and a turn-off temperature of approximately 55°F.

4.7.8 Isolated Power Supply

An isolated power supply is provided to power the isolated FM demodulator and the isolated video amplifier. The latter two units being the only solid-state modules in the receiver. Two full wave bridges are utilized to provide a +18 vdc and a -18 vdc in conjunction with capacitor input pi filters. Zener diodes VR101 and VR102 are used for voltage regulation. The return line from the power supply is not connected to chassis ground.

5.0 MAINTENANCE

Note. Refer to Fig. 5-9 for Block Diagram of Receiver.

5.1 ALIGNMENT OF 300 kc BANDWIDTH IF

5.1.1 Recommended Equipment

Jerrold Sweep Generator Model 602

Hewlett Packard Oscilloscope Model 130A

Hewlett Packard Signal Generator Model 608D

Hewlett Packard Electronic Counter Model 524D with 525A Frequency Converter

Kay Attenuator Model 30-0

Second IF Test Cable (Fig. 5-1)

Walsco #25411 alignment tool

BNC to clip leads two each

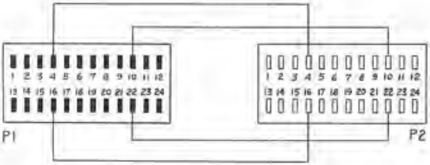
Three-inch clip leads two each

RG 62/U cable three-feet in length, four each

5.1.2 General Instructions

A low capacity cable, such as RG-62/U coaxial cable, should be used for connection to the oscilloscope. Cable capacity plus oscilloscope input capacity should be held to a maximum of 100 μμf. The direct-coupled vertical amplifier of the oscilloscope should be used to display the response. The marker generator signals should be coupled as are required to produce a suitable marker pip. If too much marker is used the baseline of the response will be shifted. In general, a minimum of marker signal should be used. The frequency of the marker signal should be very accurately set. This can be accomplished by counting the frequency directly with the HP counter Model 524D.

The second IF alignment fixture (Fig. 5-2) should be made using short leads. This fixture should be soldered in place as required during the alignment procedure. The sweep input cable and the marker input



Pin # 4 AM output
Pin # 16 B+ 170 vdc
Pin # 22 6.3 vac
Pin # 10 Chassis Ground
P-1 Plug 24 contact Min., Blue Ribbon 57-10240
P-2 Plug 24 contact Min., Blue Ribbon 57-20240

Fig. 5-1 Second IF Amplifier Test Cable

cable should be dressed towards the input end of the IF sub-chassis away from the stages already tuned. The oscilloscope input cable should be dressed away from the IF sub-chassis.

5.1.3 Procedure

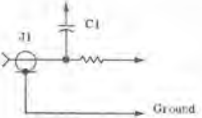
Remove the amplifier sub-chassis from the receiver. Remove its bottom cover. Set the sub-chassis on the top edge of the side cover dropping the studs on the sub-chassis sidewall through the holes in the top of the side cover provided for this purpose. Connect the IF amplifier test cable. Connect the limiter discriminator input cable to J302. Connect the oscilloscope to C125 and ground. If the signal level meter was in approximate adjustment prior to the alignment, do not disturb the adjustment of R332 and R337. If the signal level meter was not in approximate adjustment, set R332 and R337 to the center of their range. Set the Local Oscillator switch to XTAL and remove the crystal, if one is installed.

Connect alignment fixture (Fig. 5-2) between the grid pin 1 of V304 and ground on the strap-nut for this tube. Connect the sweep generator to J1 of the alignment fixture. Connect the marker generator between the 4.7 $\mu\mu f$ capacitor on the alignment fixture and ground. Connect a short clip lead from terminal B of T304B to ground.

Adjust the output of the sweep generator for a 1-volt response amplitude. Feed in marker signal as required. Adjust the tuning cores in T305A and B as required to produce a response curve centered at 10 mc with respect to the 5% down points on the response curve. The response curve should be flat-topped or slightly over-coupled.

Remove the alignment fixture and clip lead.

Connect the alignment fixture between the grid pin 1 of V303 ground on the strap-nut for this tube. Connect the sweep generator. Connect



J1 UG-1094/U
C1 4.7 ± 0.25 $\mu\mu f$ Erie NPO-A

Fig. 5-2. Second IF Alignment Fixture

the marker generator. Connect a short clip lead from terminal B of T303B to ground.

Adjust the output of the sweep generator for a 1-volt response amplitude. Feed in marker signal as required. Adjust the tuning cores in T304A and B as required to produce a response curve centered at 10 mc with respect to the 10% down points on the response curve.

Adjust the output of the sweep generator for a 10-volt response amplitude. Adjust the tuning core in T305B as required to remove tilt in the response curve. The response curve should be flat-topped or slightly overcoupled.

Remove the alignment fixture and clip lead.

Connect the alignment fixture between the frid pin 1 of V302 and ground on the strap-nut for this tube. Connect the sweep generator. Connect the marker generator. Connect a short clip lead from terminal B of T302B to ground.

Adjust the output of the sweep generator for a 10-volt response amplitude. Feed in the marker signal as required. Adjust the tuning cores in T303A and B as required to produce a response curve centered at 10 mc with respect to the 15% down points on the response curve. The response curve should be flat-topped or slightly overcoupled.

Remove the alignment fixture and clip lead.

Connect the alignment fixture between the grid pin 1 of V301 and ground on the strap-nut for this tube. Connect the sweep generator. Connect the marker generator. Connect a short clip lead from terminal B of T301B to ground.

Adjust the output of the sweep generator for a 10-volt response amplitude. Feed in marker signal as required. Adjust the tuning cores in T303A and B as required to produce a response curve centered at 10 mc with respect to the 25% down points on the response curve. The response curve should be flat-topped or slightly overcoupled.

Remove the alignment fixture and clip lead. Install the second IF subassembly bottom cover and install the subassembly in the receiver. Short out the AGC line by connecting a short clip lead from C342 to ground.

Remove the front end subassembly cover. Connect the alignment fixture between the grid pin 1 of V209 and ground at terminal D of T202B. Connect a short clip lead from terminal B of T202B to ground. Remove the second local oscillator tube, V210.

Adjust the output of the sweep generator for a 10-volt response amplitude. Feed in marker signal as required. Adjust the tuning cores in T301A and B as required to produce a response curve centered at 10 mc with respect to the 3 db down points on the response curve. The response curve should be flat-topped or slightly overcoupled.

IF bandwidth can be checked if desired as follows: Connect a VTVM to C125. Disconnect the sweep generator and connect the marker generator to the alignment fixture. Set the input frequency at 10 mc and the input level for a 10-volt dc reading on the VTVM. Vary the input frequency until the meter reading drops to 7.07 volts and record the frequency as read directly on the HP Counter. Vary the frequency until the meter reading drops to 7.07 volts on the other side of the response curve, and record this frequency. The bandwidth is the difference between both counter readings.

Disconnect the alignment fixture, clip lead, and oscilloscope. Install the front end subassembly bottom cover. Remove the short from the AGC line.

5.2 ALIGNMENT OF FM DEMODULATOR

5.2.1 Recommended Equipment

Boonton 202-F Signal Generator

Boonton 207-F Univerter

Hewlett-Packard 524D Electronic Counter with 525A Frequency Converter

Jerrold Sweep Generator Model 602

Hewlett-Packard Oscilloscope Model 130A

Kay Attenuator Model 30-0

Cubic Digital VM Model V-45

An Auxiliary-tuned amplifier with approximately 30 db gain having an essentially flat response from 8.5 mc to 11.5 mc when connected to the limiter input cable W601.

RG 62/U cable three-feet in length, six each

Walsco #2541 Alignment tool

5.2.2 General Instructions

T601A and T601B are tuned to produce a response curve having equal amplitudes at the 9 and 11 mc points. The response is that of an overcoupled, double-tuned circuit.

Z601 and Z602 are adjusted to set the discriminator peaks to 9.0 and 11.0 mc. C626 and C631 are set as required to optimize discriminator linearity.

If the discriminator response curve is viewed visually, it is necessary to disconnect the lead at the video output feed-thru terminal of the discriminator sub-chassis to avoid shape distortion caused by the RC coupling network to the video amplifier and metering circuits. Furthermore, the linearity of the discriminator is somewhat affected by the removal of the video load and the baseline produced by sweep blanking does not fall at center frequency but rather at a point determined by the division of R621 and R622. The discriminator peaks are approximately equal to amplitude about the center frequency as viewed on an oscilloscope having direct coupled vertical amplifier.

Discriminator linearity is evaluated by plotting the dc voltage change at the output of the FM demodulator sub-chassis as a function of input frequency change about the 10 mc reference and calculating the maximum error voltage deviation from the resultant nominal straight line. (Refer to Fig. 5-11 for location of FM Demodulator)

5.2.2.1 Alignment of T601A and B

Set up equipment as shown in Fig. 5-2b.

Connect "Y" axis of oscilloscope to C609.

Adjust the sweep generator for a sweep width of approximately 3 mc centered at 10 mc. Set the sweep generator output to maximum - consistant with allowing the 10 mc marker pip to be displayed on the oscilloscope.

Adjust the tuning cores in T601A and B to produce a response curve having equal amplitudes at the 9 and 11 mc points.

5.2.2.2 Alignment of Z601 and Z602

Disconnect circuitry at output of discriminator sub-chassis.

Set up equipment as shown in Fig. 5-2b.

Connect "Y" axis of oscilloscope to feed-thru of discriminator sub-chassis.

Adjust Z601 to 9.0 mc.

Adjust Z602 to 11.0 mc.

Adjust C626 and C631 to optimize discriminator linearity as observed on the oscilloscope. Note that any adjustment of either C626 or C631 will require a readjustment of either Z601 or Z602 in order to maintain the 2 mc peak separation symmetrically about the 10 mc center frequency.

5.2.2.3 Linearity Check

Set-up equipment as shown in Fig. 5-3.

Vary input frequency in 100 kc increments from 9.5 mc to 10.5 mc and record the change in dc reference output.

Plot these readings and from them draw the best possible straight line and record the maximum error voltage deviation over a range of ± 500 kc. This maximum error divided by the full scale DVM reading x 100 is the percentage error. The full scale DVM reading is $\frac{\text{DVM (9.5 mc)} - \text{DVM (10.5 mc)}}{2}$. Record the percentage error.

If the error is greater than 1% readjust C626 and C631.

5.3 ALIGNMENT OF RF SECTION

5.3.1 Adjustment of Second Local Oscillator (Refer to Fig. 5-13 for view of RF Head)

5.3.1.1 Recommended Equipment

Hewlett Packard 524D Electronic Counter with 525A Frequency Converter

Hewlett Packard 410B VTVM

Walsco #2521 Tuning Tool

5.3.1.2 General Instructions

If the Vernier Tuning dial has been removed it will be necessary to check the indexing of tuning capacitor C131. A peep hole in the bottom of the shield box containing C131 is provided for this purpose.

When looking into the peep hole from the front of the receiver, the capacitor plates should line up with the edge of the hole on the right when the Vernier Tuning Control is set to zero. As the knob is turned to indicate toward minus 50 kc, the capacitor plates should be visible moving through the hole.

5.3.1.3 Adjustment Procedure

Connect a VTVM to feed-thru capacitor C275. Set the Vernier Tuning control to zero. Adjust L234 for a maximum reading on the VTVM.

Connect a counter to feed-thru capacitor C275. Set the vernier tuning control to zero. Adjust L237 to 40 mcs ± 2 kc.

5.3.2 Alignment Procedure for First IF Amplifier

5.3.2.1 Recommended Equipment

Jerrold Sweep Generator Model 602

Hewlett Packard 608D Signal Generator

Hewlett Packard Oscilloscope Model 130A

Kay Attenuator Model 30-0

Alignment Fixture Fig. 5-2

An Auxiliary-Tuned Amplifier with approximately 30 db gain having an essentially flat response from 28 mc to 32 mc.

RG-62/U cable three-feet in length, five each

Walsco #2541 alignment tool

5.3.2.2 General Instructions

A low capacity cable such as RG-62/U coaxial cable should be used for connection to the oscilloscope. Cable capacity plus oscilloscope input capacity should be held to a maximum of 100 $\mu\mu$f. The direct coupled, vertical amplifier of the oscilloscope should be used to display the response. The marker generator signal should be coupled in (through a 4.7 $\mu\mu$f capacitor connected to the sweep generator lead) as required to produce a suitable marker pip. If too much marker is used, the baseline of the response will be shifted. In general, a minimum of marker signal should be used.

The IF alignment fixture (Fig. 5-2) should be made using reasonably short leads. The sweep input and marker input cables should be dressed away from the stages being aligned.

5.3.2.3 Alignment Procedure

a. Remove tube V210

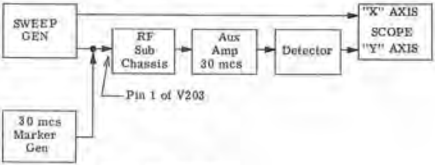


Fig. 5-2A Test Set-up

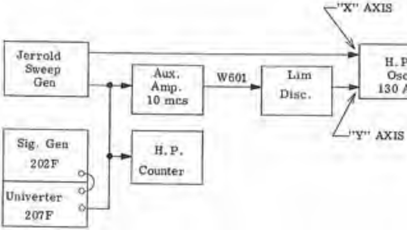


Fig. 5-2b. Alignment Set-Up

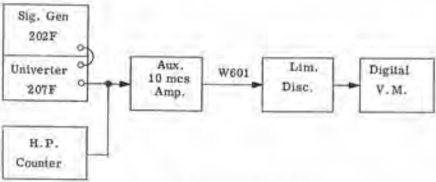


Fig. 5-3. Linearity Check Set-Up

b. Set up equipment as shown in Fig. 5-2A.

c. Connect the 30 mcs Auxiliary Amp. to the FDU output connector J203 at the rear apron.

d. Adjust the sweep generator for a suitable sweep width centered at 30 mc and set the sweep generator output for a 0.5 volt response amplitude.

e. Feed-in marker signal as required.

f. Adjust the tuning cores in T201A and T201B to produce a response curve centered at 30 mc. The response curve should be flat-topped or slightly overcoupled and tuning should be adjusted for symmetry about the ± 1 mc points.

g. Connect the 30 mc Auxiliary Amp. to the second mixer output connector J202.

h. Adjust the tuning cores in T202A and T202B to produce a response curve centered at 30 mc. The response curve should be flat-topped or slightly overcoupled and tuning should be adjusted for symmetry about the ± 1.9 mc points.

i. Repeat steps c through h.

5.3.3 Alignment Procedure for RF Amplifier

5.3.3.1 General Instructions

Since the RF circuitry of the receiver contains two sections, an input network and a double-tuned interstage, with widely differing criteria for proper tuning and tracking, separate alignment procedures are given for each stage.

5.3.3.2 Alignment of RF Interstage

5.3.3.3 Recommended Equipment

Hewlett Packard 410B VTVM

Signal Generator, Hewlett-Packard Model 608D

6V Bias Battery (Fig. 5-4)

Crystal, McCoy CR-33/U 21.3333 mc

Crystal, McCoy CR-331v 23.5000 mc

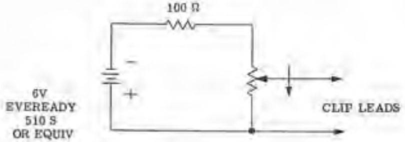


Fig. 5-4. Battery Connector

5.3.3.4 Procedure

a. Connect bias battery to C342 in the case of the 300 kc and IF being used. Connect VTVM to C125. Connect signal generator to antenna input. Set signal generator output attenuator to 100 μv. Set receiver dial at 226 mc. Tune generator to 226 mc ± 0.005%. (Tune generator for zero tuning meter reading on XTAL operation with 21.3 mc crystal). Ground C261 with a short clip lead. Set bias for a convenient VTVM reading (4-5 VDC).

b. Adjust C216 and C220 for maximum VTVM reading, readjusting bias to keep VTVM below 5v.

c. Tune generator to 252 mc ± 0.005% (with receiver dial set at 252, tune generator for zero tuning meter reading on XTAL operation with 23.5 mc crystal).

d. Adjust C216 and C220 for maximum VTVM reading, noting which one has the most effect and whether capacity is added to or taken out of each circuit.

e. If the change in VTVM reading caused by Step d is less than about 4%, the RF interstage can be considered aligned. If the change is more than this amount, the end inductors, L207 and/or L209 will require adjustment.

f. Adding capacity to a circuit in this instance indicates that the circuit has too much tuning range and the inductance of the coil must be increased. To increase the inductance of the coil compress the turns. Adjust L207 if most of the change in Step d was due to C216. Adjust L209 if the change was due to C220.

g. After adjusting the coil, peak the circuits again at 226 mc and check the tuning at 252 mc (Steps b-e). Repeat as often as necessary for tracking.

5.3.3.5 Alignment of RF Input Network

5.3.3.6 Recommended Equipment

See Appendix under Noise Figure Measurements.

5.3.3.7 Procedure

a. Using VFO operation of the receiver, make noise figure (NF) measurements at 214 mc, 235 mc and 266 mc. If the NF is less than 7 db at these three points, the input circuit can be considered aligned. If these are not the case, the input circuit must be adjusted.

b. Set the receiver to 266 mc and make an incremental adjustment of C205 (1/4 turn). Make an NF measurement.

c. Repeat Step b until the capacitor setting for minimum NF at 266 mc is determined. Set capacitor to this point.

d. Measure NF at 235 mc and 214 mc. Less than 7 db NF at these two points indicates satisfactory alignment. More than 7 db NF indicates that an adjustment of L202 is required.

e. Set the tuning dial to 235 mc and determine setting of C205 for minimum NF as in Step b. If the setting for minimum NF is far more capacity than the setting determined in Step c, the circuit has too little tuning range. To increase the tuning range, compress the coils of L202 slightly.

f. Repeat Steps b through e as required.

5.3.3.8 Adjustment of Oscillator Radiation Cancelling Network

5.3.3.9 Recommended Equipment

Receiver Empire T-2/NF 205

Signal Generator; Hewlett-Packard 608D

6-foot cable RF-62/U

5.3.3.10 Procedure

a. Set receiver under test to VFO operation.

b. Connect antenna of receiver under test to the input of the auxiliary receiver (Empire T-2/NF 205).

c. Tune receiver under test to 235 mc and tune in its local oscillator (30 mc higher in frequency on the auxiliary receiver).

d. Adjust the printed circuit capacitor for a minimum reading on the signal strength meter of the auxiliary receiver.

e. Substitute the receiver under test with the 608D and note the reading on the generator attenuator necessary to produce the same signal strength indication of the auxiliary receiver. The oscillator radiation is specified as being less then 100 μv over the tuning range, but should not be more than about 50 μv at 235 mc.

5.3.4 Alignment Procedure for First Local Oscillator

5.3.4.1 General Instructions

The RF circuits and the oscillator-multiplier circuits are provided with adjustments for both the low end and the high end of the band. The high end adjustments are end inductors or padding inductors. These are adjusted by moving the coils of the inductor. The low end adjustments are trimmer capacitors. In general, adjustment of the circuit capacity using the trimmers will suffice when replacing tubes or when performing routine alignment.

The signal generator should be set to the specified frequency within 0.005%, which is more accurate than the calibrators of most signal generators. If facilities are not available to set frequency to this accuracy, crystals of the appropriate frequencies should be obtained and the signal generator set to frequency using crystal-controlled operation of the receiver. Since the tuning meter would be used as an indication of generator tuning, the tuning meter zero and second local oscillator frequency should be checked before using this procedure. See appropriate alignment sections.

5.3.4.2 Alignment of Oscillator Multiplier Chain

5.3.4.3 Recommended Equipment

Hewlett Packard 410B VTVM

Crystal, McCoy CR-33/U, 20.3333 MC

Crystal, McCoy CR-33/U, 24.6666 MC

5.3.4.4 Alignment Check

Connect VTVM to TP203. Set front panel tuning dial to 214 mc. Set local oscillator control to XTAL operation. Insert 20.3 mc Xtal in front panel socket. Adjust C244 for maximum VTVM reading.

Connect VTVM to TP204. Adjust C251 for maximum VTVM reading.

Connect VTVM to C224. Adjust C254 for maximum VTVM reading.

Connect VTVM to TP203. Set tuning dial to 266 mc. Insert 24.6 mc Xtal in socket. Adjust C244 for maximum VTVM reading. If the change in VTVM reading is more than about 5% with this adjustment, L217 will require adjustment - see complete alignment procedure.

Connect VTVM to TP204. Adjust C251 for maximum VTVM reading. If the change in VTVM reading is more than about 10%, L220 will require adjustment. See complete alignment procedure.

Connect VTVM to C224. Adjust C254 for maximum VTVM reading. If the change in VTVM reading is more than about 15%, L224 will require adjustment. See complete alignment procedure.

5.3.4.5 Complete Alignment of Oscillator Multiplier Chain

a. Connect VTVM to TP203. Set front panel tuning dial to 214 mc. Switch front panel local oscillator control to Xtal operation. Insert 20.3 mc Xtal in front panel Xtal socket. Adjust C244 for maximum VTVM reading (approximately -10v to -15v).

b. Connect VTVM to TP204. Adjust C251 for maximum VTVM reading (approximately -20 to -30v).

c. Connect VTVM to TP203. Set tuning dial to 266 mc. Insert 24.6 mc Xtal. Check circuit tuning by adjusting C244. A decrease in the capacity required to produce a peak VTVM reading indicates that the circuit has too little tuning range. To increase the tuning range, spread the coils of L217, thereby decreasing its inductance.

d. Adjust C244 for peak VTVM reading.

e. Connect VTVM to TP204. Check circuit tuning by adjusting C251. A decrease in the capacity required to produce a peak VTVM reading indicates that the circuit has too little tuning range. To increase the tuning range, spread the coils of L220, thereby decreasing its inductance.

f. Adjust C251 for peak VTVM reading.

g. Connect VTVM to C224. Adjust C254 for maximum VTVM reading (approximately -1.5v).

h. Connect VTVM to TP203. Set the dial to 214 mc. Insert 20.3 mc Xtal. Check tuning by adjusting C244. An increase in capacity required to give a peak VTVM reading indicates too little tuning range. Reduce inductance of L217 to increase range. (Refer to Step c).

i. Adjust C244 for peak VTVM reading.

j. Connect VTVM to TP204. Check tuning by adjusting C251. An increase in capacity required to give a peak VTVM reading indicates too little tuning range. Reduce inductance of L220 to increase range. (Refer to Step e).

k. Adjust C251 for peak VTVM reading.

l. Connect VTVM to C224. Check circuit tuning by adjusting C254. An increase in the capacity required to give a peak VTVM reading indicates that the circuit has too little tuning range. To increase the tuning range, compress the coils of L224, thereby increasing its inductance.

m. Adjust C254 for peak VTVM reading.

n. Repeat Steps c through f.

o. Connect VTVM to C224. Check tuning by adjusting C254. A decrease in capacity required to give a peak VTVM reading indicates too little tuning range. Increase inductance of L224 to increase range. (Refer to Step l).

p. Adjust C254 for peak VTVM reading

q. Repeat Steps j through p as required for circuit tracking and tuning range

5.3.4.6 Alignment of VFO

5.3.4.7 Recommended Equipment

Hewlett Packard 410B VTVM

Signal Generator, Hewlett-Packard Model 608-D

Crystal, McCoy CR-33/U 20.3333 mc

Crystal, McCoy CR-33/U 24.6666 mc

Cable, RG-62/U

5.3.4.8 Alignment Check

Check the zero adjustment of the tuning meter and the second local oscillator frequency for zero setting of the vernier tuning dial. See appropriate alignment procedures.

Connect signal generator to antenna input connector. Set generator output to 214 mc ± 0.005% and 1 mv (tune generator on XTAL operation at 214 mc with 20.3 mc crystal). Switch to VFO operation and tune in the signal. If the tuning dial does not read correctly, set it to 214 mc and adjust C235 for a zero reading on the tuning meter.

Set the input frequency to 266 mc ± 0.005% (tune generator on XTAL operation at 266 mc with 24.6 mc crystal). Switch to VFO operation and tune in the signal. If the tuning dial reads 266 mc, the adjustment is complete. If the dial error is less than approximately 200 kc it is better to split the error at the band edges by adjusting C235 as required than to attempt further adjustment. If the dial error is excessive, L213 will require adjustment according to the following procedure.

5.3.4.9 Complete Alignment of VFO

a. Connect the signal generator to antenna input of receiver, using coaxial cable.

b. Set dial to 266 mc. Insert 24.6 mc crystal. Switch to XTAL operation. Tune generator to 266 mc as indicated by the tuning meter. Switch to VFO operation. Check circuit tuning by adjusting C235 for correct tuning meter reading. If a decrease in capacity is required, the circuit has too little tuning range. Reduce inductance of L213 by spreading coils.

c. Adjust C235 for tuning meter zero.

d. Set dial to 214 mc. Insert 20.3 mc crystal. Switch to XTAL operation. Tune generator to 214 mc as indicated by the tuning meter. Switch to VFO operation. Check circuit tuning by adjusting C235 for correct tuning meter reading. If an increase in capacity is required, the circuit has too little tuning range. Reduce inductance of L213 to increase range. (Refer to Step b).

e. Adjust C235 for tuning meter zero.

f. Repeat Steps b through e as required for tracking and tuning range.

g. Set dial to 214 mc. Insert 20.3 mc crystal. Switch to crystal operation. Tune generator to 214 mc as indicated by tuning meter. Switch to VFO operation. Zero tuning meter by varying receiver tuning control. Note tuning dial offset.

h. Repeat Step g at 226 mc, 238 mc, 252 mc and 266 mc. The dial error should be essentially zero at 214 and 266, as these are the oscillator tracking points. If the other points are off by more than about 0.2 mc, the oscillator will have to be adjusted.

i. If the errors are predominately on one side and are not too great the dial error may be split by adjusting C235 so that there is less error at the worst point and taking a slight error at the ends of the band.

j. If the errors are too great or Step i will not reduce the dial error to less than 0.2 mc, L214 will have to be adjusted. If the dial reads high when tuned to 252 mc, spread the turns of L214.

k. Repeat Step a.

l. Repeat Steps b through k as required.

m. Switch to VFO operation. Connect VTVM to C224. Adjust C354 for most nearly constant VTVM reading while tuning across the range.

5.4 ALIGNMENT OF ISOLATED FM DEMODULATOR

5.4.1 Recommended Equipment

Sweep Generator to sweep at 10 mc

Jerrold Model 602 or equivalent

CW Signal Generator - Hewlett Packard Model #606D or equivalent

Digital Voltmeter-Cubic Model V45

Frequency Counter-Hewlett Packard Model 524

Oscilloscope - Hewlett Packard Model 130A or equivalent (dc and demodulator probes required)

Step Attenuator - Kay Model 30-0 or equivalent

5.4.2 Preliminary Connections

Connect sweep generator (Jerrold) RF output to J1 through the Kay attenuator. Connect sweep generator (Jerrold) horizontal output to the horizontal input of the oscilloscope. By means of a Tee-connector join the output of the sweep generator to the output of the marker generator.

5.4.3 Alignment of Limiters Q1 and Q2

Connect the demodulator probe to the base pin of transistor Q2.

Note

> Maintain a minimum input signal level that will not cause limiter Q1 to saturate, thereby allowing L1 to be resonated at 10 mc for maximum amplitude.

Re-position the demodulator probe to the base pin of transistor Q3.

Note

> Adjust the input signal level to prevent saturation of limiter Q2. Adjust L2 to resonate at 10 mc for maximum amplitude (see Fig. 5-5).

Disconnect the demodulator probe. Replace module cover before proceeding with alignment.

Connect the DC probe to TP1.

Adjust the slug of L4 inward to its limit. Adjust the slug of L5 outward to its limit (see Fig. 5-6).

Increase the amplitude of the marker generator to determine the position of the 10 mc mark.

Adjust the horizontal position control on the oscilloscope to position the mark on the center line of the graticule.

Remove the 10 mc marker signal. Do Not disturb the oscilloscope horizontal position control or the horizontal sweep width control on the sweep generator after the 10 mc mark has been centered.

Proceed to adjust L3, L4, and L5 alternately to obtain the waveshape indicated in Fig. 5-7 centered on 10 mc. Note that the retrace line of the scope is approximately 2/3 down from the top of the waveshape.

5.4.4 Linearity

Adjust inductors L3, L4, and L5 and resistor R1 to obtain the desired linearity indicated in Fig. 5-7. Disconnect all test equipment. (Refer to Fig. 5-8 for Test Set-up). Connect the CW generator to J1 on the FM demodulator. Connect the Digital Voltmeter to TP1. Adjust the signal generator, without modulation to a level of minus 20 dbm. Vary the signal generator ± 500 kc around the 10 mc center frequency. Record frequency counter and digital voltmeter readings every 100 kc.

Plot these readings and from them draw the best possible straight line and record the maximum error voltage deviation over a range of ± 500 kc. This maximum error divided by the full scale digital VM reading x 100 is the percentage error. The full scale digital VM reading is digital VM $\frac{(9.5\text{ mc - digital VM }(10.5\text{ mc})}{2}$. Record the percentage error. If the error is greater than 1% readjust R1 and possibly L3, L4, and L5 as described previously.

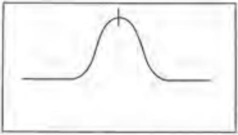


Fig. 5-5. L2 Maximum Amplitude

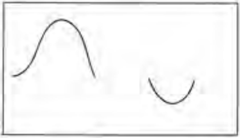


Fig. 5-6. L4 and L5, Preliminary Adjustment Waveshape

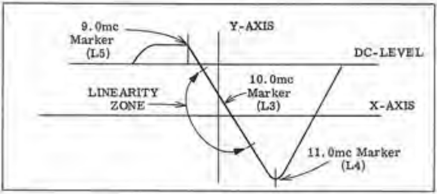


Fig. 5-7. Linearity Waveshape Adjustment

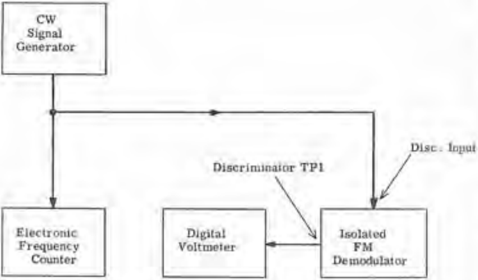


Fig. 5-8. Discriminator Linearity Test Set-Up

5.5 ALIGNMENT OF PLAYBACK UP-CONVERTER

NOTE: This alignment procedure describes the set-up for the 10 mc - 600 kc pre-detection RECORD/PLAYBACK unit. Alignment of the 10 mc - 5 mc PLAYBACK unit is made in the same manner except that 5 mc is substituted for 600 kc. In addition, the 10 mc - 5 mc unit does not provide a record feature. (Refer to Fig. 5-12 for location of playback up-converter and associated relays).

5.5.1 Recommended Equipment

Jerrold Model 602 Sweep Generator or Equivalent

Tektronix 545 with high gain preamplifier and probe

Hewlett-Packard 608-D or Equivalent

A Test Receiver GEL Model 11G1-A

Boonton 202-E with Univerter 207-E or equivalent

HP-650-A Wide Band Oscillator

HP-410-B Vacuum Tube Voltmeter

5.5.2 Alignment

a. Connect the input cable of T1101 to its IF Output. (Note: The capacity of this cable forms a part of the tuned input circuit of T1101).

b. Connect a sweep generator to the receiver adjusted to sweep its bandwidth.

c. Disable the crystal oscillator by removing its crystal.

d. Connect the oscilloscope probe to the detected side of either of the mixing diodes (CR1101 or CR1102).

e. Tune T1101 and T1102 (Top and Bottom) for a symmetrical response centered at 10.0 mc with a 500 kc bandwidth.

f. Compare the amplitudes of the detected responses from each of the mixer diodes. If the amplitudes are not equal, readjust T2, Top and Bottom, to acquire a more favorable balance (i.e.; decrease the inductance of T1102, Top, and increase the inductance of T1102, Bottom, or vice-versa), the objective being equal output responses of the mixer diodes.

g. Replace the crystal.

h. Connect the HP-410B, vacuum tube voltmeter, to the junction of C1104 (4-30 $\mu\mu$f trimmer) and C1107 (4.3 $\mu\mu$f).

i. Adjust C1112 (JFD piston) for maximum output - approximately 1.5 vrms.

j. Connect the Boonton 202E and univerter adjusted for maximum RF output at 600 kc, 1 kc, FM Modulation Rate, and 100 kc Deviation to J1102 PLAYBACK.

k. Make the necessary switching to insure that the test receiver is acting to demodulate the Boonton FM signal.

l. Observing the FM Video output from the test receiver adjust C1104 (4-30 trimmer) and C1105 (4-30 trimmer) in conjunction with L1101 and L1102 for best undistorted signal to noise ratio.

m. Connect a 220 ohm resistor to J1103 RECORD output.

n. Make the necessary switching to insure that the test receiver is acting to supply the PLAYBACK UP-CONVERTER with its 10 mc IF output.

o. Using the HP-608D, tune the test receiver to a 1 mv, 30% AM signal.

p. Connect the oscilloscope across the 220 ohm resistor at J1103 RECORD output. Observe a 30% AM signal with a 1 mc carrier. The amplitudes of this signal is determined by the Test Receiver's AGC characteristics (minimum 200 mv).

q. Adjust L1103 for best signal to noise ratio.

5.6 METER CALIBRATIONS

5.6.1 Adjustment of Deviation Meter

5.6.1.1 Recommended Equipment

Boonton 202-F Signal Generator

Hewlett-Packard 200-CD Audio Oscillator

Hewlett-Packard 400-D Vacuum Tube Voltmeter

5.6.1.2 General Instructions

The frequency response of the deviation meter amplifier is set by C114 and the calibration is set by R141. The deviation meter calibration should be checked periodically while the frequency response requires only an occasional check. (Refer to 5-10 for location of meters).

Check the zero on the deviation meter by observing the position of the pointer when the receiver has been turned off long enough for the tubes to cool.

5.6.1.3 Adjustment of R141

Connect the signal generator to the antenna input. Set the generator frequency to 238 mc and its output to 5000 µv. Set the Local Oscillator switch to VFO and tune in the signal.

Observe the incidental meter reading with no modulation. The meter indication should be no more than the equivalent of 500 cycles deviation greater than the zero indication as checked above. If there is an excessively high meter indication, this condition should be corrected.

Set the Deviation Range switch to the 150 kc range. Set the generator modulation for 125 kc deviation at 1000 cycles. Adjust R141 for a deviation meter reading of 125 kc.

5.6.1.4 Adjustment of C114

Disconnect the video output lead from the feed-thru terminal on the limiter discriminator sub-chassis. Set the Deviation Range switch to the 150 kc range. Connect the audio oscillator through a suitable attenuator between the tie point for C106 and ground. Connect the voltmeter to this same point.

Set the oscillator frequency to 1000 cps and adjust its output for a convenient indication on the deviation meter. Note the voltmeter reading.

Set the oscillator frequency to 200 kc and adjust its output for the same voltmeter reading as above. Adjust C114 to produce the same deviation meter reading as above.

Remove the voltmeter and oscillator connections. Replace the lead to the feed-thru terminal on the limiter discriminator sub-chassis. Note: After C114 has been adjusted, recheck the calibration of the deviation meter.

5.6.2 Adjustment of Tuning Meter

5.6.2.1 Recommended Equipment

Hewlett-Packard 606-A Signal Generator

5.6.2.2 General Instructions

The tuning meter zero should be checked periodically following this procedure. By using a 10 mc signal fed into the second IF strip, there is no possibility of a misadjustment due to the second local oscillator not being exactly on 40 mc.

5.6.2.3 Procedure

Disconnect the input cable to the second IF amplifier at J202 and connect the signal generator to this cable. Adjust the generator output to 200,000 microvolts (or more) and the frequency to 10 mc ± 1 kc. Adjust R114 for a zero reading on the tuning meter.

5.6.3 Adjustment of Video Output Meter

5.6.3.1 Recommended Equipment

Boonton 202-F Signal Generator

5.6.3.2 General Instructions

The Video Output Meter is generally for reference only and should be adjusted for a level convenient to the operator.

5.6.3.3 Procedure

Connect Boonton 202-F Signal Generator to the ANT. INPUT of the receiver.

Set the output of the Signal Generator for 1k µv and adjust its frequency to that for which the receiver is tuned.

Carefully peak both Main Tuning and VERNIER Tuning.

Use 1000 cps modulation and FM deviation of 150 kc.

Set DEVIATION RANGE Switch to 150 kc.

Turn VIDEO GAIN Control full clockwise.

Adjust R128 for 0 db on the dial.

Disconnect the signal generator. This completes the Video Output Meter alignment.

5.6.4 Adjustment of Signal Level Meter

5.6.4.1 Recommended Equipment

Boonton 202-F Signal Generator

5.6.4.2 General Instructions

The signal level meter should normally be set up using a power line voltage of 115-volts. Separate adjustments are provided for each second IF sub-chassis and these are located on the sub-chassis.

Install the second IF amplifier to be adjusted. Connect the signal generator to the antenna input (J101). Set the generator frequency to 238 mc. Set the Local Oscillator switch to VFO and tune in the signal.

5.6.4.3 Adjustment 750 kc Bandwidth Strip

a. Set the attenuator on the signal generator to 2 μv. Adjust R737 for a reading of 2 μv on the signal level meter.

b. Set the attenuator on the signal generator to 10 k μv. Adjust R732 for a full-scale reading on the signal level meter.

c. Repeat steps a and b above until the signal level meter reads correctly at both points.

5.6.4.4 Adjustment 500 kc Bandwidth Strip

a. Set the attenuator on the signal generator to 2 μv. Adjust R437 for a reading of 2 μv on the signal level meter.

b. Set the attenuator on the signal generator to 10 k μv. Adjust R432 for a full-scale reading on the signal level meter.

c. Repeat steps a and b above until the signal level meter reads correctly at both points.

5.6.4.5 Adjustment 300 kc Bandwidth Strip

a. Set the attenuator on the signal generator to 2 μv. Adjust R337 for a reading of 2 μv on the signal level meter.

b. Set the attenuator on the signal generator to 10 k μv. Adjust R332 for a full-scale reading on the signal level meter.

c. Repeat steps a and b above until the signal level meter reads correctly at both points.

5.6.4.6 Adjustment 100 kc Bandwidth Strip

a. Set the attenuator on the signal generator to 2 μv. Adjust R537 for a reading of 2 μv on the signal level meter.

b. Set the attenuator on the signal generator to 10 k μv. Adjust R532 for a full-scale reading on the signal level meter.

c. Repeat steps a and b above until the signal level meter reads correctly at both points.

5.6.5 Adjustment of Hum Balance Control

5.6.5.1 Recommended Equipment

Hewlett-Packard 608-D Signal Generator

Hewlett-Packard Oscilloscope Model 130A

5.6.5.2 Procedure

Remove the input cable to the second IF amplifier at J202 and connect the signal generator to this cable. Connect the oscilloscope to the FM video output (J106). Set the generator output frequency to 10 mc and set the output level as required to quiet the video output to the point where noise does not mask the hum.

Adjust R163 for a minimum amount of hum output.

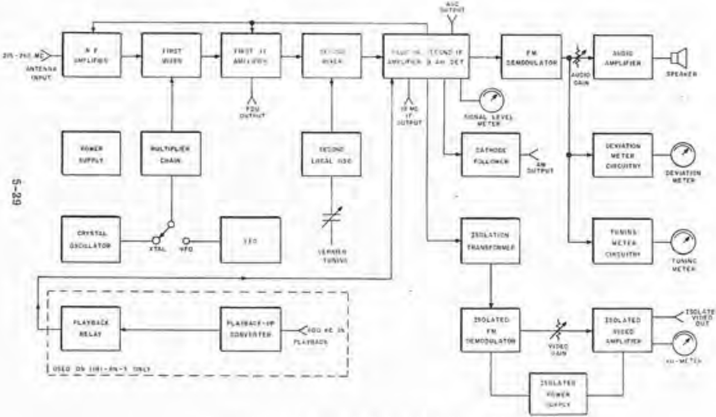


FIG. 5-9 BLOCK DIAGRAM TYPE 1181-BN-2,3 VHF TELEMETRY RECEIVER

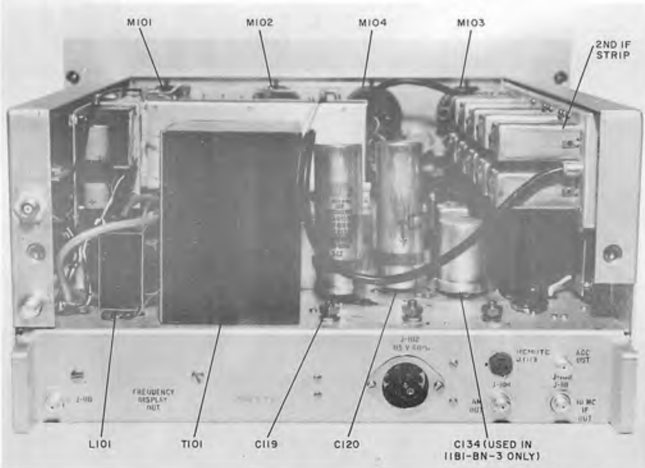


Fig. 5-10. Rear View - Cover Removed

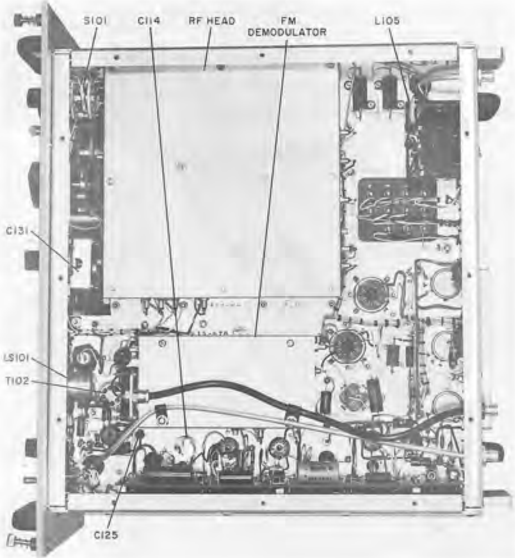


Fig. 5-11. Bottom View - Cover Removed

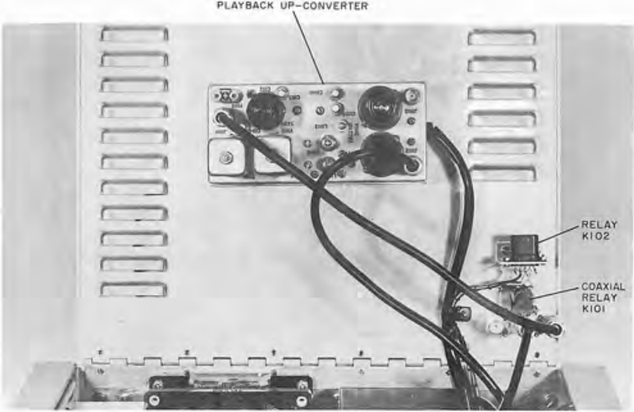


Fig. 5-12 Playback Up-Converter and Associated Relays (Model 11B1-BN-3 only)

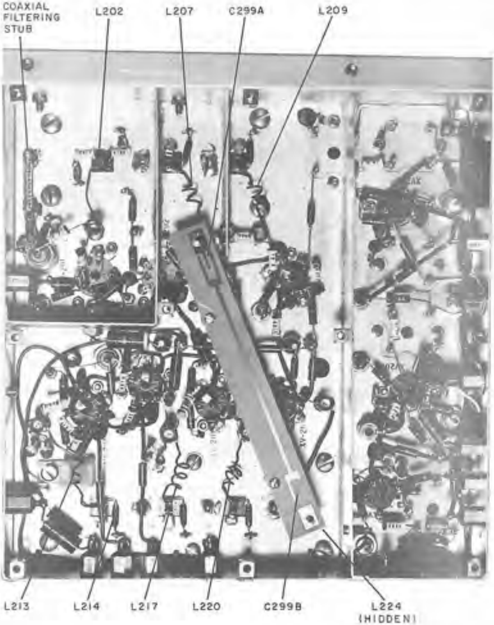


Fig. 5-13 RF Head-Cover Removed

6.0 PARTS LIST

6.1 R.F. SECTION

Ref Designation	Description	GEL Part No.
C201	CAPACITOR, FIXED, CERAMIC TUBULAR, 4.7 pf ± 0.25 pf, Erie NPO-A	12014
C202	CAPACITOR, FIXED, CERAMIC TUBULAR, 10 pf ± 5%, Erie NPO-A	12172
C203	CAPACITOR, FIXED, CERAMIC TUBULAR, 24 pf ± 5%, Erie NPO-A	12032
C204	CAPACITOR: Same as C203	
C205	CAPACITOR, VARIABLE, PISTON 0.8-8.5 pf, JFD-VC-20G	13305
C206	CAPACITOR, FIXED, CERAMIC TUBULAR, 6.8 pf ± 0.25 pf, Erie NPO-A	12018
C207	CAPACITOR, FIXED, CERAMIC FEED-THRU 0.001 pf ± 20%, Erie GP2-327	12067
C208	CAPACITOR, FIXED, CERAMIC DISC, 100 pf ± 10%, Erie HR-839-X5F	12082
C209	CAPACITOR, FIXED, CERAMIC FEED-THRU 0.001 pf ± 20%, Erie GP3-2443	12047
C210	CAPACITOR: Same as C208	
C211	CAPACITOR: Same as C207	
C212	CAPACITOR: Same as C208	

Ref. Designation	Description	GEL Part No.
C213	CAPACITOR, FIXED, CERAMIC STAND-OFF 0.0015 pf ± 20%, Erie 326-XFU-152M	12069
C214	CAPACITOR: Same as C203	
C215	CAPACITOR, FIXED, CERAMIC TUBULAR, 18 pf ± 5%, Erie NPO-A	12029
C216	CAPACITOR, VARIABLE, PISTON, 0.8-4.5 pf, JFD-VC-21G	13306
C217	CAPACITOR, FIXED, CERAMIC TUBULAR, 1.0 pf ± 0.1 pf, Erie NPO-A	12089
C218	CAPACITOR: Same as C216	
C219	CAPACITOR, FIXED, CERAMIC TUBULAR, 0.68 pf ± 0.1 pf, Erie NPO-A	12001
C220	CAPACITOR: Same as C216	
C221	CAPACITOR, FIXED, CERAMIC TUBULAR, 8.2 pf ± 0.25 pf, Erie NPO-A	12020
C222	CAPACITOR, FIXED, CERAMIC TUBULAR, 0.51 pf ± 0.1 pf, Erie NPO-A	12000
C223	CAPACITOR, FIXED, CERAMIC DISC., 0.001 pf + 100% - 20%, Erie CK61Y102Z	12070
C224	CAPACITOR, FIXED, CERAMIC FEED-THRU 47 pf ± 20%, GP1-327	12149
C225	CAPACITOR: Same as C223	
C226	CAPACITOR, FIXED, CERAMIC TUBULAR, 2.2 pf ± 0.1 pf, Erie NPO-A	12006

Ref Designation	Description	GEL Part No.
C227	CAPACITOR: Same as C205	
C228	CAPACITOR: Same as C202	
C229	CAPACITOR, FIXED, CERAMIC TUBULAR, 20 pf ± 5%, Erie NPO-A	12031
C230	CAPACITOR: Same as C207	
C231	CAPACITOR: Same as C223	
C232	CAPACITOR: Same as C207	
C233	CAPACITOR, FIXED, CERAMIC TUBULAR, 33 pf ± 5%, Erie Type NPO-T	12035
C234	CAPACITOR: Same as C233	
C235	CAPACITOR, VARIABLE, PISTON 0.7-12 pf, JFD-VC-22G	13307
C236	CAPACITOR, FIXED, CERAMIC TUBULAR, 47 pf ± 5%, Erie NPO-T	12040
C237	CAPACITOR, FIXED, CERAMIC TUBULAR, 15 pf ± 5%, Erie NPO-A	12027
C238	CAPACITOR, FIXED, CERAMIC TUBULAR, 3.9 pf ± 0.25 pf, Erie NPO-A	12012
C239	CAPACITOR: Same as C213	
C240	CAPACITOR: Same as C223	

Ref. Designation	Description	GEL Part No.
C241	CAPACITOR: Same as C236	
C242	CAPACITOR, FIXED, CERAMIC TUBULAR, 39 pf ± 5%, Erie NPO-T	12037
C243	CAPACITOR: Same as C229	
C244	CAPACITOR, VARIABLE, GLASS, 0.8 to 18 pf, JFD-VC-22G	13314
C245	CAPACITOR: Same as C207	
C246	CAPACITOR: Same as C236	
C247	CAPACITOR: Same as C223	
C248	CAPACITOR: Same as C213	
C249	CAPACITOR: Same as C203	
C250	CAPACITOR: Same as C206	
C251	CAPACITOR: Same as C205	
C252	CAPACITOR: Same as C203	
C253	CAPACITOR: Same as C237	
C254	CAPACITOR: Same as C205	

Ref Designation	Description	GEL Part No.
C255	CAPACITOR: Same as C213	
C256	CAPACITOR: Same as C223	
C257	CAPACITOR: Same as C223	
C258	CAPACITOR, FIXED, CERAMIC TUBULAR, 3.6 pf ± 0.1 pf, Erie NPO-A	
C259	CAPACITOR: Same as C221	
C260	CAPACITOR, FIXED, CERAMIC TUBULAR, 6.2 pf ± 0.25 pf, Erie NPO-A	12017
C261	CAPACITOR: Same as C207	
C262	CAPACITOR, FIXED, SILVERED MICA, 470 pf ± 5%, Elmenco CM15E471J	12524
C263	CAPACITOR: Same as C236	
C264	CAPACITOR: Same as C236	
C265	CAPACITOR: Same as C223	
C266	CAPACITOR, FIXED, CERAMIC DISC., 0.001 μf ± 10%, Erie HR-809-X5T	12087
C267	CAPACITOR: Same as C266	
C268	CAPACITOR: Same as C207	
C269	CAPACITOR, FIXED, CERAMIC TUBULAR, 10 pf ± 0.25 pf Erie N470A	

Ref. Designation	Description	GEL Part No.
C270	CAPACITOR, FIXED, CERAMIC TUBULAR, 4.3 pf ± 0.25 pf, Erie NPO-A	12013
C271	CAPACITOR, FIXED, CERAMIC TUBULAR, 5.6 pf ± 0.25 pf, Erie NPO-A	12016
C272	CAPACITOR, FIXED, CERAMIC, 22 pf ± 2%, Erie NPO-A	
C273	CAPACITOR, FIXED, CERAMIC DISC., 0.0047 + 100% - 20%, Erie CK62Y472Z	12050
C274	CAPACITOR: Same as C203	
C275	CAPACITOR: Same as C224	
C276	CAPACITOR: Same as C273	
C277	CAPACITOR: Same as C273	
C278	CAPACITOR: Same as C207	
C279	CAPACITOR: Same as C233	
C280	CAPACITOR, FIXED, CERAMIC DISC., 0.0015 pf + 100% - 20%, Erie CK61Y152Z	12053
C281	CAPACITOR, FIXED, CERAMIC TUBULAR, 12 pf ± 5%, Erie NPO-A	12024
C282	CAPACITOR: Same as C280	
C283	CAPACITOR: Same as C266	

Ref. Designation	Description	GEL Part No.
C284	CAPACITOR: Same as C207	
C285	CAPACITOR: Same as C213	
C286	CAPACITOR: Same as C207	
C287	CAPACITOR: Same as C208	
C288	CAPACITOR: Same as C207	
C289	CAPACITOR: Same as C213	
C290	CAPACITOR: Same as C280	
C291	CAPACITOR, FIXED, CERAMIC TUBULAR, 470 pf ± 10 %, Erie GP2-327	12062
C292	CAPACITOR: Same as C269	
C293	CAPACITOR, FIXED, CERAMIC DISC., 180 pf ± 1%, NPO, Erie Style 3871	12072
C294	CAPACITOR: Same as C293	
C295	CAPACITOR: Same as C280	
C296	CAPACITOR: Same as C273	
C297	CAPACITOR: Same as C273	

Ref. Designation	Description	GEL Part No.
C298	CAPACITOR: Same as C236	
C299	CAPACITOR, FIXED PRINTED	
C1201	CAPACITOR: Same as C222	
C1202	CAPACITOR, FIXED PAPER, 0.47 μf, 200V, Aerovox P-123-ZGP	12916
C2008	CAPACITOR: Same as C207	
J201	RECEPTACLE, COAXIAL, BNC, UG-1094/U	
J202	RECEPTACLE: Same as J201	
J203	RECEPTACLE: Same as J201	
J204	RECEPTACLE: Same as J201	
J205	RECEPTACLE: Same as J201	
J206	RECEPTACLE: Same as J201	
L201	INDUCTOR, FIXED	A15-255
L202	INDUCTOR	A10-786
L203	INDUCTOR	A10-779
L204	INDUCTOR	A10-780

Ref Designation	Description	GEL Part No.
L205	INDUCTOR	A10-781
L206	INDUCTOR: Same as L203	
L207	INDUCTOR	A10-787
L208	INDUCTOR	A10-782
L209	INDUCTOR: Same as L207	
L210	INDUCTOR: Same as L208	
L211	INDUCTOR: Same as L205	
L212	INDUCTOR, FIXED, 11.5 pf	A10-163
L213	INDUCTOR	A10-788
L214	INDUCTOR	A10-783
L215	INDUCTOR	A10-784
L216	INDUCTOR	A10-785
L217	INDUCTOR	A10-789
L218	INDUCTOR: Same as L214	
L219	INDUCTOR: Same as L203	
L220	INDUCTOR: Same as L217	
L221	INDUCTOR: Same as L214	

Ref Designation	Description	GEL Part No.
L222	INDUCTOR: Same as L205	
L223	INDUCTOR: Same as L201	
L224	INDUCTOR: Same as L202	
L225	INDUCTOR	B10-103
L226	INDUCTOR, PART OF T201A	
L227	INDUCTOR, PART OF T201B	
L228	INDUCTOR, PART OF T202A	
L229	INDUCTOR, PART OF T202B	
L230	INDUCTOR: Same as L225	
L231	INDUCTOR: Same as L225	
L232	INDUCTOR: Same as L225	
L233	INDUCTOR	A10-374
L234	INDUCTOR, VARIABLE	A11-308
L235	INDUCTUNER, PART OF D15-892-3	
L236	INDUCTUNER, PART OF D15-892-3	
L237	INDUCTOR, VARIABLE	A11-372
L238	INDUCTOR: Same as L225	

Ref. Designation	Description	GEL Part No.
R201	RESISTOR, FIXED COMPOSITION, 220K ± 5%, 1/2W, Allen Bradley EB-2245	10608
R202	RESISTOR: Same as R201	
R203	RESISTOR, FIXED COMPOSITION, 220 ohm ± 5%, 1/2W, Allen Bradley EB-2215	10454
R204	RESISTOR, FIXED COMPOSITION, 910 ohm ± 5%, 2W, Allen Bradley HB-9115	11403
R205	RESISTOR, FIXED COMPOSITION, 10 ohm ± 5%, 1/2W, Allen Bradley EB-1005	10442
R206	RESISTOR, FIXED COMPOSITION, 68 ohm ± 5%, 1/2W, Allen Bradley EB-6805	10444
R207	RESISTOR, FIXED COMPOSITION, 100 ohm ± 5%, 1/2W, Allen Bradley EB-1015	10447
R208	RESISTOR, FIXED COMPOSITION, 470K ± 5%, 1/2W, Allen Bradley EB-4745	10541
R209	RESISTOR: Same as R208	
R210	RESISTOR, FIXED COMPOSITION, 120K ± 5%, 1/2W, Allen Bradley EB-1245	10431
R211	RESISTOR, FIXED COMPOSITION, 22K ± 5%, 1/2W, Allen Bradley EB-2235	10427
R212	RESISTOR, FIXED COMPOSITION, 1 meg ± 5%, 1/2W, Allen Bradley EB-1055	11424
R213	RESISTOR, FIXED COMPOSITION, 13K ± 5%, 1/2W, Allen Bradley EB-1335	10400
R214	RESISTOR, FIXED COMPOSITION, 10K ± 5%, 1/2W, Allen Bradley EB-1035	10408

Ref. Designation	Description	GEL Part No.
R215	RESISTOR: Same as R212	
R216	RESISTOR: Same as R213	
R217	RESISTOR: Same as R212	
R218	RESISTOR, FIXED COMPOSITION, 100K ± 5%, 1/2W, Allen Bradley EB-1045	10430
R219	RESISTOR, FIXED COMPOSITION, 20K ± 5%, 1/2W, Allen Bradley EB-2035	10420
R220	RESISTOR: Same as R205	
R221	RESISTOR: Same as R212	
R222	RESISTOR: Same as R218	
R223	RESISTOR, FIXED COMPOSITION, 18 meg ± 5%, 1/2W, Allen Bradley EB-1865	10466
R224	RESISTOR: Same as R219	
R225	RESISTOR: Same as R237	
R226	RESISTOR, FIXED COMPOSITION, 2.2K ± 5%, 1/2W, EB-2225	
R227	RESISTOR: Same as R218	

Ref. Designation	Description	GEL Part No.
R228	RESISTOR, FIXED COMPOSITION, 51 ohm ± 5%, 1/2W, Allen Bradley EB-5105	10443
R229	RESISTOR, FIXED COMPOSITION, 120 ohm ± 5%, 1/2W, Allen Bradley EB-1215	10449
R230	RESISTOR, FIXED COMPOSITION, 33K ± 5%, 1/2W, Allen Bradley EB-3335	10600
R231	RESISTOR, FIXED COMPOSITION, 15K ± 5%, 1/2W, Allen Bradley EB-1535	10419
R232	RESISTOR: Same as R237	
R233	RESISTOR: Same as R226	
R234	RESISTOR: Same as R201	
R235	RESISTOR: Same as R214	
R236	RESISTOR, FIXED COMPOSITION, 7.5K ± 5%, 1/2W, Allen Bradley EB-7525	10415
R237	RESISTOR, FIXED COMPOSITION, 1K ± 5%, 1/2W, Allen Bradley EB-1025	10401
R238	RESISTOR: Same as R214	
R239	RESISTOR, FIXED COMPOSITION, 47K ± 5%, 1/2W, Allen Bradley EB-4735	10429
R240	RESISTOR, FIXED COMPOSITION, 56K ± 5%, 1W, Allen Bradley GB-5635	10903
R241	RESISTOR, FIXED COMPOSITION, 3.3K ± 5%, 1/2W, Allen Bradley EB-3325	10545

Ref. Designation	Description	GEL Part No.
R242	RESISTOR, FIXED COMPOSITION, 3K ± 5%, 2W, Allen Bradley HB-3025	10403
R243	RESISTOR, FIXED COMPOSITION, 200 ohm ± 5%, 2W, Allen Bradley HB-2015	10649
R244	RESISTOR, FIXED COMPOSITION, 910K ± 5%, 1/2W, Allen Bradley EB-9145	10441
R245	RESISTOR: Same as R203	
R246	RESISTOR, FIXED COMPOSITION, 10K ± 5%, 1/2W, Allen Bradley EB-1035	10406
R247	RESISTOR, FIXED COMPOSITION, 2M ± 5%, 1/2W, EB-2055	
T201A	IF TRANSFORMER ASSY.	
T201B	IF TRANSFORMER ASSY.	
T202A	IF TRANSFORMER ASSY.	
T202B	IF TRANSFORMER ASSY.	
V201	TUBE, ELECTRON, Type 5842/417A	14804
V202	TUBE: Same as V201	
V203	TUBE, ELECTRON, Type 5654/6AK5W	14834
V204	TUBE, ELECTRON, Type 6AU6WA	14762
V205	TUBE, ELECTRON, Type 6AH6	14766

Ref. Designation	Description	GEL Part No.
V206	TUBE: Same as V203	
V207	TUBE: Same as V203	
V208	TUBE, ELECTRON, Type 5749/6BA6W	14788
V209	TUBE, ELECTRON, Type 5725	14767
V210	TUBE: Same as V204	
Z201	COIL ASSY., Second Local Osc.	

6.2 300 KC SECOND IF

Ref. Designation	Description	GEL Part No.
C301	CAPACITOR, FIXED CERAMIC DISC., 0.0047 pf + 100% - 20%, Erie CK62Y472Z	1205
C302	CAPACITOR, FIXED CERAMIC TUBULAR, 5.6 pf ± 0.25 pf, Erie NPO-A	12016
C303	CAPACITOR, INTEGRAL PART of T-301A	
C304	CAPACITOR: Same as C302	
C305	CAPACITOR: Same as C302	
C306	CAPACITOR, FIXED CERAMIC TUBULAR, 6.8 pf ± 5%, Erie NPO-T	12246

Ref. Designation	Description	GEL Part No.
C307	CAPACITOR, FIXED CERAMIC DISC., 0.0015 pf + 100% - 20%, Erie CK61Y1522	12053
C308	CAPACITOR, FIXED CERAMIC DISC., 0.0047 pf ± 20%, Erie HR-829-X5T	12095
C309	CAPACITOR: Same as C308	
C310	CAPACITOR: Same as C308	
C311	CAPACITOR: Same as C308	
C312	CAPACITOR, FIXED CERAMIC TUBULAR, 5.6 pf ± 0.25 pf, Erie NPO-A	12016
C313	CAPACITOR, FIXED CERAMIC TUBULAR, 27 pf ± 5%, Erie NPO-T	12034
C314	CAPACITOR: Same as C312	
C315	CAPACITOR, FIXED CERAMIC TUBULAR, 47 pf ± 5%, Erie NPO-T	12040
C316	CAPACITOR: Same as C306	
C317	CAPACITOR: Same as C307	
C318	CAPACITOR: Same as C308	
C319	CAPACITOR: Same as C308	
C320	CAPACITOR: Same as C308	

Ref. Designation	Description	GEL Part No.
C321	CAPACITOR: Same as C302	
C322	CAPACITOR: Same as C313	
C323	CAPACITOR: Same as C302	
C324	CAPACITOR: Same as C315	
C325	CAPACITOR: Same as C306	
C326	CAPACITOR: Same as C307	
C327	CAPACITOR: Same as C308	
C328	CAPACITOR: Same as C308	
C329	CAPACITOR: Same as C308	
C330	CAPACITOR, FIXED CERAMIC TUBULAR, 6.2 pf ± 0.25 pf, Erie NPO-A	12017
C331	CAPACITOR: Same as C313	
C332	CAPACITOR: Same as C302	
C333	CAPACITOR: Same as C302	
C334	CAPACITOR: Same as C306	

Ref. Designation	Description	GEL Part No.
C335	CAPACITOR, FIXED CERAMIC DISC, 0.001 pf ± 20%, Erie HR-809-X5T	12087
C336	CAPACITOR: Same as C308	
C337	CAPACITOR: Same as C308	
C338	CAPACITOR: Same as C335	
C339	CAPACITOR: Same as C308	
C340	CAPACITOR, FIXED CERAMIC TUBULAR, 22 pf ± 5%, Erie NPO-A	12057
C341	CAPACITOR: Same as C308	
C342	CAPACITOR, FIXED CERAMIC FEED-THRU 0.001 pf ± 20%, Erie GP2-327	12049
C343	CAPACITOR: Same as C302	
C344	CAPACITOR: Same as C302	
C345	CAPACITOR, INTEGRAL PART of T-305B	
C346	CAPACITOR: Same as C340	
C347	CAPACITOR, FIXED SILVERED MICA, 820 pf ± 5%, Arco CM20D821J	12518
C348	CAPACITOR, FIXED CERAMIC TUBULAR, 470 pf ± 10%, Erie GP2-331	12062

Ref Designation	Description	GEL Part No.
C349	CAPACITOR, FIXED CERAMIC TUBULAR, 12 pf ± 5%, Erie NPO-A	12029
C350	CAPACITOR: Same as C308	
C351	CAPACITOR: Same as C308	
C352	CAPACITOR: Same as C307	
C353	CAPACITOR: Same as C307	
C354	CAPACITOR: Same as C307	
C355	CAPACITOR: Same as C307	
C356	CAPACITOR: Same as C315	
C357	CAPACITOR, CERAMIC TUBULAR 24pf ± 2% NPO-A Erie 301-COG-240G	12033
J3001	RECEPTACLE: Same as J302	
J3002	CONNECTOR, MICON 1103	23021
J302	RECEPTACLE, COAXIAL, BNC, UF-1094/U	17314
J303	RECEPTACLE: Same as J302	
L301	INDUCTOR, PART of T-301A	
L302	INDUCTOR, PART of T301B	

Ref. Designation	Description	GEL Part No.
L303	INDUCTOR, PART of T302A	
L304	INDUCTOR, PART of T302B	
L305	INDUCTOR, PART of T303A	
L306	INDUCTOR, PART of T303B	
L307	INDUCTOR, PART of T304A	
L308	INDUCTOR, INTEGRAL PART of T304B	
L309	INDUCTOR, INTEGRAL PART of T305A	
L310	INDUCTOR, INTEGRAL PART of T305B	
L311	INDUCTOR, FIXED 2.7 pf B10-103	
L312	INDUCTOR: Same as L311	
L313	INDUCTOR: Same as L311	
L314	INDUCTOR: Same as L311	
L315	INDUCTOR, FIXED, 38 pf, Wilco #3038-15	17002
P301	PLUG 24 CONTACT, Amphenol Miniature Blue Ribbon 57-10240	17496
P302	PLUG, INTEGRAL PART of W301 (UG-260/U)	
R301	RESISTOR, FIXED COMPOSITION, 1K, ± 5%, 1/2W Allen Bradley EB-1025	10401
R302	RESISTOR, FIXED COMPOSITION, 5.1K ± 5%, 1/2W, Allen Bradley EB-5125	10415

Ref. Designation	Description	GEL Part No.
R303	RESISTOR, FIXED COMPOSITION, 100K ± 5%, 1/2W, Allen Bradley EB-1045	10430
R304	RESISTOR, FIXED COMPOSITION, 120 ohm 5% 1/2W, Allen Bradley EB-1215	10449
R305	RESISTOR, FIXED COMPOSITION, 33K ± 5%, 1/2W, Allen Bradley EB-3335	10600
R306	RESISTOR, FIXED COMPOSITION, 15K, ± 5%, 1/2W, Allen Bradley EB-1535	10419
R307	RESISTOR, FIXED COMPOSITION, 47K ± 5%, 1/2W, Allen Bradley EB-4735	10429
R308	RESISTOR: Same as R301	
R309	RESISTOR: Same as R302	
R310	RESISTOR: Same as R303	
R311	RESISTOR: Same as R304	
R312	RESISTOR: Same as R305	
R313	RESISTOR: Same as R306	
R314	RESISTOR: Same as R301	
R315	RESISTOR, FIXED COMPOSITION, 4.7K ± 5%, 1/2W, Allen Bradley EB-4725	10414

Ref. Designation	Description	GEL Part No.
R316	RESISTOR: Same as R303	
R317	RESISTOR: Same as R304	
R318	RESISTOR: Same as R305	
R319	RESISTOR: Same as R306	
R320	RESISTOR, FIXED COMPOSITION, 150 ohm ± 5% 1/2W, Allen Bradley EB-1515	10451
R321	RESISTOR: Same as R301	
R322	RESISTOR, FIXED COMPOSITION, 3.6K ± 5%, 1/2W, Allen Bradley EB-3625	10523
R323	RESISTOR: Same as R303	
R324	RESISTOR, FIXED COMPOSITION, 150K ± 5%, 1/2W, Allen Bradley EB-1545	10424
R325	RESISTOR, FIXED COMPOSITION, 300 ohm ± 5%, 1/2W, Allen Bradley EB-3015	10455
R326	RESISTOR, FIXED COMPOSITION, 11K, ± 5%, 1/2W, Allen Bradley EB-1135	10455
R327	RESISTOR: Same as R301	
R328	RESISTOR, FIXED COMPOSITION, 20K ± 5%, 1/2W, Allen Bradley EB-2035	10420
R329	RESISTOR, FIXED COMPOSITION, 51 ohm ± 5%, 1/2W, Allen Bradley EB-5105	10443

Ref. Designation	Description	GEL Part No.
R330	RESISTOR, FIXED COMPOSITION, 10 ohm ± 5%, 1/2W, Allen Bradley EB-1005	10442
R331	RESISTOR, FIXED COMPOSITION, 22K, ± 5%, 1/2W, Allen Bradley EB-2235	10427
R332	POTENTIOMETER, COMPOSITION, LINEAR, 100 K, 1/2W, Ohmite AS-3610	14009
R333	RESISTOR: Same as R324	
R334	RESISTOR, FIXED COMPOSITION 4.7 ohm ± 5%, 1W, Allen Bradley GB-4705	10950
R335	RESISTOR: Same as R303	
R336	RESISTOR, FIXED COMPOSITION 10K ± 5%, 1/2W, Allen Bradley EB-1035	10408
R337	POTENTIOMETER, COMPOSITION, LINEAR 10K 1/2W, Ohmite AS-3607	14008
R338	RESISTOR: Same as R324	
R339	RESISTOR, FIXED COMPOSITION, 220K ± 5% 1/2W, Allen Bradley EB-2245	10608
R340	RESISTOR: Same as R307	
T301A	TRANSFORMER, ASSEMBLY	
T302A	TRANSFORMER, ASSEMBLY	
T303A	TRANSFORMER: Same as T302A	
T304A	TRANSFORMER: Same as T302A	

Ref. Designation	Description	GEL Part No.
T301B	TRANSFORMER, ASSEMBLY	
T302B	TRANSFORMER: Same as T301B	
T303B	TRANSFORMER: Same as T301B	
T304B	TRANSFORMER, ASSEMBLY	
T305A	TRANSFORMER, ASSEMBLY	
T305B	TRANSFORMER, ASSEMBLY	
V301	ELECTRON TUBE, Type 5749/6BA6W	
V302	ELECTRON TUBE: Same as V301	
V303	ELECTRON TUBE: Same as V301	
V304	ELECTRON TUBE, Type 6AH6	

6.3 FM DEMODULATOR

Ref. Designation	Description	GEL Part No.
C601	CAPACITOR, FIXED CERAMIC DISC., 0.0047 µf + 100% - 20%, Erie CK62Y472Z	
C602	CAPACITOR: Same as C601	
C603	CAPACITOR: Same as C601	

Ref Designation	Description	GEL Part No.
C604	Not Assigned	
C605	CAPACITOR: Same as C601	
C606	CAPACITOR: Same as C601	
C607	CAPACITOR, FIXED CERAMIC TUBULAR, 3.9 pf ± 0.25 pf, Erie NPO-A	
C608	CAPACITOR, FIXED CERAMIC TUBULAR, 47 pf ± 5%, Erie NPO-T	
C609	CAPACITOR, FIXED CERAMIC FEED-THRU, 47 pf ± 20%, Erie GP1-327	
C610	CAPACITOR: Same as C601	
C611	CAPACITOR: Same as C601	
C612	CAPACITOR: Same as C601	
C613	CAPACITOR: Same as C601	
C614	CAPACITOR: Same as C601	
C615	CAPACITOR: Same as C601	
C616	CAPACITOR: Same as C601	
C617	CAPACITOR: Same as C601	

Ref. Designation	Description	GEL Part No.
C618	CAPACITOR, FIXED CERAMIC DISC., 0.0015 pf + 100%, - 20%, Erie CK61Y152Z	
C619	CAPACITOR, FIXED CERAMIC TUBULAR, 30 pf ± 5%, Erie NPO-T	
C620	CAPACITOR: Same as C618	
C621	CAPACITOR, FIXED CERAMIC TUBULAR, 20 pf ± 5%, Erie NPO-T	
C622	CAPACITOR: Same as C601	
C623	CAPACITOR, FIXED SILVERED MICA, 100 pf ± 5%, Elmenco CM15F101J	
C624	CAPACITOR, FIXED CERAMIC FEED-THRU 0.001 pf ± 20%, Erie GP2-327	
C625	CAPACITOR: Same as C601	
C626	CAPACITOR, VARIABLE, PISTON TYPE, 0.7 pf - 12 pf, JFD Type VC-220	
C627	CAPACITOR: Same as C624	
C628	CAPACITOR: Same as C624	
C629	CAPACITOR: Same as C624	
C630	CAPACITOR: Same as C601	
C631	CAPACITOR: Same as C626	

Ref Designation	Description	GEL Part No.
C632	CAPACITOR, FIXED CERAMIC STAND-OFF, 0.0015 pf ± 20%, Erie Style 326	
C633	Not Assigned	
C634	Not Assigned	
C635	Not Assigned	
CR601	DIODE, GERMANIUM, Type-1N198	
CR602	DIODE, SILICON, ZENER VOLTAGE REGULATOR, Texas 400 mw, 12 volts, 1N759	14520
CR603	Not Assigned	
J601	CONNECTOR, BNC, UG-1094/U	
L601	INDUCTOR, FIXED, 2.7 pf	
L602	INDUCTOR, Integral Part of T601A	
L603	INDUCTOR, Integral Part of T601B	
L604	INDUCTOR, Integral Part of Z601	
L605	INDUCTOR, Integral Part of Z602	
L606	INDUCTOR: Same as L601	
L607	INDUCTOR, FIXED 38 pf, Wilco #3038-15	
L608	INDUCTOR: Same as L601	
L609	INDUCTOR, FIXED, 6.8 pf	
L610	Not Assigned	

Ref. Designation	Description	GEL Part No.
P601	PLUG, INTEGRAL PART of W601	
R601	RESISTOR, FIXED COMPOSITION, 130 ohm ± 5%, 1/2W, Allen Bradley EB-1315	
R602	RESISTOR, FIXED COMPOSITION 10K ± 5%, 1W, Allen Bradley GB-1035	
R603	RESISTOR, FIXED COMPOSITION, 11K ± 5%, 1/2W, Allen Bradley EB-1135	
R604	RESISTOR, FIXED COMPOSITION, 130K ± 5%, 1/2W, Allen Bradley EB-1345	
R605	RESISTOR, FIXED COMPOSITION, 150 ohm ± 5%, 1/2W, Allen Bradley EB-1515	
R606	RESISTOR, FIXED COMPOSITION, 47K ± 5%, 1/2W, Allen Bradley EB-4735	
R607	RESISTOR, FIXED COMPOSITION, 4.7K ± 5%, 1/2W, Allen Bradley EB-4725	
R608	RESISTOR, FIXED COMPOSITION, 100K ± 5%, 1/2W, Allen Bradley EB-1045	
R609	RESISTOR: Same as R601	
R610	RESISTOR, FIXED COMPOSITION 7.5K ± 5%, 1/2W, Allen Bradley EB-7525	
R611	RESISTOR: Same as R604	
R612	RESISTOR: Same as R603	
R613	RESISTOR: Same as R601	

Ref. Designation	Description	GEL Part No.
R614	RESISTOR: Same as R610	
R615	RESISTOR: Same as R604	
R616	RESISTOR: Same as R603	
R617	RESISTOR: Same as R605	
R618	RESISTOR: Same as R607	
R619	RESISTOR: Same as R607	
R620	RESISTOR, FIXED COMPOSITION, 33K ± 5%, 2W, Allen Bradley GB-3335	
R621	RESISTOR, FIXED COMPOSITION, 51K ± 5%, 1/2W, Allen Bradley EB-5135	
R622	RESISTOR: Same as R621	
R623	RESISTOR, FIXED COMPOSITION, 4.7 ohm ± 5%, 1W, Allen Bradley GB-47G5	
R624	RESISTOR, FIXED COMPOSITION, 820 ohm ± 5%, 1/2W, RC20GF821J	10500
R625	RESISTOR: Same as R624	
R626	RESISTOR, FIXED COMPOSITION, 330 ohm ± 5%, 1/2W	

Ref. Designation	Description	GEL Part No.
T601A	IF TRANSFORMER ASSEMBLY	
T601B	IF TRANSFORMER ASSEMBLY	
V601	TUBE, ELECTRON, Type 6BN8	
V602	TUBE: Same as V601	
V603	TUBE: Same as V601	
V604	TUBE, ELECTRON, Type 5726/6AL5W	
W601	CABLE ASSEMBLY	
Z601	IF TRANSFORMER ASSEMBLY	
Z602	IF TRANSFORMER ASSEMBLY	

6.4 FM DEMODULATOR, ISOLATED (Used in 11B1-BN-2 serial Nos. 1 through 5 and 11B1-BN-3 serial Nos. 1 and 2 only)

Ref Designation	Description	GEL Part No.
C1	CAPACITOR, FIXED CERAMIC, DISC 0.005 MF 200V, Erie #835-X5V-502Z	12209
C2	CAPACITOR, FIXED CERAMIC DISC 0.01 MF, ± 20%, 200V, Erie #CK63AW103M	12210
C3	CAPACITOR, FIXED CERAMIC TUBULAR, 15 pf ± 5%	12027
C4	CAPACITOR: Same as C2	
C5	CAPACITOR: Same as C3	

Ref. Designation	Description	GEL Part No.
C6	CAPACITOR: Same as C2	
C7	CAPACITOR, FIXED CERAMIC, TUBULAR 12 pf ± 5%, NPO-A	12024
C8	CAPACITOR: Same as C1	
C9	CAPACITOR, FIXED CERAMIC, TUBULAR 3 pf, ± 25 pf Erie #301-COJ-209C	12009
C10	CAPACITOR: Same as C2	
C11	CAPACITOR, Same as C7	
C12	CAPACITOR: Same as C2	
C13	CAPACITOR, FIXED CERAMIC TUBULAR 18 pf ± 2% NPO-A Erie #301-COG-180G	12030
C14	CAPACITOR, FEED-THRU 0.001 MF Allen Bradley #FU6D	12175
C15	Not Assigned	
C16	CAPACITOR: Same as C14	
C17	CAPACITOR: Same as C14	
C18	CAPACITOR: Same as C14	
C19	CAPACITOR: Same as C14	

Ref. Designation	Description	GEL Part No.
C20	CAPACITOR: Same as C14	
C21	CAPACITOR, FIXED CERAMIC, TUBULAR 4.7 pf ± 0.25 pf NPO-A Erie	12014
C22	CAPACITOR, FIXED CERAMIC, TUBULAR 9.0 pf ± 0.25 pf Erie #301-COH-909C	
C23	CAPACITOR: Same as C9	
C24	CAPACITOR: Same as C14	
C25	CAPACITOR: Same as C2	
C26	CAPACITOR: Same as C14	
C27	CAPACITOR: Same as C2	
C28	CAPACITOR: Same as C14	
C29	CAPACITOR: Same as C2	
C30	CAPACITOR: Same as C14	
C31	CAPACITOR: Same as C2	
C32	CAPACITOR: Same as C14	
C33	CAPACITOR: Same as C14	

Ref. Designation	Description	GEL Part No.
C34	Not Assigned	
C35	CAPACITOR, FIXED TANTALUM, 1 pf 35V, 150D105X0035A2 (Sprague)	
C36	CAPCITOR, TUB. 25 pf, 25vdc Sprague TE-1207	12711
CR1	DIODE, 1N914 (USN)	14628
CR2	DIODE: Same as CR1	
CR3	DIODE: Same as CR1	
CR4	DIODE: Same as CR1	
CR5	DIODE, 1N483B (USN)	14507
CR6	DIODE: Same as CR5	
CR7	DIODE: Same as CR5	
CR8	DIODE, 1N277 (JAN)	14669
CR9	DIODE: Same as CR8	
CR10	DIODE: Same as CR5	
CR11	DIODE: Same as CR5	

Ref Designation	Description	GEL Part No.
CR12	DIODE: Same as CR5	
CR13	DIODE: Same as CR5	
CR14	DIODE: Same as CR5	
CR15	DIODE, 1N719A	14668
CR16	DIODE: Same as CR15	
CR17	DIODE: Same as CR5	
J1	CONNECTOR, MICON 11D3	23021
J2	CONNECTOR, Not Assigned	
J3	CONNECTOR, Rework	17736
L1	INDUCTOR, VARIABLE Cambion #1505-5	16236
L2	INDUCTOR: Same as L1	
L3	INDUCTOR: Same as L1	
L4	INDUCTOR: Same as L1	
L5	INDUCTOR: Same as L1	
L6	Not Assigned	

Ref Designation	Description	GEL Part No.
L7	INDUCTOR, FIXED 100 pf, Delevan #1537-76	21140
L8	INDUCTOR: Same as L7	
L9	INDUCTOR: Same as L7	
L10	INDUCTOR: Same as L7	
L11	INDUCTOR: Same as L7	
L12	INDUCTOR: Same as L7	
L13	INDUCTOR: Same as L7	
L14	INDUCTOR: Same as L7	
L15	INDUCTOR: Same as L7	
L16	INDUCTOR: Same as L7	
L17	INDUCTOR: Same as L7	
L18	INDUCTOR: Same as L7	
R1	RESISTOR, POTENTIOMETER, 5K ± 10% Ohmite #RV6LAYSA502A	14025

Ref. Designation	Description	GEL Part No.
R2	Not Assigned	
R3	RESISTOR, FIXED COMPOSITION, 10K, 1/4W, RC09GF103J	10112
R4	RESISTOR, FIXED COMPOSITION, 3.3K, 1/4W, RC09GF332J	10169
R5	RESISTOR, FIXED COMPOSITION, 2.2K, 1/4W, RC09GF222J	10116
R6	RESISTOR: Same as R3	
R7	RESISTOR, FIXED COMPOSITION, 5.6K, 1/4W, RC09GF562J	10122
R8	RESISTOR: Same as R4	
R9	RESISTOR, FIXED COMPOSITION, 4.7K, 1/4W, RC09GF472J	10105
R10	RESISTOR, FIXED COMPOSITION, 4.3K, 1/4W, RC09GF432J	10191
R11	RESISTOR: Same as R4	
R12	RESISTOR: Same as R3	
R13	RESISTOR: Same as R3	
R14	RESISTOR: Same as R4	
R15	RESISTOR, FIXED COMPOSITION, 6.8K, 1/2W, RC09GF682J	10103

Ref. Designation	Description	GEL Part No.
R16	RESISTOR, FIXED COMPOSITION, 82K, 1/4W, RC09GF822J	10173
R17	RESISTOR, FIXED COMPOSITION, 47 ohm, 1/4W, RC09GF470J	10176
R18	RESISTOR: Same as R9	
R19	RESISTOR: Same as R9	
R20	RESISTOR, FIXED COMPOSITION, 39K, 1/4W, RC09GF393J	10192
R21	RESISTOR, FIXED COMPOSITION, 3.6K, 1/4W, RC09GF362J	10193
R22	RESISTOR: Same as R7	
R23	RESISTOR: Same as R7	
R24	RESISTOR: Same as R7	
R25	RESISTOR: Same as R7	
R26	RESISTOR, FIXED COMPOSITION, 68 ohm, 1/4W, RC09GF680J	10174
R27	RESISTOR: Same as R17	
R28	RESISTOR, FIXED COMPOSITION, 100 ohm, 1/4W, RC09GF101J	10160
R29	RESISTOR: Same as R5	

Ref. Designation	Description	GEL Part No.
R30	Not Assigned	
R31	Not Assigned	
R32	RESISTOR: Same as R7	
R33	RESISTOR, FIXED COMPOSITION, 330K, 1/4W, RC09GF334J	
R34	RESISTOR: Same as R3	
Q1	TRANSISTOR, 2N2360	14258
Q2	TRANSISTOR: Same as Q1	
Q3	TRANSISTOR: Same as Q1	
Q4	TRANSISTOR: Same as Q1	
Q5	TRANSISTOR, 2N338 (USN)	14264
Q6	TRANSISTOR, 2N697	
Q7	TRANSISTOR: Same as Q5	

6.4.a FM DEMODULATOR, ISOLATED

Ref. Designation	Description	GEL Part No.
C1	CAPACITOR, FIXED CERAMIC DISC 0.005 pf, 100V, Erie #835-X5V-502Z	12209
C2	CAPACITOR, FIXED CERAMIC DISC 0.01 pf 20%, Erie 805-X5V-103Z	12210

Ref. Designation	Description	GEL Part No.
C3	CAPACITOR: Same as C2	
C4	CAPACITOR, FIXED CERAMIC TUBULAR 15 pf ± 5% Erie 301-COH-150J	12027
C5	CAPACITOR: Same as C2	
C6	CAPACITOR: Same as C2	
C7	CAPACITOR: Same as C4	
C8	CAPACITOR: Same as C2	
C9	CAPACITOR: Same as C2	
C10	CAPACITOR, FIXED MICA 150 pf ± 5%, DM15-151J Cornell Dubilier	12622
C11	CAPACITOR, FIXED CERAMIC TUBULAR 12 pf ± 5%, NPO-A Erie #301-COH-120J	12024
C12	CAPACITOR: Same as C1	
C13	CAPACITOR: Same as C2	
C14	CAPACITOR, FIXED CERAMIC TUBULAR 3 pf, ± 0.25 pf Erie #301-COJ-209C	12008
C15	CAPACITOR: Same as C14	
C16	CAPACITOR: Same as C2	

Ref. Designation	Description	GEL Part no.
C17	CAPACITOR, FIXED CERAMIC TUBULAR 9.0 pf Erie #301-COH-909C	12032
C18	CAPACITOR, FIXED CERAMIC TUBULAR 4.7 pf ± 0.25 pf NPO-A Erie	12014
C19	CAPACITOR: Same as C11	
C20	CAPACITOR: Same as C2	
C21	CAPACITOR, FIXED CERAMIC DISC 0.001 μf + 80% - 20% #HR-839-X5T	12074
C22	CAPACITOR, FIXED CERAMIC TUBULAR 18 pf ± 2%, NPO-A Erie #301-COG-180G	12030
C23	CAPACITOR: Same as C21	
C24	CAPACITOR: Same as C21	
C25	CAPACITOR: Same as C21	
C26	CAPACITOR: Same as C21	
C27	CAPACITOR: Same as C21	
C28	CAPACITOR, FIXED ELECTROLYTIC 1 μf Sprague #TE-1200	12790
C29	CAPACITOR: Same as C21	
C30	CAPACITOR: Same as C21	

Ref. Designation	Description	GEL Part No.
C31	CAPACITOR: Same as C21	
C32	CAPACITOR, FIXED ELECTROLYTIC 39 uf 10V Sprague 150D-396X9010B2	12806
C33	CAPACITOR, FIXED ELECTROLYTIC 50 uf 25 VDC Sprague TE-1209	12794
CR1	DIODE, 1N914	14628
CR2	DIODE: Same as CR1	
CR3	DIODE: Same as CR1	
CR4	DIODE: Same as CR1	
CR5	DIODE, 1N483B	14507
CR6	DIODE: Same as CR5	
CR7	DIODE: Same as CR5	
CR8	DIODE: Same as CR5	
CR9	DIODE, 1N277	14669
CR10	DIODE: Same as CR9	
CR11	DIODE: Same as CR5	
CR12	DIODE: Same as CR5	

Ref. Designation	Description	GEL Part No.
CR13	DIODE: Same as CR5	
CR14	DIODE: Same as CR5	
CR15	DIODE: Same as CR5	
J1	CONNECTOR, Micon #1116	23022
J2	CONNECTOR: Same as J1	
L1	INDUCTOR, Variable Cambion #1505-5 (Using 2566 Housing)	21161
L2	INDUCTOR, FIXED 100 pf Delevan #1537-76	21140
L3	INDUCTOR: Same as L1	
L4	INDUCTOR: Same as L2	
L5	INDUCTOR, Variable	
L6	INDUCTOR: Same as L2	
L7	INDUCTOR: Same as L2	
L8	INDUCTOR: Same as L1	
L9	INDUCTOR: Same as L1	
L10	INDUCTOR: Same as L2	

Ref. Designation	Description	GEL Part No.
L11	INDUCTOR: Same as L2	
L12	INDUCTOR: Same as L2	
L13	INDUCTOR: Same as L2	
L14	INDUCTOR: Same as L2	
L15	INDUCTOR: Same as L2	
L16	INDUCTOR: Same as L2	
L17	INDUCTOR: Same as L2	
L18	INDUCTOR, DELEVAN #1537-48 27 pf ± 5%	17053
P1	CONNECTOR, H. H. Buggie #4534	23026
Q1	TRANSISTOR, 2N2360	14258
Q2	TRANSISTOR: Same as Q1	
Q3	TRANSISTOR Same as Q1	
Q4	TRANSISTOR: Same as Q1	
Q5	TRANSISTOR, 2N697/JAN	14260
Q6	TRANSISTOR: Same as Q5	

Ref. Designation	Description	GEL Part No.
Q7	TRANSISTOR: Same as Q5	
Q8	TRANSISTOR: Same as Q5	
R1	RESISTOR, FIXED COMPOSITION 47 ohms 1/4W, ± 5%, RC09GF470J	10176
R2	RESISTOR, FIXED COMPOSITION 10K, 1/4W, ± 5%, RC09GF103J	10112
R3	RESISTOR, FIXED COMPOSITION 5.6K, 1/4W, ± 5%, RC09GF562J	10122
R4	RESISTOR, FIXED COMPOSITION 3.3K, 1/4W, ± 5%, RC09GF332J	10169
R5	RESISTOR, FIXED COMPOSITION 2.2K, 1/4W, ± 5%, RC09GF222J	10116
R6	RESISTOR: Same as R3	
R7	RESISTOR: Same as R2	
R8	RESISTOR: Same as R4	
R9	RESISTOR, FIXED COMPOSITION 4.3K, 1/4W, ± 5%, RC09GF432J	10191
R10	RESISTOR, FIXED COMPOSITION 4.7K, 1/4W, ± 5%, RC09GF472J	10105
R11	RESISTOR: Same as R4	
R12	RESISTOR: Same as R2	

Ref. Designation	Description	GEL Part No.
R13	RESISTOR: Same as R4	
R14	RESISTOR, FIXED COMPOSITION 6.8K, 1/4W, ± 5%, RC09GF682J	10103
R15	RESISTOR, FIXED COMPOSITION 8.2K, 1/4W, ± 5%, RC09GF822J	10173
R16	RESISTOR, POTENTIOMETER 5K, ± 10%, 1/2W, Bourns #3067P-1-502	14105
R17	RESISTOR: Same as R10	
R18	RESISTOR: Same as R10	
R19	RESISTOR, FIXED COMPOSITION 39K, 1/4W, ± 5%, RC09GF393J	10192
R20	RESISTOR, FIXED COMPOSITION 330K, 1/4W, ± 5%, RC09GF334J	10107
R21	RESISTOR, FIXED COMPOSITION 3.6K, 1/4W, ± 5%, RC09GF362J	10193
R22	RESISTOR, FIXED COMPOSITION 1K, 1/4W, ± 5%, RC09GF102J	10113
R23	RESISTOR, FIXED COMPOSITION 51K, 1/4W, ± 5%, RC09GF513J	10200
R24	RESISTOR: Same as R21	
R25	RESISTOR, FIXED COMPOSITION 27K, 1/4W, ± 5%, RC09GF273J	10110
R26	RESISTOR: Same as R16	

Ref. Designation	Description	GEL Part No.
R27	RESISTOR, FIXED COMPOSITION 120 ohms, 1/4W, ± 5% RC07GF121J	10161
R28	RESISTOR, FIXED COMPOSITION 56 ohms, 1/4W, ± 5%, RC07GF560J	10171
R29	RESISTOR: Same as R3	
R30	RESISTOR, FIXED COMPOSITION 680 ohms 1/4W, ± 5%, RC07GF681J	10182
R31	RESISTOR: Same as R3	
R32	RESISTOR: Same as R4	
R33	RESISTOR, FIXED COMPOSITION 100 ohms 1/4W, ± 5%, RC09GF101J	10160
R34	RESISTOR: Same as R22	
R35	RESISTOR: Same as R2	
R36	RESISTOR: Same as R2	
TP1	TEST JACK, Sealectro #SKT-103PC	20910
TP2	TEST JACK: Same as TP1	
VR16	DIODE, 1N719A (Zener)	14668
VR17	DIODE: Same as CR16	

6.5 VIDEO AMPLIFIER

Ref. Designation	Description	GEL Part No.
C1	CAPACITOR, FIXED ELECTROLYTIC 50 pf 25 VDC, Sprague TE-1209	12794
C2	CAPACITOR: Same as C5	

Ref. Designation	Description	GEL Part No.
C3	CAPACITOR, FIXED ELECTROLYTIC 10 pf 25 VDC, Sprague TE-1204	12717
C4	CAPACITOR: Same as C3	
C5	CAPACITOR, FIXED ELECTROLYTIC 100 pf 15 VDC, Sprague TE-1162	12795
C6	Not Assigned	
C7	Not Assigned	
C8	CAPACITOR: Same as C3	
C9	CAPACITOR, FIXED ELECTROLYTIC 75 pf 25 VDC, Sprague TE-1210	
C10	CAPACITOR: Same as C3	
C11	CAPACITOR: Same as C9	
CR1	DIODE, 1N270	14541
CR2	DIODE: Same as CR1	
J1	CONNECTOR, MICON #1116	23022
J2	CONNECTOR: Same as J1	
L1	CHOKE, 82 pf Delevan 1537-72	21139
P1	CONNECTOR, H. H. Buggie #4534	23026

Ref. Designation	Description	GEL Part No.
Q1	TRANSISTOR, 2N706	14271
Q2	TRANSISTOR, 2N697	14260
Q3	TRANSISTOR: Same as Q2	
Q4	TRANSISTOR: Same as Q2	
Q5	TRANSISTOR: Same as Q2	
Q6	TRANSISTOR Same as Q2	
Q7	TRANSISTOR: Same as Q2	
R1	RESISTOR, FIXED COMPOSITION Not Assigned	
R2	RESISTOR, FIXED COMPOSITION 10K 1/2W ± 5%, RC20GF103J	10400
R3	RESISTOR, FIXED COMPOSITION 100 ohm 1/2W, ± 5% RC20GF101J	10447
R4	RESISTOR, FIXED COMPOSITION 27K 1/2W ± 5%, RC20GF273J	10477
R5	RESISTOR, FIXED COMPOSITION 1.5K 1/2W, ± RC20GF152J	10470
R6	RESISTOR, FIXED COMPOSITION 91 ohm 1/2W, ± 5%, RC20GF910J	10446
R7	RESISTOR, FIXED COMPOSITION 2.7K 1/2W, ± 5%, RC20GF272J	10412

Ref. Designation	Description	GEL Part No.
R8	RESISTOR, FIXED COMPOSITION 2.2K 1/2W, ± 5%, RC20GF222J	10411
R9	RESISTOR, FIXED COMPOSITION 4.7K 1/2W, ± 5%, RC20GF472J	10414
R10	RESISTOR: Same as R4	
R11	RESISTOR, FIXED COMPOSITION 12K 1/2W, ± 5%, RC20GF123J	10418
R12	RESISTOR: Same as R5	
R13	RESISTOR, FIXED COMPOSITION 15K 1/2W ± 5%, RC20GF153J	10419
R14	RESISTOR, FIXED COMPOSITION 18K 1/2W ± 5%, RC20GF183J	10426
R15	RESISTOR, FIXED COMPOSITION 910 ohms 1/2W, ± 5%, RC20GF911J	10510
R16	RESISTOR, FIXED COMPOSITION 5.6K 1/2W, ± 5%, RC20GF562J	10594
R17	RESISTOR, FIXED COMPOSITION 560 ohms 1/2W, ± 5%, RC20GF561J	10583
R18	RESISTOR, FIXED COMPOSITION 120 ohms 1/2W, ± 5%, RC20GF121J	10449
R19	RESISTOR: Same as R18	
R20	RESISTOR, FIXED COMPOSITION 15 ohms 1/2W, ± 5%, RC20GF150J	10559
R21	RESISTOR, FIXED COMPOSITION 100K 1/2W, ± 5%, RC2-GF104J	10430

Ref. Designation	Description	GEL Part No.
R22	RESISTOR, FIXED COMPOSITION 68 ohm 1/2W ± 5%, RC20GF680J	10444

6.6 PLAYBACK-UP CONVERTER

Ref. Designation	Description	GEL Part No.
C1101	CAPACITOR, FIXED CERAMIC TUBULAR 16 pf ± 5%, Erie NPO-A	12028
C1102	CAPACITOR, FIXED CERAMIC TUBULAR 6.8 pf ± 0.25 pf Erie NPO-A	12018
C1103	CAPACITOR, Same as C1102	
C1104 & C1105	CAPACITOR, VARIABLE, Two Section, 4-30 pf ea. section Erie style CV21C3004-30pf	13334
C1106	CAPACITOR, FIXED CERAMIC TUBULAR 20 pf ± 5%, Erie NPO-A	12031
C1107	CAPACITOR, FIXED CERAMIC TUBULAR 4.3 pf ± 0.25 pf, Erie NPO-A	12013
C1108	CAPACITOR, FIXED CERAMIC STANDOFF, 0.0015 pf ± 20%, Erie 326	12069
C1109	CAPACITOR, FIXED CERAMIC TUBULAR 18 pf ± 5%, Erie NPO-A	12029
C1110	CAPACITOR, FIXED CERAMIC DISC 0.0047 pf + 100% - 20%, CK62Y472Z	12050
C1111	CAPACITOR, Same as C1110	
C1112	CAPACITOR, VARIABLE, PISTON, 0.8 pf, JFD, VC 23G	13314

Ref. Designation	Description	GEL Part No.
C1113	CAPACITOR: Same as C1108	
C1114	CAPACITOR: Same as C1108	
C1115	CAPACITOR: Same as C1109	
C1116	CAPACITOR, FIXED CERAMIC TUBULAR 1000 pf, Erie GP2-331	12062
C1117	CAPACITOR: Same as C1110	
C1118	CAPACITOR: Same as C1106	
C1119	CAPACITOR: Same as C1106	
C1120	CAPACITOR: Same as C1116	
C1121	CAPACITOR, FIXED CERAMIC DISC. 0.001 pf + 100% - 20%, Erie CK61Y102Z	12070
C1122	CAPACITOR: Same as C1116	
C1123	CAPACITOR: Same as C1121	
C1124	CAPACITOR, FIXED CERAMIC DISC. 0.01 pf + 100% - 20%, Erie CK63Y103Z	12046
C1125	CAPACITOR, FIXED CERAMIC DISC. 0.0015 pf + 100% - 20%, Erie CK61Y152Z	12053
C1126	CAPACITOR: Same as C1112	

Ref. Designation	Description	GEL Part No.
C1127	CAPACITOR: Same as C1109	
C1128	CAPACITOR: Same as C1106	
C1129	CAPACITOR, FIXED CERAMIC TUBULAR 12 pf ± 5% NPO-A	12024
CR1101	DIODE, GERMANIUM, Sylvania D1820	14526
CR1102	DIODE: Same as CR1101	
J1101	CONNECTOR, COAXIAL RECEPTACLE BNC UG-1094/U	17314
J1102	CONNECTOR: Same as J1101	
J1103	CONNECTOR: Same as J1101	
L1101	INDUCTOR, VARIABLE, 7.8 - 16 pf Cambion 1505-5	16236
L1102	INDUCTOR: Same as L1101	
L1103	INDUCTOR, VARIABLE, 238-450 pf Cambion 2060-0	17056
L1104	INDUCTOR, FIXED 15 pf Wilco 1015-15	17025
L1105	INDUCTOR	B14-896
L1106	INDUCTOR, FIXED, RF CHOKE 2.70 pf ± 10%, Delevan Part No. 1537-22	17054

Ref. Designation	Description	GEL Part No.
L1107	INDUCTOR: Same as L1106	
L1108	INDUCTOR: Same as L1106	
L1109	INDUCTOR: Part of T1101	
L1110	INDUCTOR: Part of T1102	
P1101	CONNECTOR, WINCHESTER M5P Retaining Ring Hood	17557 17562 17569
R1101	RESISTOR, Not Assigned	
R1102	RESISTOR, FIXED COMPOSITION 5.6K ± 5%, 1/2W, RC20GF562J	10594
R1103	RESISTOR, FIXED COMPOSITION 18K ± 5%, 1/2W, RC20GF183J	10426
R1104	RESISTOR, FIXED COMPOSITION 3.3K ± 5%, 1/2W, RC20GF332J	10545
R1105	RESISTOR: Same as R1104	
R1106	RESISTOR, FIXED COMPOSITION 4.7K ± 5%, 1/2W, RC20GF472J	10414
R1107	RESISTOR: Same as R1106	
R1108	RESISTOR, FIXED COMPOSITION 240 ohms ± 5%, 1/2W, RC20GF241J	10521
R1109	RESISTOR: Same as R1108	

Ref Designation	Description	GEL Part No.
R1110	RESISTOR, FIXED COMPOSITION 2K ± 5%, 1/2W, RC20GF202J	10410
R1111	RESISTOR, FIXED COMPOSITION 150K ± 5%, 1/2W, RC20GF154J	10424
R1112	RESISTOR, FIXED COMPOSITION 6.8K ± 5%, 1/2W, RC20GF682J	10406
R1113	RESISTOR, FIXED COMPOSITION 390 ohms ± 5%, 1/2W, RC20GF391J	10506
R1114	RESISTOR, FIXED COMPOSITION 1K ± 5%, 1/2W, RC20GF102J	10401
R1115	RESISTOR, FIXED COMPOSITION 100K ± 5%, 1/2W, RC20GF104J	10430
R1116	RESISTOR Same as R1103	
R1117	RESISTOR Same as R1115	
R1118	RESISTOR, FIXED COMPOSITION 200 ohms ± 5%, 1/2W, AB-EB2015	10576
R1119	RESISTOR, FIXED COMPOSITION 5.1K ± 5%, 1/2W, RC20GF512J	10415
R1120	RESISTOR, FIXED COMPOSITION 51K ± 5%, 1/2W, RC20GF513J	10481
R1121	RESISTOR Same as R1106	
R1122	RESISTOR Same as R1118	
R1123	RESISTOR, FIXED COMPOSITION 47K ± 5%, 1/2W, RC20GF473J	11549

Ref. Designation	Description	GEL Part No.
R1124	RESISTOR: Same as R1114	
R1125	RESISTOR: Same as R1108	
R1126	RESISTOR: Same as R1108	
R1127	RESISTOR, FIXED COMPOSITION 2.7K ± 5%, 1/2W, RC20GF272J	10412
T1101	TRANSFORMER ASSEMBLY	
T1102	TRANSFORMER ASSEMBLY	
V1101	TUBE, ELECTRON, 5654	14752
V1102	TUBE, ELECTRON 12AT7WA	14775
V1103	TUBE, ELECTRON 5670	14796
Y1101	XTAL, QUARTZ, Type CR-33/U	41831

6.7 MAIN CHASSIS

Ref. Designation	Description	GEL Part No.
B101	MOTOR, Fan, Roton Muffin Fan Series P-1	18901
C101	CAPACITOR, FIXED, PAPER 0.047 μf, 200V, Aerovox P-123ZGP	12919
C102	CAPACITOR, Not Assigned	
C103	CAPACITOR, FIXED PAPER 0.22 μf, 200V, Aerovox P123ZGP	12920

Ref Designation	Description	GEL Part No.
C104	CAPACITOR, Part of TB #1	
C105	CAPACITOR, Part of TB #1	
C106	CAPACITOR, Part of TB #1	
C107	Not Assigned	
C108	Not Assigned	
C109	CAPACITOR, Part of TB #2	
C110	Not Assigned	
C111	CAPACITOR, Part of TB #1	
C112	CAPACITOR, Part of TB #1	
C113	CAPACITOR, FIXED, MICA 0.002 µf ± 5%, 500V, Elmenco CM20E202J	12514
C114	CAPACITOR, VARIABLE, AIR DIELECTRIC 4.5 to 100 pf, Hammerlund MAPC-100	13312
C115	CAPACITOR, FIXED MICA 130 pf ± 5%, 500V, Elmenco CM15E131J	12510
C116	CAPACITOR, Part of TB #1	
C117	CAPACITOR, Part of TB #1	
C118	Not Assigned	
C119 A & B	CAPACITOR, FIXED ELECTROLYTIC 45-45 µf, 400V, CE52C450Q	12701
C120 A & B	CAPACITOR, FIXED ELECTROLYTIC 70-70 µf, 300V, CE52C700N	12702
C121	Not Assigned	

Ref. Designation	Description	GEL Part No.
C122	Not Assigned	
C123	Not Assigned	
C124	Not Assigned	
C125	CAPACITOR, FIXED CERAMIC FEED-THRU 47 pf, ± 20%, GP1-327	12148
C126	CAPACITOR, FIXED CERAMIC DISC: 0.0047 pf + 100%, - 20%, CK62Y472Z	12050
C127	CAPACITOR, FIXED CERAMIC DISC: 0.0033 pf ± 20%, Erie 2R5KV-332	12091
C128	CAPACITOR: Same as C127	
C129	CAPACITOR, Part of TB #1	
C130	CAPACITOR, FIXED CERAMIC DISC 0.001 pf, ± 10%, Erie HR-809-X5T	12087
C131	Not Assigned	
C132	Not Assigned	
C133	CAPACITOR, FIXED PAPER 25 pf, 25V, TE 1207 Sprague	12711
C134	Not Assigned	
C135	Not Assigned	
C136	Not Assigned	
C137	Not Assigned	
C138	Not Assigned	
C139	Not Assigned	

Ref Designation	Description	GEL Part No.
C140	Not Assigned	
C141	Not Assigned	
C142	Not Assigned	
C143	Not Assigned	
C144	Not Assigned	
C145	Not Assigned	
C146	Not Assigned	
C147	Not Assigned	
C148	Not Assigned	
C149	Not Assigned	
C150	CAPACITOR, FIXED MICA 510 pf CM15E511J	12594
C151	CAPACITOR, FIXED CERAMIC DISC., 0.005 pf, 100V, Erie 835-X5V-502Z	12209
C152	CAPACITOR Same as C151	
C153	CAPACITOR, FIXED CERAMIC DISC., 0.01 pf, 200V, Erie CK63AW103M	12046
C154	CAPACITOR, TUBULAR 0.47 pf 200V, Aerovox P123ZNP	12951
C155	CAPACITOR Same as C153	
C156	CAPACITOR, TUBULAR 0.47 pf 200V, Aerovox P123ZNGP	12916

Ref. Designation	Description	GEL Part No.
C157	CAPACITOR, FIXED MICA 5100 pf, CM20E512J	
C158	CAPACITOR, FIXED MICA 2200 pf, CM20E222J	12526
C159	CAPACITOR, FIXED MICA 1000 pf, CM20D102J	12515
C160	CAPACITOR, FIXED MICA 330 pf, CM15E331J	12502
C161	CAPACITOR, FIXED ELECTROLYTIC 75 pf, + 150%, - 10%, 50V, NLW 75-50 (Cor. Dub.)	13151
C162	CAPACITOR: Same as C161	
C163	CAPACITOR: Same as C161	
C164	CAPACITOR: Same as C161	
C165	CAPACITOR, Not Assigned	
C166	CAPACITOR, 500 pf, 20VDC, Suogo	
C167	CAPACITOR: Same as C166	
CR101	DIODE, Part of TB #1	
CR102	DIODE, Part of TB #1	
CR103	DIODE, Part of TB #1	
CR104	DIODE, Part of TB #1	

Ref Designation	Description	GEL Part No.
CR105	DIODE, SILICON, Texas Instrument 1N547	14526
CR106	DIODE: Same as CR105	
CR107	DIODE: Same as CR105	
CR108	DIODE: Same as CR105	
CR109	DIODE: Same as CR105	
CR110	DIODE BRIDGE, Part of L106	
CR111	DIODE BRIDGE, Part of L106	
F101	FUSE, 2.0 amp Slo-Blo	17906
I101	LAMP, Pilot, GE #328	17802
J101	CONNECTOR, Part of W101	
J102	RECEPTACLE, Male, Motor Base, Hubbel #7486-G	17325
J103	RECEPTACLE, Winchester M5S Lock Spring Nut & Washer	17556 17563 17564
J104	CONNECTOR, Part of W104	
J105	RECEPTACLE, #4535 Buggie	23027
J106	RECEPTACLE: Same as J105	

Ref. Designation	Description	GEL Part No.
J107	RECEPTACLE, 24 Contact Amphenol Min. Blue Ribbon - 57-20240	17489
J108	RECEPTACLE, #79775 TNC, FXR	17395
J109	RECEPTACLE, 2 Contact Alden #462-2	17333
J110	CONNECTOR, Part of W102	
J111	CONNECTOR, Part of W103	
J112	CONNECTOR, Micon 1103	23021
J113	CONNECTOR, Part of W111	
J114	CONNECTOR, Part of W117	
J115	CONNECTOR: Same as J112	
J116	CONNECTOR: Same as J112	
J117	CONNECTOR: Same as J112	
J118	CONNECTOR: Same as J103	
J119	CONNECTOR: Same as J103	
J120	CONNECTOR: Same as J112	
J121	CONNECTOR: Same as J112	
K101	RELAY, Coax. 318-010407-3 FXR 26V DC	20516

Ref Designation	Description	GEL Part No.
K102	RELAY, P26A1H6AS, Low Level Filters INC.	20519
L101	CHOKE, Power C12X-6 Henries Triad	
L102	INDUCTOR, 1.8 pf	17083
L103	INDUCTOR: Same as L102	
L104	INDUCTOR, FIXED 620 pf Delevan 2500-18	21101
L105	CHOKE, Power C17X-1.5 Henries Triad	
L106 A & B	INDUCTOR, Dual Power Choke (Newton 3073)	
L107	INDUCTOR, Molded 62 pf 1/4W, SWD-62 Super Wee Ductor	21136
L108	INDUCTOR: Same as L107	
LS101	SPEAKER, RCA 76373	16700
M101	METER, Signal Level	
M102	METER, Tuning	
M103	METER, Deviation	
M104	METER, Output	
P101	PLUG, Part of W101	
P102	PLUG, 2 Contact Alden #462-2	17332
P103	Not Assigned	
P104	CONNECTOR, Part of W103	

Ref. Designation	Description	GEL Part No.
P105	CONNECTOR, Part of W113	
P106	CONNECTOR, Part of W113	
P107	CONNECTOR, Part of W112	
P108	CONNECTOR, Part of W112	
P109	CONNECTOR, Part of W111	
P110	CONNECTOR, Part of W114	
P111	CONNECTOR, Part of W114	
P112	CONNECTOR, Part of W110	
P113	CONNECTOR, Winchester M5P Retaining Ring Hood	17557 17562 17569
P114	CONNECTOR, Part of W115	
P115	CONNECTOR, Part of W115	
P116	CONNECTOR, Part of W116	
P117	CONNECTOR, Part of W116	
P118	CONNECTOR, Part of W117	
P119	CONNECTOR, Part of W118	
P120	CONNECTOR, Part of W118	
P121	CONNECTOR, Part of W105	
P122	CONNECTOR, Part of W102	
R101	RESISTOR, FIXED COMPOSITION, 1.1 meg, 1/2W, ± 5%, Allen-Bradley EB-1155	10464

Ref. Designation	Description	GEL Part No.
R102	RESISTOR, FIXED COMPOSITION 560K 1/2W, ± 5%, Allen Bradley EB-5645	10433
R103	RESISTOR, FIXED COMPOSITION 10K, 2W, ± 5%, Allen Bradley HB1035	11408
R104	RESISTOR, FIXED COMPOSITION 330 ohm 1/2W, ± 5%, Allen Bradley EB-3315	10458
R105	POTENTIOMETER	14014-027
R106	RESISTOR, Part of TB #2	
R107	RESISTOR, FIXED COMPOSITION 470K 1/2W, ± 5%, Allen Bradley EB-4745	10541
R108	RESISTOR, Part of TB #1	
R109	RESISTOR, Part of TB #1	
R110	RESISTOR, Part of TB #1	
R111	RESISTOR, Part of TB #1	
R112	RESISTOR, FIXED COMPOSITION 2.7K 1/2W, ± 5%, Allen Bradley EB-2725	10412
R113	RESISTOR Same as R112	
R114	POTENTIOMETER 10K, 2W, Ohmite CLU-1031	14002
R115	RESISTOR, FIXED COMPOSITION 20K, 2W, ± 5%, Allen Bradley HB-2035	11404
R116	RESISTOR, FIXED COMPOSITION 18K, 2W, ± 5%, Allen Bradley HB-2035	11401
R117	RESISTOR, Part of TB #1	

Ref. Designation	Description	GEL Part No.
R118	RESISTOR, Part of TB #1	
R119	RESISTOR, Not Assigned	
R120	RESISTOR, Not Assigned	
R121	RESISTOR, Not Assigned	
R122	RESISTOR, FIXED COMP. 1.5K 1/2W, 5%, Allen Bradley EB-1525	10470
R123	RESISTOR, VARIABLE 500 ohms, 2W, CU5011, Ohmite	14047
R124	RESISTOR, FIXED COMP. 10K, 1/2W, 5%, RC20GF103J	10408
R125	RESISTOR, Not Assigned	
R126	RESISTOR, Not Assigned	
R127	RESISTOR, Not Assigned	
R128	RESISTOR, Not Assigned	
R129	RESISTOR, Part of C10-694-1	
R130	RESISTOR, Part of C10-694-1	
R131	RESISTOR, Part of C10-694-1	
R132	RESISTOR, Part of TB #1	
R133	RESISTOR, Part of TB #1	
R134	RESISTOR, FIXED COMPOSITION 180 ohm 1/2W, ± 5%, Allen Bradley EB-1815	10453
R135	RESISTOR, FIXED COMPOSITION 5.1 meg, 1/2W, ± 5%, Allen Bradley EB-5155	10462

Ref. Designation	Description	GEL Part No.
R136	RESISTOR, FIXED COMPOSITION 220K, 1/2W, ± 5%, Allen Bradley EB-2245	10608
R137	RESISTOR, FIXED COMPOSITION 3.9K, 1/2W, ± 5%, Allen Bradley EB-3925	
R138	RESISTOR, Part of TB #1	
R139	RESISTOR, Part of TB #1	
R140	RESISTOR, Part of TB #2	
R141	POTENTIOMETER, COMPOSITION Linear Taper, 500K, 2W, ± 10%, Ohmite CLU-5041	14000
R142	RESISTOR, FIXED, Wire Wound 43 ohm 25W, ± 3% Dale Products Co. RH-25	11609
R143	RESISTOR, FIXED, Wire Wound 200 ohm, 25W, ± 3%, Dale Products Co. RH-25	11611
R144	RESISTOR, FIXED, Wire Wound 3.3K 25W, ± 3%, Dale Products Co. PH-25	11649
R145	RESISTOR, FIXED COMPOSITION 47K, 1/2W, ± 5%, Allen Bradley EB-473K	10429
R146	RESISTOR, Not Assigned	
R147	RESISTOR, FIXED COMPOSITION 4.7K, 1/2W, ± 5%, Allen Bradley EB-4725	10414
R148	RESISTOR: Same as R127	
R149	RESISTOR, Not Assigned	
R150	RESISTOR, Part of TB #2	
R151	RESISTOR, Not Assigned	

Ref. Designation	Description	GEL Part No.
R152	RESISTOR, FIXED COMPOSITION 10 ohm 1W, ± 5%, Allen Bradley GB-1005	10492
R153	RESISTOR, Not Assigned	
R154	RESISTOR, Part of C10-694-1	
R155	RESISTOR, FIXED COMPOSITION 22K, 1/2W, ± 5%, Allen Bradley EB-2235	10427
R156	RESISTOR, FIXED COMPOSITION 18K, 1/2W, ± 5%, Allen Bradley EB-1835	10426
R157	RESISTOR: Same as R156	
R158	RESISTOR, FIXED COMPOSITION 2.0M 1/2W, 5%, Allen Bradley EB-2055	10465
R159	RESISTOR: Same as R127	
R160	RESISTOR, Not Assigned	
R161	RESISTOR: Same as R127	
R162	RESISTOR, FIXED COMPOSITION 1.5 meg, 1/2W, ± 5%, Allen Bradley EB-1555	10512
R163	POTENTIOMETER, COMPOSITION Linear Taper 50K, 2W, ± 10%, Ohmite CLU-5031	14011
R164	RESISTOR: Same as R145	
S101	SWITCH, Wafer Centrelab #PA-2010	18009
S102	SWITCH, DPST, Toggle Switch #522	18004

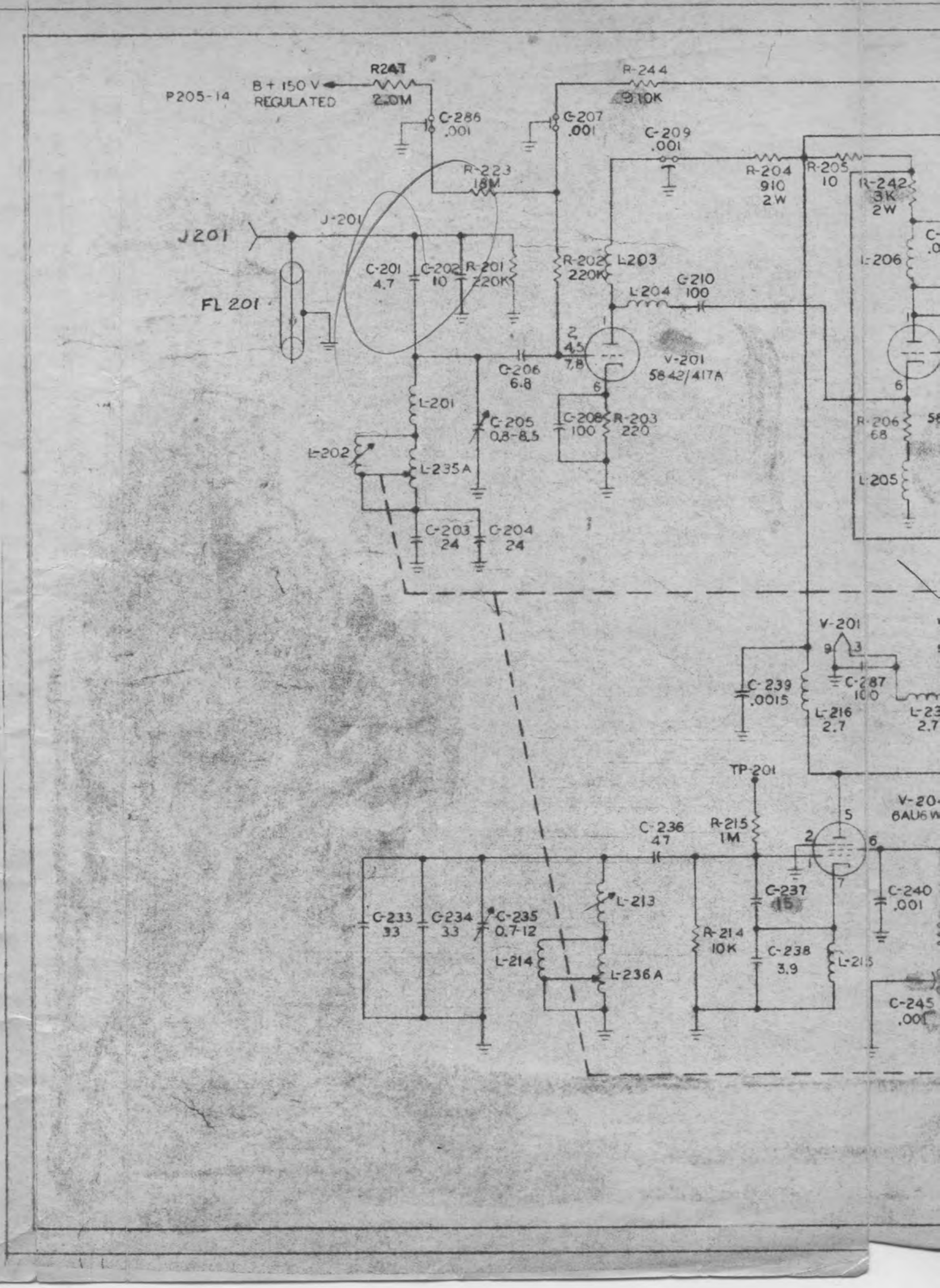
Ref. Designation	Description	GEL Part No.
S103	SWITCH, Not Assigned	
S104	SWITCH, SP4T, Rotary, non-shorting, PA 2001, 17/32" Shaft	18006
S105	SWITCH, Rotary Centralab PA2001 SP5T	18006
T101	TRANSFORMER, Power	
T102	TRANSFORMER, Audio Output Chicago AMS-6	15252
T103	TRANSFORMER, Power Newton 3072	
T104	TRANSFORMER, Isolation	
V101	TUBE, Electron 12AT7WA	14775
V102	TUBE: Same as V101	
V103	TUBE, Electron, 5814A	14781
V104	TUBE, Not Assigned	
V105	TUBE, Not Assigned	
V106	TUBE, Electron, 6AH6WA	14776
V107	TUBE: Same as V103	
V108	TUBE, Electron 0A2WA	14782
VR101	DIODE, Zener 1N2982B	14637
VR102	DIODE: Same as VR101	

Ref. Designation	Description	GEL Part No.
W101	CABLE ASSY.	B18-123-3
W102	CABLE ASSY.	B18-123-6
W103	CABLE ASSY.	B18-123-2
W104	CABLE ASSY.	B18-123-4
W105	CABLE ASSY.	B11-039-8
W106	CABLE ASSY.	B18-123-7
W107	CABLE ASSY.	B18-188

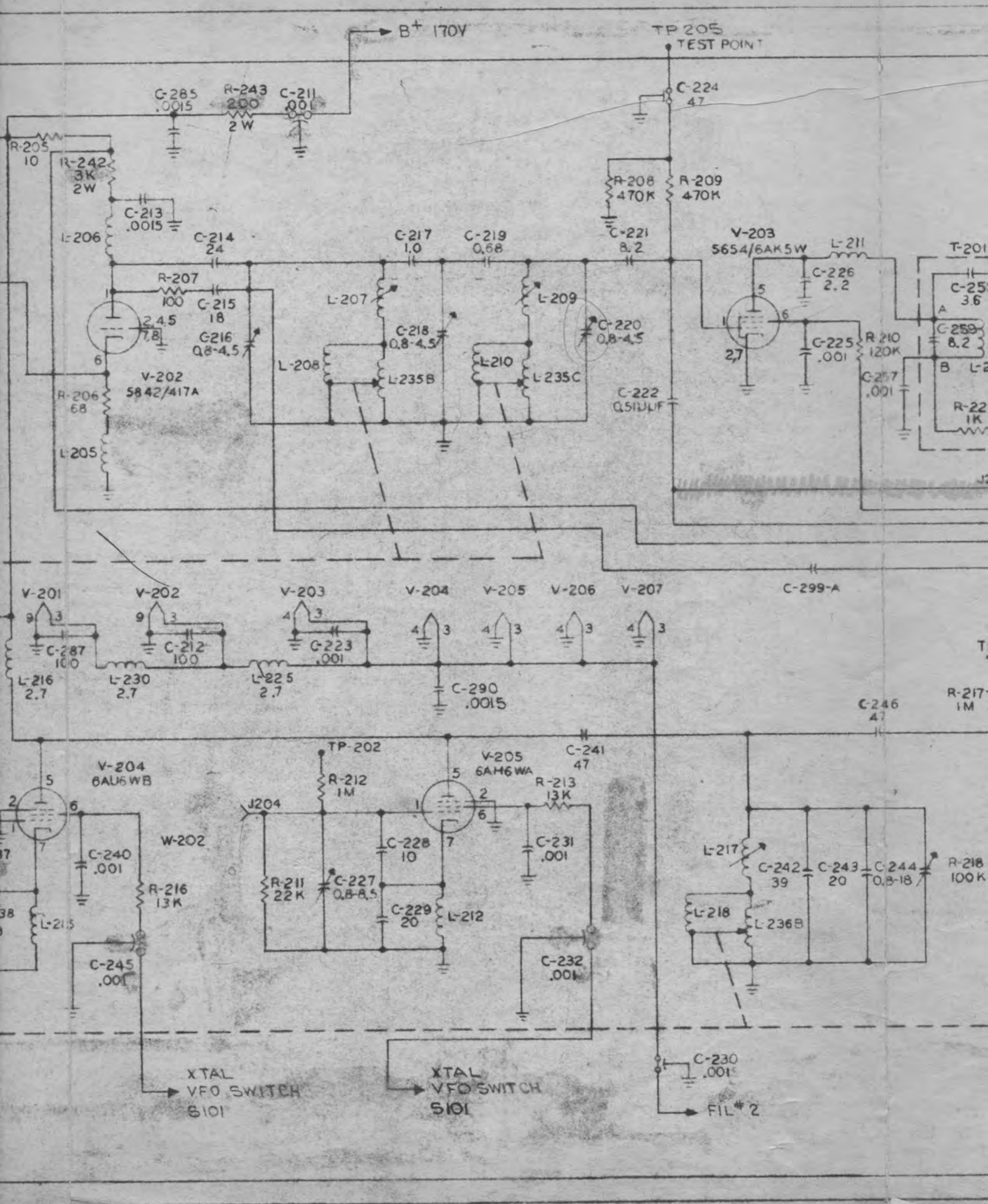
7.0 SCHEMATIC DIAGRAMS

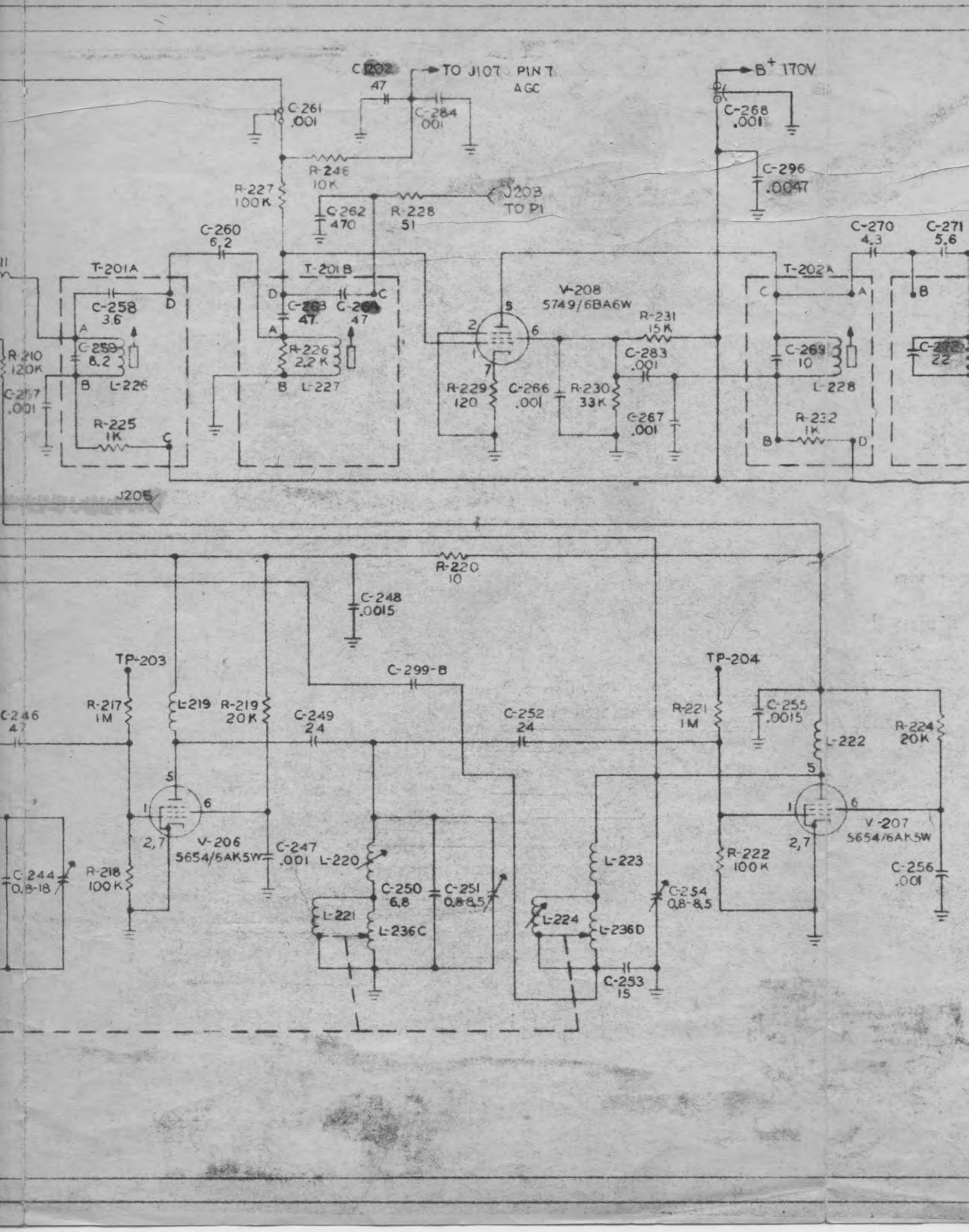
The following schematic diagrams for the 11B1-BN, 2, 3 receiver are contained in this section in the order listed below.

- RF HEAD - FRONT END
- 300 KC BANDWIDTH 2nd. IF STRIP
- FM DEMODULATOR
- MAIN CHASSIS
- VIDEO AMPLIFIER
- ISOLATED FM DEMODULATOR (R18-179)
- ISOLATED FM DEMODULATOR (R18-313)
- PLAYBACK UP-CONVERTER

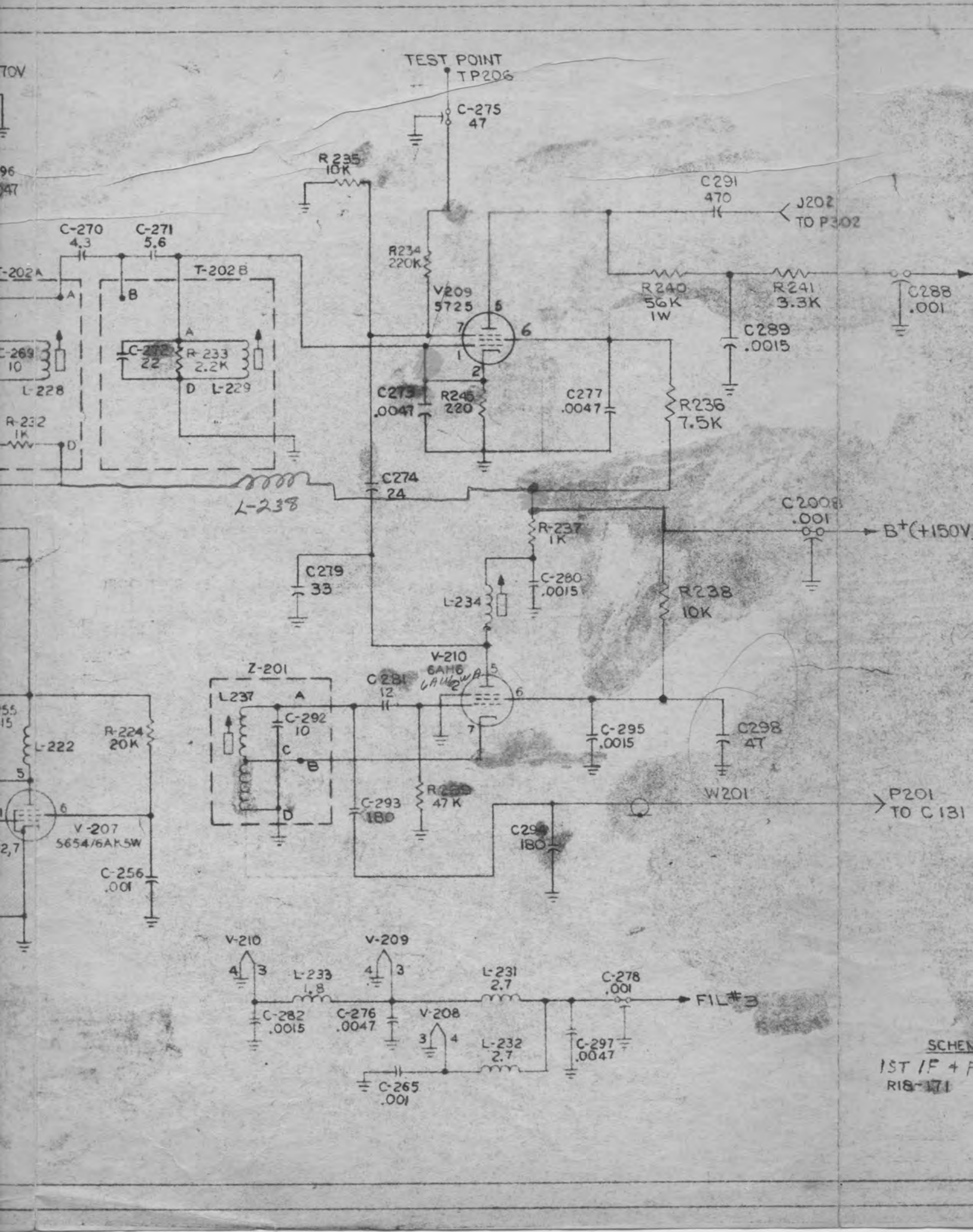


P205-14
B + 150 V
REGULATED
R247
2.0M
C-286
.001
R-244
910K
C-207
.001
C-209
.001
R-223
18M
R-204
910
2W
R-205
10
R-242
3K
2W
L-206
J201
J-201
C-201
4.7
C-202
10
R-201
220K
FL 201
R-202
220K
L-203
L-204
C-210
100
C-206
6.8
V-201
5842/417A
L-201
L-202
C-205
0.8-8.5
L-235A
C-208
100
R-203
220
R-206
68
L-205
C-203
24
C-204
24
V-201
C-287
100
C-239
.0015
L-216
2.7
TP-201
R-215
1M
C-236
47
V-20
6AU6W
C-233
33
C-234
33
C-235
0.7-12
L-213
L-214
L-236A
R-214
10K
C-237
15
C-238
3.9
C-240
.001
C-245
.001

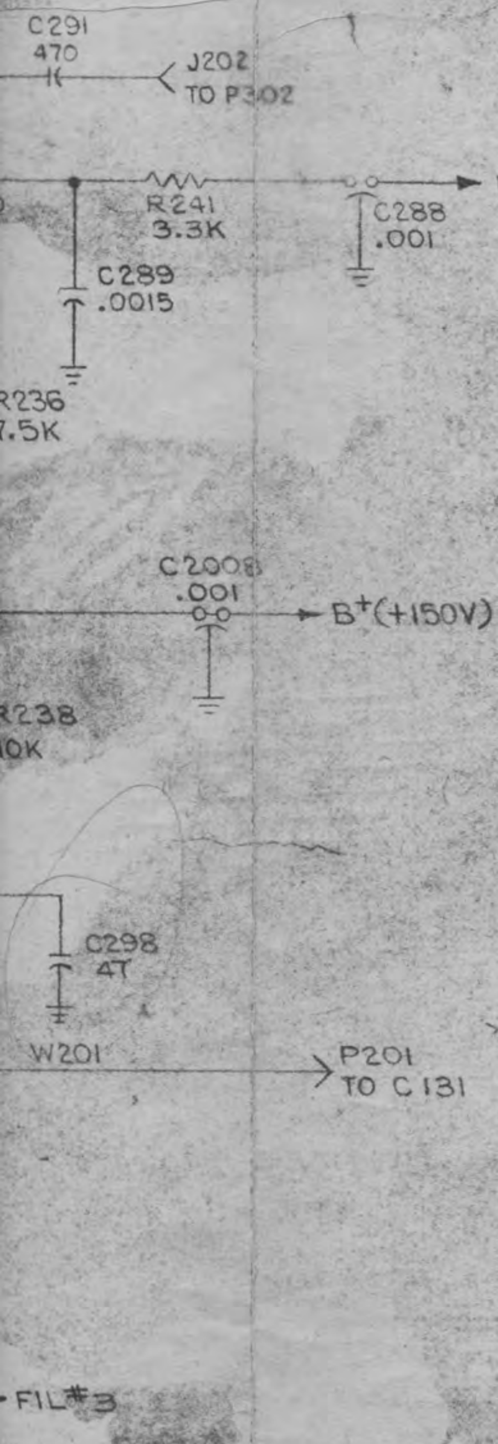

B+ 170V
TP 205
TEST POINT
C-224
47
C-285
.0015
R-243
200
2 W
C-211
.001
R-205
10
R-242
3K
2W
C-213
.0015
L-206
C-214
24
R-207
100
C-215
18
C-216
0.8-4.5
V-202
5842/417A
R-206
68
L-205
C-217
1.0
C-219
0.68
L-207
C-218
0.8-4.5
L-208
L-235B
L-209
C-220
0.8-4.5
L-210
L-235C
R-208
470K
R-209
470K
C-221
8.2
C-222
0.51UUF
V-203
5654/6AK5W
L-211
C-226
2.2
C-225
.001
R 210
120K
T-201
C-257
.001
R-22
1K
V-201
V-202
V-203
V-204
V-205
V-206
V-207
C-299-A
C-287
100
C-212
100
C-223
.001
L-216
2.7
L-230
2.7
L-225
2.7
C-290
.0015
C-246
47
R-217
1M
V-204
6AU6WB
TP-202
V-205
6AH6WA
C-241
47
W-202
J204
R-212
1M
R-213
13K
C-240
.001
R-216
13K
C-228
10
C-227
0.8-8.5
R-211
22K
C-229
20
L-212
C-231
.001
L-215
C-245
.001
C-232
.001
L-217
L-218
L-236B
C-242
39
C-243
20
C-244
0.8-18
R-218
100K
C-230
.0015
XTAL
VFO SWITCH
S101
XTAL
VFO SWITCH
S101
FIL # 2



TO J107 PIN 7
AGC
B+ 170V
C-261 .001
C-284 .001
C-268 .001
R-246 10K
C-296 .0047
R-227 100K
C-262 470
R-228 51
J203 TO P1
C-260 6.2
T-201A
T-201B
C-270 4.3
C-271 5.6
T-202A
C-258 3.6
C-259 8.2
L-226
R-226 2.2K
L-227
V-208 5749/6BA6W
R-231 15K
C-283 .001
C-269 10
L-228
R-210 120K
C-257 .001
R-225 1K
R-229 120
C-266 .001
R-230 33K
C-267 .001
R-232 1K
J205
R-220 10
C-248 .0015
TP-203
TP-204
C-299-B
R-217 1M
L-219
R-219 20K
C-249 24
C-252 24
R-221 1M
C-255 .0015
L-222
R-224 20K
C-246 47
V-206 5654/6AK5W
C-247 .001
L-220
C-250 6.8
C-251 0.8-8.5
L-223
C-254 0.8-8.5
R-222 100K
V-207 5654/6AK5W
C-256 .001
C-244 0.8-18
R-218 100K
L-221
L-236C
L-224
L-236D
C-253 15



TEST POINT
TP206
C-275
47
R 235
10K
C291
470
J202
TO P302
C-270
4.3
C-271
5.6
T-202A
T-202B
R234
220K
V209
5725
R240
56K
1W
R241
3.3K
C288
.001
C289
.0015
C-269
10
L-228
C-272
22
R-233
2.2K
L-229
C273
.0047
R245
220
C277
.0047
R236
7.5K
R-232
1K
C274
24
L-238
C2008
.001
B+(+150V)
R-237
1K
C279
33
C-280
.0015
L-234
R238
10K
V-210
6AH6
Z-201
L237
C281
12
C-292
10
L-222
R-224
20K
C-295
.0015
C298
47
V-207
5654/6AK5W
C-293
180
R-239
47K
W201
P201
TO C131
C294
180
C-256
.001
V-210
V-209
L-233
1.8
L-231
2.7
C-278
.001
FIL#3
C-282
.0015
C-276
.0047
V-208
L-232
2.7
C-297
.0047
C-265
.001
SCHEM
1ST IF + F
R18-171

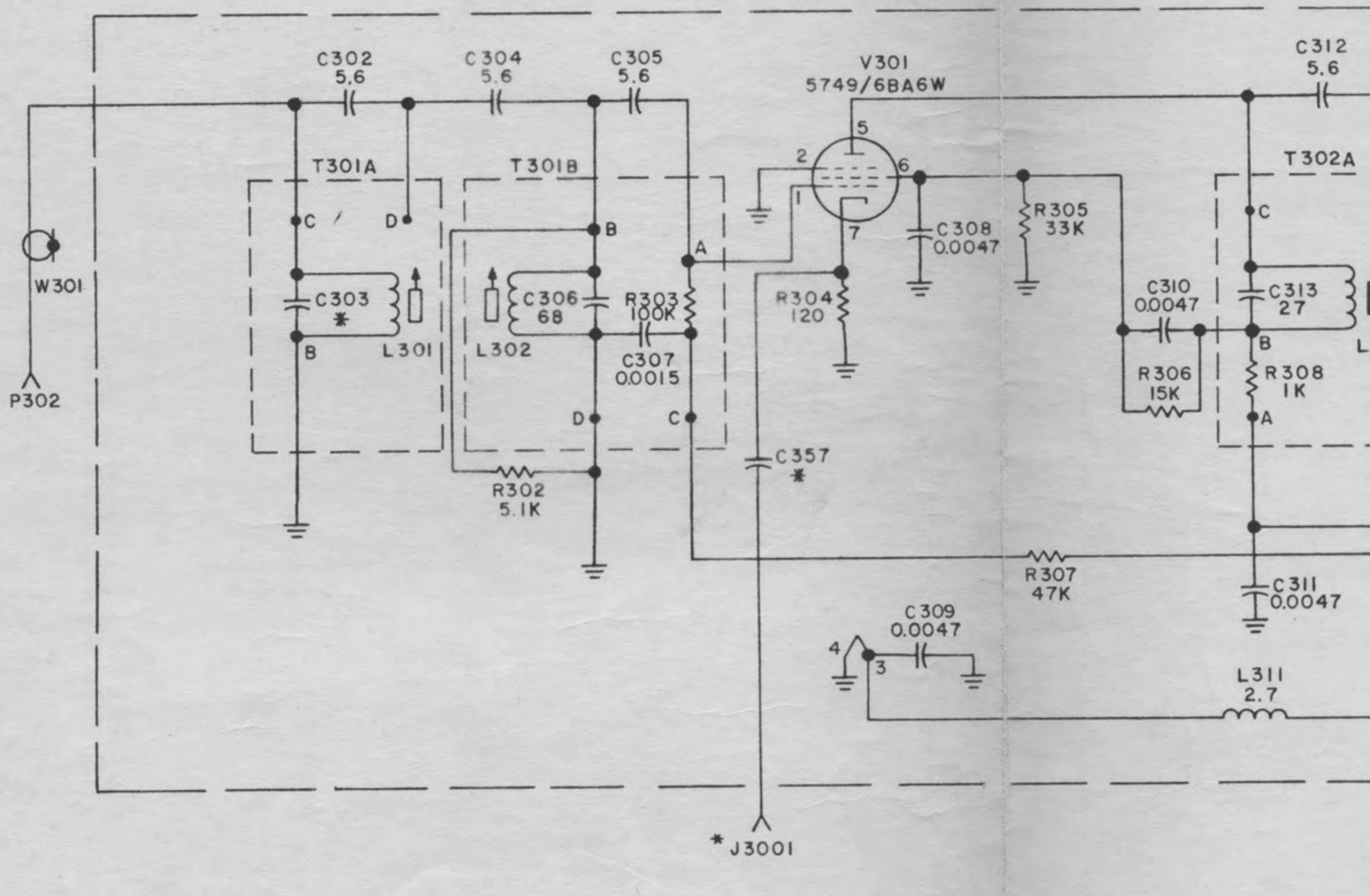


UNLESS OTHERWISE INDICATED:
CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS
CAPACITOR VALUES GREATER THAN ONE ARE IN MICROMICROFARADS
INDUCTANCE VALUES ARE IN MICROHENRYS.
RESISTOR VALUES ARE IN OHMS.
K=1,000 M=1000,000

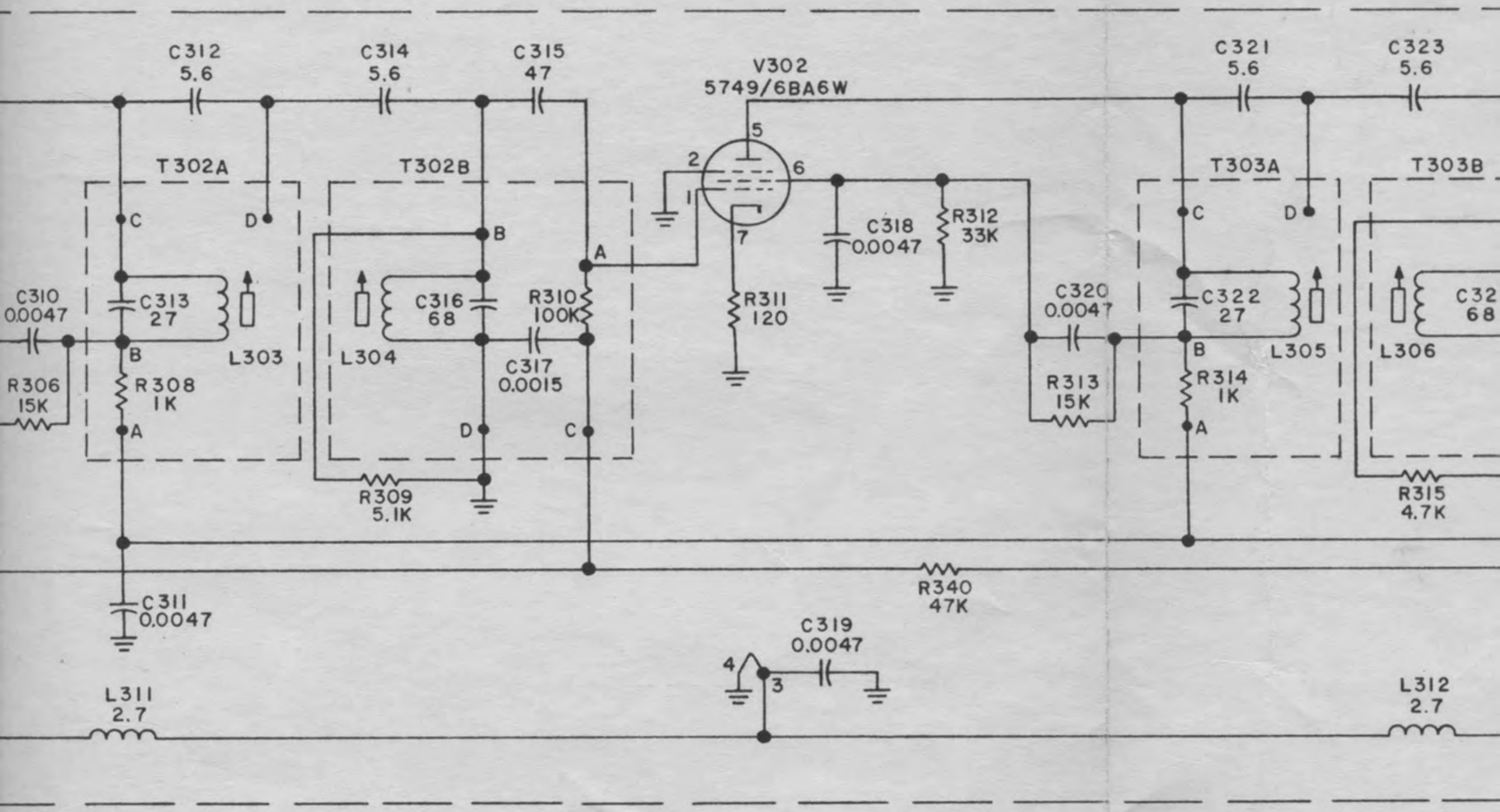
SCHEMATIC DIAGRAM

1ST IF + FRONT END ASSEMBLY

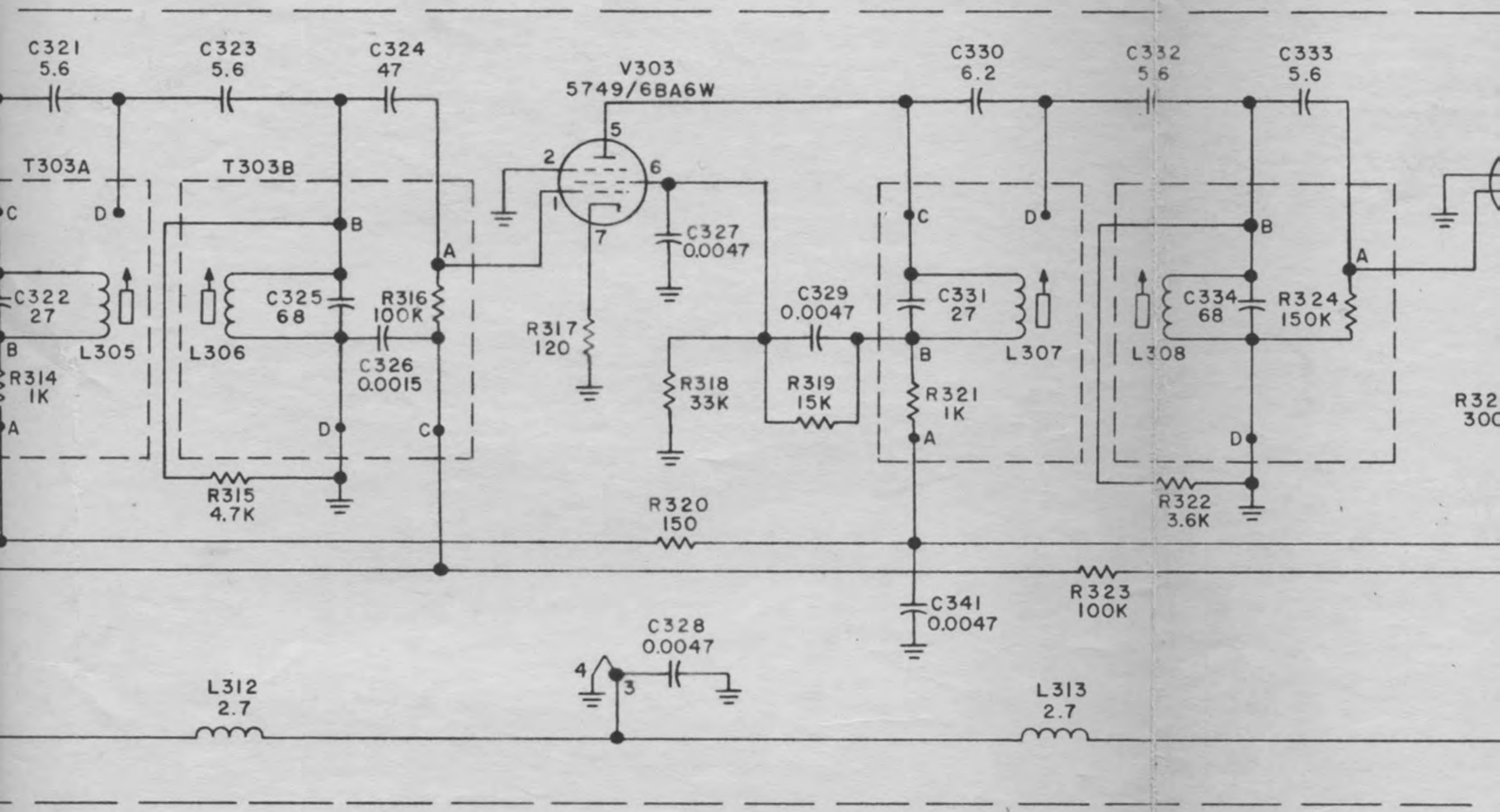
R18-171



C302
5.6
C304
5.6
C305
5.6
V301
5749/6BA6W
C312
5.6
T301A
T301B
T302A
W301
P302
C303
L301
C306
68
L302
R303
100K
C307
0.0015
R302
5.1K
C308
0.0047
R305
33K
R304
120
C310
0.0047
C313
27
R306
15K
R308
1K
C357
R307
47K
C311
0.0047
C309
0.0047
L311
2.7
J3001


C312
5.6
C314
5.6
C315
47
V302
5749/6BA6W
C321
5.6
C323
5.6
T302A
T302B
T303A
T303B
C
D
B
A
C310
0.0047
C313
27
L303
C316
68
L304
R310
100K
C317
0.0015
R306
15K
R308
1K
R309
5.1K
C318
0.0047
R312
33K
R311
120
C320
0.0047
R313
15K
C322
27
L305
R314
1K
L306
R315
4.7K
C311
0.0047
R340
47K
C319
0.0047
L311
2.7
L312
2.7

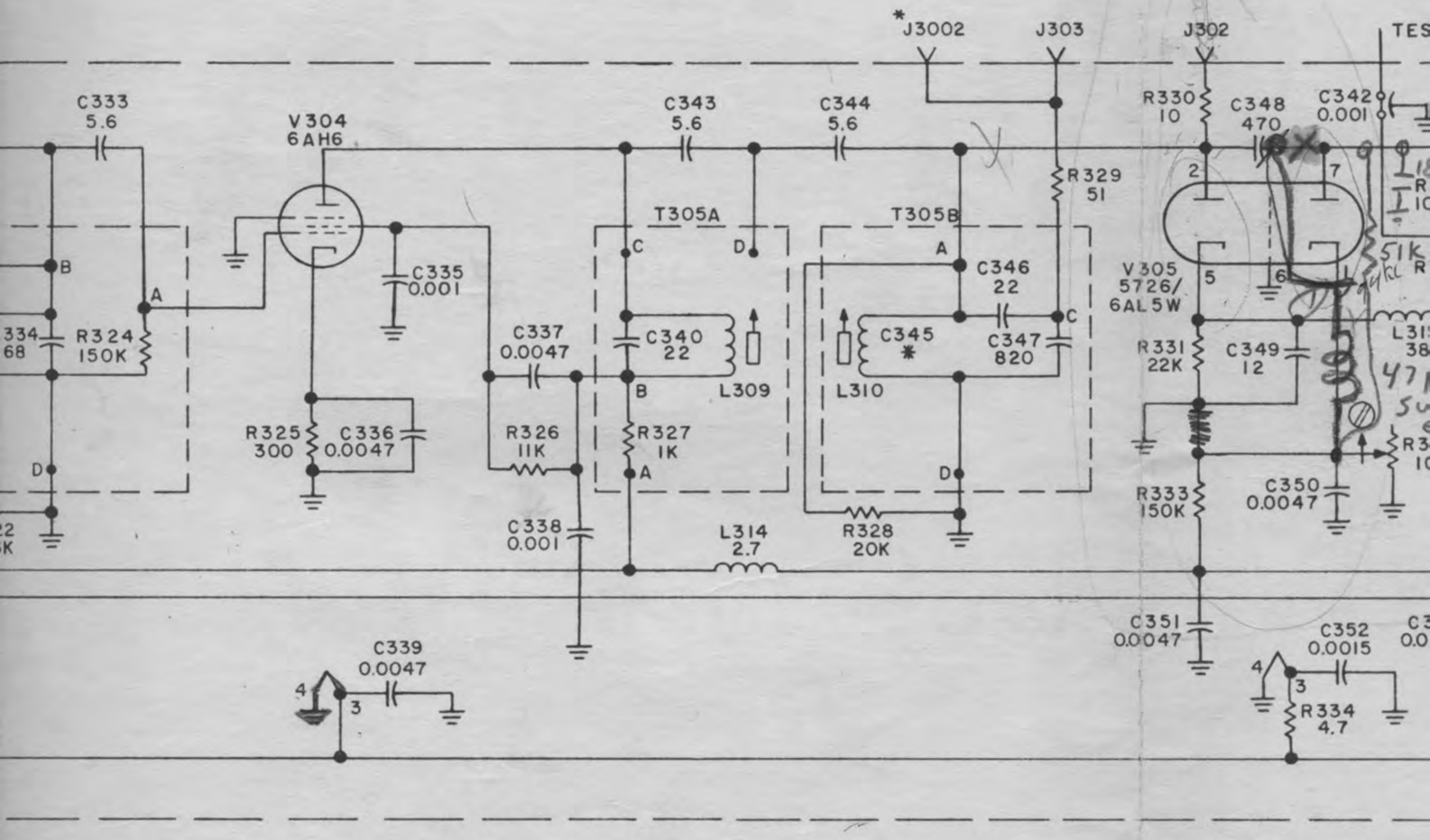
DASH NO.	C303	C345	C357
-1	OMIT	OMIT	OMIT
-2	27uuf	39uuf	OMIT
-3	27uuf	39uuf	.51uf



C303	C345	C357	J3001	J3002
OMIT	OMIT	OMIT	OMIT	OMIT
27uuf	39uuf	OMIT	OMIT	OMIT
27uuf	39uuf	.51uf	INCLUDE	INCLUDE

DASH	MPL	EPL
-1		
-2	A14-538	A14-539
-3	A17-903	

CENTER FREQ.	10MC
BANDWIDTH	300KC



NOTES:

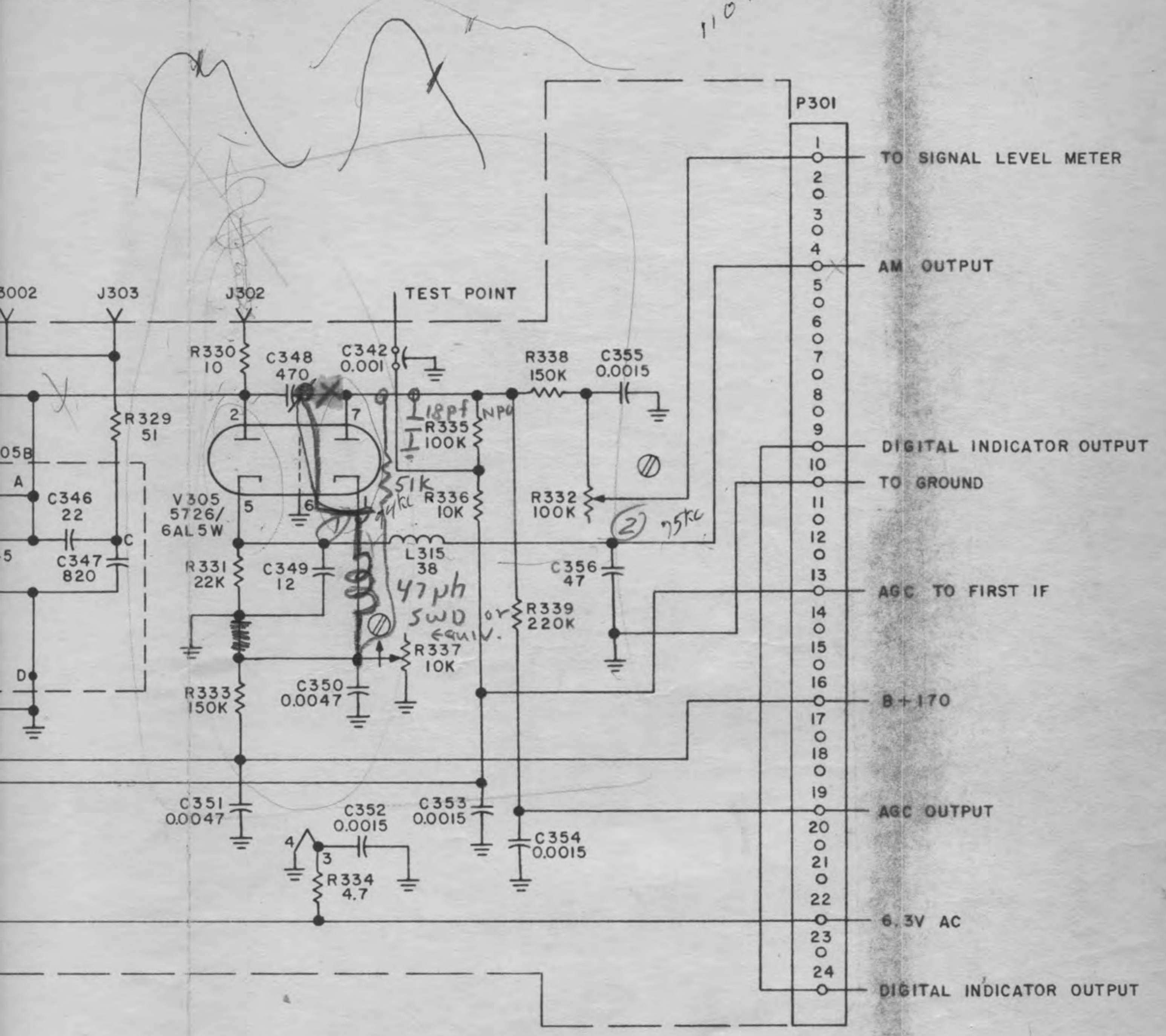
UNLESS OTHERWISE INDICATED

1. CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS, VALUES GREATER THAN ONE ARE IN MICROMICROFARADS.
2. RESISTOR VALUES ARE IN OHMS, K=1000, M=1,000,000
3. INDUCTANCE VALUES ARE IN MICROHENRIES.
   - (symbol) SCREW DRIVER ADJUSTMENT.
   - (symbol) ARROW DENOTES CLOCKWISE ROTATION.
4. * INDICATES COMPONENTS ARE TABULATED

CENTER FREQ.	10MC
BANDWIDTH	300KC

6AL5

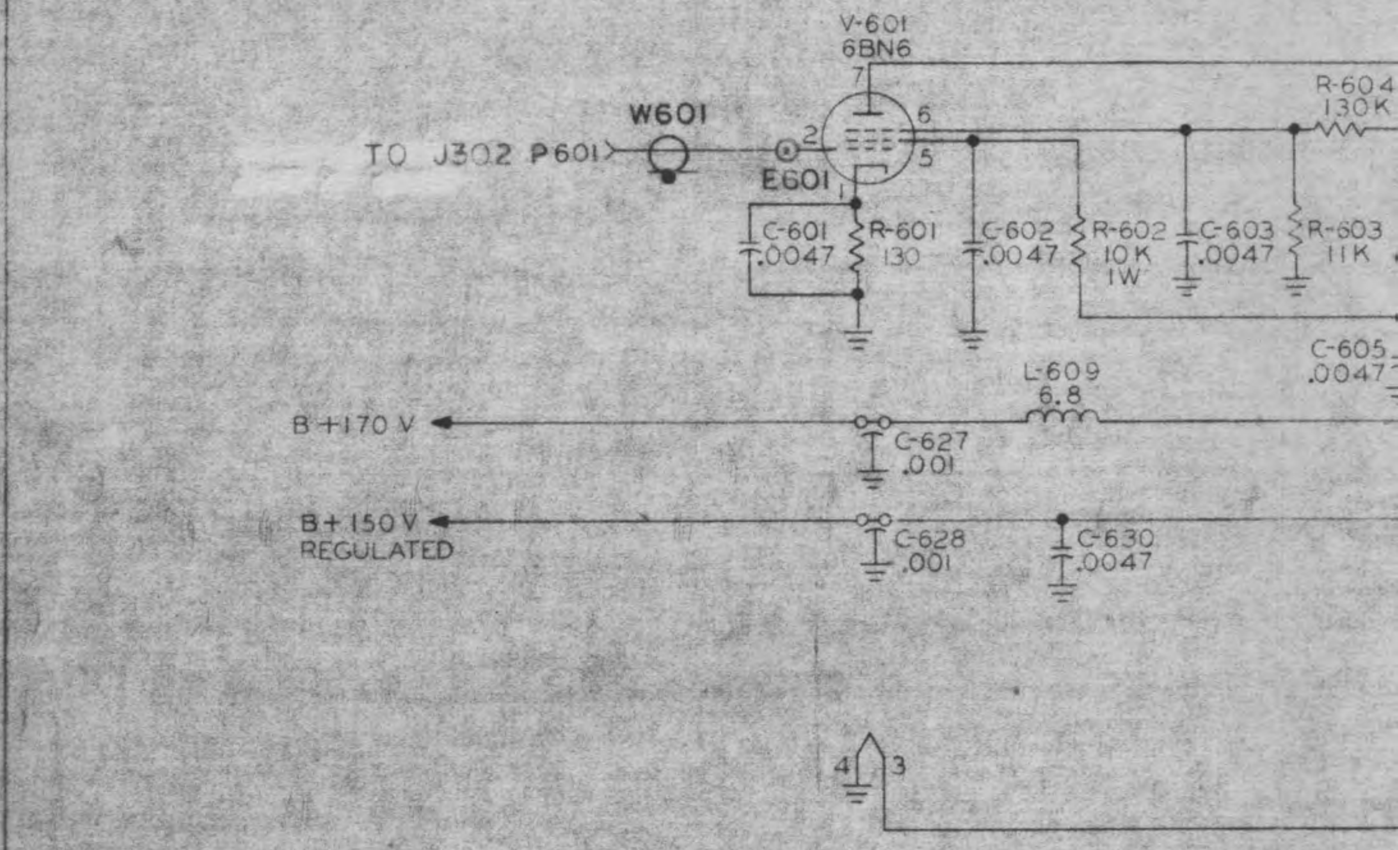
306 kcs
3.4 VRMS
110 kc Overall freq. Response



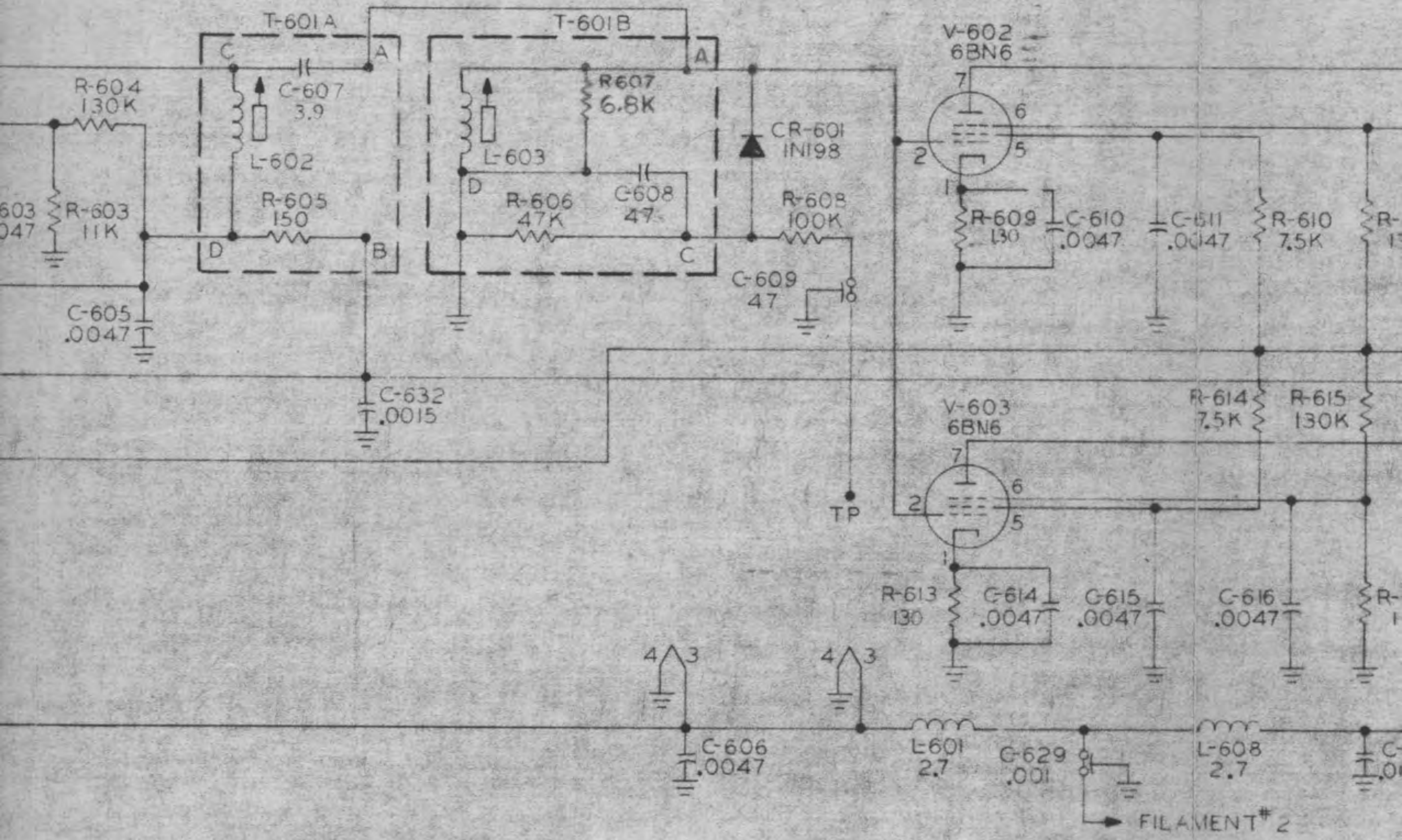
MICROFARADS,
ICROFARADS.

=1,000,000

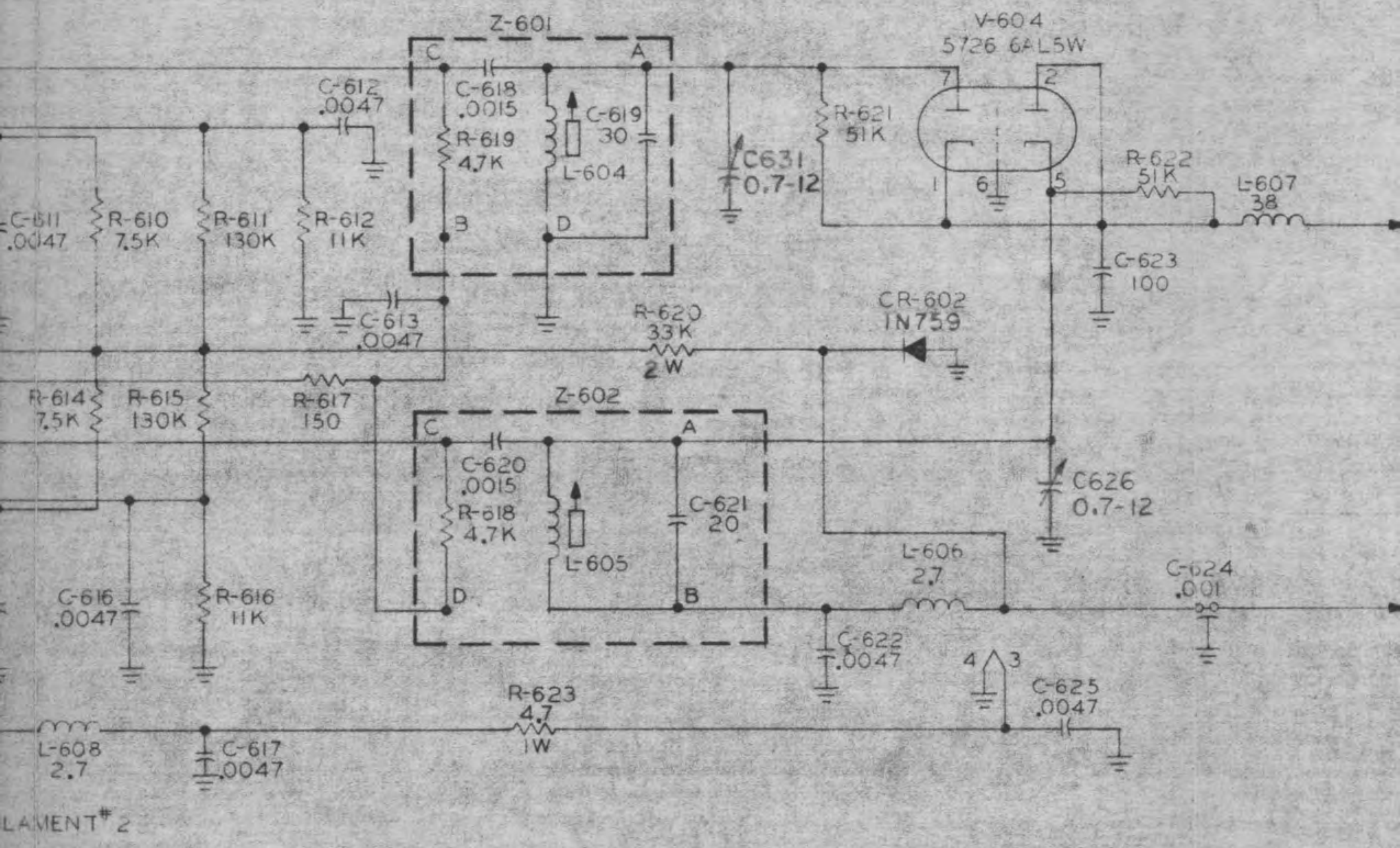
SCHEMATIC
300 KC BANDWIDTH 2ND I.F. STRIP



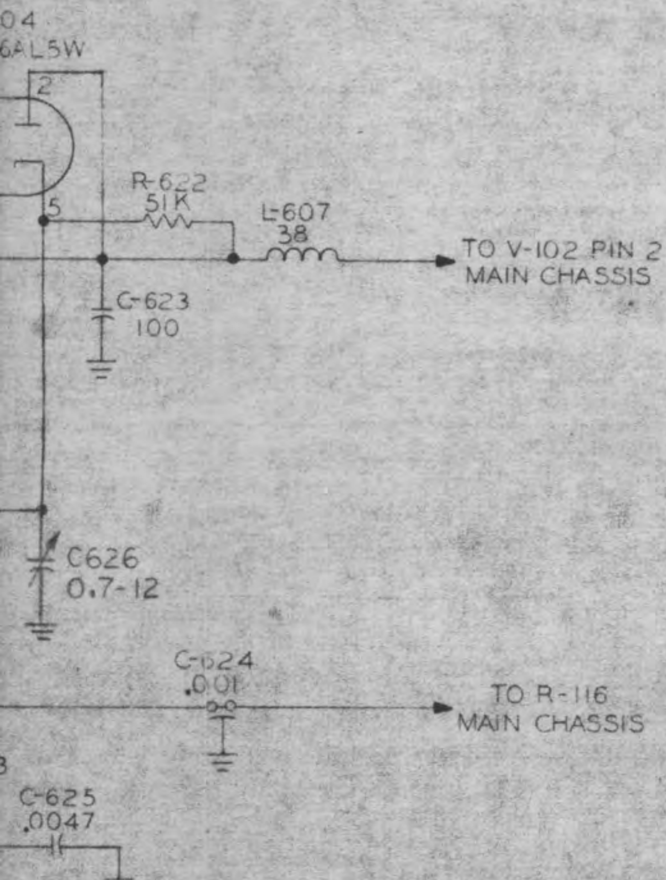
V-601
6BN6
W601
TO J302 P601
E601
C-601
.0047
R-601
130
C-602
.0047
R-602
10K
1W
C-603
.0047
R-603
11K
R-604
130K
C-605
.0047
L-609
6.8
B+170 V
C-627
.001
B+150 V
REGULATED
C-628
.001
C-630
.0047



T-601A
T-601B
R-604
130K
C-607
3.9
L-602
R-603
11K
R-605
150
C-605
.0047
C-632
.0015
R607
6.8K
L-603
R-606
47K
C-608
47
CR-601
IN198
R-608
100K
C-609
47
TP
V-602
6BN6
R-609
130
C-610
.0047
C-611
.0047
R-610
7.5K
R-614
7.5K
R-615
130K
V-603
6BN6
R-613
130
C-614
.0047
C-615
.0047
C-616
.0047
C-606
.0047
L-601
2.7
C-629
.001
L-608
2.7
FILAMENT # 2



Z-601
C
A
C-618
.0015
R-619
4.7K
C-619
30
L-604
B
D
C-612
.0047
C-611
.0047
R-610
7.5K
R-611
130K
R-612
11K
C-613
.0047
V-604
5726 6AL5W
7
2
1
6
5
R-621
51K
C631
0.7-12
R-622
51K
L-607
38
C-623
100
CR-602
1N759
R-620
33K
2 W
R-614
7.5K
R-615
130K
R-617
150
Z-602
C
A
C-620
.0015
R-618
4.7K
C-621
20
L-605
D
B
C626
0.7-12
L-606
2.7
C-624
.001
C-616
.0047
R-616
11K
C-622
.0047
4
3
R-623
4.7
1W
C-625
.0047
L-608
2.7
C-617
.0047
LAMENT#2



NOTE:

UNLESS OTHERWISE NOTED:

CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS.

CAPACITOR VALUES GREATER THAN ONE ARE IN MICROMICROFARADS.

INDUCTANCE VALUES ARE IN MICROHENRYS.

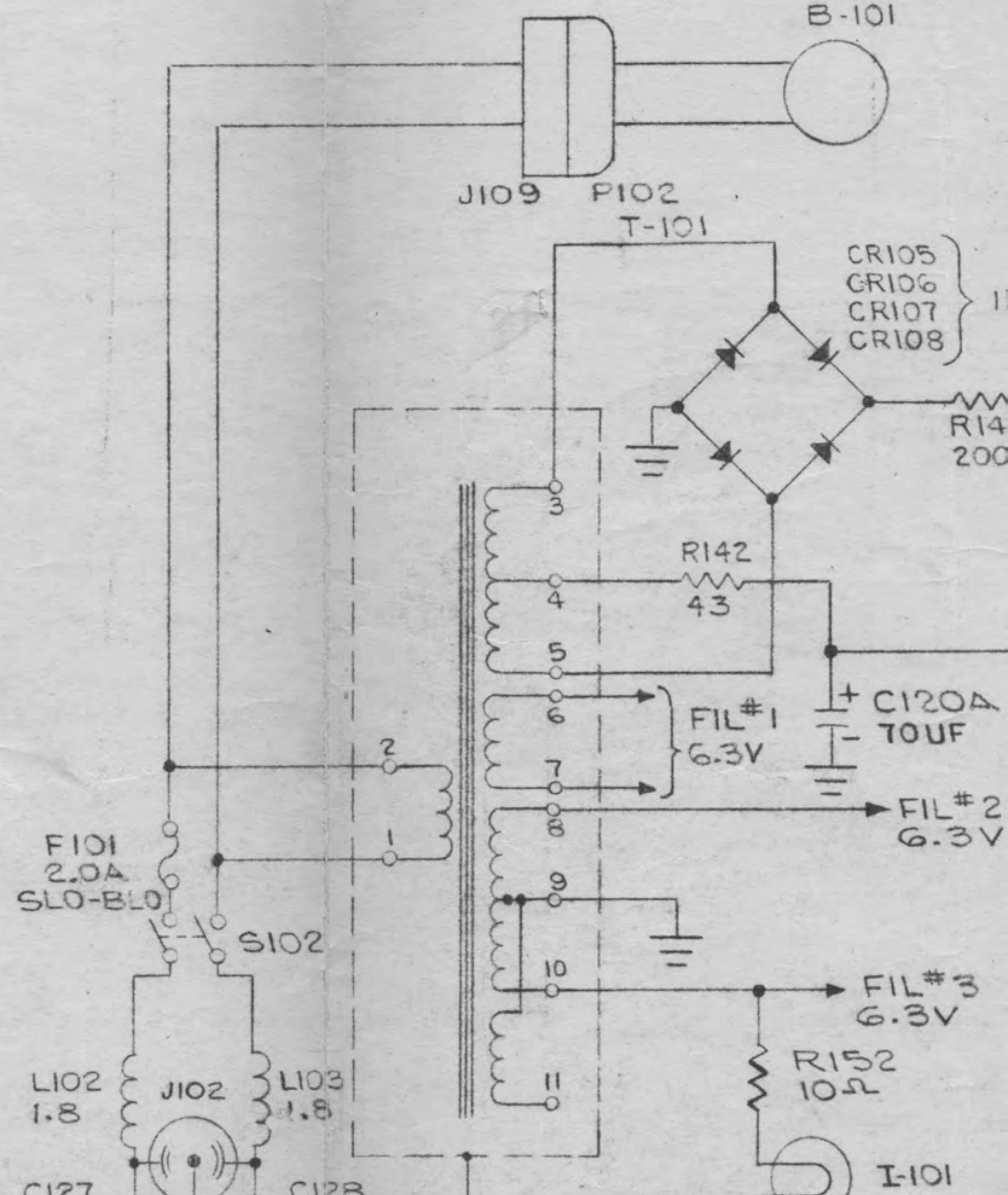
RESISTOR VALUES ARE IN OHMS, K=1000, M=1,000,000.

RESISTOR WATTAGE IS 1/2 W.

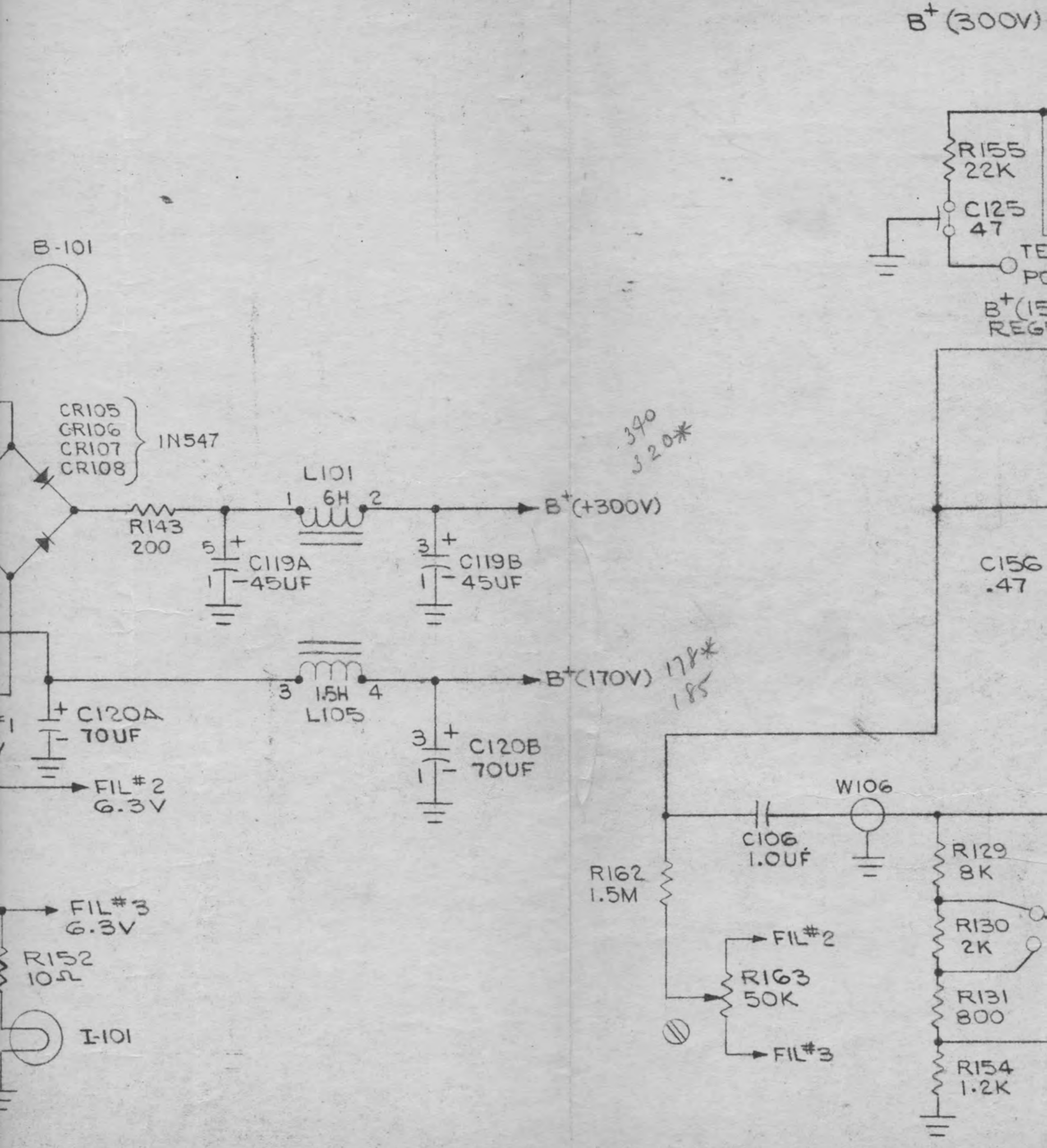
SCHEMATIC DIAGRAM

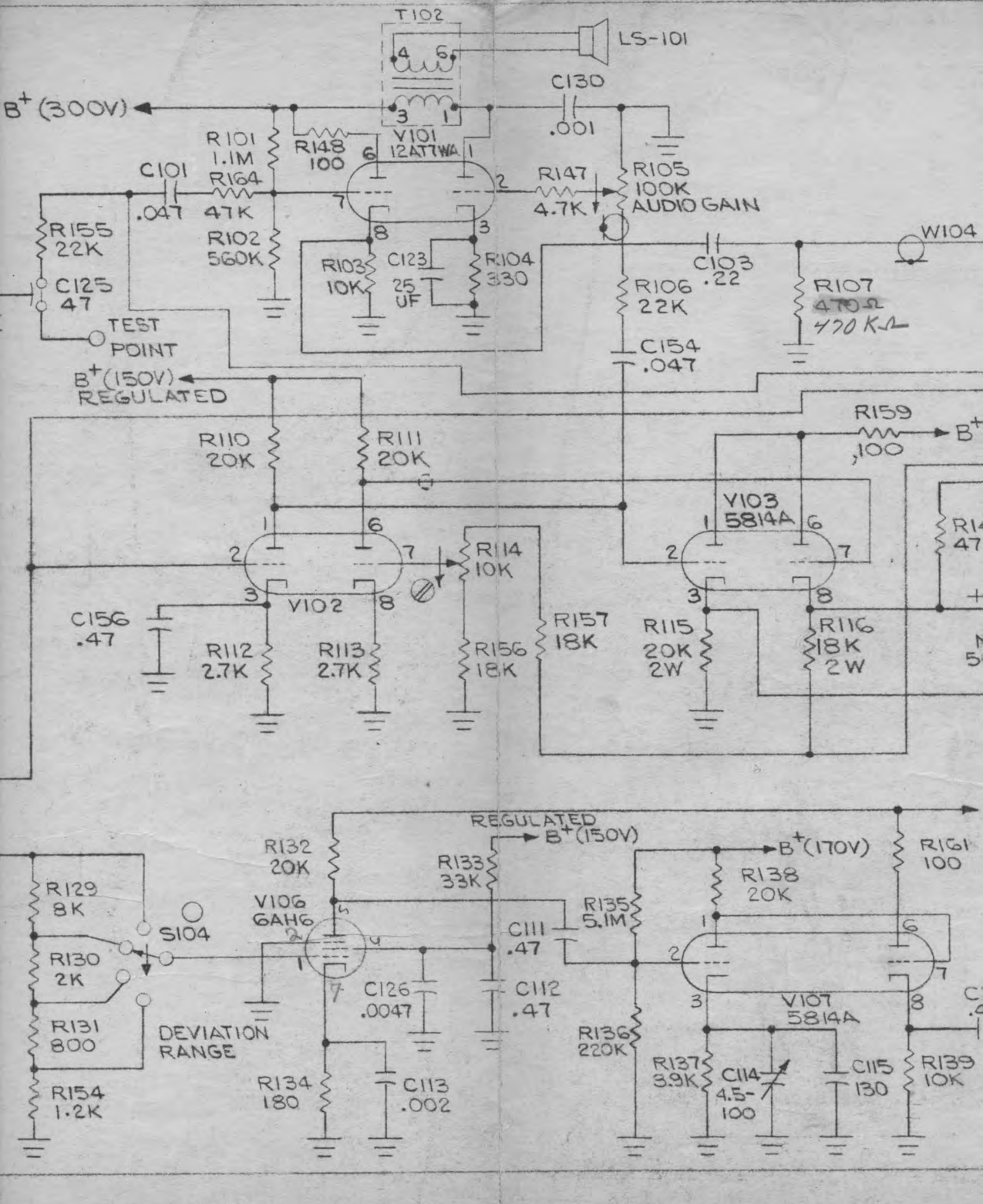
FM DEMODULATOR

R12-956

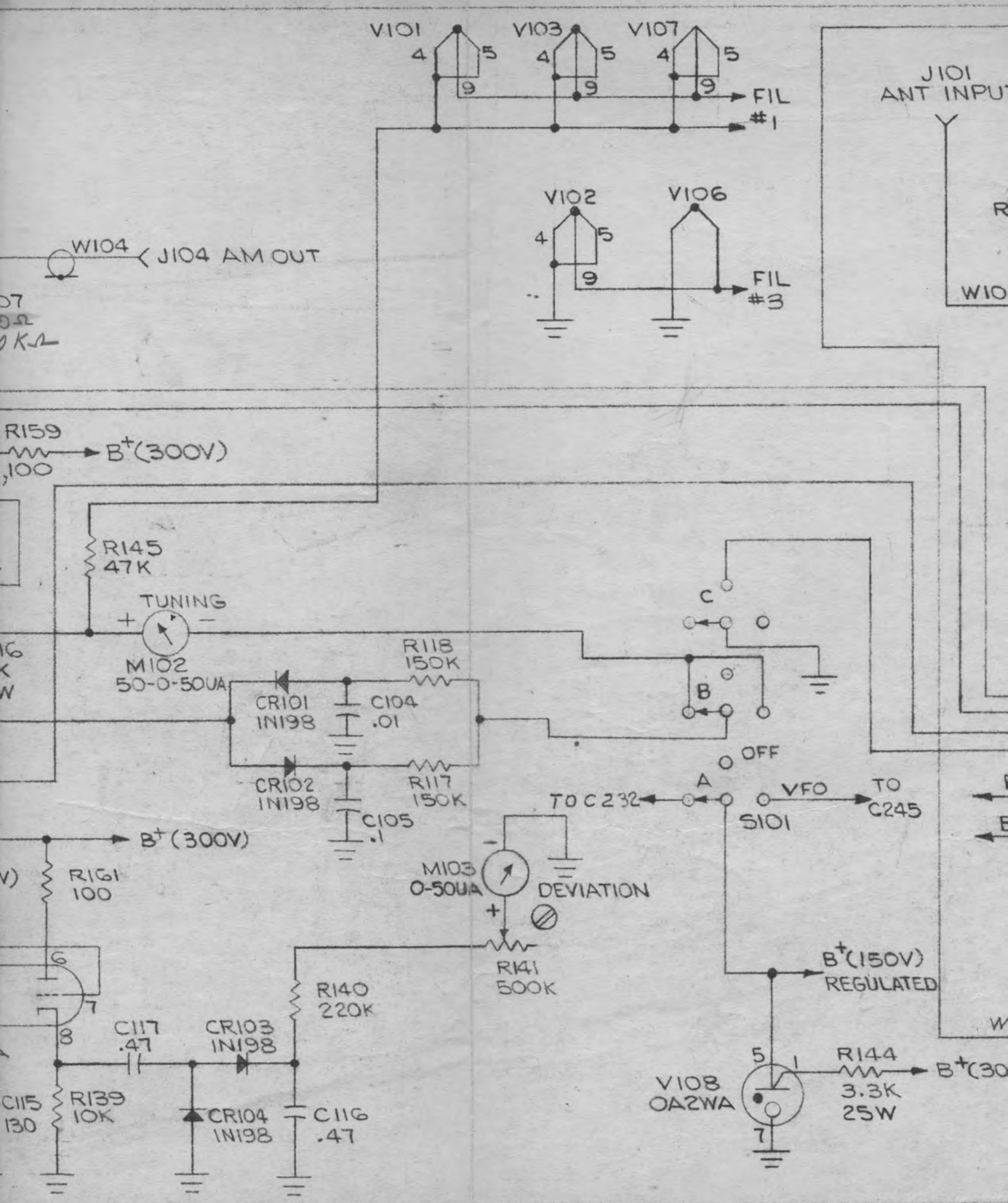


B-101
J109
P102
T-101
CR105
CR106
CR107
CR108
R14
200
R142
43
C120A
70UF
FIL#1
6.3V
FIL#2
6.3V
FIL#3
6.3V
F101
2.0A
SLO-BLO
S102
L102
1.8
J102
L103
1.8
C127
.0033
C128
.0033
R152
10Ω
I-101

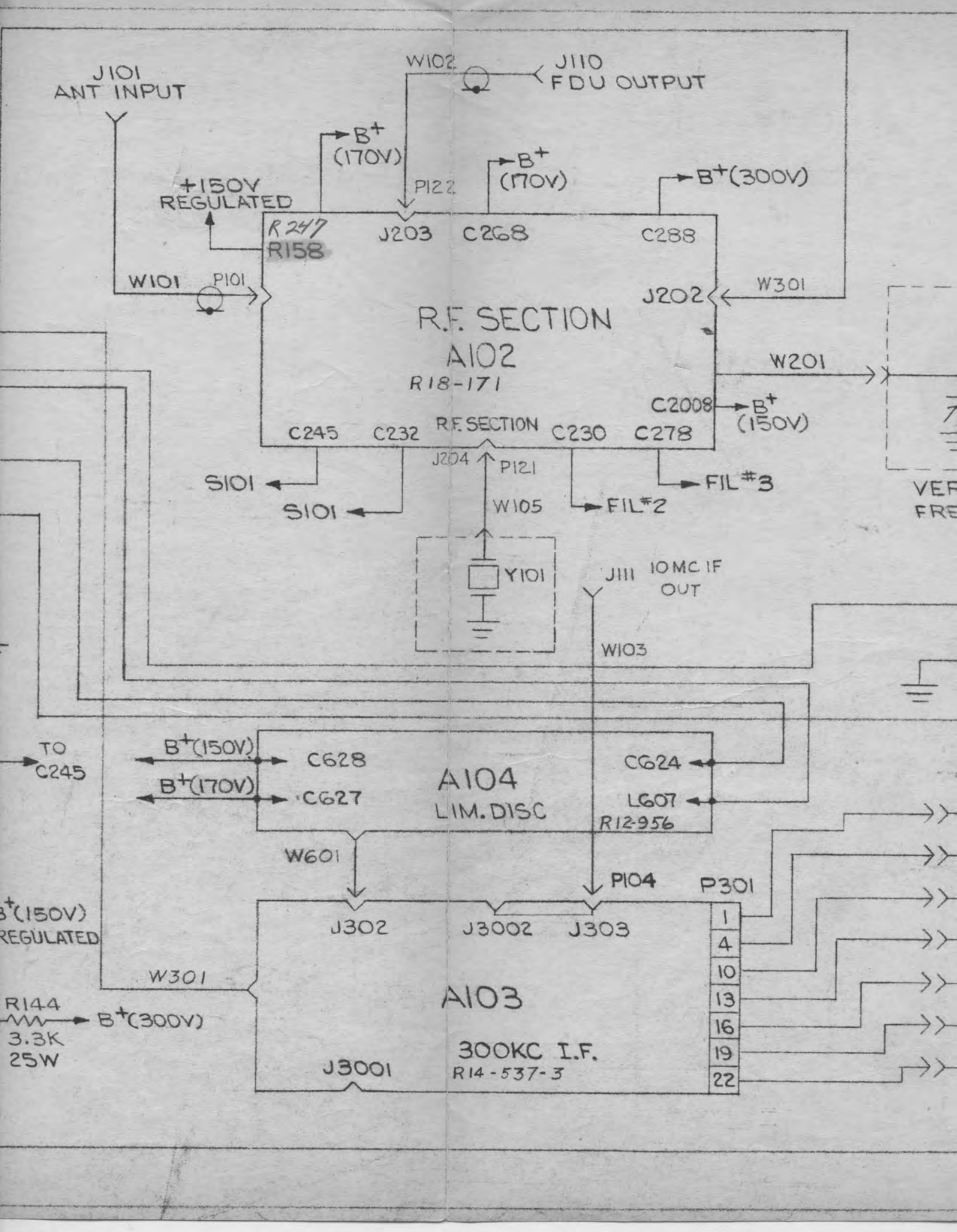

B+ (300V)
R155
22K
C125
47
TE
PO
B+(15
REG
B-101
CR105
CR106
CR107
CR108
IN547
340
320*
L101
6H
B+(+300V)
R143
200
C119A
45UF
C119B
45UF
C156
.47
B+(170V)
178*
185
1.5H
L105
C120A
70UF
C120B
70UF
FIL#2
6.3V
W106
C106
1.0UF
R129
8K
R162
1.5M
FIL#3
6.3V
R130
2K
R152
10Ω
R163
50K
R131
800
I-101
R154
1.2K



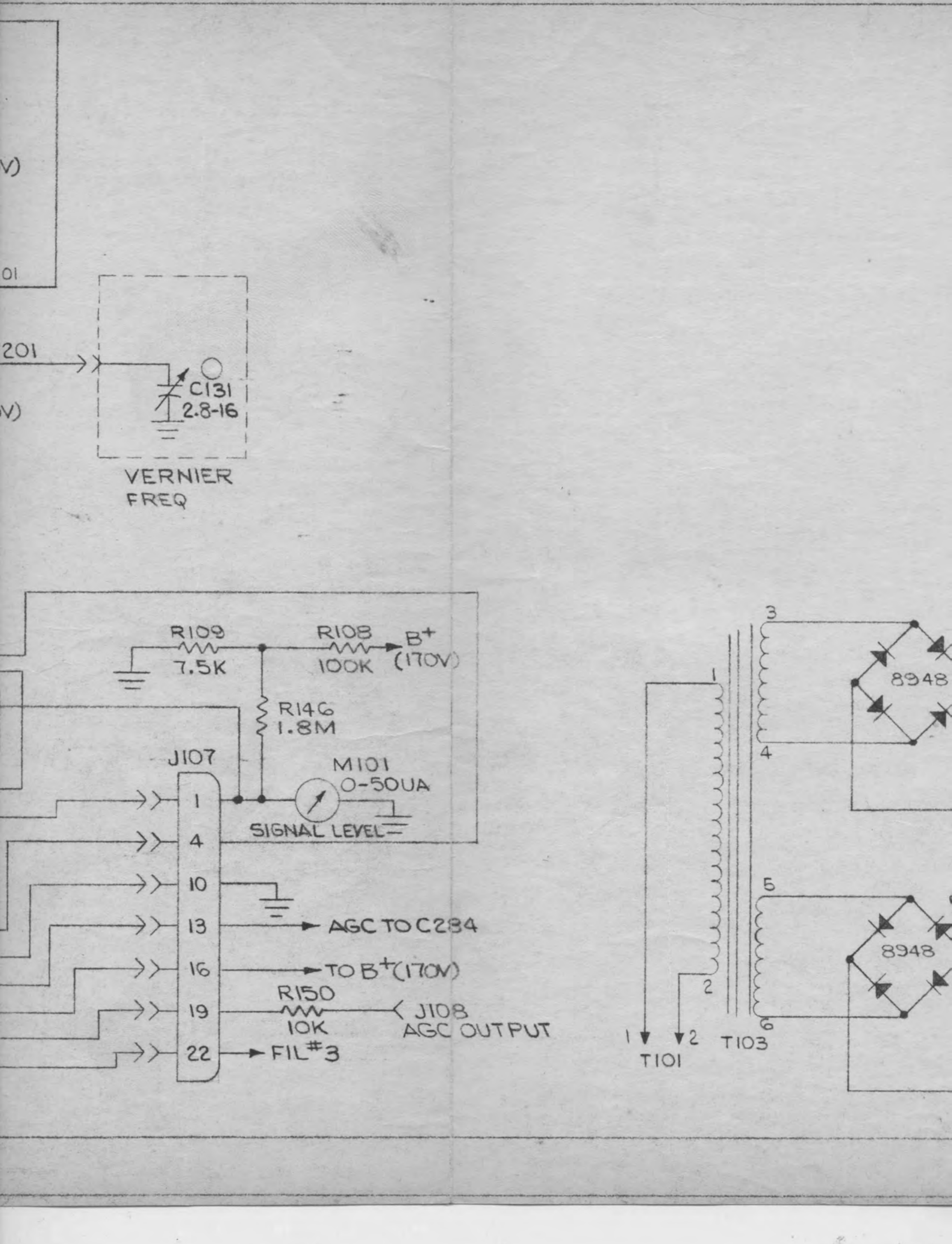
T102
LS-101
C130
.001
B+ (300V)
R101
1.1M
R148
100
V101
12AT7WA
C101
.047
R164
47K
R147
4.7K
R105
100K
AUDIO GAIN
R155
22K
R102
560K
R103
10K
C123
25 UF
R104
330
C103
.22
W104
C125
47
R106
22K
R107
470Ω
470 KΩ
TEST POINT
C154
.047
B+(150V) REGULATED
R159
100
R110
20K
R111
20K
V103
5814A
V102
R114
10K
C156
.47
R112
2.7K
R113
2.7K
R156
18K
R157
18K
R115
20K
2W
R116
18K
2W
REGULATED B+(150V)
B+(170V)
R161
100
R132
20K
R133
33K
R138
20K
R129
8K
V106
6AH6
S104
R135
5.1M
C111
.47
R130
2K
C126
.0047
C112
.47
V107
5814A
R131
800
DEVIATION RANGE
R136
220K
R137
3.9K
C114
4.5-100
C115
130
R139
10K
R154
1.2K
R134
180
C113
.002

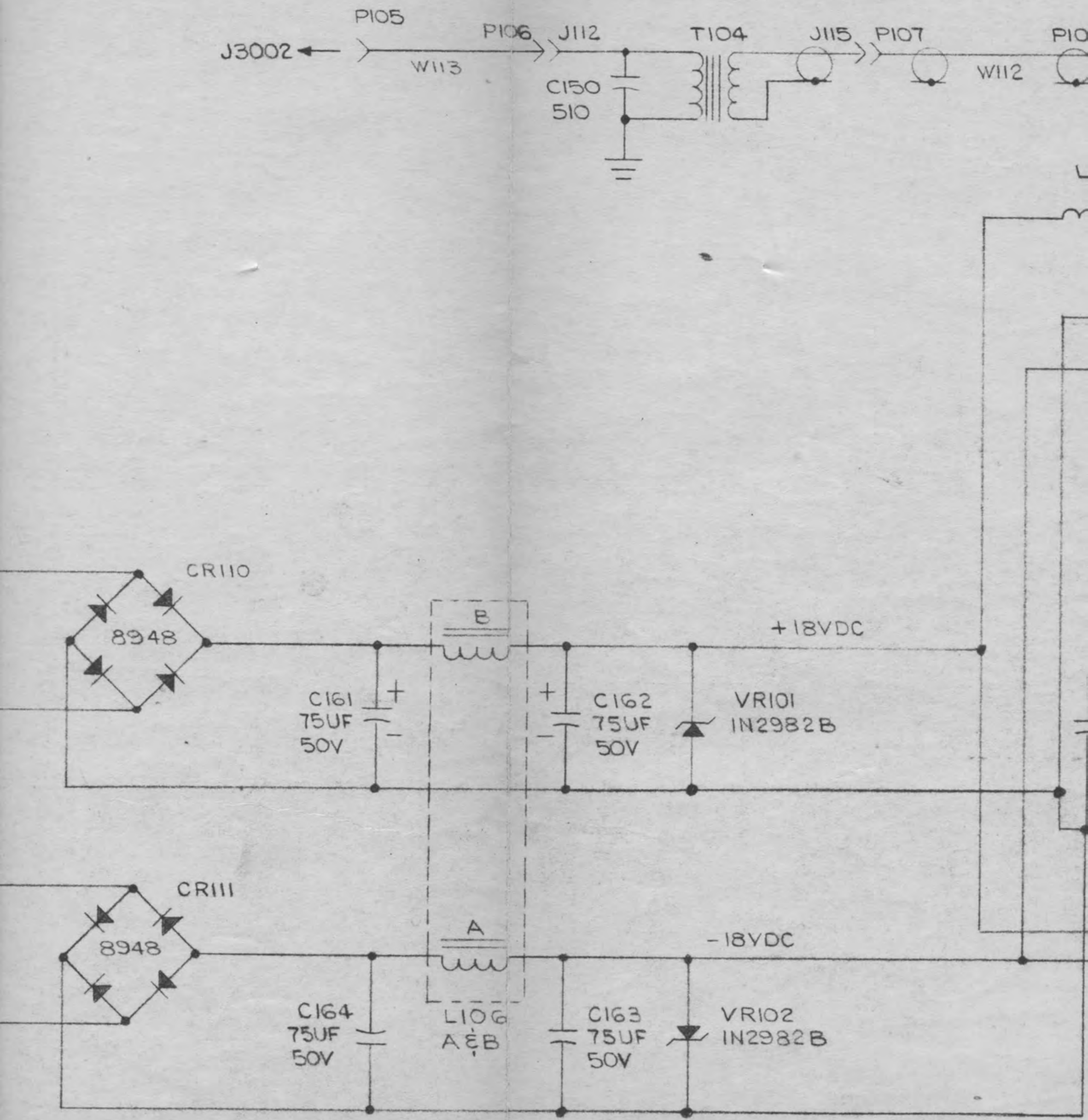


V101
V103
V107
4
5
9
FIL #1
J101
ANT INPUT
V102
V106
FIL #3
W104
J104 AM OUT
R159
B+(300V)
,100
R145
47K
TUNING
M102
50-0-50UA
R118
150K
CR101
1N198
C104
.01
CR102
1N198
R117
150K
C105
.1
C
B
A
OFF
TO C232
VFO
TO C245
S101
B+(300V)
R161
100
M103
0-50UA
DEVIATION
R141
500K
R140
220K
B+(150V)
REGULATED
C117
.47
CR103
1N198
C115
130
R139
10K
CR104
1N198
C116
.47
V108
OA2WA
R144
3.3K
25W
B+(30

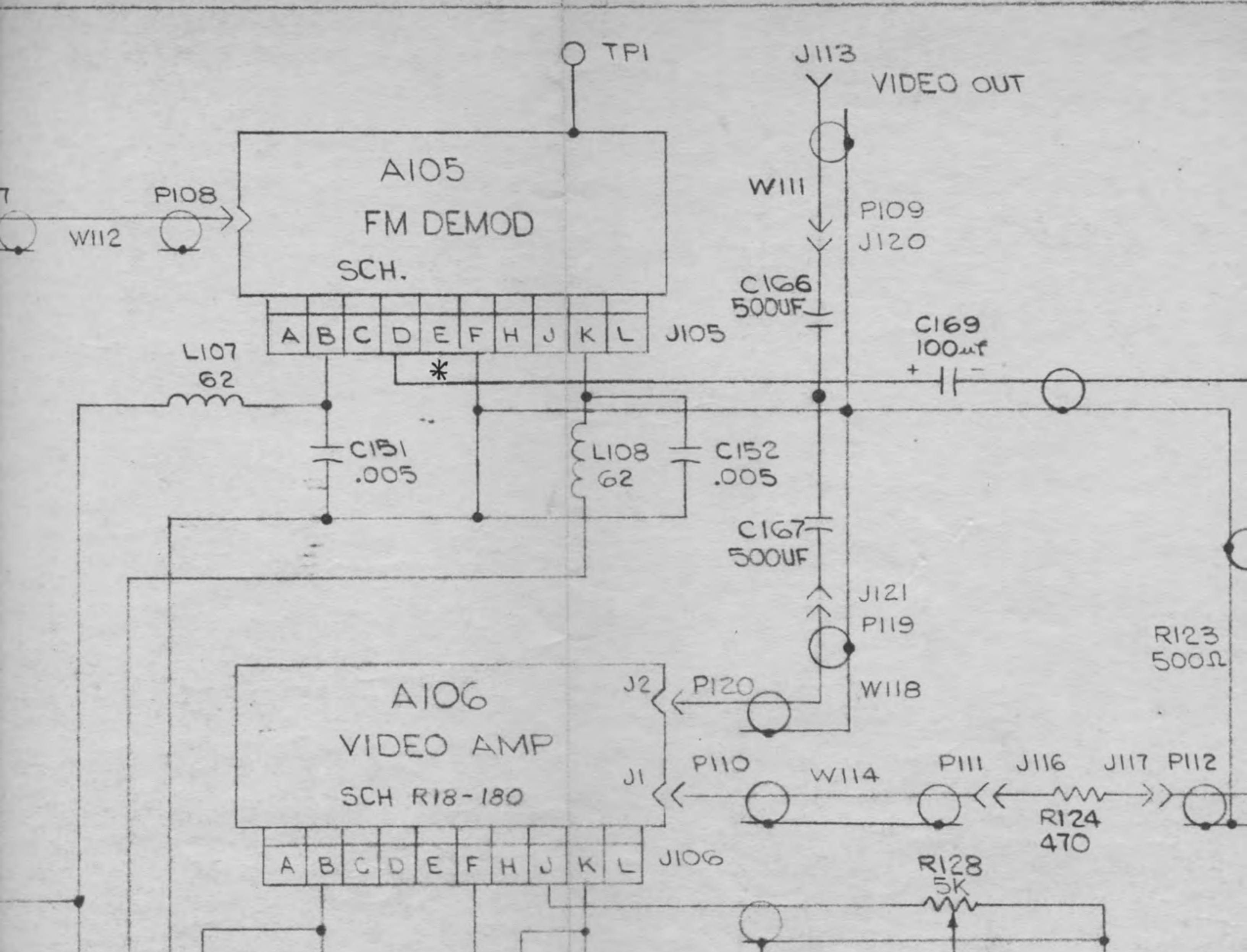


J101
ANT INPUT
W102
J110
FDU OUTPUT
B+ (170V)
B+ (170V)
B+(300V)
+150V
REGULATED
P122
R247
R158
J203
C268
C288
W101
P101
J202
W301
R.F. SECTION
A102
R18-171
W201
C2008
B+ (150V)
C245
C232
R.F. SECTION
C230
C278
J204
P121
S101
S101
W105
FIL#3
FIL#2
VER
FRE
Y101
J111
10 MC IF
OUT
W103
TO
C245
B+(150V)
C628
B+(170V)
C627
A104
LIM. DISC
C624
L607
R12-956
W601
P104
P301
B+(150V)
REGULATED
J302
J3002
J303
1
4
10
13
16
19
22
W301
A103
R144
B+(300V)
3.3K
25W
300KC I.F.
J3001
R14-537-3


V)
01
201
C131
2.8-16
V)
VERNIER
FREQ
R109
7.5K
R108
100K
B+
(170V)
R146
1.8M
J107
M101
0-50UA
SIGNAL LEVEL
1
4
10
13
16
19
22
AGC TO C284
TO B+(170V)
R150
10K
J108
AGC OUTPUT
FIL#3
3
4
1
2
5
6
8948
8948
1
2
T101
T103



J3002
P105
W113
P106
J112
C150
510
T104
J115
P107
W112
CR110
8948
+18VDC
C161
75UF
50V
C162
75UF
50V
VR101
IN2982B
CR111
8948
-18VDC
C164
75UF
50V
L106
A&B
C163
75UF
50V
VR102
IN2982B



TP1
J113
VIDEO OUT
A105
FM DEMOD
SCH.
P108
W112
W111
P109
J120
C166
500UF
A B C D E F H J K L
J105
C169
100uf
L107
62
C151
.005
L108
62
C152
.005
C167
500UF
J121
P119
R123
500Ω
A106
VIDEO AMP
SCH R18-180
J2
P120
W118
J1
P110
W114
P111
J116
J117
P112
R124
470
A B C D E F H J K L
J106
R128
5K
C153
.01
C155
.01
M104
VU-METER
C168
500uf
R160
75

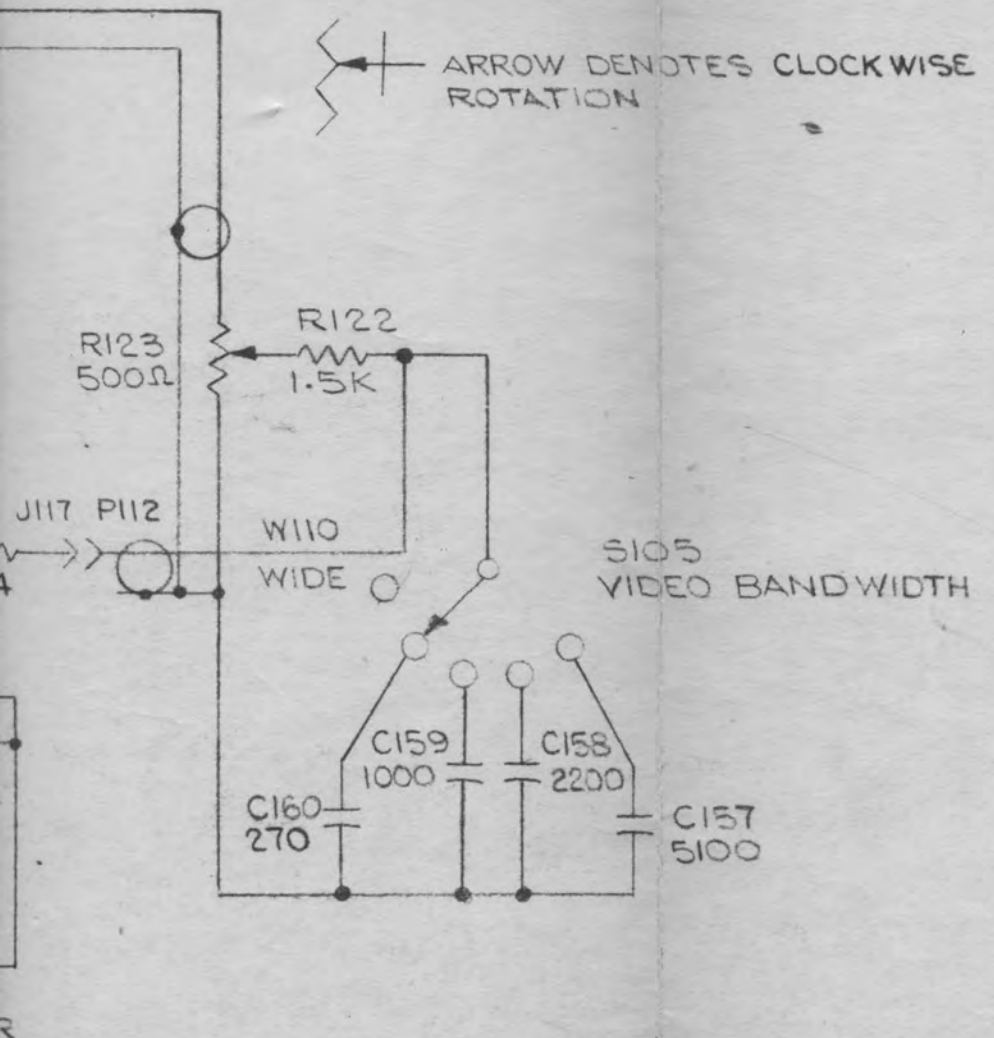
NOTE:

UNLESS OTHERWISE NOTED CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS
CAPACITOR VALUES GREATER THAN ONE ARE IN MICRO-MICROFARADS
INDUCTANCE VALUES ARE IN MICROHENRIES
RESISTOR VALUES ARE IN OHMS
K = 1000, M = 1,000,000

○ OPERATING CONTROL

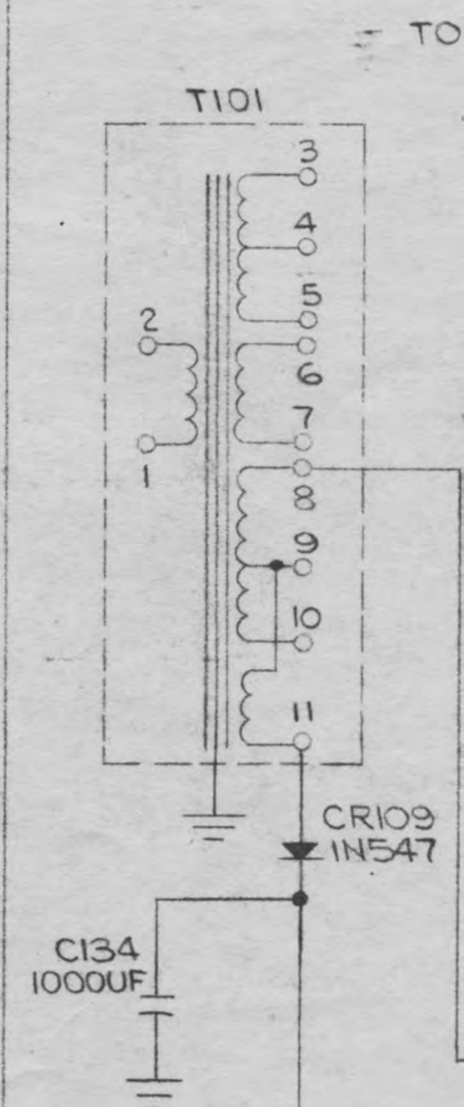
⊘ INTERNAL ADJUSTMENT

ARROW DENOTES CLOCKWISE ROTATION



* SERIAL NO'S 1-7, POSITIVE TERM. OF C169 TERMINATES AT PIN E. RECEIVERS SERIAL NO'S 8 & SUBSEQUENT UTILIZE PRINTED CIRCUIT FM DEMODULATOR, PIN D.

11B1-BN-0002
R15-675-1



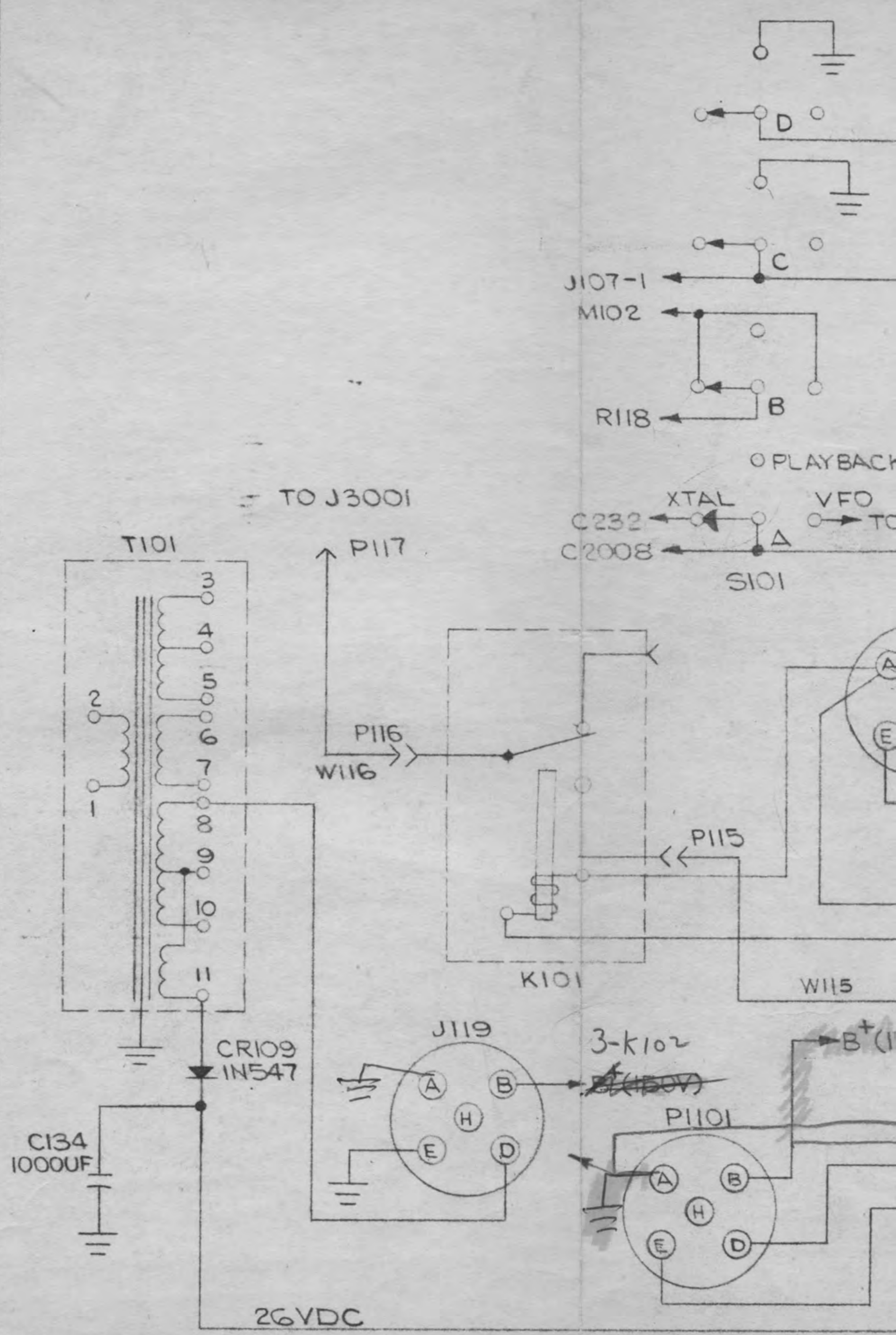
ED CAPACITOR
RE IN MICROFARADS
R THAN ONE ARE

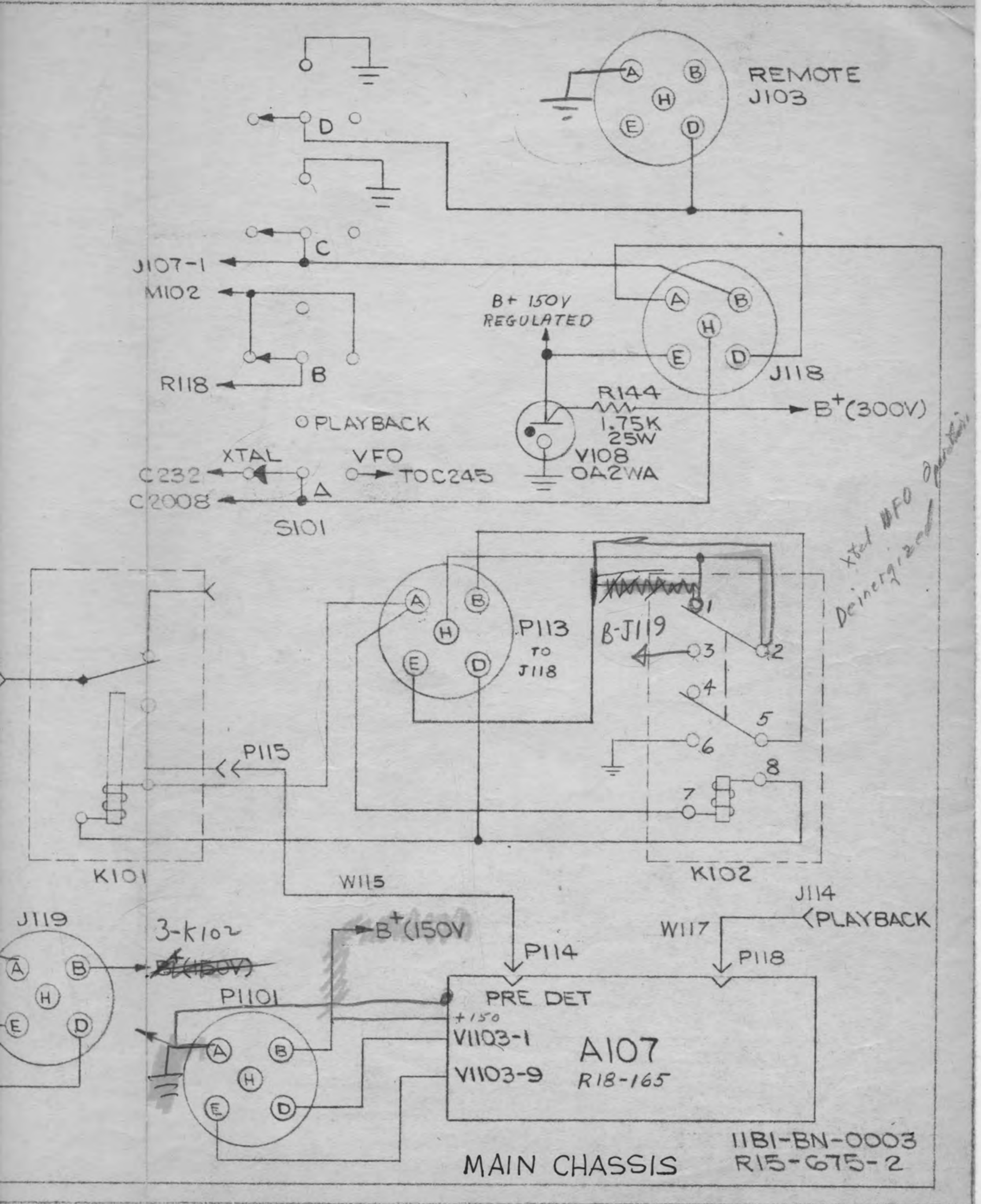
N MICROHENRIES
OHMS

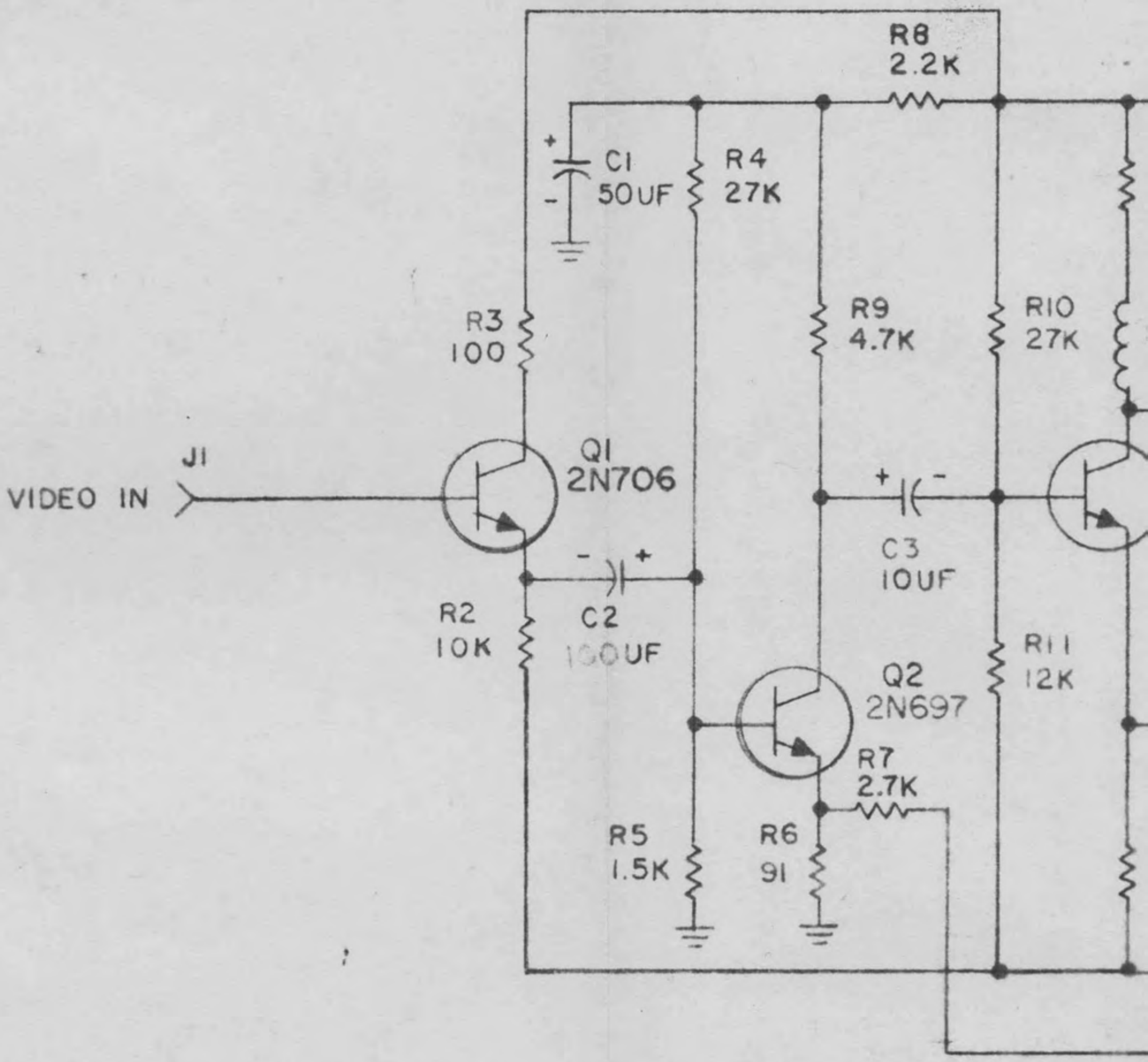
OCKWISE

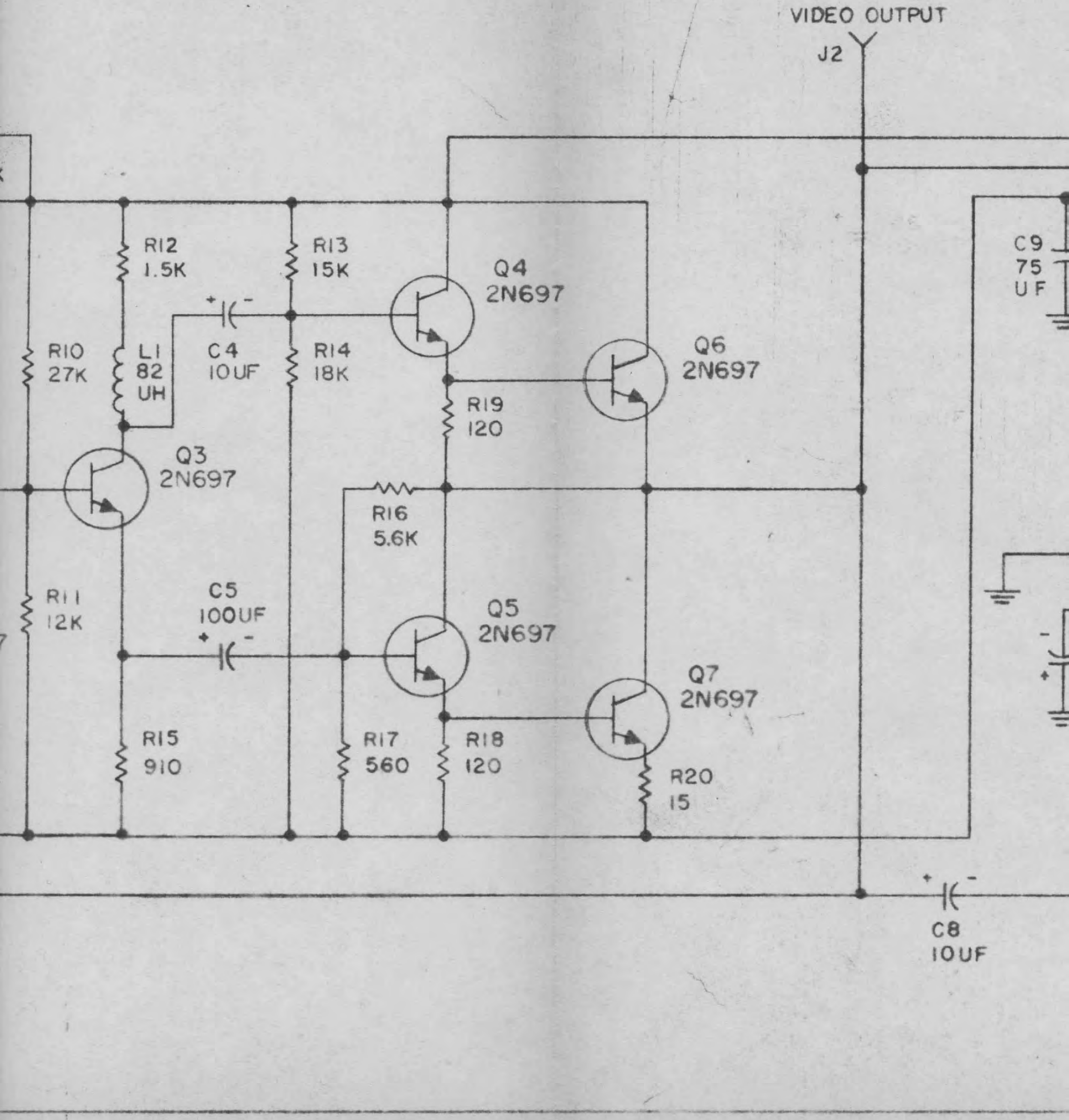
DWIDTH

M. OF C169
IVERS SERIAL
PRINTED CIRCUIT

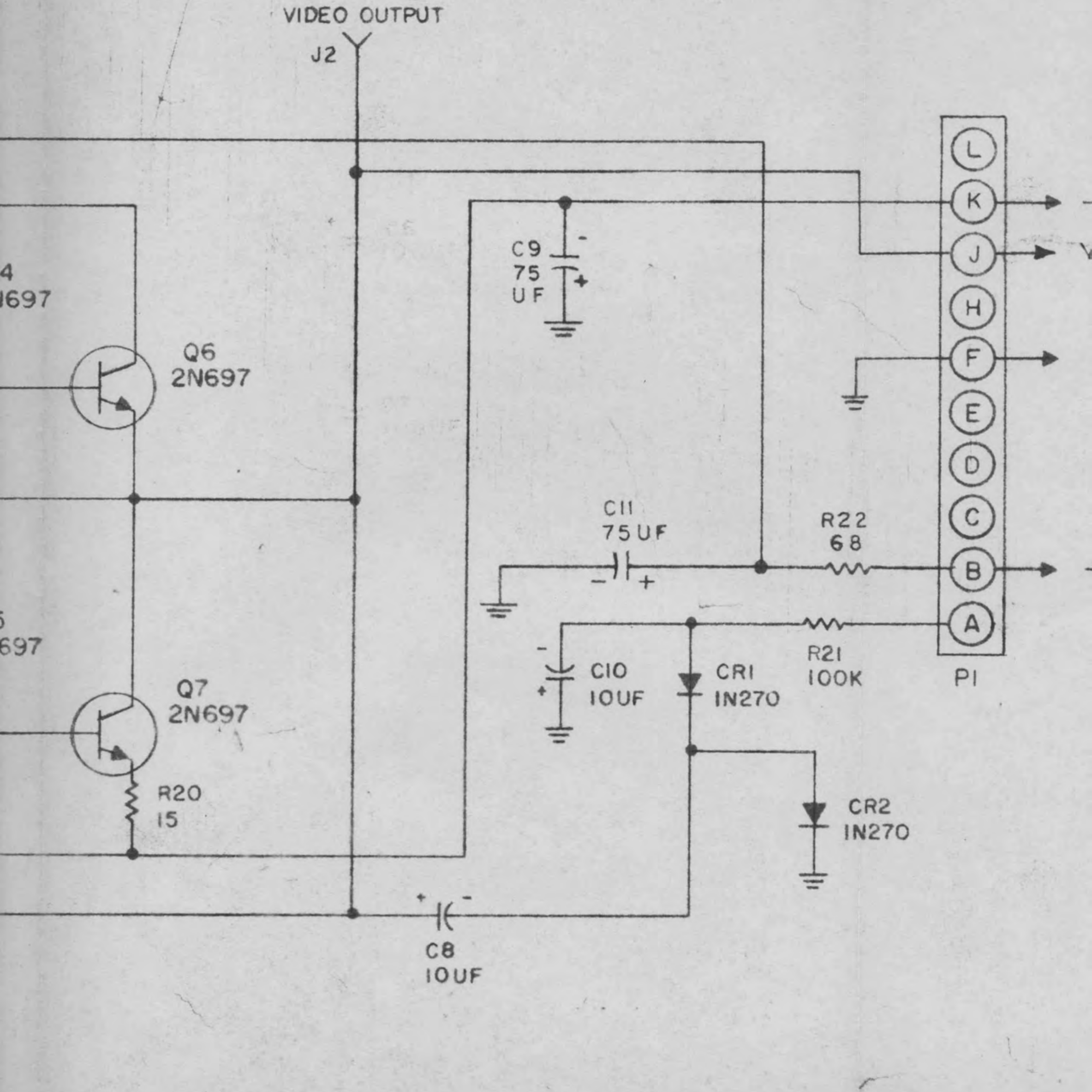



REMOTE
J103
J107-1
M102
R118
B+ 150V
REGULATED
J118
R144
1.75K
25W
B+(300V)
PLAYBACK
XTAL
VFO
C232
TOC245
C2008
V108
OA2WA
S101
xtal VFO operation
Deinergized
P113
TO
J118
B-J119
K101
K102
P115
W115
J114
PLAYBACK
W117
P118
J119
3-K102
B+(150V)
B+(150V
P114
P1101
PRE DET
+150
V1103-1
V1103-9
A107
R18-165
MAIN CHASSIS
11B1-BN-0003
R15-675-2


R8
2.2K
C1
50UF
R4
27K
R3
100
R9
4.7K
R10
27K
J1
VIDEO IN
Q1
2N706
C3
10UF
C2
100UF
R2
10K
R11
12K
Q2
2N697
R7
2.7K
R5
1.5K
R6
91



VIDEO OUTPUT
J2
R12
1.5K
R13
15K
Q4
2N697
C9
75
UF
R10
27K
L1
82
UH
C4
10UF
R14
18K
Q6
2N697
R19
120
Q3
2N697
R16
5.6K
R11
12K
C5
100UF
Q5
2N697
Q7
2N697
R15
910
R17
560
R18
120
R20
15
C8
10UF

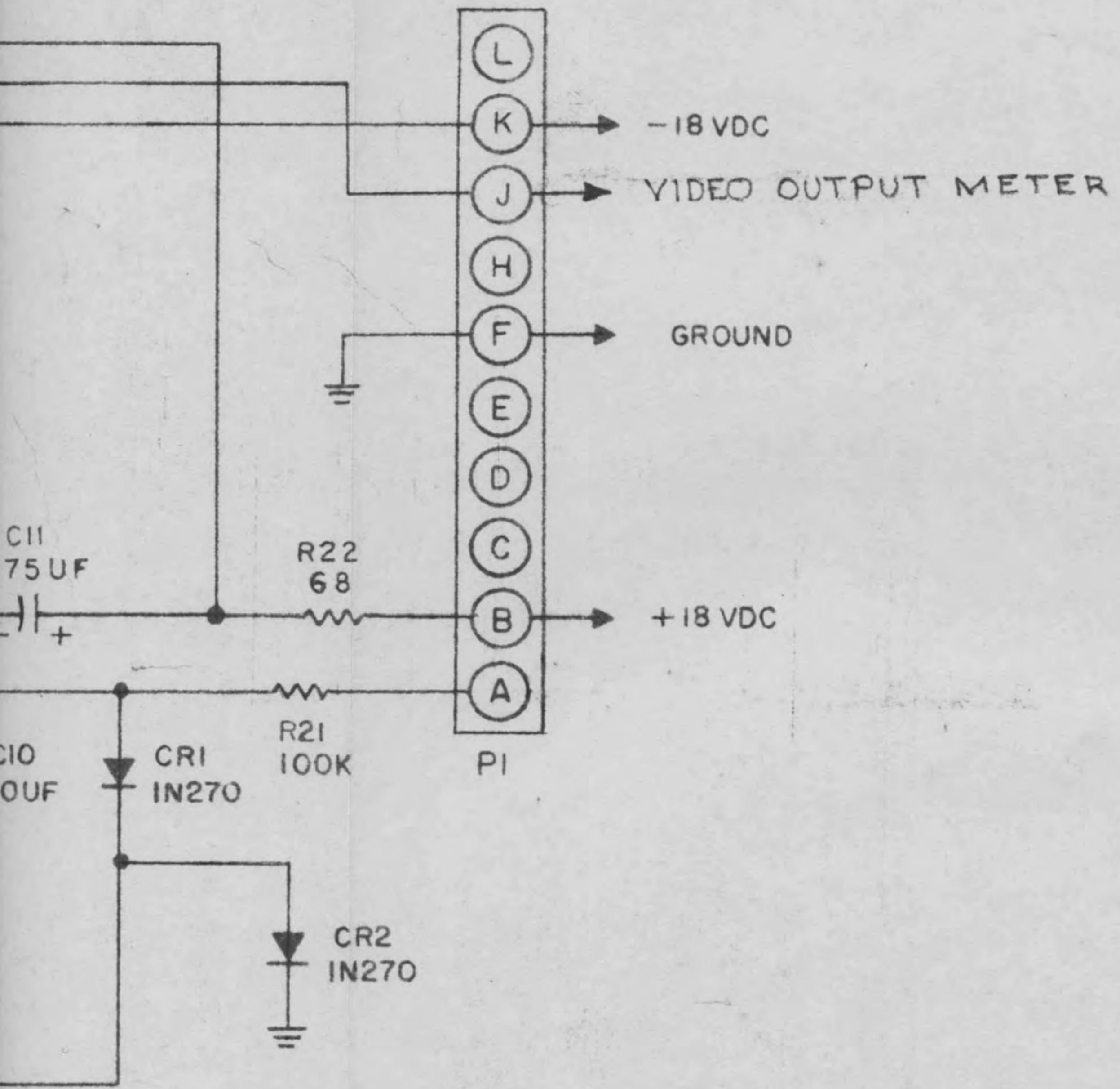


VIDEO OUTPUT
J2
Q6
2N697
Q7
2N697
R20
15
C9
75
UF
C11
75UF
R22
68
C10
10UF
CR1
IN270
R21
100K
P1
CR2
IN270
C8
10UF
L
K
J
H
F
E
D
C
B
A

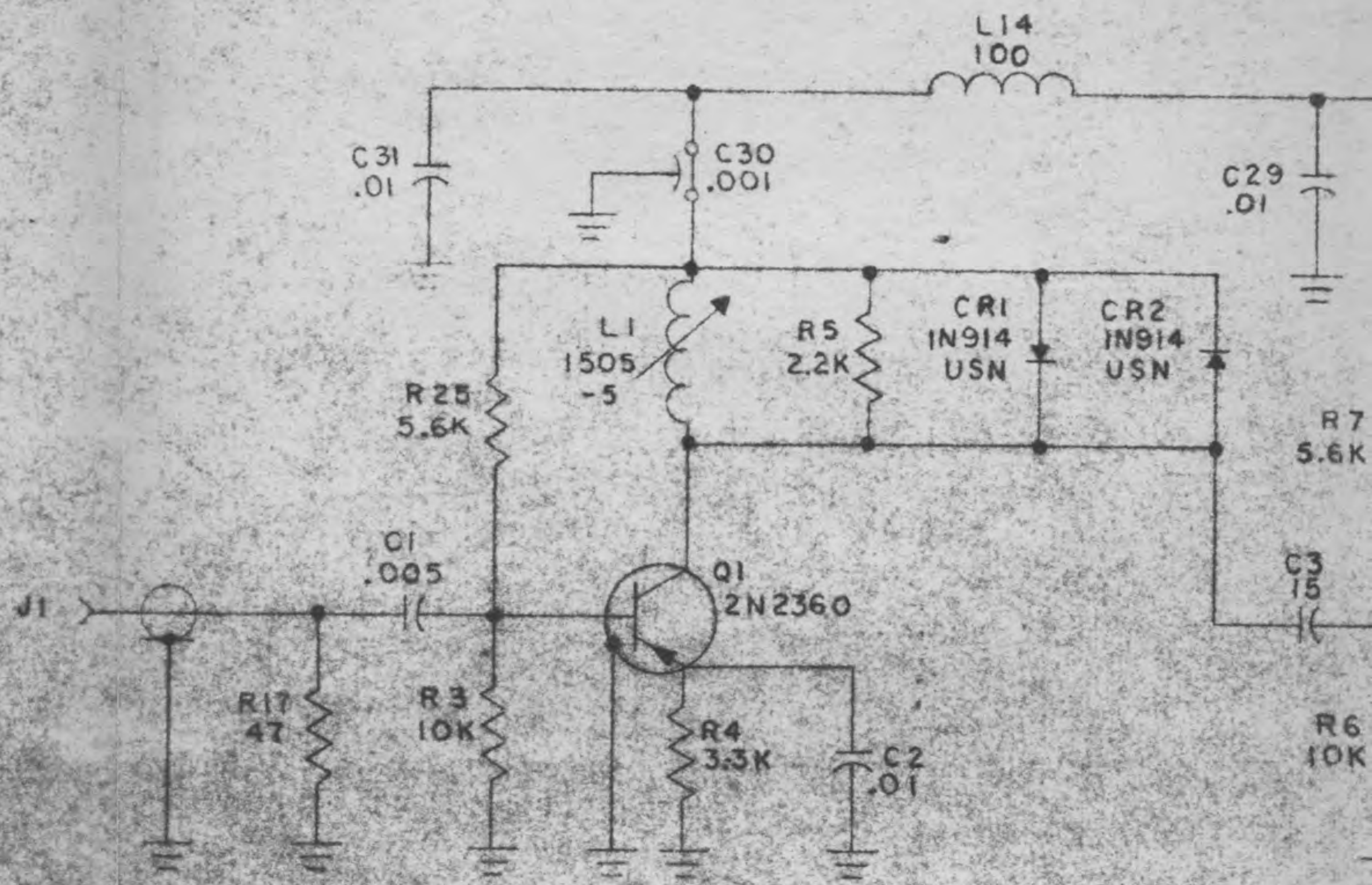
NOTES—

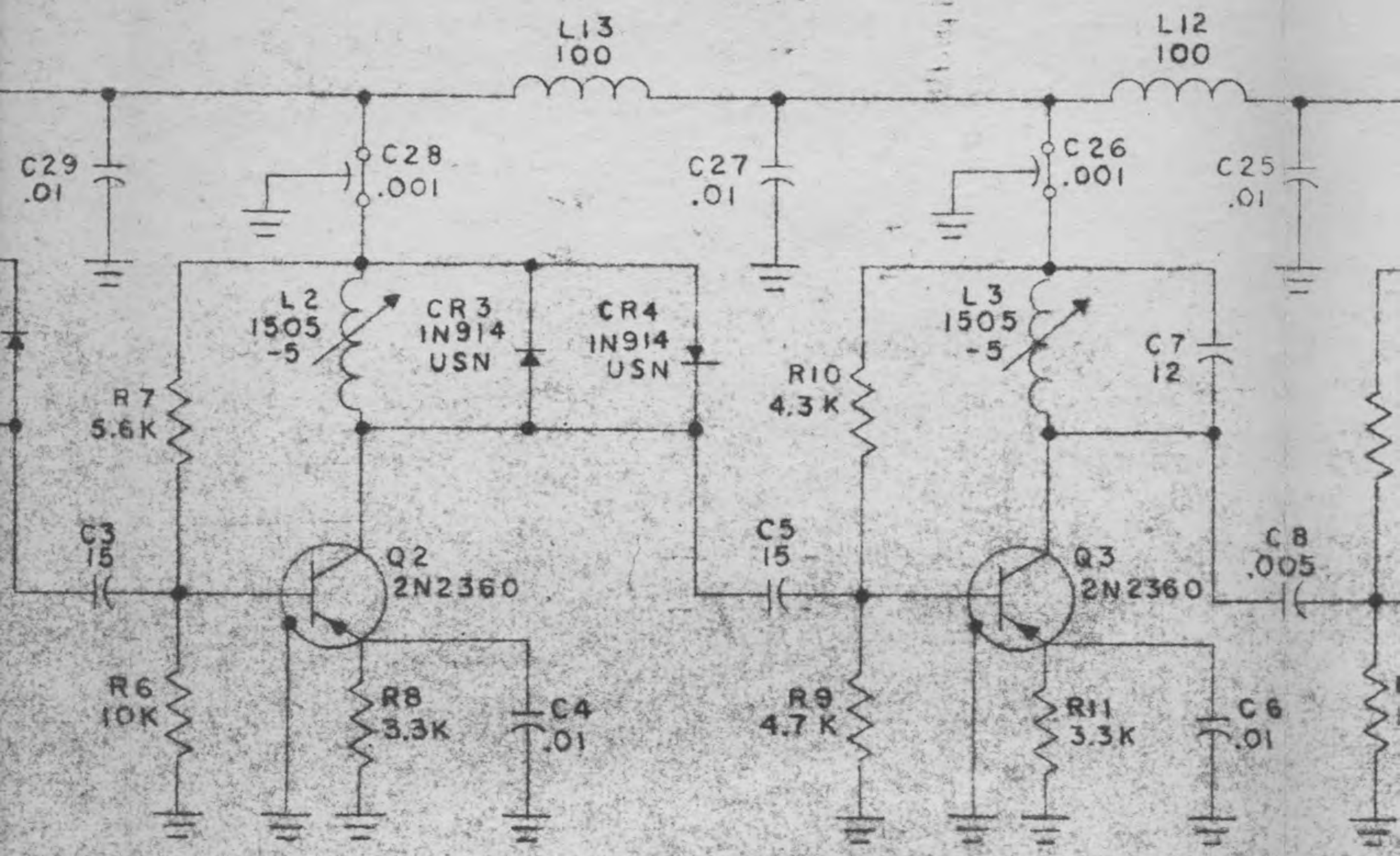
UNLESS OTHERWISE NOTED

1. CAPACITOR VALUES ARE IN MICROFARADS.
2. RESISTOR VALUES ARE IN OHMS, K=1000 WATTAGE = 1/2

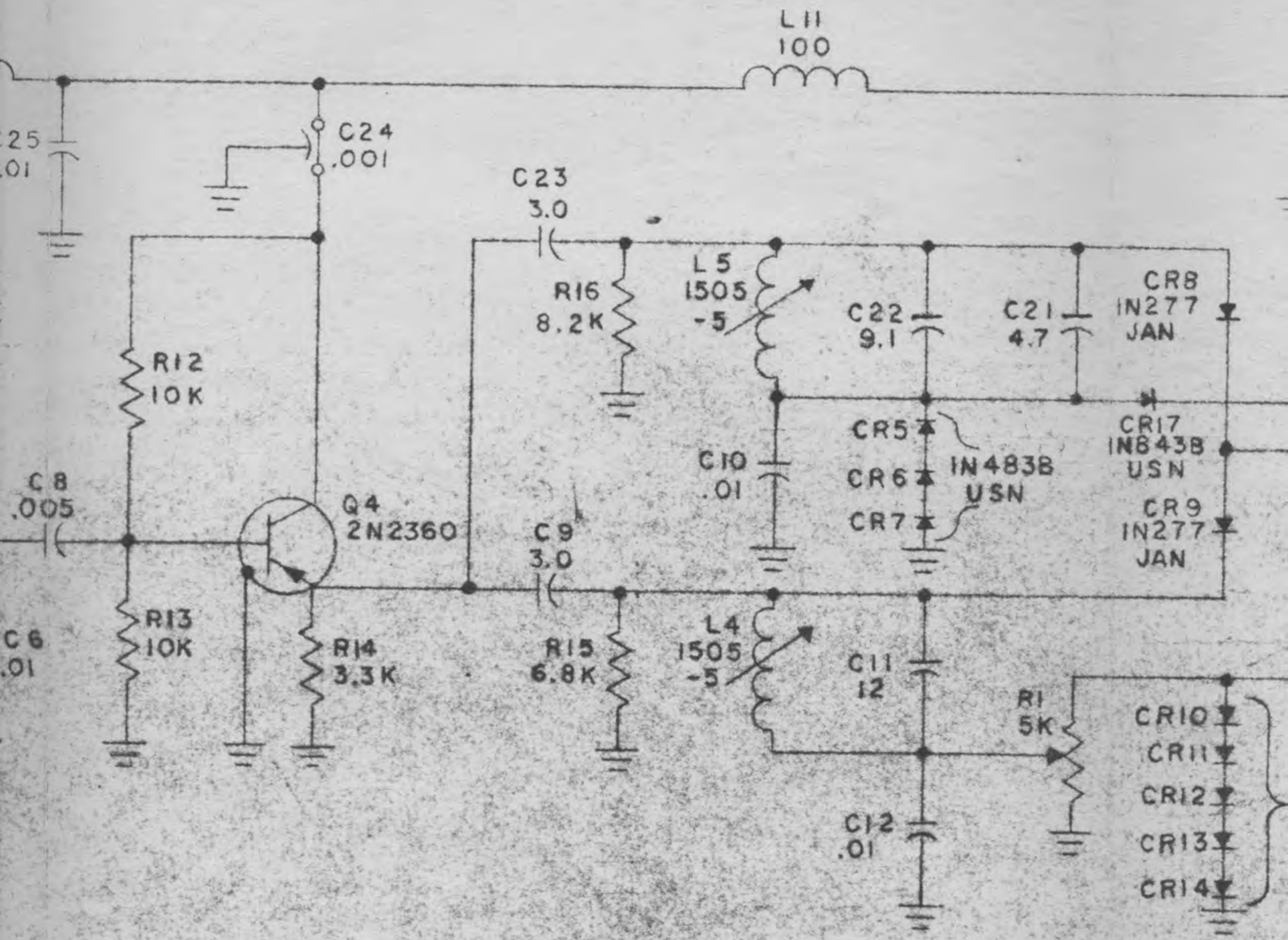


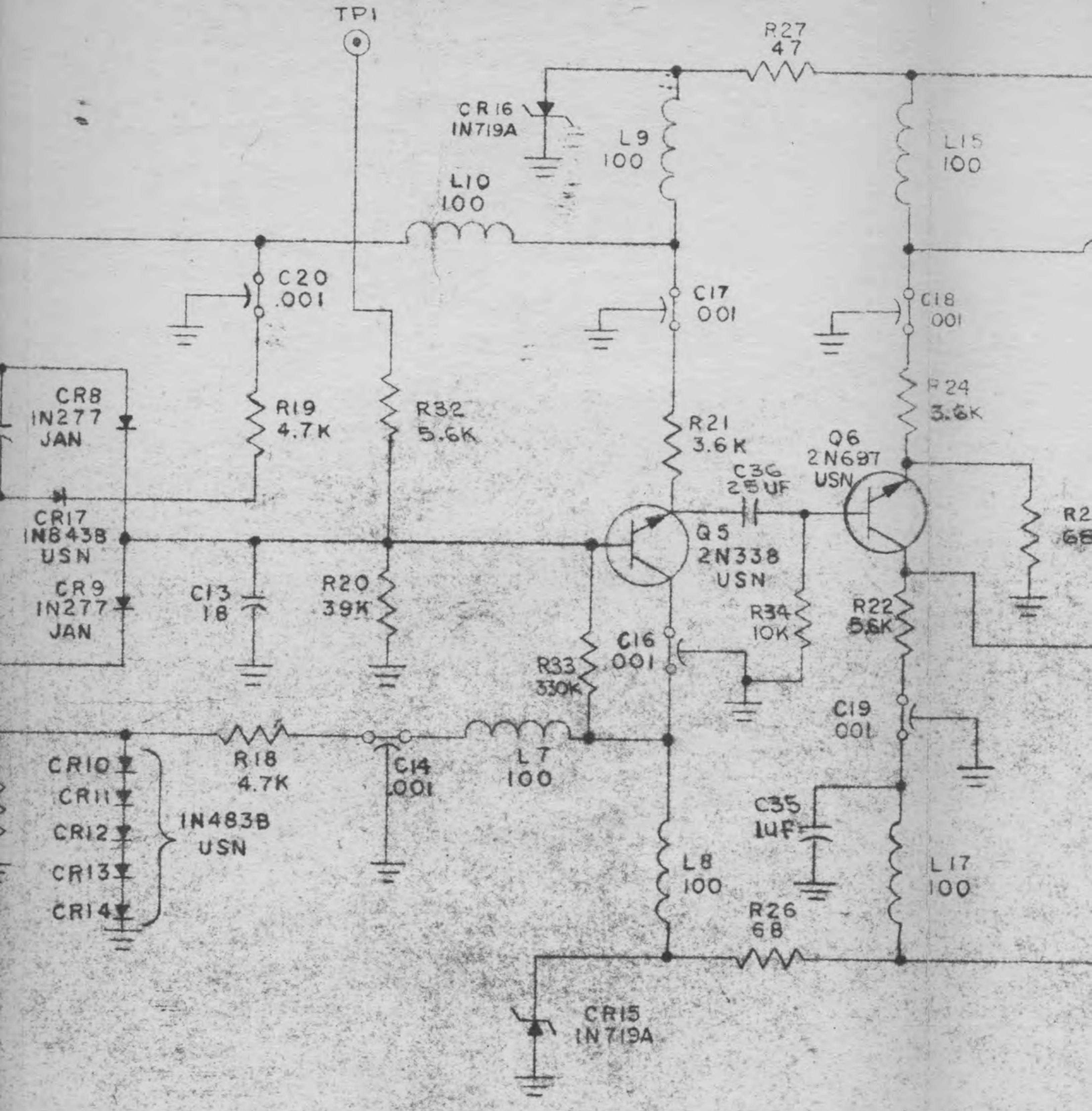
VIDEO AMPLIFIER
(R18-180)

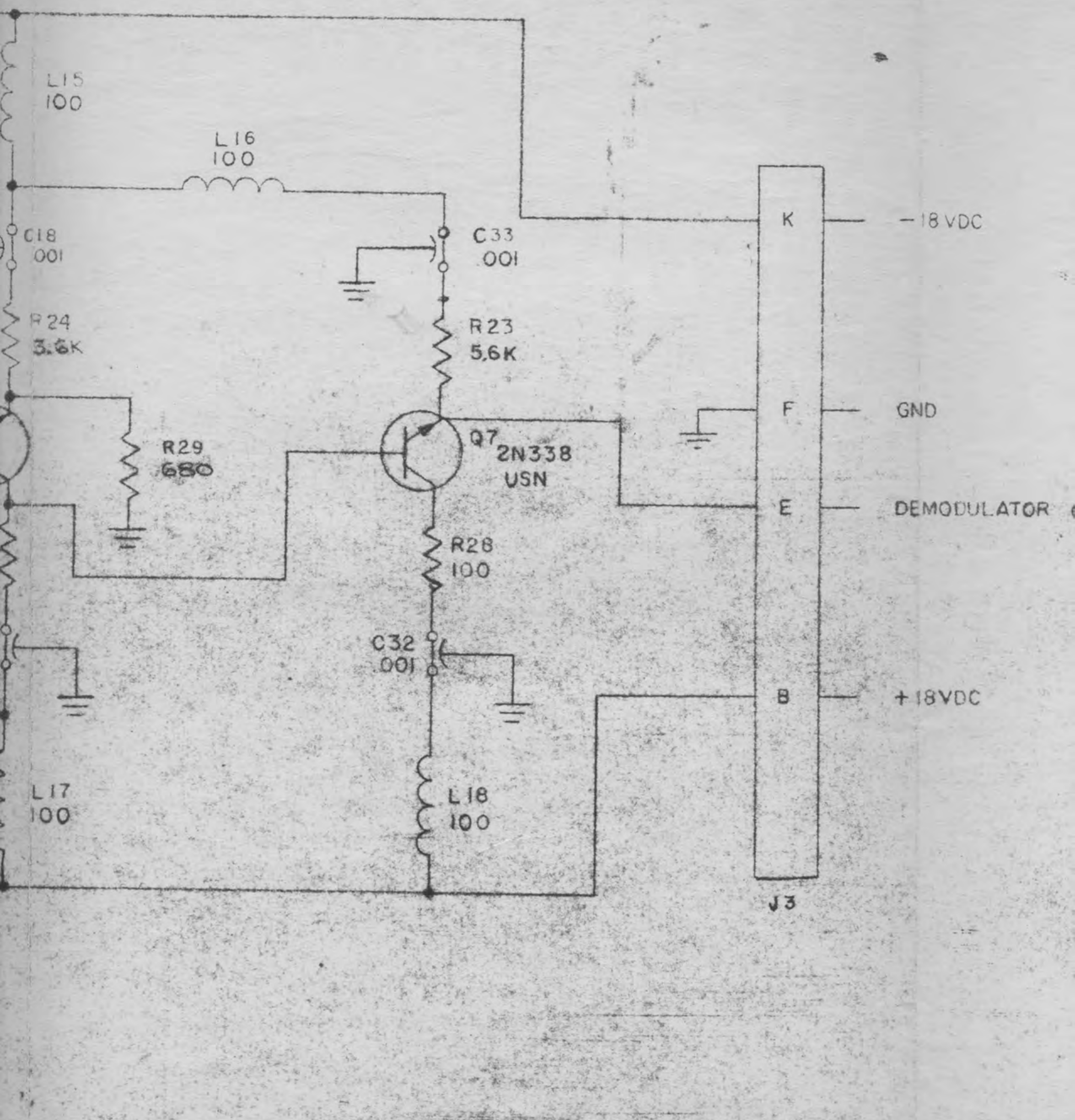

L14
100
C31
.01
C30
.001
C29
.01
L1
1505
-5
R5
2.2K
CR1
1N914
USN
CR2
1N914
USN
R25
5.6K
R7
5.6K
C1
.005
J1
Q1
2N2360
C3
15
R17
47
R3
10K
R4
3.3K
C2
.01
R6
10K



L13
100
L12
100
C29
.01
C28
.001
C27
.01
C26
.001
C25
.01
L2
1505
-5
CR3
1N914
USN
CR4
1N914
USN
R10
4.3 K
L3
1505
-5
C7
12
R7
5.6K
C3
15
Q2
2N2360
C5
15
Q3
2N2360
C8
.005
R6
10K
R8
3.3K
C4
.01
R9
4.7 K
R11
3.3K
C6
.01


L11
100
C25
.01
C24
.001
C23
3.0
R16
8.2K
L5
1505
-5
C22
9.1
C21
4.7
CR8
IN277
JAN
R12
10K
CR5
CR6
CR7
IN483B
USN
CR17
IN843B
USN
C10
.01
C8
.005
Q4
2N2360
C9
3.0
CR9
IN277
JAN
C6
.01
R13
10K
R14
3.3K
R15
6.8K
L4
1505
-5
C11
12
R1
5K
CR10
CR11
CR12
CR13
CR14
C12
.01

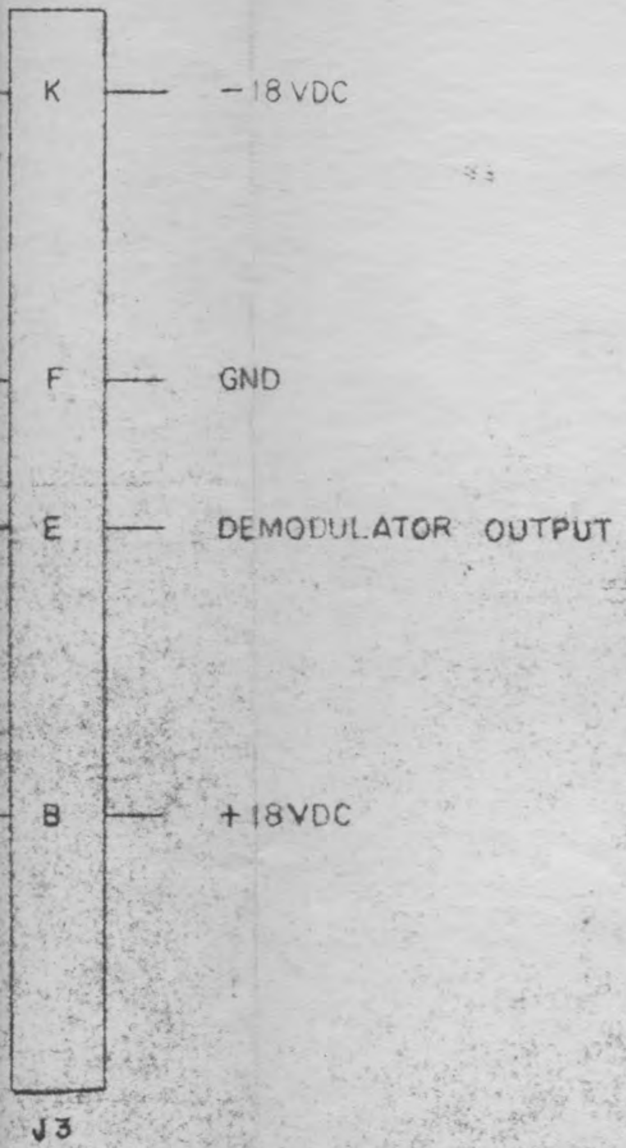

TP1
R27
47
CR16
IN719A
L9
100
L15
100
L10
100
C20
.001
C17
.001
C18
.001
CR8
IN277
JAN
R19
4.7K
R32
5.6K
R21
3.6K
R24
3.6K
Q6
2N697
USN
C36
25UF
CR17
IN8438
USN
Q5
2N338
USN
R2
68
CR9
IN277
JAN
C13
18
R20
39K
R34
10K
R22
5.6K
C16
.001
R33
330K
C19
.001
R18
4.7K
C14
.001
L7
100
CR10
CR11
CR12
CR13
CR14
IN483B
USN
C35
1UF
L8
100
L17
100
R26
68
CR15
IN719A


L15
100
L16
100
C18
.001
C33
.001
R24
3.6K
R23
5.6K
R29
680
Q7
2N338
USN
R28
100
C32
.001
L17
100
L18
100
K
F
E
B
J3
-18 VDC
GND
DEMODULATOR
+18VDC

NOTES:

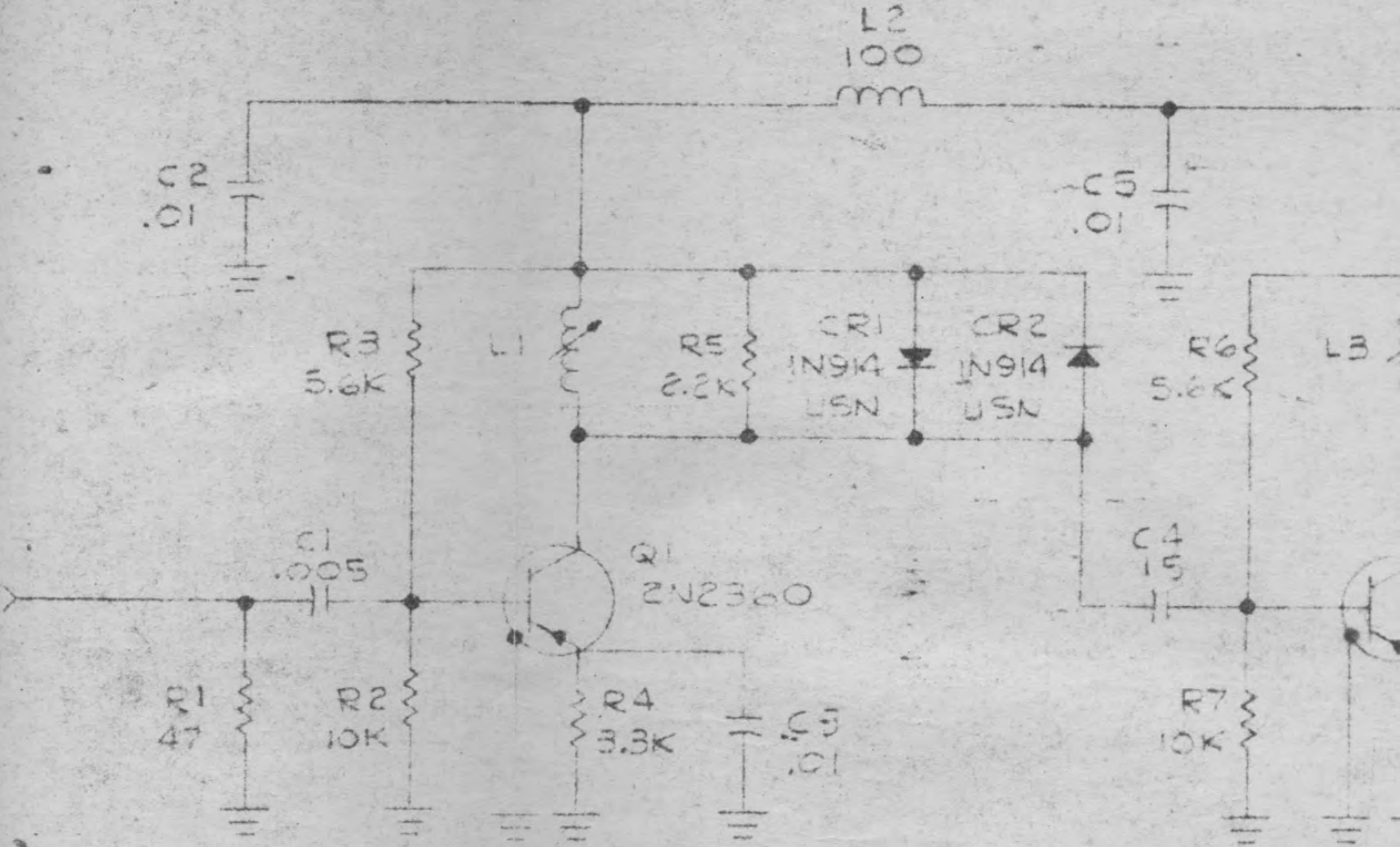
1. CAPACITOR VALUES; LESS THAN ONE ARE IN MICROFARADS, GREATER THAN ONE ARE IN PICOFARADS.
2. RESISTORS ARE 1/4 WATT IN OHMS.
3. INDUCTANCE VALUES ARE IN MICROHENRIES.

* 4. THESE COMPONENTS MAY CHANGE IN TEST.

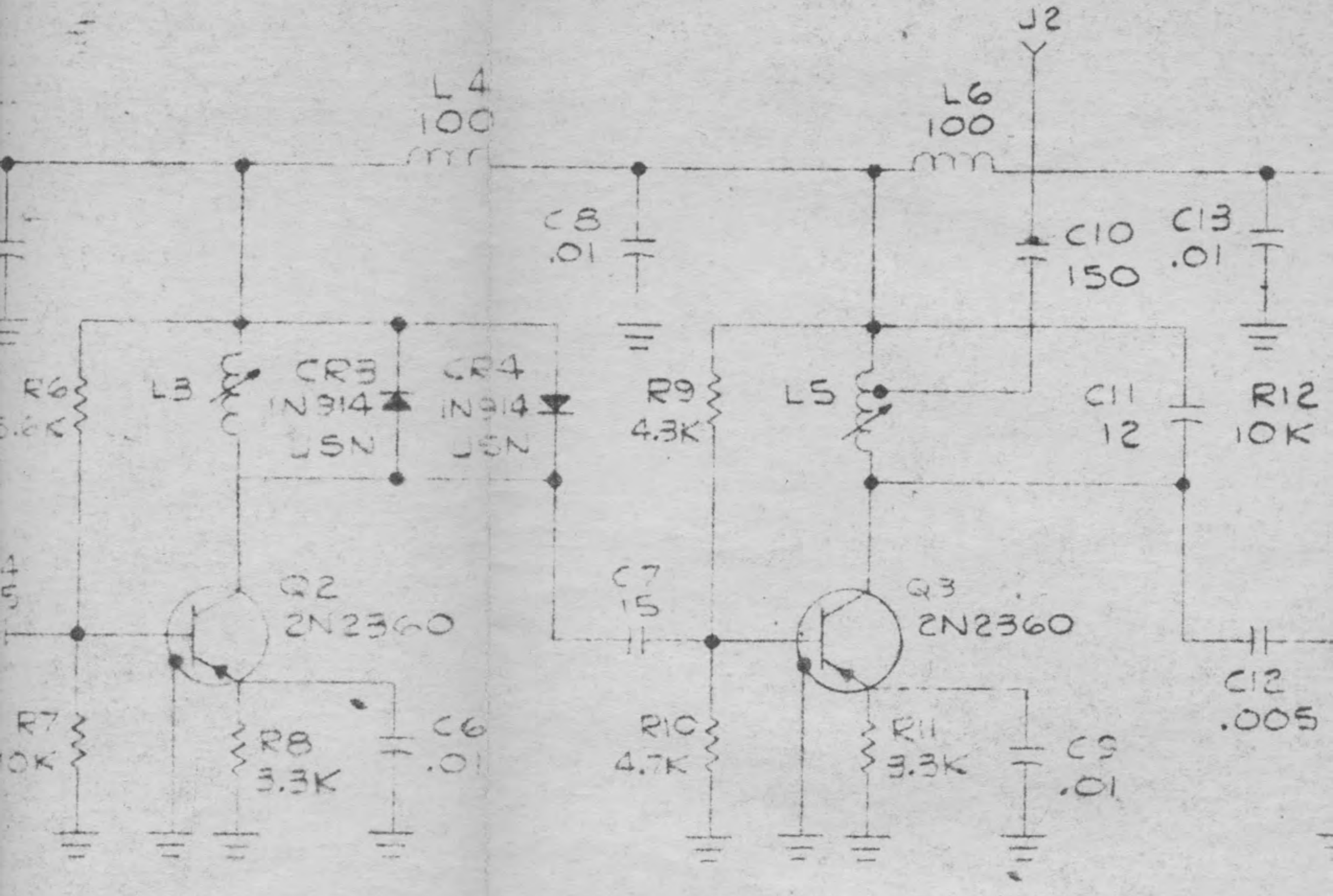


NOTES:
USED IN 11B1-BN-2 SERIAL NOS. 1 THROUGH 5 AND 11B1-BN-3 SERIAL NOS 1 & 2 ONLY

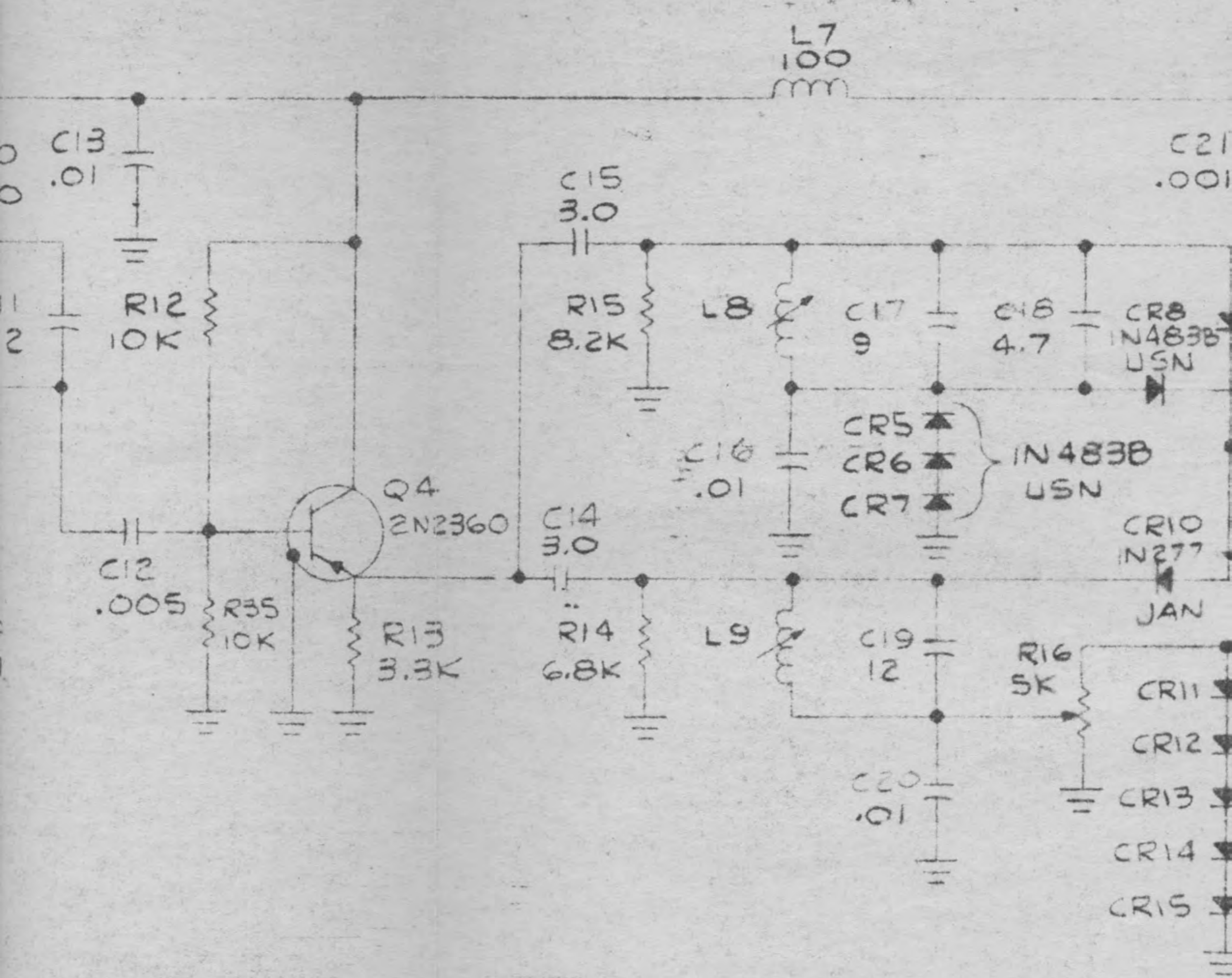
ISOLATED FM DEMODULATOR
(R18-179)

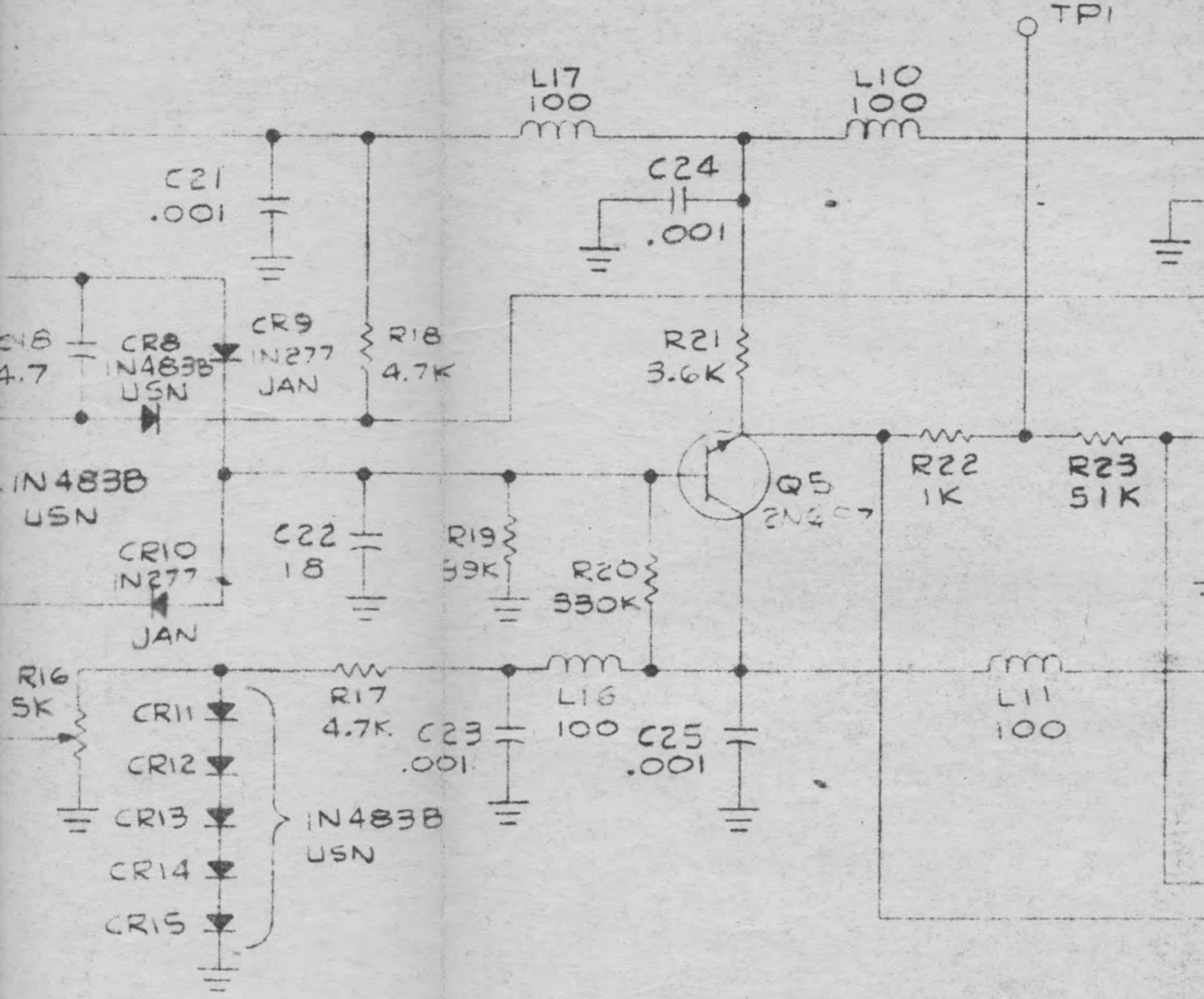


L2
100
C2
.01
C5
.01
R3
5.6K
L1
R5
2.2K
CR1
1N914
USN
CR2
1N914
USN
R6
5.6K
L3
C1
.005
Q1
2N2360
C4
15
R1
47
R2
10K
R4
3.3K
C3
.01
R7
10K

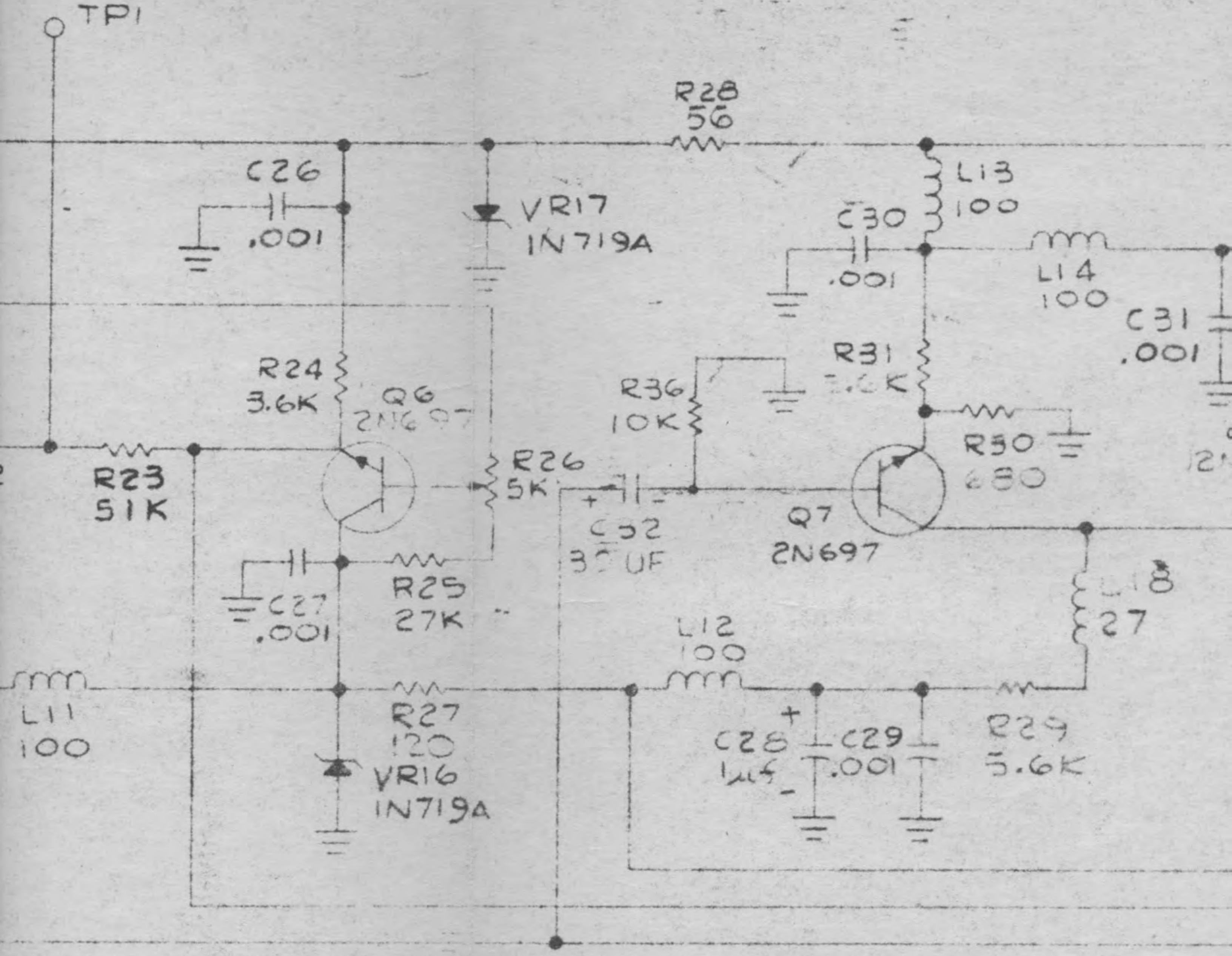


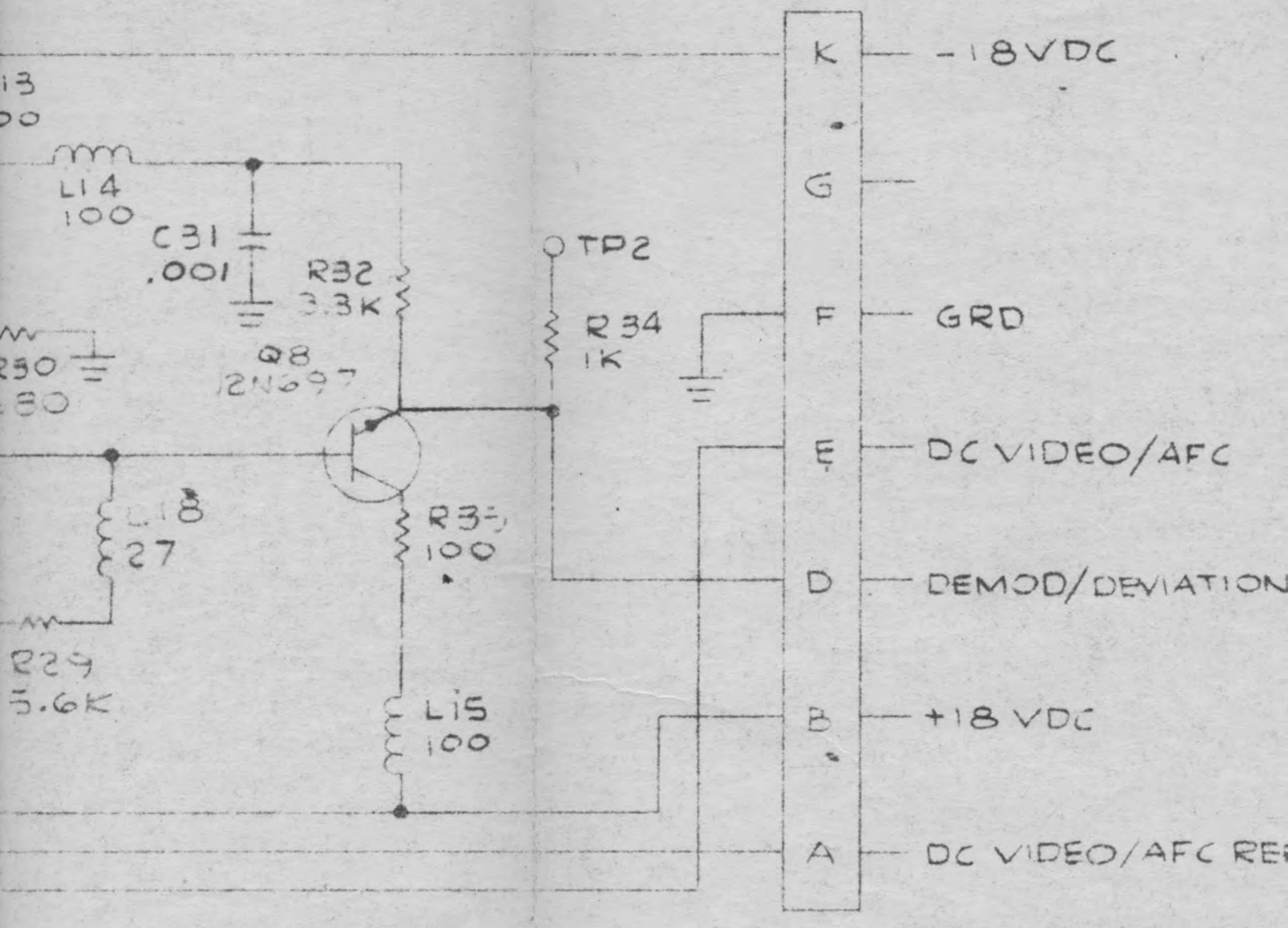
J2
L4
100
L6
100
C8
.01
C10
150
C13
.01
R6
L3
CR3
1N914
USN
CR4
1N914
USN
R9
4.3K
L5
C11
12
R12
10K
C7
15
Q2
2N2360
Q3
2N2360
C12
.005
R7
R8
3.3K
C6
.01
R10
4.7K
R11
3.3K
C9
.01


L7
100
C13
.01
C21
.001
C15
3.0
R12
10K
R15
8.2K
L8
C17
9
C18
4.7
CR8
IN483B
USN
CR5
CR6
CR7
IN483B
USN
C16
.01
Q4
2N2360
C14
3.0
CR10
IN277
JAN
C12
.005
R35
10K
R13
3.3K
R14
6.8K
L9
C19
12
R16
5K
CR11
CR12
CR13
CR14
CR15
C20
.01

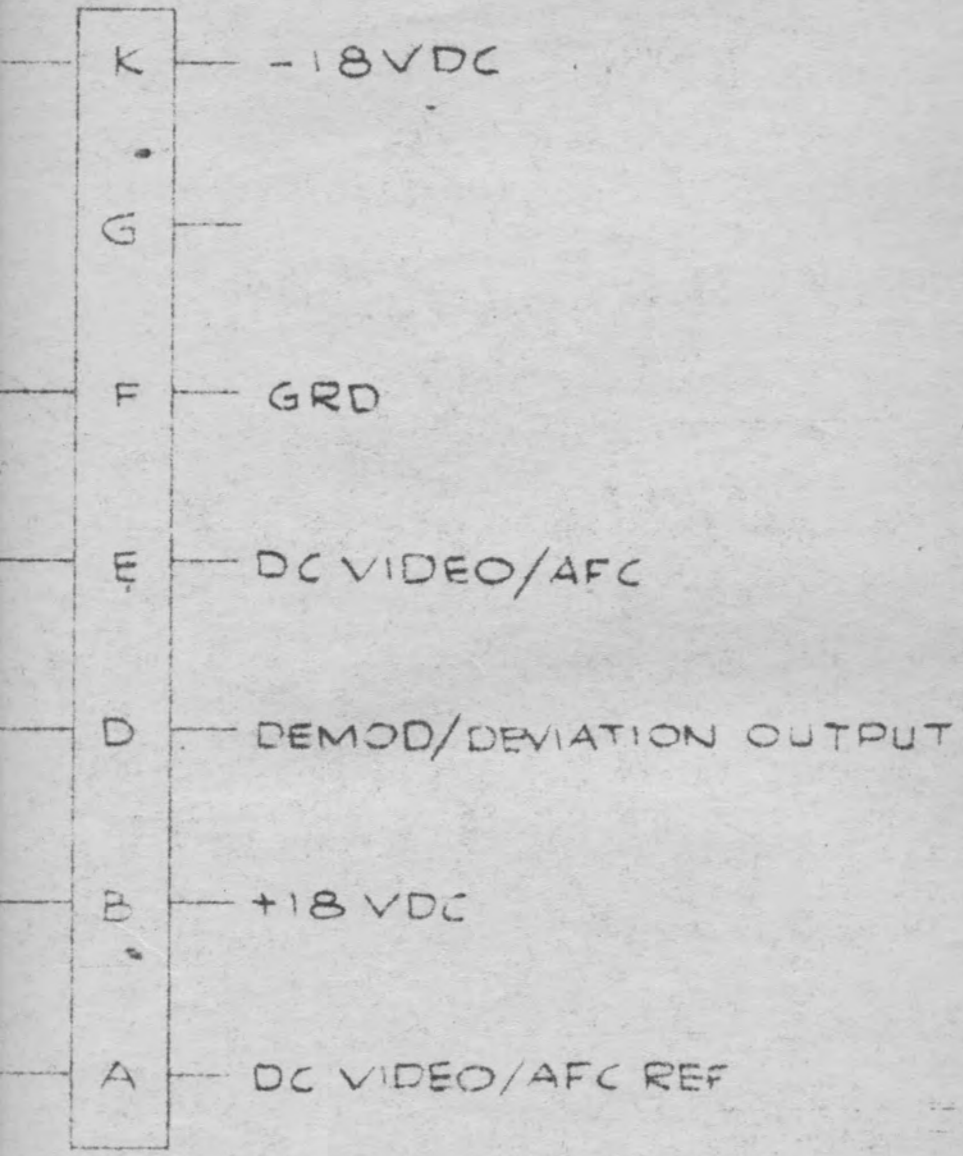


TP1
L17
100
L10
100
C24
.001
C21
.001
CR9
1N277
JAN
R18
4.7K
R21
3.6K
CR8
1N4838
USN
4.7
1N4838
USN
R22
1K
R23
51K
Q5
C22
18
R19
39K
R20
330K
CR10
1N277
JAN
R16
5K
R17
4.7K
L16
100
L11
100
C23
.001
C25
.001
CR11
CR12
CR13
CR14
CR15
1N4838
USN


TP1
R28
56
C26
.001
VR17
1N719A
L13
100
C30
.001
L14
100
C31
.001
R24
3.6K
Q6
2N697
R36
10K
R31
R23
51K
R26
5K
C32
R50
680
Q7
2N697
C27
.001
R25
27K
L18
27
L12
100
L11
100
R27
120
VR16
1N719A
C28
1µf
C29
.001
R29
5.6K



-18VDC
K
G
F
GRD
E
DC VIDEO/AFC
D
DEMOD/DEVIATION
B
+18 VDC
A
DC VIDEO/AFC RE
TP2
R34
1K
R32
3.3K
C31
.001
L14
100
Q8
2N697
L18
27
R29
5.6K
L15
100



NOTES

1. UNLESS OTHERWISE
CAPACITOR VALUES
ONE ARE IN MICRO
GREATER THAN ONE
PICOFARADS.
2. RESISTORS ARE 1/4
3. INDUCTANCE VALUES AR

NOTE:
NOT U
Nos.
BN-3

ISOLA

PUT

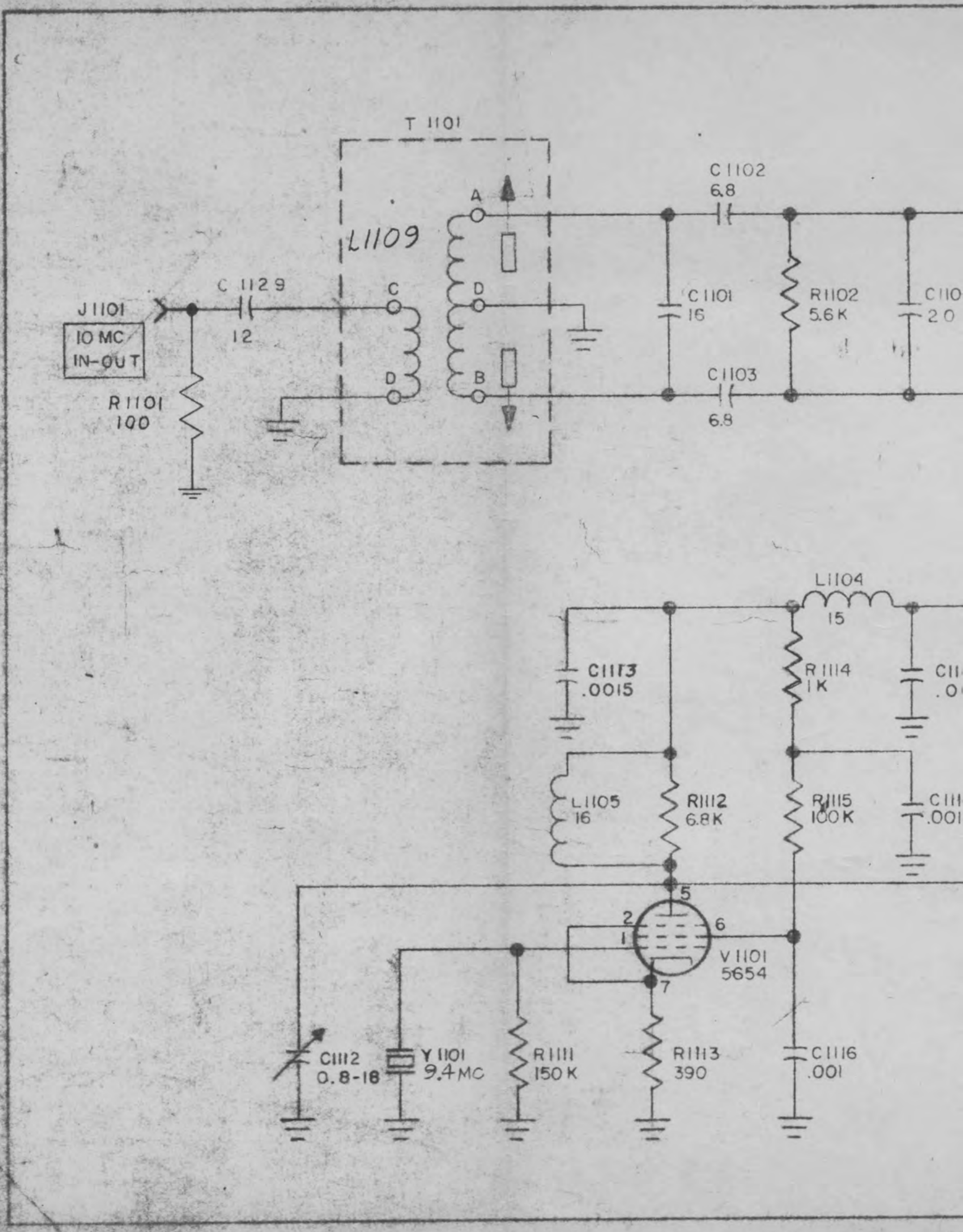
NOTES

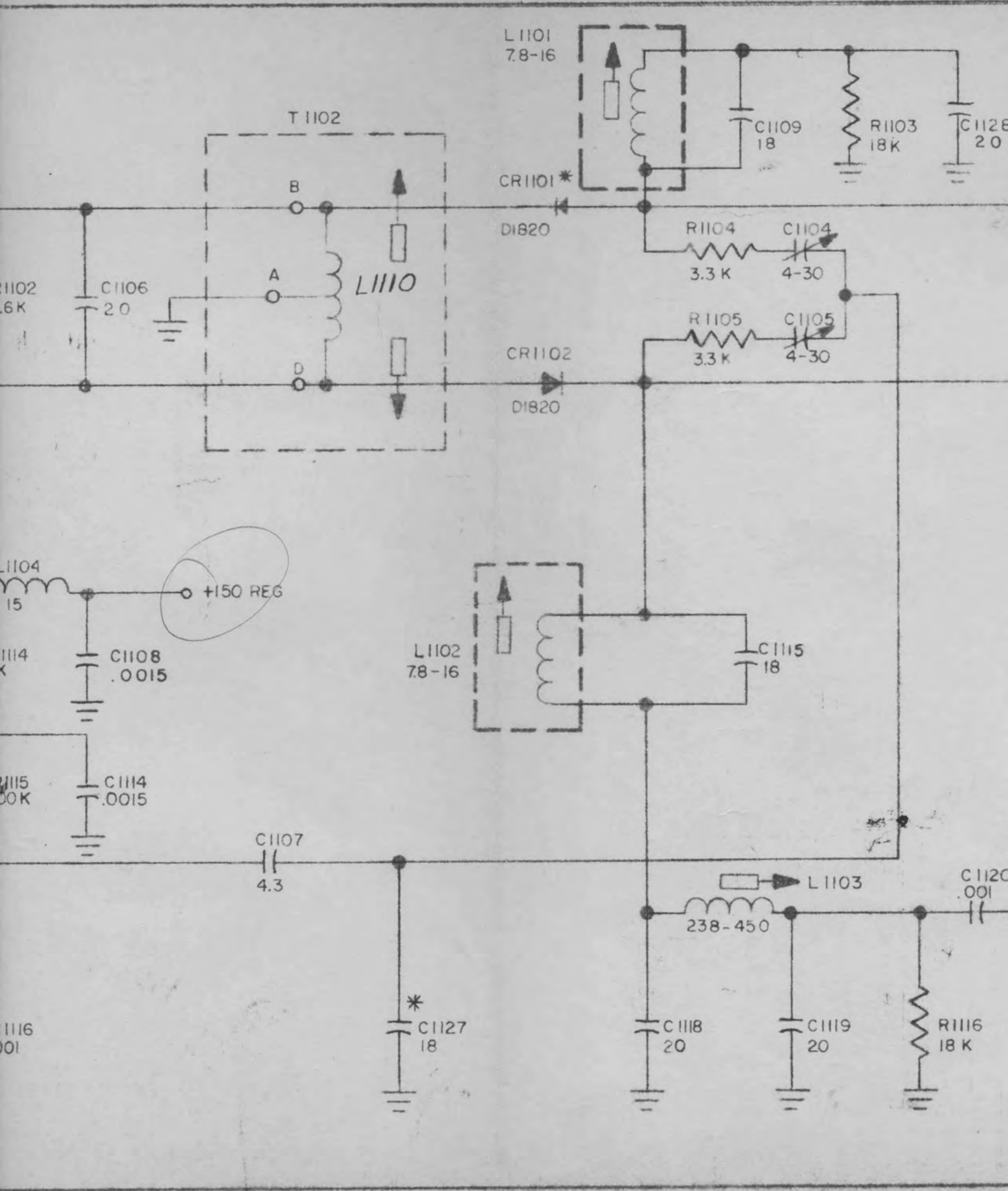
1. UNLESS OTHERWISE SPECIFIED:
CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS. GREATER THAN ONE ARE IN PICOFARADS.
2. RESISTORS ARE 1/4 WATT IN OHMS.
3. INDUCTANCE VALUES ARE IN MICROHENRIES.

NOTE:
NOT USED IN MODEL 11B1-BN-2 SERIAL NOS. 1 THROUGH 5 AND MODEL 11B1-BN-3 SERIAL NOS. 1 & 2.

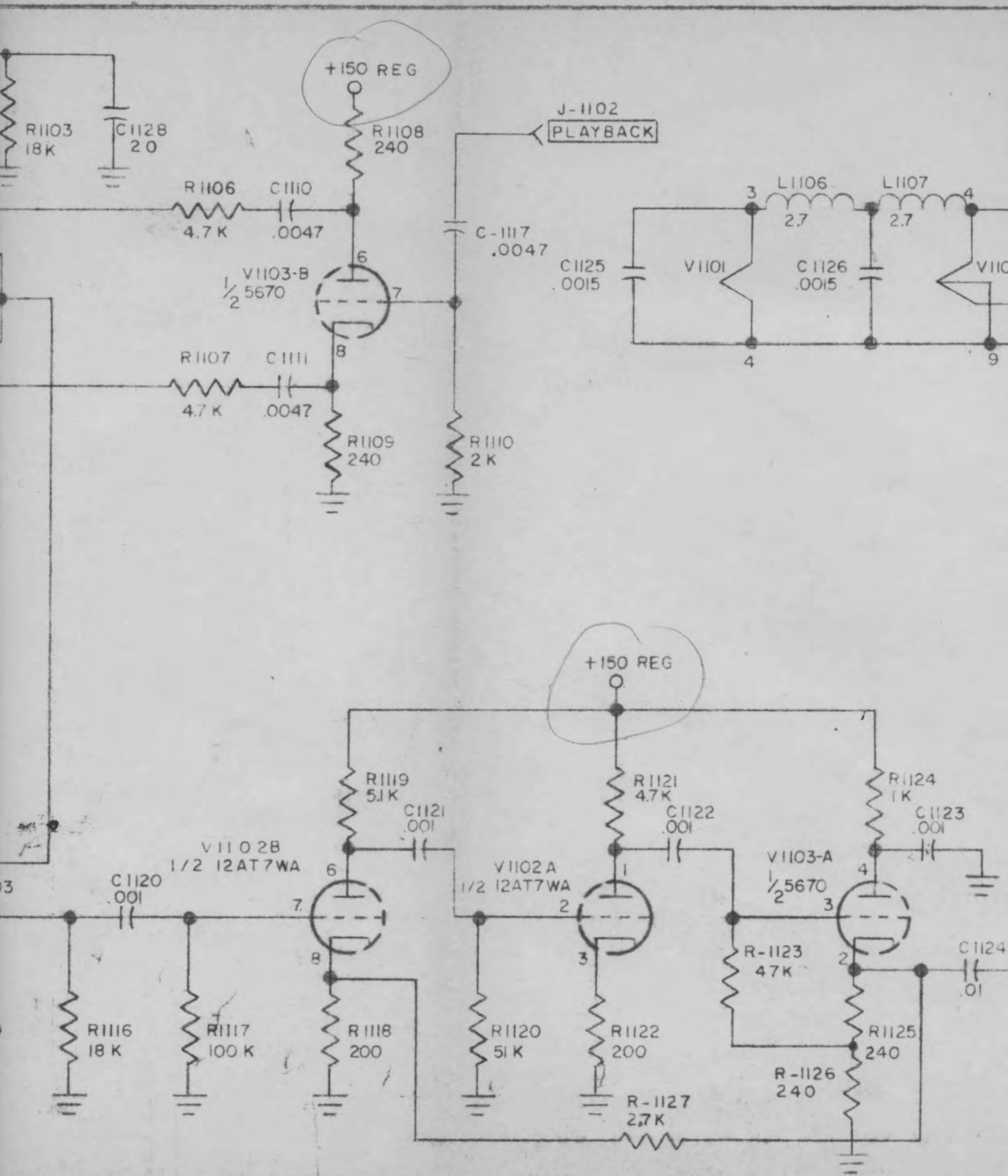
ISOLATED FM DEMODULATOR

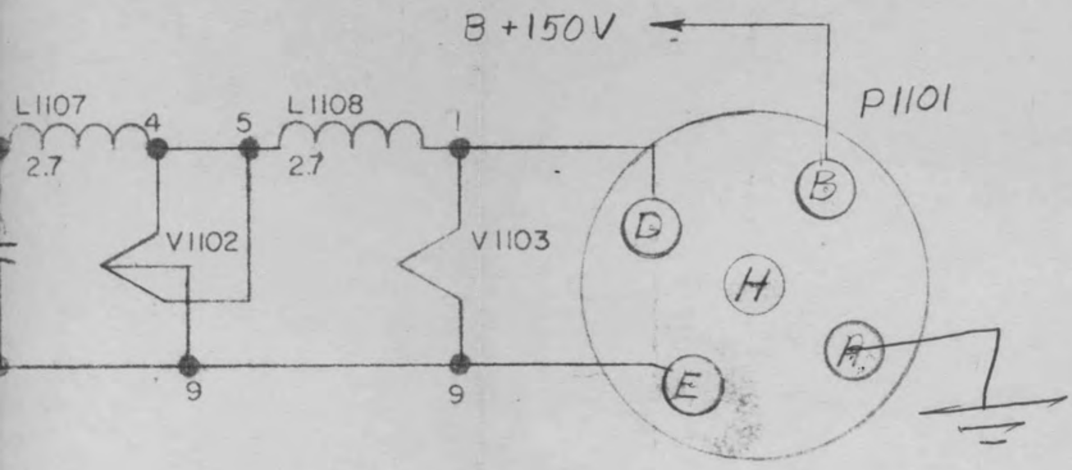
R18-313

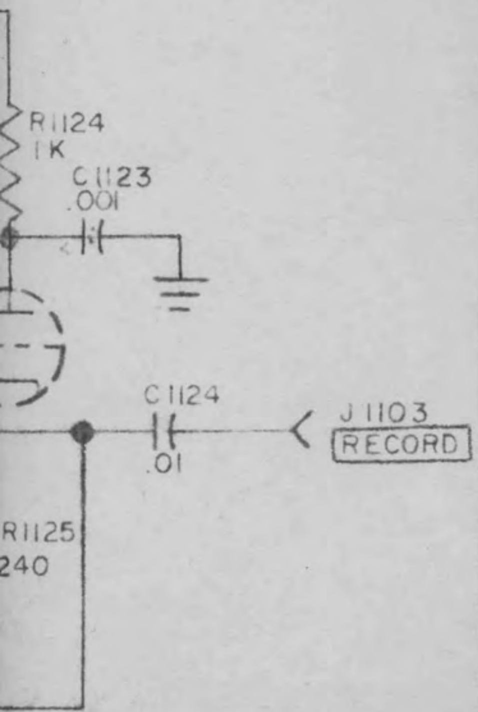

T 1101
L1109
C 1129
12
J1101
10 MC
IN-OUT
R1101
100
A
C
D
D
B
C1102
6.8
C1101
16
R1102
5.6K
C1103
6.8
L1104
15
C1113
.0015
R1114
1K
L1105
16
R1112
6.8K
R1115
100K
V1101
5654
C1112
0.8-18
Y1101
9.4 MC
R1111
150K
R1113
390
C1116
.001



L1101
7.8-16
T1102
C1109
18
R1103
18K
C1128
20
CR1101 *
B
D1820
R1104
3.3 K
C1104
4-30
R1102
.6K
C1106
20
A
L1110
R1105
3.3 K
C1105
4-30
CR1102
D
D1820
L1104
15
+150 REG
L1102
7.8-16
C1115
18
R1114
K
C1108
.0015
R1115
00K
C1114
.0015
C1107
4.3
L1103
C1120
.001
238-450
*
C1116
.001
C1127
18
C1118
20
C1119
20
R1116
18 K


+150 REG
R1103
18K
C1128
20
R1108
240
J-1102
PLAYBACK
R1106
4.7 K
C1110
.0047
C-1117
.0047
V1103-B
1/2 5670
L1106
2.7
L1107
2.7
C1125
.0015
V1101
C1126
.0015
R1107
4.7 K
C1111
.0047
R1109
240
R1110
2 K
+150 REG
R1119
5.1 K
C1121
.001
R1121
4.7 K
C1122
.001
R1124
1 K
C1123
.001
V1102 B
1/2 12AT7WA
C1120
.001
V1102 A
1/2 12AT7WA
V1103-A
1/2 5670
C1124
.01
R-1123
47K
R1116
18 K
R1117
100 K
R1118
200
R1120
51 K
R1122
200
R1125
240
R-1126
240
R-1127
2.7 K





NOTES
UNLESS OTHERWISE NOTES!
CAPACITOR VALUES LESS THAN ONE ARE IN MICROFARADS.
CAPACITOR VALUES GREATER THAN ONE ARE IN MICROMICROFARADS.
INDUCTANCE VALUES ARE IN MICRO-HENRYS.
RESISTOR VALUES ARE IN OHMS – ½ WATT.
K=1,000 M=1,000,000

(R-18-184)
PLAYBACK UP-CONVERTER