INSTRUCTION BOOK

FOR

MODEL G-110B RECEIVER

AND

TEMCO G-116 COR UNIT

NEMS CLARKE, CO

919 JESUP BLAIR DRIVE • SILVER SPRING, MARYLA

A DIVISION OF Vitro CORPORATION OF AMERI

INSTRUCTION BOOK

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NEMS-CLARKE Company
919 Jesup-Blair Drive
Silver Spring, Maryland
A Division of VITRO Corporation of America

SMM4663031058

WARNING

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised while working with this equipment.

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PART I

MODEL G-110B RECEIVER

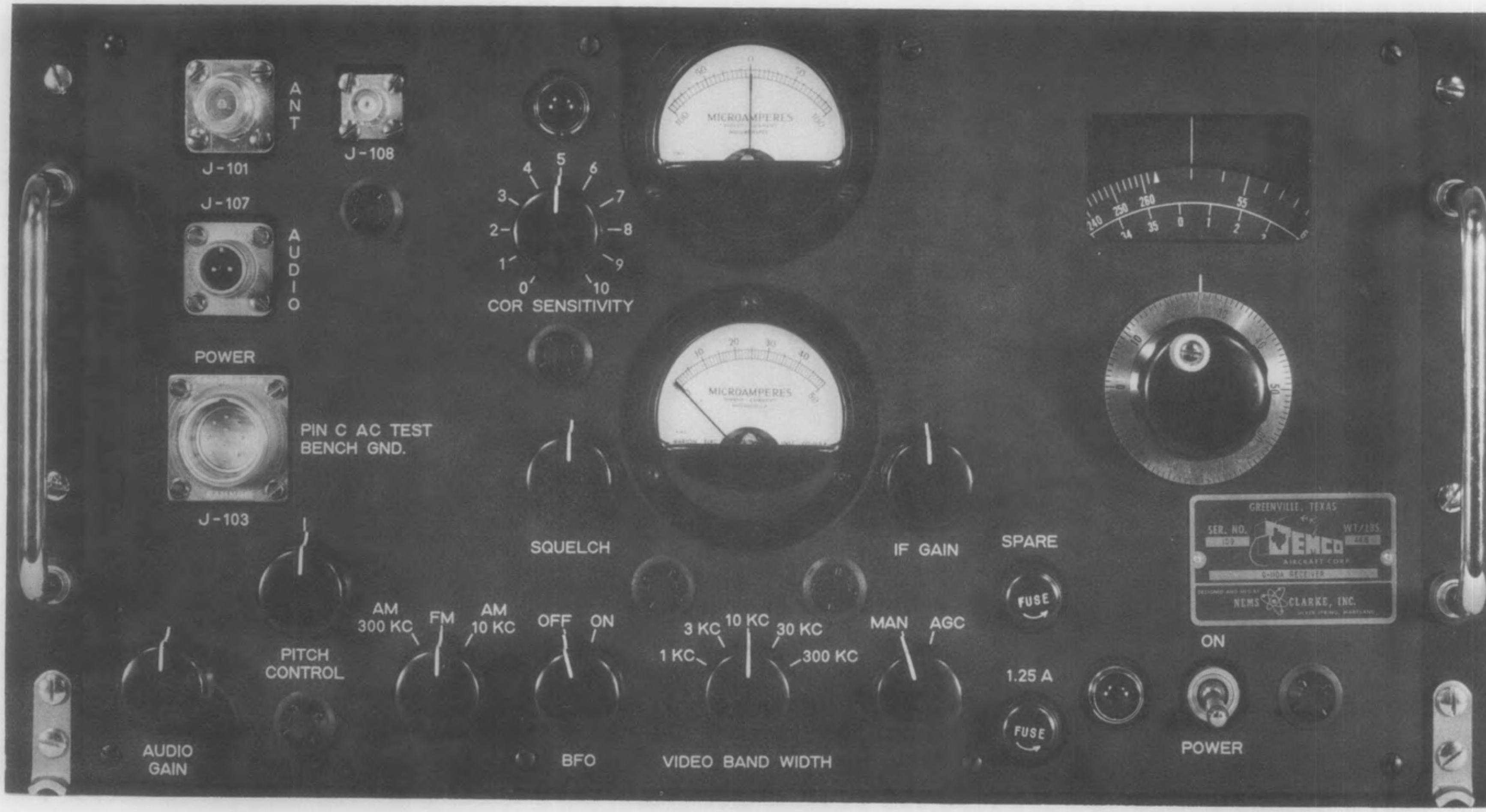


Figure 1. Model G-110B Receiver, Front View

PERFORMANCE SPECIFICATIONS

Tuning Range	55-260 mc
IF Rejection	70 db, minimum
Image Rejection	60 db, minimum
Noise Figure	6 db, maximum
Absolute Sensitivity Measured without band-restricting filters	4 µv produces at least 23 db S/N with 100-kc deviation, 1 kc modulation frequency.
IF Frequencies	21.4 mc and 1 mc
IF Bandwidth	300 kc and 10 kc
Outputs Provided	1. Signal -- Wide band for supplying high-impedance load. 2. Monitor -- panel-mounted speaker, headphones, or 600 ohms balanced output for external use.
FM Output	0.10 volt per kc, approx.
AM Outputs 300-kc and 10-kc strips	Approx. 10V RMS for 500 µv input modulated 50% at 1 kc.
FM Output Stability	Varies less than 2 db for inputs above 1 µv.
AM Output Stability Both IF strips	7 db maximum variation for 40-db variation in input.
Input Impedance	Approx. 50 ohms
Video Response	10 c.p.s. to 300 kc
Video Bandwidth Control	5 positions - 1, 3, 10, 30, and 300 kc
Power Input	115/230 volts, 50 to 60 c.p.s. and 400 c.p.s.
Power Consumption	127 watts
Weight	44.5 lbs.

Table 1. Performance Specifications

TUBE COMPLEMENT

Symbol	Type	Function
V-101	5R4WGA	Rectifier
V-102	OA2	Voltage regulator
V-103	OA2	Voltage regulator
V-104	6AL5	AGC delay diode
V-105	12AU7A	Squelch
V-106	12AU7A	1st video amplifier and tuning meter bridge
V-107	12AU7A	Audio amplifier
V-108	12AU7A	Video cathode follower output
V-201	416B/6280	1st RF amplifier
V-202	6J4	2nd RF amplifier
V-203	6AK5	Mixer, 21.4 mc
V-204	6AF4A	Local oscillator
V-301	6DC6	1st IF amplifier, 21.4 mc
V-302	6DC6	2nd IF amplifier, 21.4 mc
V-303	6CB6	3rd IF amplifier AM; 1st limiter FM, 21.4 mc
V-304	6AK5	AM detector, AM; 2nd limiter FM, 21.4 mc
V-305	6AL5	Discriminator
V-306	6AU6	Crystal-controlled 2nd conversion oscillator, 22.4 mc
V-307	6BA6	1st IF amplifier, 21.4 mc
V-308	6AK5	Mixer, 1 mc
V-309	6BA6	IF amplifier, 1 mc
V-310	6AL5	AM and AGC detector
V-311	6CB6	B.F.O., 1 mc
V-312	6CB6	B.F.O., 21.4 mc

Table 2. Tube Complement

SECTION 1

GENERAL DESCRIPTION

1. PURPOSE OF EQUIPMENT.

The Model G-110B Receiver has been specifically designed to meet the requirements of a highly stable, extremely sensitive AM-FM-CW receiver for critical application in the 55-260-mc range.

The receiver has a self-contained power supply and is capable of operation from a power source of 115/230 volts ±10%, 50 to 60 cycles, single phase, alternating current.

Among the special features of the Model G-110B receiver is audio squelch with adjustable threshold, FM reception with very low distortion, AM reception with selective IF bandwidths of 10 kc or 300 kc, B.F.O. for CW reception, and a high-quality 600-ohm audio output. The video output signal passes through a variable low-pass filter, allowing a greatly improved S/N ratio when the full video bandwidth is not needed. High-level, low-impedance IF output from both IF amplifiers is made available through connectors J-303 and J-304 located on the top of the IF strip.

A "COR SENSITIVITY" control, located on the front panel, is designed to control the sensitivity of the COR unit which may be mounted as auxiliary equipment on top of the chassis. For a complete description of the COR Unit, see Part II of this book, beginning on page 56.

For further details concerning the capabilities and special features of the Model G-110B receiver, see Table 1, Performance Specifications.

2. DESCRIPTION OF EQUIPMENT.

The Model G-110B receiver is 8-1/2 inches high by 16-1/2 inches wide by 16-7/8 inches deep. It occupies approximately 1.36 cubic feet and weighs approximately 44.5 pounds (including the COR Unit). Panel and chassis are of aluminum construction, and the panel is finished in black enamel. A plastic "Edge-lite" panel is fitted over the aluminum front panel to provide illumination for control and identification markings on the front of the receiver. The receiver is equipped with a dust cover and may be used independently on a shelf or table, or it may be mounted in aircraft shock mountings. The IF amplifier and RF tuner are built as completely shielded subassemblies with most of the audio and video components mounted on a single terminal board on the underside of the main chassis.

Figure 1 shows a front view of the Model G-110B Receiver, and Table 2 shows the tube complement.

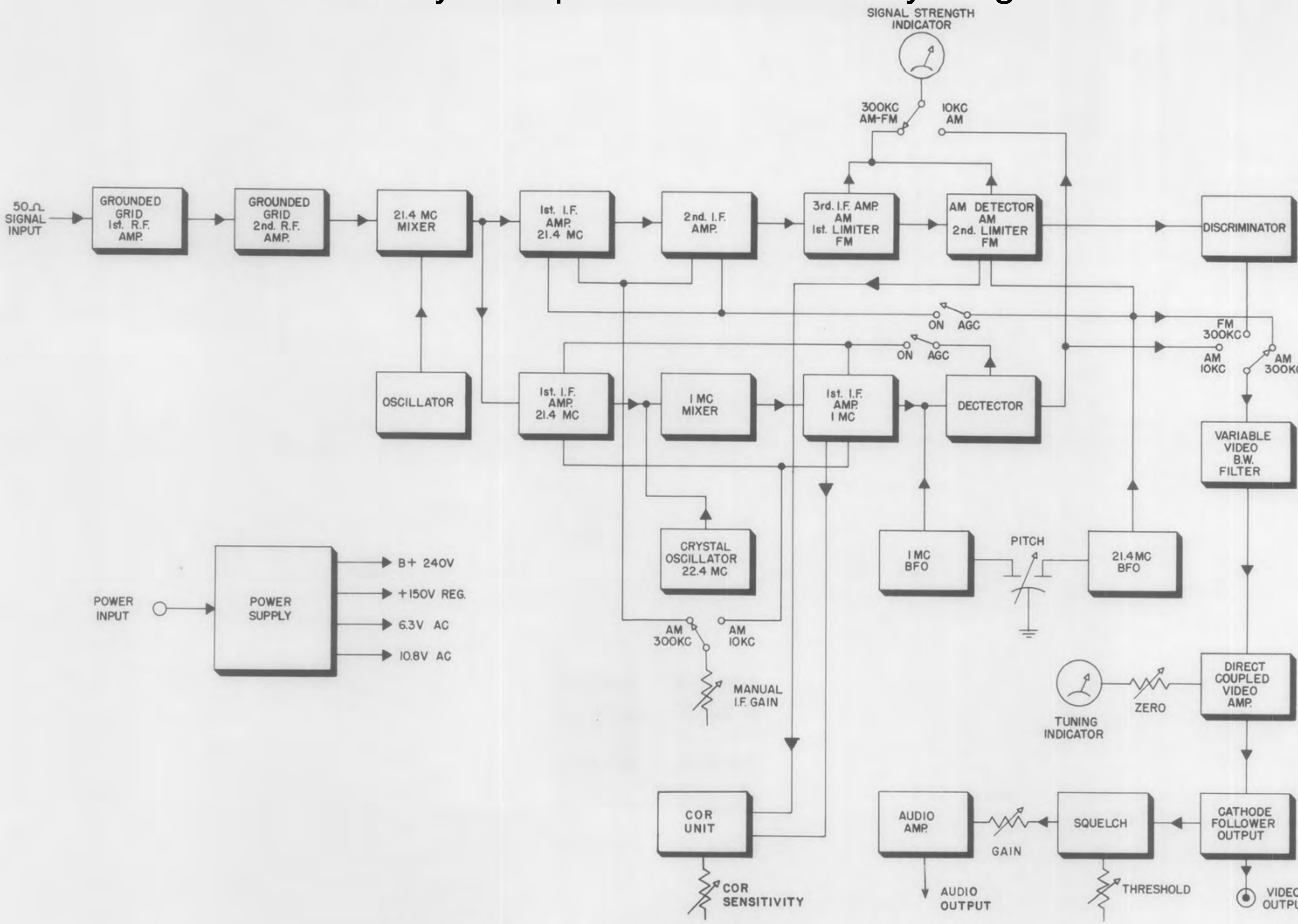


Figure 2. Block Diagram, Model G-110B Receiver

SECTION 2

THEORY OF OPERATION

1. ANALYSIS, MODEL G-110B RECEIVER.

a. A block diagram of the Model G-110B Receiver is shown in Figure 2. The circuit, with the function switch in the AM 300KC or FM position, is a single superheterodyne with an IF of 21.4 mc. With the function switch in the AM 10KC position, a dual-conversion circuit is used, with a 21.4-mc first IF, followed by a 1-mc second IF.

The tuner is designed to produce the lowest possible noise figure consistent with a practical tuning structure capable of tuning 55 to 260 mc, with reasonably uniform performance over the band.

The IF amplifier, with the function switch in the FM position, uses two stages of amplification, cascade limiters, and a phase-shift discriminator. With the function switch in the AM 300KC position, AGC voltage is applied to the first two stages, and the second limiter becomes the AM detector. With the function switch in the AM 10KC position, plate voltage is removed from the 21.4-mc IF amplifier and applied to the 1-mc dual conversion mixer and IF amplifier.

The output signal of the IF strips (AM 300KC, FM, or AM 10KC) is fed through a variable low-pass filter, thus providing the maximum S/N ratio when the full video bandwidth is not needed. The output of the filter drives a two-stage direct-coupled video amplifier with cathode follower output. A portion of the follower output drives a four-stage squelch-audio amplifier circuit.

2. DETAILED THEORY.

a. ANTENNA.--The input impedance of the receiver is approximately

50 ohms over the frequency range of 55 to 260 mc. The input signal is applied through a type "N" 50-ohm coaxial receptacle located on the rear apron of the chassis.

b. FIRST RF STAGE.--The input signal is applied to the cathode of the 416B low-noise planar triode. To prevent loss of input signal due to cathode-to-filament capacity, the filaments are kept above RF ground with broad-band chokes. The input resistance of the 416B is approximately equal to $\frac{2}{G_m}$ when $R_L - R_p$, and in this case is 40 ohms.

The cathode circuit is not tuned, due to the extreme bandwidth produced by the 40-ohm shunt load and the low cathode-to-ground capacity.

The plate tank circuit takes the form of a modified pi network and is used to couple the high impedance plate circuit of the 416B tube to the low input impedance of the 6J4 grounded grid second RF amplifier.

c. SECOND RF STAGE.--The output of the pi network drives the cathode of the 6J4 grounded-grid second RF amplifier. A low-noise second stage is used so that the system noise figure (first RF, second RF, and mixer) is essentially that of the first stage.

The plate of the 6J4 is coupled to the grid of the 6AK5 pentode mixer by a double-tuned overcoupled band-pass filter. A capacity "T" is used to provide coupling between the primary and secondary tuned circuits. The shunt element of the "T" is adjustable, thus providing a control over the interstage bandwidth. A small iron-core inductor across the shunt element of the "T" network approaches parallel resonance at 55 mc, thus increasing the coupling at the low end and providing a more uniform coupling over the tuning range of 55 to 260 mc.

The single-tuned high-Q plate circuit of the 416B tube is used to "fill in" the dip in the overcoupled interstage network. The overall RF response when viewed at the mixer grid test point is essentially flat over the band.

A convenient means for measuring the plate current of the 416B tube is made possible by TP-201 at the junction of R-201 and R-202, the cathode bias resistors. A VTVM at TP-201 will read the voltage drop across 100 ohms. Thus 2V equals 20 ma, 3V equals 30 ma, etc.

The filament of the 416B is operated from a 10.8-volt winding of T-101 through a total series dropping resistor of 4 ohms. This produces a self-regulating effect, which extends the tube life.

A blower motor mounted on the front-end subassembly is used to cool the 416B tube. The motor plugs into the main chassis with a 6-pin Jones plug. A jumper between pins 5 and 6 of the Jones plug removes plate voltage from the 416B when the motor is disconnected, thus protecting the tube.

Positive grid bias of 8 volts is applied from a voltage divider from the 150-volt regulated B+. This voltage is necessary to cancel the cathode self-bias voltage of 8.2 volts so that the tube will operate with approximately 0.2 volt bias. The d-c degeneration due to the large cathode resistor has a considerable stabilizing effect on the 416B tube and minimizes performance variations from one tube to the next if replacement becomes necessary.

If, for any reason, the grid bias voltage is shorted or removed, the plate current is reduced and the tube will not be damaged.

d. MIXER.--A 6AK5 pentode is used as a converter. The oscillator signal is injected into the grid circuit, developing an operating bias proportional to the amplitude of the local oscillator signal. This causes a minimum effect on the receiver operation due to variations in local oscillator amplitude. A decoupled test point (TP-202) from a tap on the mixer voltage developed at the grid of the 6AK5 (V-304) AM detector. The third IF amplifier (V-303), which drives the AM detector, is not gain controlled, but its signal-handling capabilities have been improved by increasing the screen voltage. A self-resonant choke is connected in the AM output lead from the 6AK5 AM detector (V-304) to prevent IF signals from leaving the IF subassembly.

With the AGC switch in the manual position the AGC voltage is shorted to ground, and the IF gain control in the cathode circuit of the two 6DC6 IF amplifier is unshorted and becomes operative. The gain-controlled stages use cathode compensation of input capacity variation with bias change.

The zero-center tuning meter operates only in the FM position. Correct tuning of an AM sognal may be accomplished by first tuning in the signal with the selector switch in the FM position and then switching to the AM 300KC position.

The signal-strength meter, M-101, is not calibrated, though it may be used for a relative indication of signal strength. The signal-strength meter is switched between the limiters or AM detector in the 300-kc-wide amplifier and the AM detector in the 10-kc-wide amplifier.

h. IF AMPLIFIER FUNCTION SWITCH IN AM 10KC POSITION.--Plate and screen voltages are removed from the 21.4-mc IF amplifier, and a 21.4-mc signal is capacitively coupled from T-302 to the grid of V-307, the 21.4-mc isolation amplifier preceding V-308, the 1-mc pentode mixer. The output of V-306, the 22.4-mc crystal-controlled 2nd conversion oscillator, is capacitively coupled to the grid of V-308, the 1-mc mixer. Terminal "D" of T-310 provides a convenient test point for the alignment of the selective double-tuned 21.4-mc amplifier, consisting of T-309 and T-310. This selective 21.4-mc amplifier is used to increase the rejection of the second image and to further isolate the 22.4-mc crystal oscillator from the front end.

The output of the 1-mc mixer, V-308 is coupled to V-309, a 1-mc amplifier, through T-311 and T-312, a 1-mc double-tuned transformer. V-310, the signal detector and AGC diode, is coupled to V-309 through T-313 and T-314, the second 1-mc double-tuned IF transformer.

With the AGC switch in the manual position, the AGC voltage is shorted to ground, and R-105 is unshorted and becomes operational. (R-105 is the IF gain control in the cathode circuit of V-307 and V-309, the two 6BA6 remote cutoff IF amplifiers).

i. BEAT FREQUENCY OSCILLATORS, 21.4 MC AND 1 MC.--The two BFO's use 6CB6 type tubes in an electron-coupled Hartley circuit. The BFO's are an integral part of the IF amplifiers, with V-312 in the 21.4-mc circuit and V-311 in the 1-mc circuit. A differential capacitor is used, permitting a single front panel Pitch control to operate both the 21.4-mc and the 1-mc BFO's.

The BFO "ON-OFF" switch is interwired with the "AM 300KC-FM-AM 10KC" function switch so that the appropriate BFO is energized.

j. VIDEO.--The output of the IF strips, AM 300KC, FM 300KC, or AM 10KC, is fed to the input of a 5-position lowpass filter. The cutoff frequency can be set to 300 kc, 30 kc, 10 kc, 3 kc, or 1 kc by a front-panel selector switch. The output of this filter drives one-half of a 12AU7 direct-coupled video amplifier (V-106A). A zero-center scale meter (M-102) is used as a tuning indicator and is connected in a bridge circuit consisting of the video amplifier and the other half of the 12AU7 (V-106B). A partial bypass of the cathode of the first video amplifier extends the high frequency response. The output video amplifier is a 12AU7 tube (V-108) connected as a direct-coupled cathode follower. A tap on the cathode resistor of the output video amplifier provides the signal source to drive the monitor audio amplifier, V-107.

k. THE SQUELCH CIRCUIT.--The squelch circuit is best described with the aid of the simplified schematic of Figure 3. V-105A acts as a gated audio amplifier stage, while V-105B serves as a d-c amplifier and gate generator. The circuit is connected in such a manner that V-105B has zero grid voltage when no signal is being received and has a negative signal applied when a carrier is being received. The audio amplifier stage, V-105A, will pass an audio signal when the d-c amplifier, V-105B, is non-conducting, and will not pass an audio signal when V-105B is in a conducting condition. In this manner the audio circuit is disabled when no carrier is being received. The carrier strength necessary to make the audio section operative is adjusted by the threshold (squelch) control R-115. The operation of this circuit is detailed in the following paragraph.

The d-c amplifier tube, V-105B, is connected between the 150V supply and ground. The fixed bias on this stage is adjusted by R-115. The audio section, V-105A, is connected between the 250-volt supply and the 150-volt supply. The bias on this stage is the voltage drop across the cathode resistor, R-114, plus the voltage drop, if any, in the plate load resistor, R-117, in V-105B. Assuming no signal is being received, the grid of the d-c amplifier tube is zero, or at most has a very small negative voltage on it. R-115 is adjusted until the noise just disappears from the output. In this condition the d-c amplifier tube is drawing plate current, and the drop across its plate load, R-117, appears as a bias to V-105A. This voltage drop is sufficient to cut off V-105A and disable the audio signal. When a carrier is tuned in, a negative voltage is supplied from the second limiter in the IF strip through an isolation resistor, R-111, to the grid of V-105B. This voltage is sufficient to cut off V-105B, causing the voltage to drop to zero across the V-105B plate load resistor, R-117. V-105A receives only its normal cathode bias generated in its cathode bias resistor, R-114, and audio signals are passed through to the output.

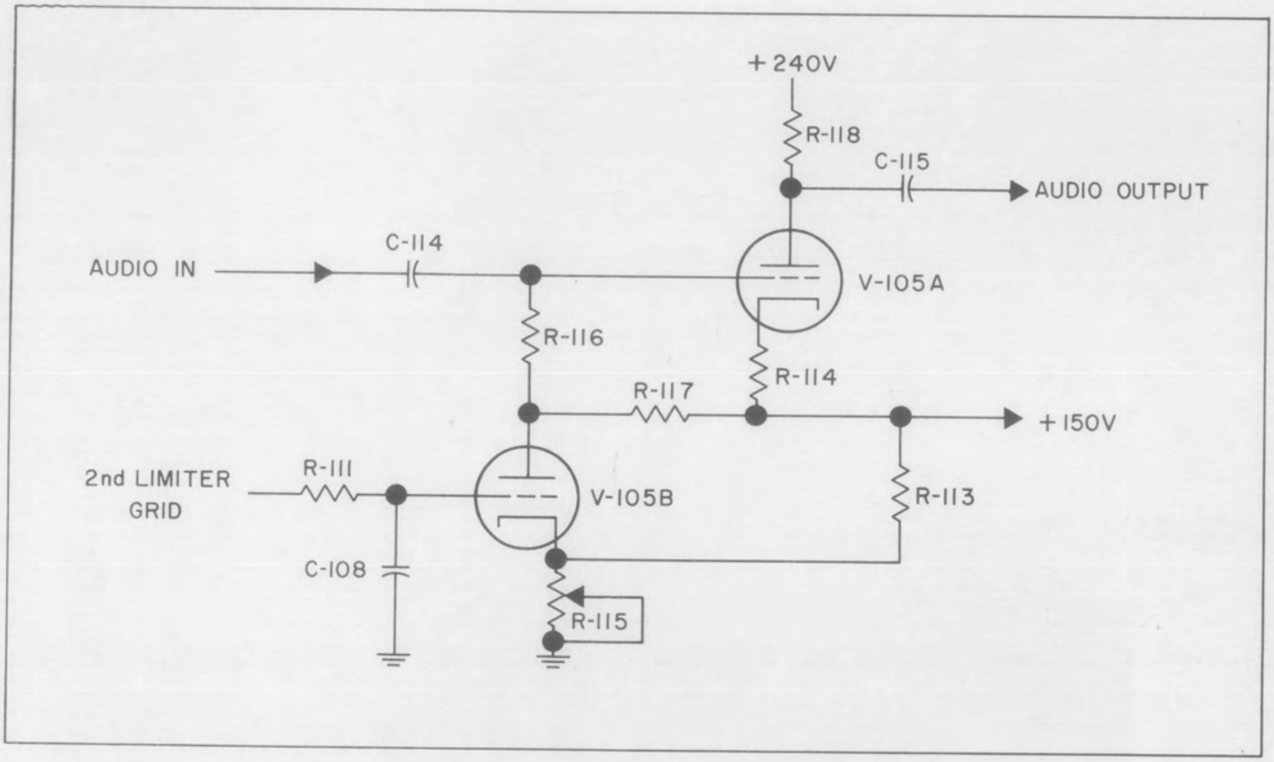


Figure 3. Model G-110B Receiver Squelch Circuit, Simplified Schematic

When receiving amplitude-modulated signals with a high percentage of modulation, the squelch circuit may be cut off on negative modulation peaks when the envelope amplitude becomes zero. To prevent this, a filter consisting of R-111 and C-108 is placed between the limiter and the grid of the d-c amplifier. This filter has a long enough time constant to reject the lowest audio frequency likely to be received, but not long enough to noticeably delay operation of the squelch.

l. AUDIO AMPLIFIER.--The output of V-105A is used to drive a two-stage resistance coupled audio amplifier. The output amplifier drives a 600-ohm balanced output (J-107).

m. SDU OUTPUT.--An output at the IF 21.4-mc frequency is provided for connection to a spectrum display unit. This output is obtained from the 6AK5 (V-203) mixer plate load through a capacity divider. A spectrum display unit, type no. 200-2, may be secured from the manufacturer of this receiver. The function of the spectrum display unit is briefly described in the accompanying bulletin.

n. POWER SUPPLY.--A conventional two-section capacitive input filter power supply delivers a d-c potential of 240 volts. V-102 and V-103 provide two separate 150-volt d-c regulated outputs.

A 6.3-volt winding supplies the filaments of all tubes except V-101 and V-201. V-201 is supplied by a separate 10.8-volt winding in series with an external 4-ohm dropping resistor and V-101 by a separate 5-volt winding of the power transformer T-101.

SECTION 3

OPERATION

1. INTRODUCTION.

Figure 1 shows the appearance and location of controls on the front panel of the Model G-110B Receiver.

2. CONTROL SETTINGS.

a. POWER.--Turn on the power switch, S-101, located on the front panel.

NOTE: A time delay relay (K-101) is used to delay the application of plate voltage to the 1st and 2nd RF amplifiers for approximately 120 seconds. Delay of plate voltage to the type 416B tube (V-201) is in the interest of improved tube life. The receiver will therefore be inoperative for approximately two minutes after it is turned on.

b. MODULATION.--The function switch (S-104) has three positions, AM 300KC, FM, and AM 10KC.

(1) FM.--The function switch must be in the FM position. The IF bandwidth is 300 kc. The BFO should be in the "OFF" position. The Manual-AGC switch (S-105) and the IF gain control are inoperative in the FM position. The zero-center tuning meter (M-102) is operative only in the FM position.

(2) AM WIDE BAND (300KC).--The function switch must be in the AM 300KC position. The Manual-AGC switch should be in the AGC position except when the BFO is to be used. For BFO operation, the manual IF gain control (R-105) should be adjusted to produce the loudest beat note.

(3) AM NARROW BAND (10KC).--The function switch must be in the AM 10KC position. The Manual-AGC switch should be in the AGC position except when the BFO is to be used. For BFO operation, the manual IF gain

control (R-105) should be adjusted to produce the loudest beat note. Care must be taken when tuning in the 10KC IF position to avoid "missing" the station.

c. VIDEO BANDWIDTH.--The video bandwidth switch (S-106) has five positions: 300KC, 30KC, 10KC, 3KC, and 1KC. The position resulting in the best S/N ratio should be used.

d. SQUELCH.--The squelch circuit is inoperative with the squelch control R-115 counterclockwise against its stop. In the absence of a signal, rotate the squelch threshold control clockwise until the background noise just becomes inaudible. Any usable signal should then disable the squelch circuit.

SECTION 4

MAINTENANCE

1. INTRODUCTION.

The Model G-110B Receiver should give comparatively trouble-free performance. If, however, trouble occurs, rapid and accurate trouble-shooting can be accomplished by the application of a simple effect-to-cause reasoning process, along with the data given in this section. A thorough knowledge of the theory of operation, as contained in Section 2, is essential to successful effect-to-cause reasoning. As a general statement, it may be said that frequent recurrence of a trouble usually indicates that the effect, not the cause, has been remedied, and further investigation should be made.

In time, the blower for the 416B tube (V-201), may become clogged with dust collected from the atmosphere. Since this impairment of the blower's efficiency may cause the loss of a very expensive tube, it is recommended that the blower be disassembled and cleaned whenever it is found to be sufficiently dirty to warrant such action.

The voltage chart and the overall schematic diagram contained herein will be useful in locating trouble. Such trouble as broken leads or solder joints and loose or defective tubes will not be discussed in detail, but should be suspected and searched for in all cases where the trouble is not immediately apparent. Illustrations given in this section show the location of all major components and such smaller components as cannot be readily identified from adjacent stencils on the receiver.

2. ALIGNMENT PROCEDURE.--Function Switch in FM 300KC Position.

Alignment and adjustment of the Model G-110B Receiver is accomplished according to the following outline, and should be carried out in the sequence given.

a. SECOND LIMITER ALIGNMENT

(1) C. W. METHOD

Step 1. Remove V-302

Step 2. Set the signal generator to 21.4 mc and connect to pin 1 of V-303.

Step 3. Connect a high-resistance voltmeter (VTVM) to the second limiter grid return (TP-302).

Step 4. Set the signal generator output to produce approximately 2 volts on the VTVM.

Step 5. Detune the primary slug of T-307 counterclockwise against the stop.

Step 6. Increase the signal generator output to produce approximately the same value on the VTVM as in Step 4 above.

Step 7. Adjust the secondary slug of T-307 for a maximum reading on the VTVM.

Step 8. Adjust the primary slug of T-307 for maximum reading, keeping the signal generator output adjusted for the same value on the VTVM as in Step 4 above. DO NOT readjust the secondary for a maximum as this will result in improper adjustment.

The second limiter transformer, T-307, has a 3-db bandwidth of approximately 2.5 mc. The low circuit Q's and heavy coupling make visual alignment of this transformer desirable but not essential. The procedure outlined above will produce less than 1 db tilt in this transformer. Thus the slope is negligible over the narrow 300-kc IF bandwidth.

(2) SWEEP METHOD

Step 1. Remove V-302.

Step 2. Connect sweep generator to pin 1 of V-303.

Step 3. Connect oscilloscope to second limiter grid (TP-302).

Step 4. Adjust the primary and secondary of T-307 for maximum symmetrical output around a 21.4-mc center frequency.

b. DISCRIMINATOR ALIGNMENT.--In preparation for alignment of the discriminator transformer, T-308, remove the 6AK5 (second limiter) tube, V-304, and note the reading of the center frequency meter M-102. If it is off center, it should be centered by means of the potentiometer, R-127, located on the rear apron of the chassis. Difficulty in readily securing an exact center reading is indicative of a defective 6AL5 tube (V-305), a defective 12AU7 tube (V-106), or their associated components, and must be corrected before proceeding further. After this adjustment, replace V-308 and proceed as follows:

(1) C. W. METHOD

Step 1. Remove V-302.

Step 2. Set the signal generator to 21.4 mc and connect to pin 1 of V-303.

Step 3. Connect a high-resistance d-c voltmeter (VTVM) to the second limiter grid return (TP-302).

Step 4. Set the signal generator output to produce 2 volts on the VTVM.

Step 5. Connect the VTVM to the discriminator output lead (TP-303).

Step 6. Tune the secondary of T-308 to zero output, then counterclockwise until the VTVM shows a reading of 0.5 volt.

Step 7. Tune the primary of T-308 to give a maximum reading on the VTVM.

Step 8. Retune the secondary to produce a zero (balance) reading on the VTVM.

Step 9. Detune the signal generator above and below 21.4 mc to produce a maximum positive and negative output. These voltages should be equal and have a magnitude of approximately ±8 volts D. C. Minor adjustment of the primary of T-308 will cause the two peak voltages to become exactly equal.

(2) SWEEP METHOD

Step 1. Remove V-302.

Step 2. Connect the sweep generator to pin 1 of V-303.

Step 3. Connect the oscilloscope to the discriminator output lead (TP-303).

Step 4. Adjust the primary and secondary slugs of T-308 for maximum symmetrical output around a 21.4-mc center frequency. The peak-to-peak separation should be 750 kc.

c. IF ALIGNMENT

(1) C. W. METHOD.--The characteristics of cascaded, critically coupled amplifier stages are such as to make alignment difficult; however, the advantages of response stability, gain, and adjacent-channel selectivity make this type of coupling most desirable. Alignment has been kept as simple as possible by designing the three capacitively coupled double-tuned IF transformers, comprising T-301, T-302, T-303, T-304, T-305, and T-306, to have almost identical characteristics. The primary and secondary Q's have been kept high, and therefore the mutual coupling is low for the required bandwidth. These factors suggest a rather simple alignment procedure with a minimum of equipment. The resonant frequency of the primary or the secondary in the absence of the other (no coupling) is very nearly the proper tuning when the circuits are coupled. If the primary circuit is detuned, the secondary adjusted for maximum output, and the primary

then retuned to maximum, the overall response will be approximately correct. This procedure is as follows:

Step 1. Remove the oscillator tube (V-204) to prevent mixing at the signal generator harmonic frequencies.

Step 2. Set the receiver dial to approximately 60 mc.

Step 3. Set the generator to 21.4 mc and connect to pin 1 of V-203

Step 4. Connect a high-resistance d-c voltmeter (VTVM) to the second limiter grid return (TP-302).

Step 5. Set the generator output level to produce approximately 2V on the VTVM.

Step 6. If the IF amplifier is known to be considerably out of adjustment, it will be necessary to peak T-301, T-302, T-303, T-304, T-305, and T-306 to provide adequate gain.

Step 7. Detune the primary (T-305) counterclockwise against the stop.

Step 8. Increase the signal generator output to produce 2V on the VTVM.

Step 9. Adjust the secondary (T-306) for maximum reading on the VTVM.

Step 10. Adjust the primary (T-305) for maximum reading, keeping the signal generator output adjusted to maintain 2V on the VTVM. DO NOT readjust the secondary (T-306) for a maximum as this will result in improper adjustment.

Step 11. Repeat Steps 7 through 10 for T-302, T-303, and T-304. NOTE: It is not necessary to follow this sequence, as any transformer may be adjusted without affecting the others.

The alignment may be checked by varying the signal generator frequency ±100 kc. The output voltage should be constant within ±1 db over this range.

(2) SWEEP METHOD.--If a sweep generator and an oscilloscope are available, they may be used to check the response; however, the above procedure should first be performed and then the response checked or retouched, as required. For this test, replace the signal generator with the sweep generator and the VTVM with the oscilloscope. Slight readjustment of the transformer slugs may give some improvement in response shape.

3. BFO ADJUSTMENT.--Function switch in AM 300KC position, AGC-Man. switch in "Man." position.

Step 1. Adjust IF gain as needed.

Step 2. Connect 21.4-mc CW marker to TP-202.

Step 3. Turn BFO on and, with pitch control on reference line, adjust T-316 for zero beat.

4. ALIGNMENT PROCEDURE.--Function switch in AM 10KC position, BFO off, AGC off, IF gain control maximum clockwise.

a. C. W. METHOD

Step 1. Connect an accurate 21.4-mc CW generator to pin 1 of V-307.

Step 2. Remove local oscillator, V-204.

Step 3. Connect VTVM to terminal "D" of T-310.

Step 4. Adjust T-309 and T-310 for maximum indication on meter.

Step 5. Connect VTVM to TP-304.

Step 6. Peak T-311, T-312, T-313, and T-314 for maximum indication on meter.

Step 7. Turn BFO on and with pitch control on reference line, adjust T-315 for zero beat.

b. SWEEP METHOD

Step 1. Connect sweep generator to pin 1 of V-307.

Step 2. Connect oscilloscope to terminal "D" of T-310.

Step 3. Adjust T-309 and T-310 for symmetrical round-nosed response centered at 21.4 mc. (Use accurate 21.4-mc marker).

Step 4. Reduce sweep width to approximately 20 kc and connect oscilloscope to TP-304.

Step 5. Adjust T-311, T-312, T-313, and T-314 for round-nosed response with maximum gain with 21.4-mc marker in center of response.

Step 6. Turn BFO on and with pitch control on reference line, adjust T-315 for zero beat.

5. MECHANICAL ADJUSTMENTS.

a. The procedure for adjusting the dial on the Model G-110B Receiver is simple and can be done rapidly.

Step 1. Rotate inductuner to high frequency end until stopped by the inductuner mechanism.

Step 2. Set main dial so small triangle is coincident with the indicator hairline. Tighten screws.

Step 3. Set logging dial for an indication of 30 and tighten set screws.

Step 4. Check for coincidence of triangle mark with pointer, logging dial on 30, and mechanical stop on inductuner occuring simultaneously. Reset if necessary.

Step 5. Set the high end mechanical stop at 35-20±1.

Step 6. Set the low end mechanical stop at 0-00.

b. LOCAL OSCILLATOR ADJUSTMENT.--The only adjustment necessary in the local oscillator is to make the tuning dial read properly. This section may be disregarded if the dial is reading correctly. If a tube has been replaced and an error is noted, it may be corrected by adjustment of C-229.

This adjustment should be made with a signal generator of high accuracy at 60 mc.

The high-frequency end of the dial is controlled by the location of C-230 on the end inductor L-210. The correct adjustment is made at the factory and should not require readjustment in the field.

6. RF AMPLIFIER ALIGNMENT.

The RF circuits are wide band compared with the IF selectivity and are designed around the highly stable Mallory S-4 spiral inductuner. The end inductors are also very stable, and therefore the unit should not require realignment. If realignment is found necessary, proceed as follows:

Step 1. Unsolder C-248 from the inductuner lug and solder to the BNC test connector.

Step 2. Connect a sweep generator with a 50-ohm source impedance to the BNC test jack.

Step 3. Connect oscilloscope to front-end test point TP-202.

Step 4. Set the dial to 70 mc.

Step 5. Adjust C-217 and C-222 for a double-tuned symmetrical response centered at 70 mc. Use 70-mc marker.

Step 6. Adjust C-220 for a 15% dip in the response.

Step 7. Repeat Step 5 above.

Step 8. Set dial to 250 mc and bend end inductors L-207 and L-209 to produce a symmetrical response centered at 250 mc. Use 250-mc marker.

Step 9. Unsolder C-248 from the BNC test connector and resolder to the inductuner.

Step 10. Connect sweep generator to the antenna jack J-101 or J-201. NOTE: An accurate 50-ohm source can be achieved by using a

6- or 10-db 50-ohm pad between the sweep generator output and the receiver input.

Step 11. Set the dial to 70 mc.

Step 12. Adjust C-243 for a symmetrical response.

Step 13. Set the dial to 250 mc and move the position of C-244 along the end portion of end inductor L-204 to produce a symmetrical round-nose response.

TUBE	TYPE	Pin#1	Pin#2	Pin#3	Pin#4	Pin#5	Pin#6	Pin#7	Pin#8	Pin#9
					FRONT END					
V-201	416B	Cathode	+6.95V	Fila-ments	6.0VAC	Plate +	195V	Grid Ring	+6.9V	
V-202	6J4	Gnd	1.1	Gnd	6.3AC	Gnd	Gnd	130		
V-203	6AK5	-2.0	Gnd	6.3AC	Gnd	145	59	Gnd		
V-204	6AF4A	*53	Do not measure	Gnd	6.3AC	2.5	Do not measure	*53		
					MAIN CHASSIS					
V-101	5R4WGY	NC	5VAC 255DC	NC	255AC	NC	255AC	NC	5VAC 255DC	
V-102	OA2	147	NC	NC	NC	147	NC	Gnd		
V-103	OA2	148	NC	NC	NC	148	NC	Gnd		
V-104	6AL5	NC	-.34	6.3AC	Gnd	Gnd	NC	NC		
V-105	12AU7	145	-.27	24	Gnd	Gnd	210	133	150	6.2AC
V-106	12AU7	135	Gnd	6.7	Gnd	Gnd	137	-.1	6.8	6.2AC
V-107	12AU7	98	0	5.7	Gnd	Gnd	230	0	8	6.2AC
V-108	12AU7	235	138	141	Gnd	Gnd	235	138	141	6.2AC
					IF AMPLIFIER; FUNCTION SWITCH IN FM POSITION					
V-301	6DC6	-.33	.7	5.9AC	Gnd	134	76	Gnd		
V-302	6DC6	-.32	.82	5.9AC	Gnd	133	69	Gnd		
V-303	6CB6	-.31	.12	6.0AC	Gnd	135	34	Gnd		
V-304	6AK5	-6.6	Gnd	6.0AC	Gnd	37	83	Gnd		
V-305	6AL5	-.22	-7.0	4.8AC	Gnd	Gnd	Gnd	-12.4		
					IF AMPLIFIER; FUNCTION SWITCH IN AM 300KC POS.					
V-301	6DC6	-1.2	.68	5.9AC	Gnd	130	76	Gnd		
V-302	6DC6	-.37	.81	5.9AC	Gnd	130	71	Gnd		
V-303	6CB6	-.18	.31	6.0AC	Gnd	131	58	Gnd		
V-304	6AK5	-3.8	Gnd	6.0AC	Gnd	35	85	Gnd		
V-305	6AL5	-.13	-7.2	4.8AC	Gnd	Gnd	Gnd	-12.0		

Table 3. Voltage Measurements

TUBE	TYPE	Pin#1	Pin#2	Pin#3	Pin#4	Pin#5	Pin#6	Pin#7	Pin#8	Pin#
					BFO SWITCH ON					
V-312	6CB6	-9.7	0	5.9AC	Gnd	145	126	Gnd		
				IF AMPLIFIER; FUNCTION SWITCH IN AM 10KC POS.						
V-306	6AU6	-7.4	Gnd	Gnd	5.9AC	149	83	0		
V-307	6BA6	-.22	Gnd	5.9AC	Gnd	143	58	.6		
V-308	6AK5	-1.17	Gnd	5.9AC	Gnd	148	71	Gnd		
V-309	6BA6	-.22	Gnd	5.9AC	Gnd	148	61	.65		
V-310	6AL5	0	-.1	5.9AC	Gnd	5.6	Gnd	-1.25		
					BFO SWITCH ON					
V-311	6CB6	-27	0	5.9AC	Gnd	149	104	Gnd		

Table 3. Voltage Measurements (Continued)

NOTES: Line voltage 115VAC, 60 c.p.s.; S-102 set to 115V; dial tuned to 220 mc; no signal input; squelch control and audio gain control full CCW; AGC on; BFO off except for measurements on V-311 and V-312; R-127 discriminator tuning meter balance set in accordance with procedure shown in Section 4; filament voltages measured between tube pin and chassis except V-201; DC voltages taken with an 11-megohm VTVM; all voltages measured with respect to Gnd.

*Use 1-Meg isolating resistor between tube pin and meter probe.

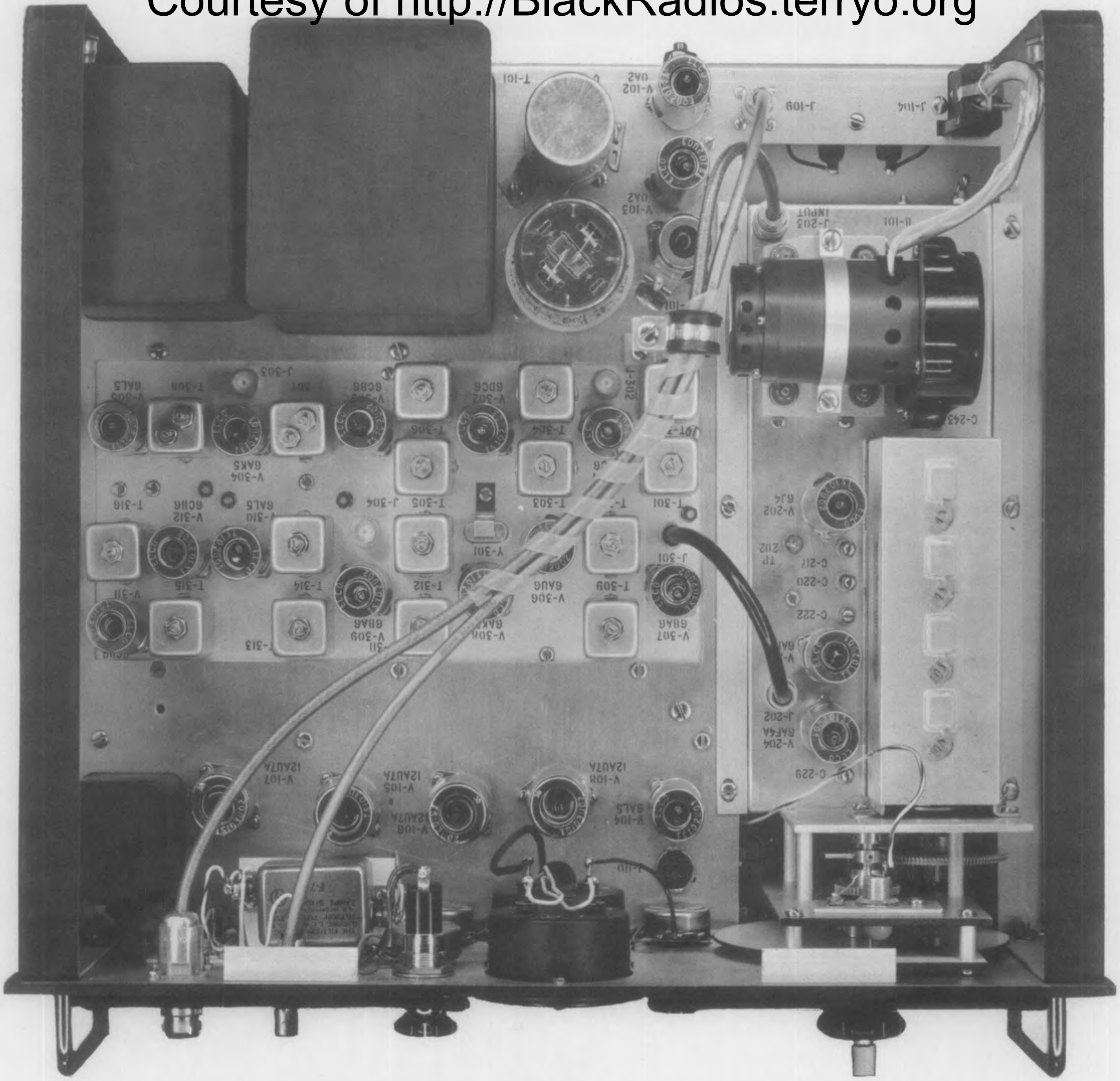


Figure 4. Model G-110B Receiver, Top View (Dust Cover Removed)

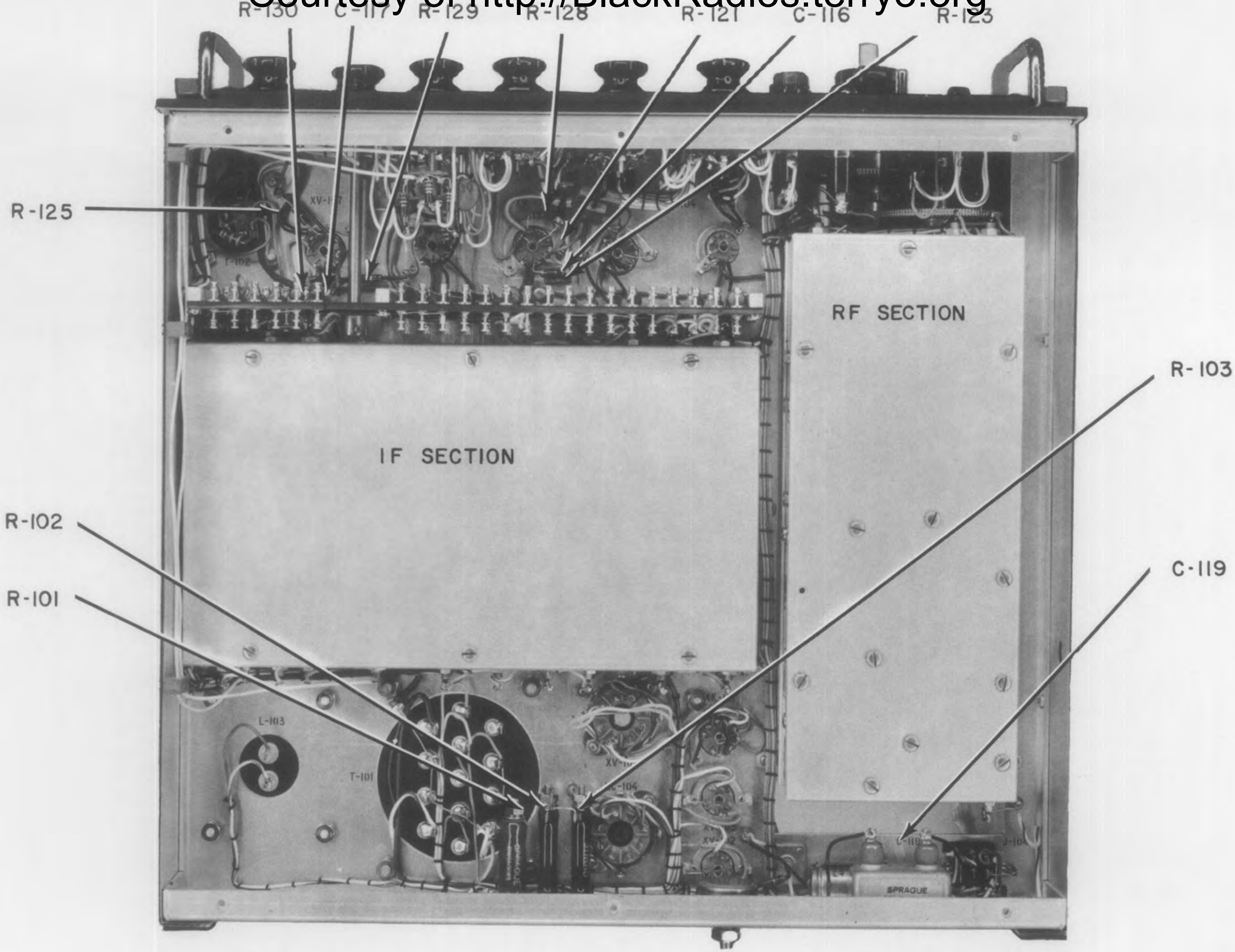


Figure 5. Model G-110B Receiver, Bottom View (Dust Cover Removed)

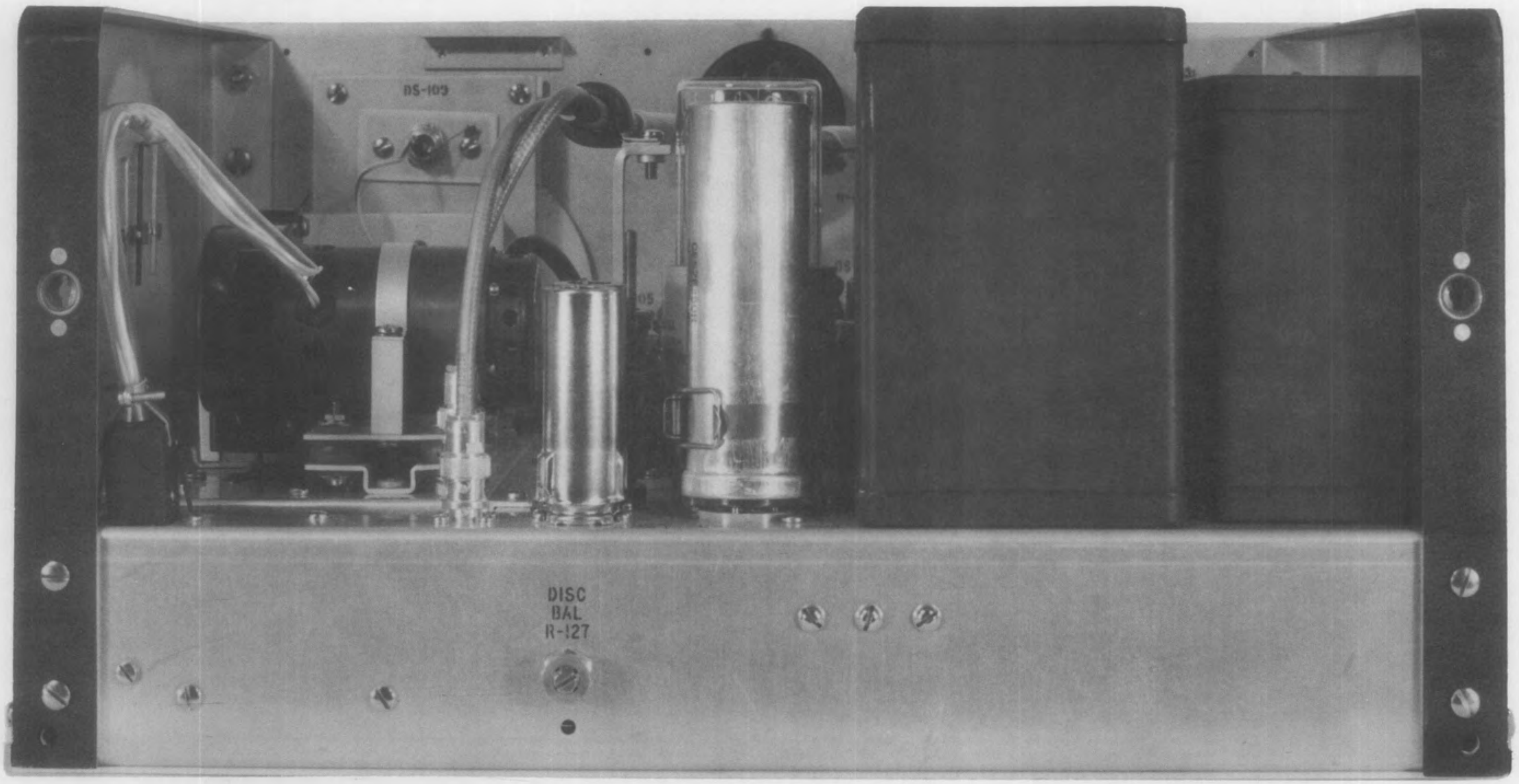


Figure 6. Model G-110B Receiver, Rear View (Dust Cover Removed)

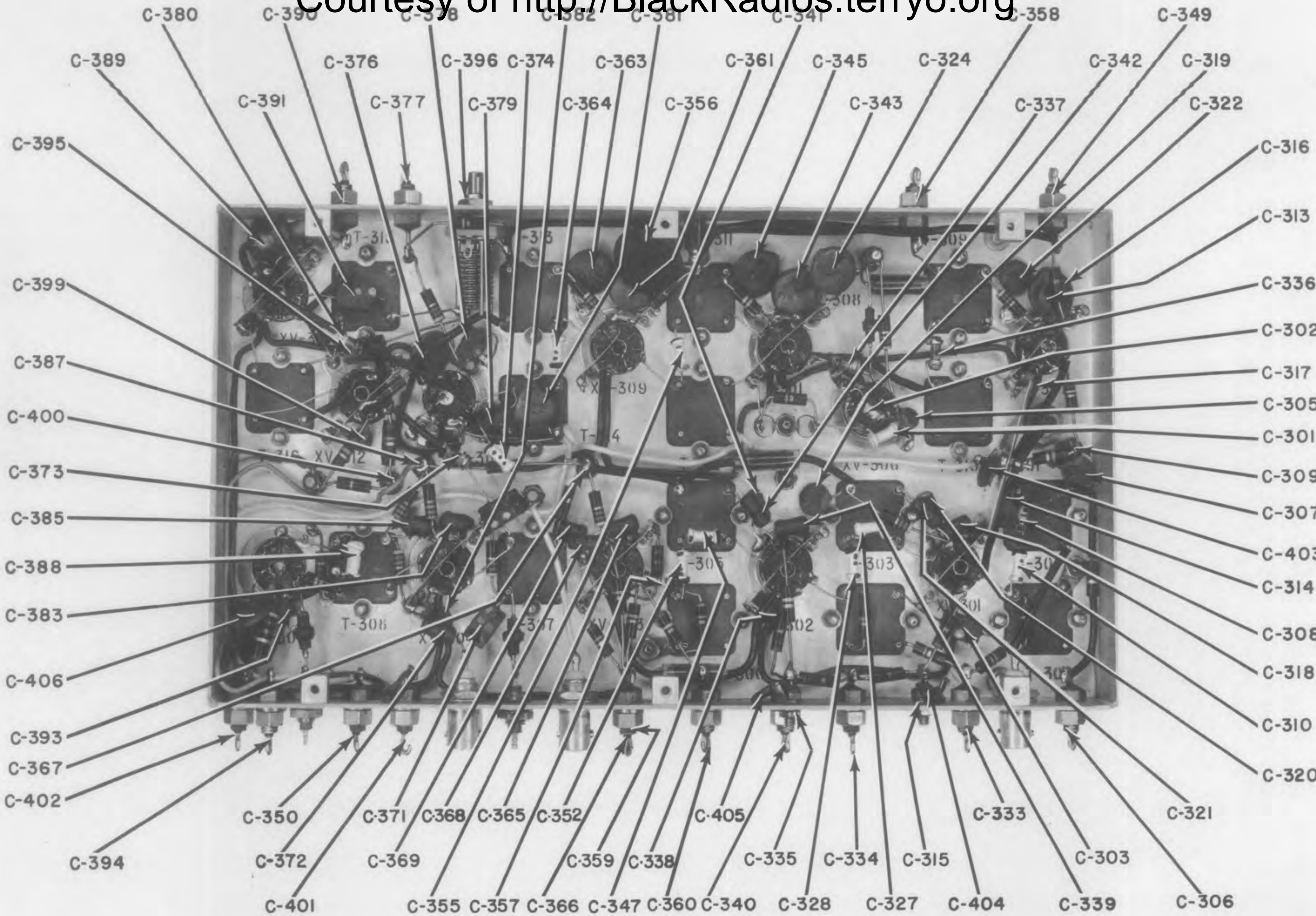


Figure 8. IF Strip, Model G-110B Receiver, Bottom View (Dust Cover Removed)

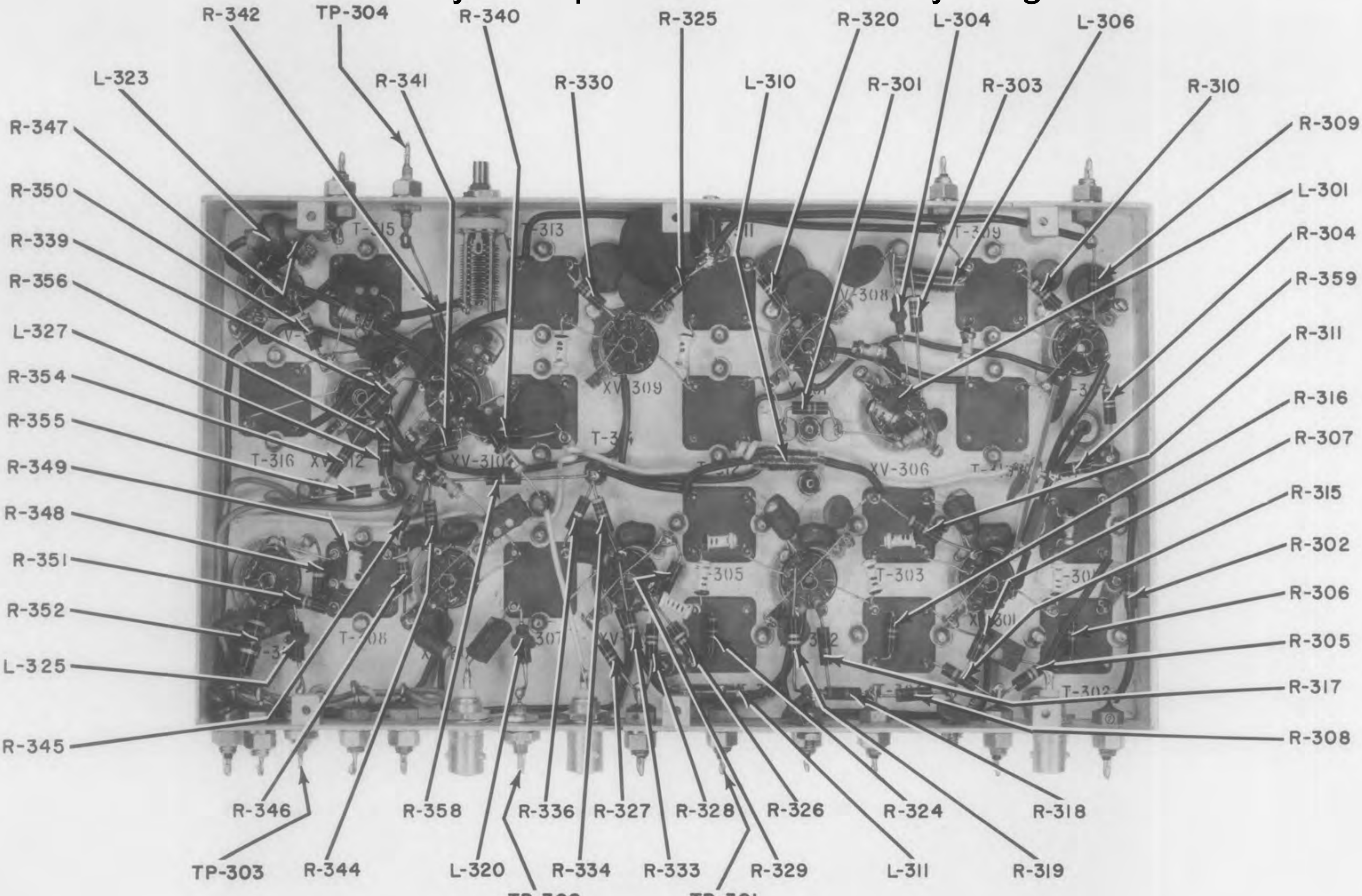
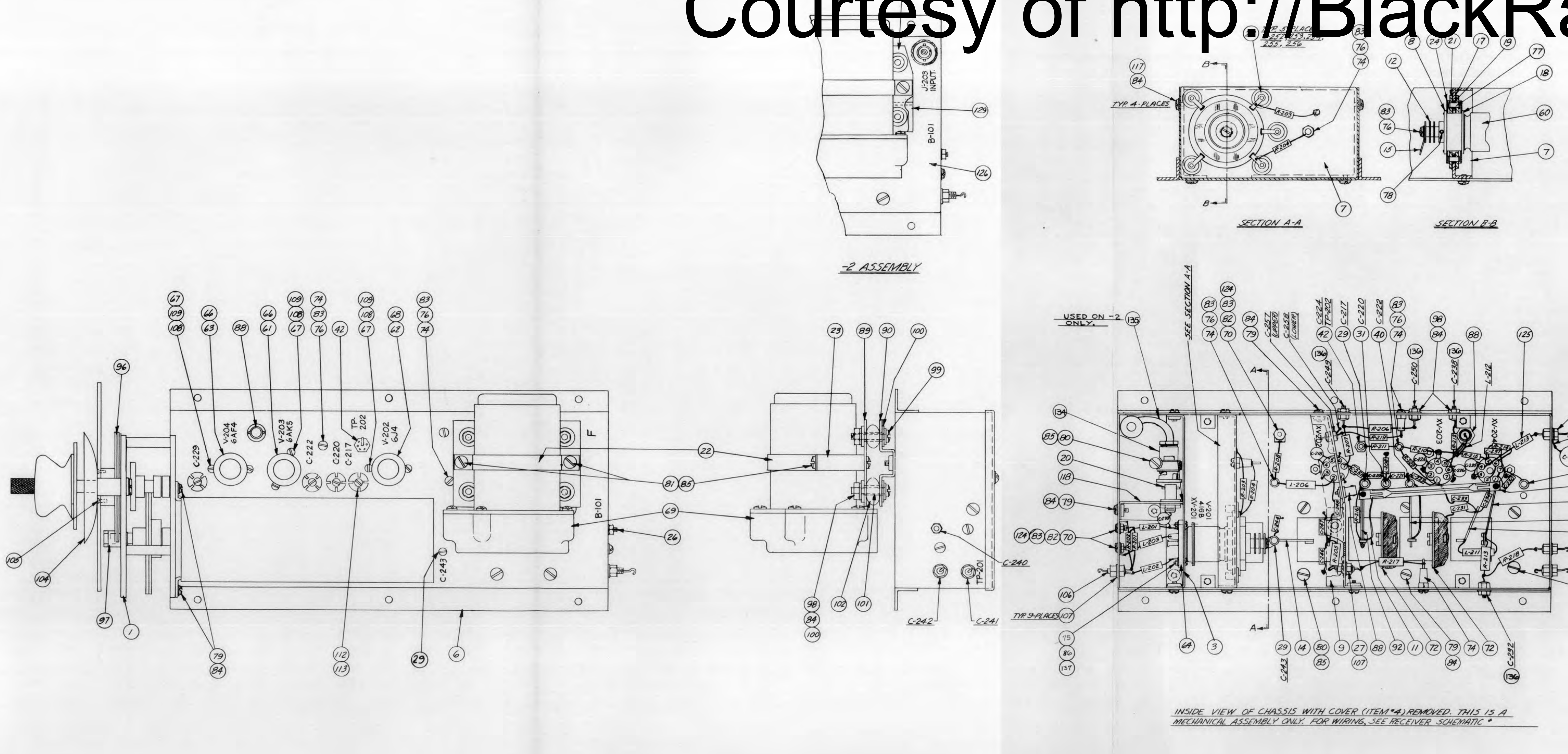


Figure 9. IF Strip, Model G-110B Receiver, Bottom View (Dust Cover Removed)



Symbol No.	Name of Part and Description	Item No.
B-101	Blower: fan, Air-Marine Corp. Part no. A-1321-46	69
C-217	See Section 5, Parts List	29
C-218	See Section 5, Parts List	25
C-219	See Section 5, Parts List	39
C-220	See Section 5, Parts List	31
C-221	Same as C-219	39
C-222	See Section 5, Parts List	40
C-223	See Section 5, Parts List	41
C-224	See Section 5, Parts List	42
C-225	Same as C-218	25
C-226	Same as C-218	25
C-227	See Section 5, Parts List	27
C-228	Same as C-227	27
C-229	Same as C-220	31
C-230	See Section 5, Parts List	33
C-231	See Section 5, Parts List	30
C-232	See Section 5, Parts List	136
C-233	See Section 5, Parts List	37
C-234	See Section 5, Parts List	38
C-235	Same as C-218	25
C-236	Same as C-227	27
C-237	Same as C-233	37
C-238	Same as C-232	136
C-239	Same as C-218	25
C-240	See Section 5, Parts List	26
C-241	Same as C-227	27
C-242	Same as C-227	27
C-243	Same as C-217	29
C-244	Same as C-231	30
C-245	Same as C-227	27
C-246	See Section 5, Parts List	32
C-247	See Section 5, Parts List	34
C-248	See Section 5, Parts List	35
C-249	Same as C-232	136
C-250	Same as C-232	136
C-251	See Section 5, Parts List	36
C-252	See Section 5, Parts List	28
C-253	Same as C-252	28
C-254	Same as C-252	28
C-255	Same as C-252	28
C-256	Same as C-252	28
C-257	Same as C-227	27
C-258	Same as C-227	27
J-201	Connector: Receptacle, modified per NEMS-CLARKE dwg. no. A-14,777	20
J-202	See Section 5, Parts List	88
J-203	Connector: Receptacle, type UG-89/U	133
L-201	Coil: R.F., per NEMS-CLARKE dwg. no. A-14,734	56
L-202	Coil: R.F., per NEMS-CLARKE dwg. no. A-14,735	57
L-203	Same as L-202	57
L-204	See Section 5, Parts List	--
L-205	Inductuner: Mallory spiral, modified per NEMS-CLARKE dwg. no. B-14,961-2	5
L-206	Same as L-202	57
L-207	See Section 5, Parts List	--
L-208	Coil: R.F., per NEMS-CLARKE dwg. no. A-14,737	59
L-209	See Section 5, Parts List	--
L-210	See Section 5, Parts List	--

Symbol No.	Name of Part and Description	Item No.
L-211	Coil: R.F., per NEMS-CLARKE dwg. no. A-14,806	58
L-212	Same dwg. reference as L-208	122
L-213	Coil: R.F., per NEMS-CLARDE dwg. no. A-16,625	125
P-201	See Section 5, Parts List	134
R-201	See Section 5, Parts List	43
R-202	See Section 5, Parts List	44
R-203	See Section 5, Parts List	45
R-204	Resistor: fixed, composition, 51,000 Ω ±5%, 1/2 W, AB	46
R-205	See Section 5, Parts List	48
R-206	See Section 5, Parts List	50
R-207	See Section 5, Parts List	51
R-208	See Section 5, Parts List	49
R-209	See Section 5, Parts List	55
R-210	Same as R-209	55
R-211	See Section 5, Parts List	54
R-212	See Section 5, Parts List	47
R-213	See Section 5, Parts List	52
R-214	Same as R-211	54
R-215	See Section 5, Parts List	53
R-216	Same as R-202	44
R-217	Resistor: fixed, composition, 519 Ω ±5%, 1 W	119
R-218	Resistor: fixed, composition, 1000 Ω ±5%, 1 W	120
R-219	Resistor: fixed, composition, 150 K Ω ±5%, 1/2 W	121
V-201	Tube: electron, Western Electric #6280	60
V-202	See Section 5, Parts List	62
V-203	See Section 5, Parts List	61
V-204	See Section 5, Parts List	63
XV-201	Socket: electron tube, Cinch no. 14F14078	64
XV-202	Socket: electron tube, Elco no. BR-151-BC	65
XV-203	Same as XV-202	65
XV-204	Same as XV-202	65
--	Printed Circuit	73

Figure 7. Tuner, Model G-110B Receiver

SECTION 5

PARTS LIST, MODEL G-110B RECEIVER

When ordering replacement parts, give the equipment name and model number, and the symbol number and description of each item ordered.

Replacement parts which will be supplied against an order may not be exact duplicates of the original parts. However, only minor differences in the electrical or mechanical characteristics will be involved and, consequently, will in no way impair the operation of the equipment.

SYMBOL NO.	DESCRIPTION
B-101	FAN: Air-Marine part no. A132-46
C-101	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-102	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-103	CAPACITOR: Paper, oil filled, 1 μf ±10%, 400V
C-104A,B	CAPACITOR: Electrolytic, NPO, 35 μf, 450V
C-105	CAPACITOR: Paper, 100,000 μμf ±20%, 200V
C-106	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-107	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-108	CAPACITOR: Paper, 50,000 μμf ±20%, 200V
C-109	CAPACITOR: Mica, NPO, 56 μμf ±5%, 300V
C-110	CAPACITOR: Mica, NPO, 2200 μμf ±5%, 500V
C-111	CAPACITOR: Mica, NPO, 750 μμf ±5%, 500V
C-112	CAPACITOR: Mica, NPO, 220 μμf ±5%, 300V
C-113	CAPACITOR: Mica, NPO, 43 μμf ±5%, 300V
C-114	CAPACITOR: Ceramic, GP3, uninsulated, 10,000 μμf ±20%, 600V
C-115	CAPACITOR: Ceramic, GP3, uninsulated, 10,000 μμf ±20%, 600V
C-116	CAPACITOR: Mica, NPO, 300 μμf ±5%, 300V
C-117	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-118	NOT USED
C-119	CAPACITOR: Paper, 1 μf +30% -20%, 400V
C-120	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-213	NOT USED
C-214	NOT USED
C-215	NOT USED
C-216	NOT USED
C-217	CAPACITOR: Ceramic, compression, 0.5-3 μμf, 500V
C-218	CAPACITOR: Ceramic, disc, 1000 μμf MRC; 1000V

SYMBOL NO.	DESCRIPTION
C-219	CAPACITOR: Ceramic, NPO, uninsulated, 2.0 µµf ±0.25 µµf, 500
C-220	CAPACITOR: Ceramic, compression, 1-6 µµf, 500V
C-221	CAPACITOR: Ceramic, NPO, uninsulated, 2.0 µµf ±0.25 µµf, 500
C-222	CAPACITOR: Ceramic, compression, 1-4 µµf, 500V
C-223	CAPACITOR: Ceramic, NPO, uninsulated, 10 µµf ±1 µµf, 500V
C-224	CAPACITOR: Ceramic, feed thru, 47 µµf ±10%, 500V
C-225	CAPACITOR: Ceramic, disc, 1000 µµf MRC; 1000V
C-226	CAPACITOR: Ceramic, disc, 1000 µµf MRC; 1000V
C-227	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-228	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-229	CAPACITOR: Ceramic, compression, 1-6 µµf, 500V
C-230	CAPACITOR: Ceramic, NPO, uninsulated, 8.2 µµf ±0.5 µµf, 500V
C-231	CAPACITOR: Ceramic, NPO, uninsulated, 6.8 µµf ±0.5 µµf, 500V
C-232	CAPACITOR: Ceramic, solder tab, 1000 µµf MRC; 500V
C-233	CAPACITOR: Ceramic, NPO, uninsulated, 0.5 µµf ±0.25 µµf, 600
C-234	CAPACITOR: Ceramic, NPO, uninsulated, 3.3 µµf ±0.25 µµf, 500
C-235	CAPACITOR: Ceramic, disc, 1000 µµf MRC; 1000V
C-236	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-237	CAPACITOR: Ceramic, NPO, uninsulated, 0.5 µµf ±0.25 µµf, 600
C-238	CAPACITOR: Ceramic, solder tab, 1000 µµf MRC; 500V
C-239	CAPACITOR: Ceramic, disc, 1000 µµf MRC; 1000V
C-240	CAPACITOR: Ceramic, solder tab, 1000 µµf MRC; 500V
C-241	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-242	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-243	CAPACITOR: Ceramic, compression, 0.5-3 µµf, 500V
C-244	CAPACITOR: Ceramic, NPO, uninsulated, 6.8 µµf ±0.5 µµf, 500V
C-245	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V

SYMBOL NO.	DESCRIPTION
C-246	CAPACITOR: Ceramic, NPO, uninsulated, 33 μμf ±10%, 500V
C-247	CAPACITOR: Ceramic, NPO, uninsulated, 22 μμf ±10%, 500V
C-248	CAPACITOR: Ceramic, uninsulated, 1000 μμf ±20%, 600V
C-249	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-250	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-251	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-252	CAPACITOR: Silver Mica, button, 200 μμf ±10%, 500V
C-253	CAPACITOR: Silver Mica, button, 200 μμf ±10%, 500V
C-254	CAPACITOR: Silver Mica, button, 200 μμf ±10%, 500V
C-255	CAPACITOR: Silver Mica, button, 200 μμf ±10%, 500V
C-256	CAPACITOR: Silver Mica, button, 200 μμf ±10%, 500V
C-257	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-258	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-301	CAPACITOR: Ceramic, NPO, uninsulated, 10 μμf ±1 μμf, 500V
C-302	CAPACITOR: Ceramic, NPO, uninsulated, 8.2 μμf ±0.5 μμf, 500V
C-303	CAPACITOR: Mica, NPO, 220 μμf ±5%, 300V
C-304	CAPACITOR: Ceramic, NPO, uninsulated, 4.7 μμf ±0.5 μμf, 500V
C-305	CAPACITOR: Ceramic, disc, 1000 μμf MRC; 1000V
C-306	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-307	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-308	CAPACITOR: Ceramic, NPO, uninsulated, 2.2 μμf ±0.1 μμf, 500V
C-309	CAPACITOR: Ceramic, solder tab, 1000 μμf MRC; 500V
C-310	CAPACITOR: Ceramic, NPO, uninsulated, 2.2 μμf ±0.1 μμf, 500V
C-311	CAPACITOR: Ceramic, N030, uninsulated, 39 μμf ±5%, 500V
C-312	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-313	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-314	CAPACITOR: Mica, NPO, 3 μμf ±20%, 300V

SYMBOL NO.	DESCRIPTION
C-315	CAPACITOR: Ceramic, solder tab, 1000 μμf MRC; 500V
C-316	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-317	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-318	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-319	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-320	CAPACITOR: Ceramic, GP2, uninsulated, 390 μμf ±10%, 600V
C-321	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-322	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-323	CAPACITOR: Ceramic, NPO, uninsulated, 8.2 μμf ±0.5 μμf, 500V
C-324	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-325	CAPACITOR: Ceramic, NPO, uninsulated, 8.2 μμf ±0.5 μμf, 500V
C-326	CAPACITOR: Ceramic, NPO, uninsulated, 68 μμf ±2%, 600V
C-327	CAPACITOR: Ceramic, NPOA, uninsulated, 1.5 μμf ±0.1 μμf, 500V
C-328	CAPACITOR: Ceramic, NPOA, uninsulated, 1.8 μμf ±0.1 μμf, 500V
C-329	CAPACITOR: Ceramic, N030, uninsulated, 39 μμf ±5%, 500V
C-330	CAPACITOR: Mica, NPO, 220 μμf ±5%, 300V
C-331	CAPACITOR: Ceramic, N030, uninsulated, 39 μμf ±5%, 500V
C-332	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-333	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-334	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-335	CAPACITOR: Ceramic, solder tab, 1000 μμf MRC; 500V
C-336	CAPACITOR: Ceramic, NPO, uninsulated, 0.5 μμf ±0.25 μμf, 600V
C-337	CAPACITOR: Ceramic, NPO, uninsulated, 0.5 μμf ±0.25 μμf, 600V
C-338	CAPACITOR: Ceramic, disc, 4700 μμf, 500V
C-339	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-340	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-341	CAPACITOR: Ceramic, GP2, uninsulated, 390 μμf ±10%, 600V

SYMBOL NO.	DESCRIPTION
C-342	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-343	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-344	CAPACITOR: Mica, NPO, 62 μμf ±5%, 300V
C-345	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-346	CAPACITOR: Ceramic, NPO, uninsulated, 2.2 μμf ±.25 μμf, 500V
C-347	CAPACITOR: Ceramic, NPOA, uninsulated, 1.5 μμf ±0.1 μμf, 500
C-348	CAPACITOR: Ceramic, NPO, uninsulated, 8.2 μμf ±0.5 μμf, 500V
C-349	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-350	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-351	CAPACITOR: Ceramic, N030, uninsulated, 39 μμf ±5%, 500V
C-352	CAPACITOR: Ceramic, NPOA, uninsulated, 1.8 μμf ±0.1 μμf, 50C
C-353	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-354	CAPACITOR: Mica, NPO, 91 μμf ±5%, 300V
C-355	CAPACITOR: Ceramic, NPO, uninsulated, 2.2 μμf ±.25 μμf, 500V
C-356	CAPACITOR: Ceramic, disc, 30,000 μμf ±20%, 600V
C-357	CAPACITOR: Ceramic, NPO, uninsulated, 22 μμf ±5%, 500V
C-358	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-359	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-360	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-361	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-362	CAPACITOR: Mica, NPO, 62 μμf ±5%, 300V
C-363	CAPACITOR: Ceramic, disc, 100,000 μμf, 500V
C-364	CAPACITOR: Ceramic, NPO, uninsulated, 1.5 μμf ±0.25 μμf, 500
C-365	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V
C-366	CAPACITOR: Ceramic, uninsulated, 1000 μμf MRC; 500V
C-367	CAPACITOR: Ceramic, solder tab, 1000 μμf MRC; 500V
C-368	CAPACITOR: Ceramic, GP2, uninsulated, 500 μμf ±20%, 500V

SYMBOL NO.	DESCRIPTION
C-369	CAPACITOR: Ceramic, GP2, uninsulated, 500 µµf ±20%, 500V
C-370	CAPACITOR: Mica, NPO, 43 µµf ±5%, 300V
C-371	CAPACITOR: Mica, NPO, 33 µµf ±5%, 300V
C-372	CAPACITOR: Mica, NPO, 500 µµf ±5%, 300V
C-373	CAPACITOR: Ceramic, NPO, uninsulated, 0.5 µµf ±0.25 µµf, 600V
C-374	CAPACITOR: Ceramic, NPO, uninsulated, 10 µµf ±1 µµf, 500V
C-375	CAPACITOR: Mica, NPO, 100 µµf ±5%, 300V
C-376	CAPACITOR: Ceramic, disc, 100,000 µµf, 500V
C-377	CAPACITIR: Ceramic, feed thru, 47 µµf ±10%, 500V
C-378	CAPACITOR: Mica, NPO, 51 µµf ±5%, 300V
C-379	CAPACITOR: Mica, NPO, 100 µµf ±5%, 300V
C-380	CAPACITOR: Ceramic, NPO, uninsulated, 0.5 µµf ±0.25 µµf, 600V
C-381	CAPACITOR: Ceramic, disc, 100,000 µµf, 500V
C-382	CAPACITOR: Ceramic, disc, 4700 µµf, 500V
C-383	CAPACITOR: Ceramic, uninsulated, 1000 µµf ±20%, 600V
C-384	CAPACITOR: Ceramic, NPO, uninsulated, 33 µµf ±10%, 500V
C-385	CAPACITOR: Ceramic, uninsulated, 1000 µµf ±20%, 600V
C-386	CAPACITOR: Ceramic, NPO, uninsulated, 22 µµf ±5%, 500V
C-387	CAPACITOR: Ceramic, solder tab, 1000 µµf MRC; 500V
C-388	CAPACITOR: Ceramic, N030, uninsulated, 39 µµf ±5%, 500V
C-389	CAPACITOR: Ceramic, disc, 100,000 µµf, 500V
C-390	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-391	CAPACITOR: Mica, NPO, 270 µµf ±5%, 300V
C-392	CAPACITOR: Mica, NPO, 330 µµf ±5%, 300V
C-393	CAPACITOR: Mica, NPO, 27 µµf ±5%, 300V
C-394	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-395	CAPACITOR: Mica, NPO, 10 µµf ±5%, 300V

SYMBOL NO.	DESCRIPTION
C-396	CAPACITOR: Air, variable, plate meshing, 2.7-19.6 µµf, 850V
C-397	CAPACITOR: Mica, NPO, 82 µµf ±5%, 500V
C-398	CAPACITOR: Ceramic, NPO, 47 µµf ±10%, 500V
C-399	CAPACITOR: Ceramic, disc, 1000 µµf MRC; 1000V
C-400	CAPACITOR: Ceramic, solder tab, 1000 µµf MRC; 500V
C-401	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-402	CAPACITOR: Ceramic, uninsulated, 1000 µµf MRC; 500V
C-403	CAPACITOR: Ceramic, disc, 4700 µµf, 500V
C-404	CAPACITOR: Ceramic, disc, 4700 µµf, 500V
C-405	CAPACITOR: Ceramic, disc, 4700 µµf, 500V
C-406	CAPACITOR: Ceramic, disc, 100,000 µµf, 500V
C-407	CAPACITOR: Ceramic, disc, 100,000 µµf, 500V
C-408	CAPACITOR: Ceramic, disc, 4700 µµf MRC; 500V
F-101	FUSE: Slo-Blo, ferrule, 1.25 amp, 125V
F-102	FUSE: Slo-Blo, ferrule, 0.6 amp, 125V
I-101	LAMP: Incandescent, 6-8V, 0.15 amp
J-101	CONNECTOR: Receptacle, IPC 36000
J-102	CONNECTOR: Receptacle, UG-262/U
J-103	CONNECTOR: Receptacle, "twist-lok", 3 contact
J-104	CONNECTOR: Receptacle, non-locking, 6 contact
J-105	JACK: Panel, straight, RG-291/U
J-106	JACK: Panel, straight, RG-291/U
J-107	JACK: Telephone, form B contact arrangement, JJ-089
J-108	CONNECTOR: Receptacle, UG-290/U
J-201	CONNECTOR: Receptacle, UG-1094/U
J-202	CONNECTOR: Receptacle, UG-1094/U
J-203	CONNECTOR: Receptacle, UG-1094/U

SYMBOL NO.	DESCRIPTION
J-301	BOX CONNECTOR: Electrical, straight, MX-1530
J-302	CONNECTOR: Receptacle, UG-1094/U
J-303	CONNECTOR: Receptacle, UG-1094/U
J-304	CONNECTOR: Receptacle, UG-1094/U
K-101	RELAY: Time Delay, SPDT; 3 amp, 230V AC
L-101	COIL, RADIO FREQUENCY: 3.1 µh, part/dwg no. A-15,060
L-102	COIL, RADIO FREQUENCY: 3.1 µh, part/dwg no. A-15,060
L-103	REACTOR: 12 hy, 150 ma, 150 Ω, 2500V, Chicago Transformer part no. RH-12150
L-104	COIL, RADIO FREQUENCY: 24 µh, part/dwg no. A-15,056
L-105	COIL, RADIO FREQUENCY: 24 µh, part/dwg no. A-15,056
L-201	COIL, RADIO FREQUENCY: 0.72 µh, part/dwg no. A-14,734
L-202	COIL, RADIO FREQUENCY: 14 µh, part/dwg no. A-14,735
L-203	COIL, RADIO FREQUENCY: 14 µh, part/dwg no. A-14,735
L-204	INDUCTANCE: Fixed
L-205	INDUCTUNER: Spiral; Mallory part no. 8304, modified per HEMS-CLARKE dwg no. B-14,961
L-206	COIL, RADIO FREQUENCY: 14 µh, part/dwg no. A-14,735
L-207	INDUCTANCE: Adjustable
L-208	COIL, RADIO FREQUENCY: 1.67 µh, part/dwg no. A-14,737
L-209	INDUCTANCE: Adjustable
L-210	INDUCTANCE: Fixed
L-211	COIL, RADIO FREQUENCY: 1.15 µh, part/dwg no. A-14,806
L-301	COIL, RADIO FREQUENCY: 28 µh, 3900 Ω, 75 ma, part/dwg no. A-14,804
L-302	COIL, RADIO FREQUENCY: part of T-301; part/dwg no. A-14,792
L-303	COIL, RADIO FREQUENCY: part of T-302; part/dwg no. A-14,791
L-304	COIL, RADIO FREQUENCY: 8 µh, part/dwg no. A-15,059
L-305	COIL, RADIO FREQUENCY: part of T-309; part/dwg no. A-14,984

SYMBOL NO.	DESCRIPTION
L-306	COIL, RADIO FREQUENCY: 24 µh, part/dwg no. A-15,056
L-307	COIL, RADIO FREQUENCY: part of T-303; part/dwg no. A-14,984
L-308	COIL, RADIO FREQUENCY: part of T-304; part/dwg no. A-14,791
L-309	COIL, RADIO FREQUENCY: part of T-310; part/dwg no. A-14,791
L-310	COIL, RADIO FREQUENCY: 2.5 µh, 0.22 Ω, part/dwg no. A-14,805
L-311	COIL, RADIO FREQUENCY: 22 turns #26 "soderezo", part/dwg no. A-16,625
L-312	COIL, RADIO FREQUENCY: part of T-305; part/dwg no. A-14,984
L-313	COIL, RADIO FREQUENCY: part of T-311; part/dwg no. A-15,378
L-314	COIL, RADIO FREQUENCY: part of T-312; part/dwg no. A-15,096
L-315	COIL, RADIO FREQUENCY: part of T-306; part/dwg no. A-14,791
L-316	COIL, RADIO FREQUENCY: part of T-313; part/dwg no. A-15,378
L-317	COIL, RADIO FREQUENCY: part of T-314; part/dwg no. A-15,097
L-318	COIL, RADIO FREQUENCY: part of T-307; part/dwg no. A-14,789
L-319	COIL, RADIO FREQUENCY: part of T-307; part/dwg no. A-14,790
L-320	COIL, RADIO FREQUENCY: 28 µh, 3900 Ω, 75 ma, part/dwg no. A-14,804
L-321	COIL, RADIO FREQUENCY: part of T-308; part/dwg no. A-14,788
L-322A,B	COIL, RADIO FREQUENCY: part of T-308; part/dwg no. A-14,787
L-323	COIL, RADIO FREQUENCY: 1.22 µh, 19 Ω, part/dwg no. AA-15,058
L-324	COIL, RADIO FREQUENCY: part of T-315; part/dwg no. A-15,105
L-325	COIL, RADIO FREQUENCY: 28 µh, 3900 Ω, 75 ma, part/dwg no. A-14,804
L-326A,B	COIL, RADIO FREQUENCY: part of T-316; part/dwg no. A-14,786
L-327	COIL, RADIO FREQUENCY: 9.2 µh, part/dwg no. A-14,807
L-328	COIL, RADIO FREQUENCY: 22 turns #26 "soderezo", part/dwg no. A-16,625
LS-101	LOUDSPEAKER: Permanent magnet, RCA dwg no. 502640-503
M-101	AMMETER: 2-3/4", round, 100-0-00 DC scale
M-102	AMMETER: 2-3/4", round, 0-50 ma DC scale

SYMBOL NO.	DESCRIPTION
O-101	KNOB: Set screw, Molded Insulation part VIZ no. A
O-102	KNOB: Set screw, Molded Insulation part VIZ no. A
O-103	KNOB: Set screw, Molded Insulation part VIZ no. A
O-104	KNOB: Set screw, Molded Insulation part VIZ no. A
O-105	KNOB: Set screw, Molded Insulation part VIZ no. A
O-106	KNOB: Set screw, Molded Insulation part VIZ no. A
O-107	KNOB: Set screw, Molded Insulation part VIZ no. A
O-108	KNOB: Set screw, Molded Insulation part VIZ no. A
O-109	KNOB: Set screw, Molded Insulation part VIZ no. E, as modified per NEMS-CLARKE dwg no. A-14,825
P-101	NOT USED
P-102	NOT USED
P-103	CONNECTOR: Plug, 3 contact, twist locking, 10 amp 250V, 15 amp 125V
P-104	CONNECTOR: Plug, 6 contact, non-locking
P-105	NOT USED
P-106	NOT USED
P-107	NOT USED
P-108	NOT USED
P-109	CONNECTOR: Plug, 3 contact, 15 amp 105-125V AC, UP121M
P-201	CONNECTOR: Plug, UG-88/U
P-202	CONNECTOR: Plug, UG-260/U
P-301	NOT USED
P-302	CONNECTOR: Plug, UG-260/U
P-303	CONNECTOR: Plug, UG-88/U
P-304	CONNECTOR: Plug, UG-88/U
R-101	RESISTOR: Fixed, Wirewound, 3.5 Ω ±5%, 10W
R-102	RESISTOR: Fixed, Wirewound, 4000 Ω ±10%, 10W

SYMBOL NO.	DESCRIPTION
R-103	RESISTOR: Fixed, Wirewound, 2500 Ω ±10%, 10W
R-104	RESISTOR: Fixed, Composition, 12,000 Ω ±10%, 1W
R-105	RESISTOR: Variable, composition element, 10,000 Ω ±20%, 2W
R-106	RESISTOR: Fixed, Composition, 20 Meg, ±5%, 1/2W
R-107	RESISTOR: Fixed, Composition, 330,000 Ω ±10%, 1/2W
R-108	RESISTOR: Fixed, Composition, 330,000 Ω ±10%, 1/2W
R-109	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-110	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-111	RESISTOR: Fixed, Composition, 1 Meg, ±5%, 1/2W
R-112	RESISTOR: Fixed, Composition, 100,000 Ω ±10%, 1/2W
R-113	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 2W
R-114	RESISTOR: Fixed, Composition, 2000 Ω ±10%, 1/2W
R-115	RESISTOR: Variable, composition element, 10,000 Ω ±20%, 2W
R-116	RESISTOR: Fixed, Composition, 1 Meg, ±5%, 1/2W
R-117	RESISTOR: Fixed, Composition, 240,000 Ω±5%, 1/2W
R-118	RESISTOR: Fixed, Composition, 22,000 Ω ±10%, 1/2W
R-119	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-120	RESISTOR: Variable, composition element, 250,000 Ω ±10%, 2W
R-121	RESISTOR: Fixed, Composition, 220,000 Ω ±10%, 1/2W
R-122	RESISTOR: Fixed, Composition, 15,000 Ω ±5%, 1/2W
R-123	RESISTOR: Fixed, Composition, 3300 Ω ±5%, 1/2W
R-124	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-125	RESISTOR: Fixed, Composition, 10,000 Ω ±10%, 1/2W
R-126	RESISTOR: Fixed, Composition, 22,000 Ω ±10%, 1/2W
R-127	RESISTOR: Variable, composition element, 50,000 Ω ±10%, 2W
R-128	RESISTOR: Fixed, Composition, 3300 Ω ±5%, 1/2W
R-129	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W

SYMBOL NO.	DESCRIPTION
R-130	RESISTOR: Fixed, Composition, 1 Meg, ±5%, 1/2W
R-131	RESISTOR: Fixed, Composition, 220,000 Ω ±10%, 1/2W
R-132	RESISTOR: Fixed, Composition, 6800 Ω ±10%, 1W
R-133	RESISTOR: Fixed, Composition, 10,000 Ω ±10%, 1W
R-134	RESISTOR: Fixed, Composition, 1 Meg, ±5%, 1/2W
R-135	RESISTOR: Fixed, Composition, 100,000 Ω ±10%, 1/2W
R-136	RESISTOR: Fixed, Composition, 24,000 Ω ±5%, 1/2W
R-137	RESISTOR: Fixed, Composition, 24,000 Ω ±5%, 1/2W
R-138	RESISTOR: Fixed, Composition, 110,000 Ω ±5%, 1/2W
R-139	RESISTOR: Fixed, Composition, 39,000 Ω ±5%, 1/2W
R-201	RESISTOR: Fixed, Composition, 160 Ω ±5%, 1/2W
R-202	RESISTOR: Fixed, Composition, 100 Ω ±5%, 1/2W
R-203	RESISTOR: Fixed, Composition, 8200 Ω ±5%, 1/2W
R-204	RESISTOR: Fixed, Composition, 51,000 Ω ±5%, 1/2W
R-205	RESISTOR: Fixed, Composition, 1500 Ω ±5%, 2W
R-206	RESISTOR: Fixed, Composition, 5600 Ω ±5%, 1W
R-207	RESISTOR: Fixed, Composition, 6200 Ω ±5%, 1W
R-208	RESISTOR: Fixed, Composition, 120 Ω ±5%, 1/2W
R-209	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-210	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-211	RESISTOR: Fixed, Composition, 27,000 Ω ±10%, 1/2W
R-212	RESISTOR: Fixed, Composition, 150,000 Ω ±10%, 1/2W
R-213	RESISTOR: Fixed, Composition, 8200 Ω ±10%, 2W
R-214	RESISTOR: Fixed, Composition, 27,000 Ω ±10%, 1/2W
R-215	RESISTOR: Fixed, Composition, 220 Ω ±10%, 1/2W
R-216	RESISTOR: Fixed, Composition, 100 Ω ±5%, 1/2W
R-217	RESISTOR: Fixed, Composition, 510 Ω ±5%, 1W

SYMBOL NO.	DESCRIPTION
R-218	RESISTOR: Fixed, Composition, 1000 Ω ±5%, 1W
R-219	RESISTOR: Fixed, Composition, 100,000 Ω ±5%, 1/2W
R-301	RESISTOR: Fixed, Composition, 22,000 Ω ±10%, 1/2W
R-302	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-303	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-304	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-305	RESISTOR: Fixed, Composition, 220,000 Ω ±10%, 1/2W
R-306	RESISTOR: Fixed, Composition, 10,000 Ω ±5%, 1/2W
R-307	RESISTOR: Fixed, Composition, 82 Ω ±5%, 1/2W
R-308	RESISTOR: Fixed, Composition, 82 Ω ±5%, 1/2W
R-309	RESISTOR: Fixed, Composition, 100 Ω ±5%, 1/2W
R-310	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-311	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-312	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-313	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-314	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-315	RESISTOR: Fixed, Composition, 220,000 Ω ±10%, 1/2W
R-316	RESISTOR: Fixed, Composition, 20,000 Ω ±5%, 1/2W
R-317	RESISTOR: Fixed, Composition, 82 Ω ±5%, 1/2W
R-318	RESISTOR: Fixed, Composition, 82 Ω ±5%, 1/2W
R-319	RESISTOR: Fixed, Composition, 150,000 Ω ±5%, 1/2W
R-320	RESISTOR: Fixed, Composition, 100,000 Ω ±10%, 1/2W
R-321	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-322	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-323	RESISTOR: Fixed, Composition, 470,000 Ω ±10%, 1/2W
R-324	RESISTOR: Fixed, Composition, 30,000 Ω ±5%, 1/2W
R-325	RESISTOR: Fixed, Composition, 100 Ω ±5%, 1/2W

SYMBOL NO.	DESCRIPTION
R-326	RESISTOR: Fixed, Composition, 820,000 Ω ±10%, 1/2W
R-327	RESISTOR: Fixed, Composition, 10,000 Ω ±10%, 1/2W
R-328	RESISTOR: Fixed, Composition, 100,000 Ω ±10%, 1/2W
R-329	RESISTOR: Fixed, Composition, 51 Ω ±5%, 1/2W
R-330	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-331	RESISTOR: Fixed, Composition, 51,000 Ω ±10%, 1/2W
R-332	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-333	RESISTOR: Fixed, Composition, 22,000 Ω ±10%, 1/2W
R-334	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-335	RESISTOR: Fixed, Composition, 33,000 Ω ±5%, 1/2W
R-336	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-337	RESISTOR: Fixed, Composition, 33,000 Ω ±5%, 1/2W
R-338	NOT USED
R-339	RESISTOR: Fixed, Composition, 4700 Ω ±5%, 1/2W
R-340	RESISTOR: Fixed, Composition, 1.5 Meg, ±10%, 1/2W
R-341	RESISTOR: Fixed, Composition, 1.5 Meg, ±10%, 1/2W
R-342	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-343	NOT USED
R-344	RESISTOR: Fixed, Composition, 33,000 Ω ±5%, 1/2W
R-345	RESISTOR: Fixed, Composition, 33,000 Ω ±5%, 1/2W
R-346	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-347	RESISTOR: Fixed, Composition, 10,000 Ω ±10%, 1/2W
R-348	RESISTOR: Fixed, Composition, 100,000 Ω ±5%, 1/2W
R-349	RESISTOR: Fixed, Composition, 100,000 Ω ±5%, 1/2W
R-350	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-351	RESISTOR: Fixed, Composition, 100,000 Ω ±5%, 1/2W
R-352	RESISTOR: Fixed, Composition, 4.7 Ω ±10%, 1W

SYMBOL NO.	DESCRIPTION
R-353	RESISTOR: Fixed, Composition, 47,000 Ω ±10%, 1/2W
R-354	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-355	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-356	RESISTOR: Fixed, Composition, 10,000 Ω ±10%, 1/2W
R-357	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-358	RESISTOR: Fixed, Composition, 1000 Ω ±10%, 1/2W
R-359	RESISTOR: Fixed, Composition, 10,000 Ω ±10%, 1/2W
R-360	RESISTOR: Fixed, Composition, 51 Ω ±5%, 1/2W
R-361	RESISTOR: Fixed, Composition, 100 Ω ±5%, 1/2W
S-101	SWITCH: Toggle, SPST, Herman H. Smith part no. 520
S-102	SWITCH: Toggle, SPDT, Herman H. Smith part no. 521
S-103	SWITCH: Rotary, 2 position, part/dwg no. A-15,072
S-104	SWITCH: Rotary, 3 position, part/dwg no. A-15,071
S-105	SWITCH: Rotary, 2 position, part/dwg no. A-15,074
S-106	SWITCH: Rotary, 5 position, part/dwg no. A-15,073
T-101	TRANSFORMER: Power, part/dwg no. AB-14,733-2
T-102	TRANSFORMER: Audio, part/dwg no. B-14,487
T-301	TRANSFORMER: IF, part/dwg no. AB-14,796
T-302	TRANSFORMER: IF, part/dwg no. AB-14,794
T-303	TRANSFORMER: IF, part/dwg no. AB-14,797
T-304	TRANSFORMER: IF, part/dwg no. AB-14,795
T-305	TRANSFORMER: IF, part/dwg no. AB-14,797
T-306	TRANSFORMER: IF, part/dwg no. AB-14,793
T-307	TRANSFORMER: IF, part/dwg no. AB-14,799
T-308	TRANSFORMER: IF, part/dwg no. B-14,976
T-309	TRANSFORMER: IF, part/dwg no. AB-15,098
T-310	TRANSFORMER: IF, part/dwg no. AB-15,101

SYMBOL NO.	DESCRIPTION
T-311	TRANSFORMER: IF, part/dwg no. AB-15,103
T-312	TRANSFORMER: IF, part/dwg no. AB-15,100
T-313	TRANSFORMER: IF, part/dwg no. AB-15,102
T-314	TRANSFORMER: IF, part/dwg no. AB-15,104
T-315	TRANSFORMER: IF, part/dwg no. AB-15,099
T-316	TRANSFORMER: IF, part/dwg no. AB-14,798-2
V-101	TUBE: Electron, 5R4WGA
V-102	TUBE: Electron, OA2
V-103	TUBE: Electron, OA2
V-104	TUBE: Electron, 6AL5
V-105	TUBE: Electron, 12AU7
V-106	TUBE: Electron, 12AU7
V-107	TUBE: Electron, 12AU7
V-108	TUBE: Electron, 12AU7
V-201	TUBE: Electron, Western Electric 6280
V-202	TUBE: Electron, 6J4
V-203	TUBE: Electron, 6AK5
V-204	TUBE: Electron, 6AF4A (RCA)
V-301	TUBE: Electron, 6DC6
V-302	TUBE: Electron, 6DC6
V-303	TUBE: Electron, 6CB6
V-304	TUBE: Electron, 6AK5
V-305	TUBE: Electron, 6AL5
V-306	TUBE: Electron, 6AU6
V-307	TUBE: Electron, 6BA6
V-308	TUBE: Electron, 6AK5
V-309	TUBE: Electron, 6BA6

SYMBOL NO.	DESCRIPTION
V-310	TUBE: Electron, 6AL5
V-311	TUBE: Electron, 6CB6
V-312	TUBE: Electron, 6CB6
W-101	CORD, POWER: Belden type 8453, per MEHS-CLARKE part/dwg no. A-17,555
XC-104	SOCKET, ELECTRON TUBE: Octal, TS101P01
XF-101	FUSEHOLDER: Extraction post, 15 amp 250V, Bussman part no. HKP
XF-102	FUSEHOLDER: Extraction post, 15 amp 250V, Bussman part no. HKP
XI-101	LIGHT, INDICATOR: Dialco part no. 81410-111
XK-101	SOCKET, ELECTRON TUBE: 9 pin miniature; Elco type BR-283-BC
XV-101	SOCKET, ELECTRON TUBE: Octal, TS101P01
XV-102	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-103	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-104	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-105	SOCKET, ELECTRON TUBE: 9 pin miniature; Elco type BR-283-BC
XV-106	SOCKET, ELECTRON TUBE: 9 pin miniature; Elco type BR-283-BC
XV-107	SOCKET, ELECTRON TUBE: 9 pin miniature; Elco type BR-283-BC
XV-108	SOCKET, ELECTRON TUBE: 9 pin miniature; Elco type BR-283-BC
XV-201	SOCKET, ELECTRON TUBE: 3 contact, accommodates W. E. type 416B tube; Cinch part no. 14F14078
XV-202	SOCKET, ELECTRON TUBE: 7 pin miniature; shield base; Elco type BR-151-BC-125
XV-203	SOCKET, ELECTRON TUBE: 7 pin miniature; shield base; Elco type BR-151-BC-125
XV-204	SOCKET, ELECTRON TUBE: 7 pin miniature; shield base; Elco type BR-151-BC-125
XV-301	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-302	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-303	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-304	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC

SYMBOL NO.	DESCRIPTION
XV-305	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-306	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-307	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-308	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-309	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-310	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-311	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XV-312	SOCKET, ELECTRON TUBE: 7 pin miniature; Elco part BR-151-BC
XY-301	SOCKET, CRYSTAL: 2 contact, E. F. Johnson part no. 126-105
Y-301	CRYSTAL UNIT, QUARTZ: Overtone mode; 10,000-25,000 mc ±0.005, CR-33/U

PART II

MODEL G-116 COR UNIT

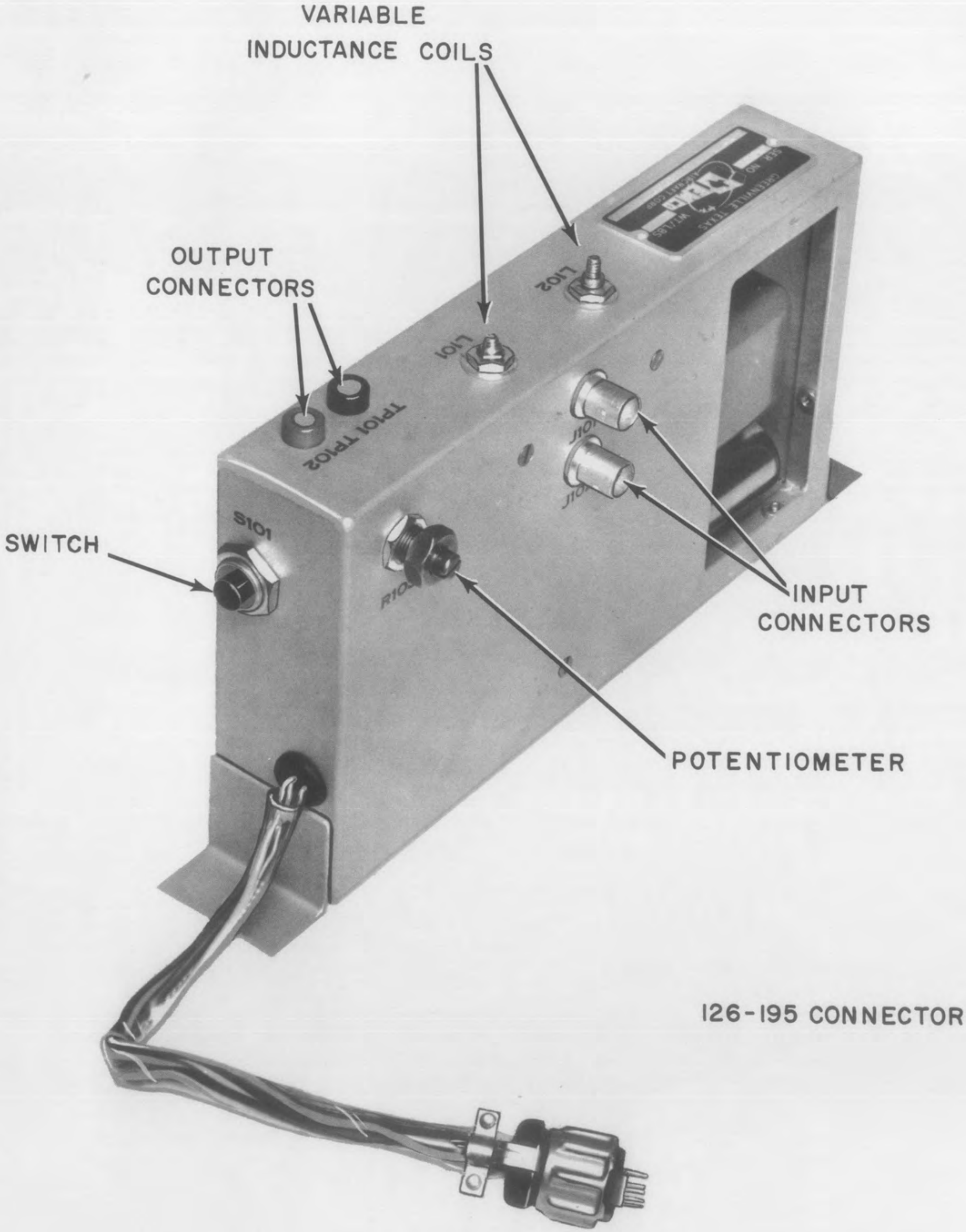


Figure 11. COR Unit, Overall View

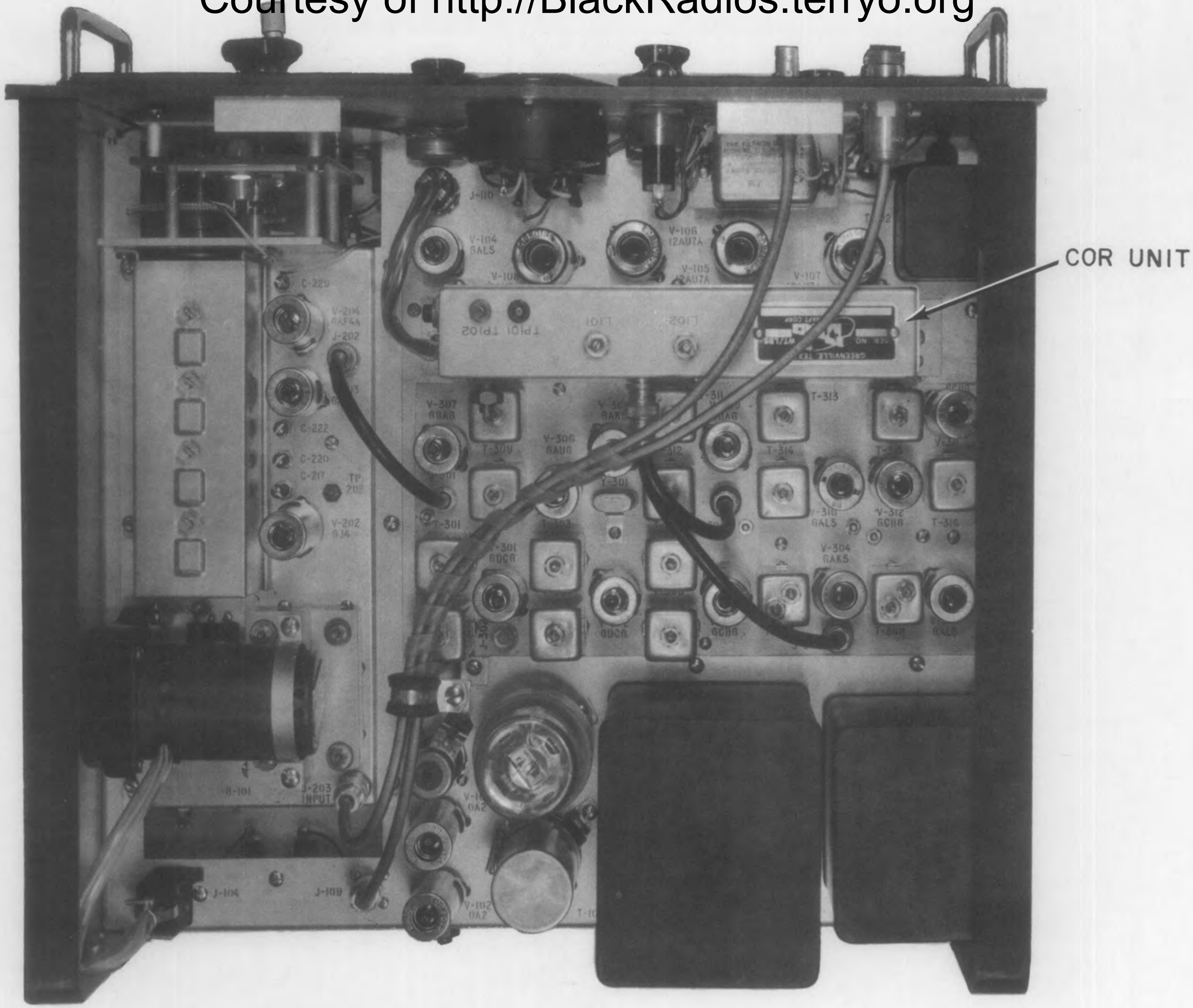


Figure 12. COR Unit Installed In Model G-110B Receiver

SECTION 1

GENERAL DESCRIPTION

1. PURPOSE OF EQUIPMENT.

The COR unit is designed primarily as a switching device for semi-automatic operation of recording units or to indicate the presence of radio signals. It may be used in any suitable situation requiring a switching device actuated by radio signals.

2. DESCRIPTION OF EQUIPMENT.

The COR unit is an electronic instrument housed in an aluminum case, designed to mount in a G-110B receiver. The case mounts two input connectors (J-101 and J-102), two output connectors (TP-101 and TP-102), a switch (S-101), two variable inductance coils (L-101 and L-102), and a potentiometer (R-103). Power for this unit is furnished by the G-110B power supply.

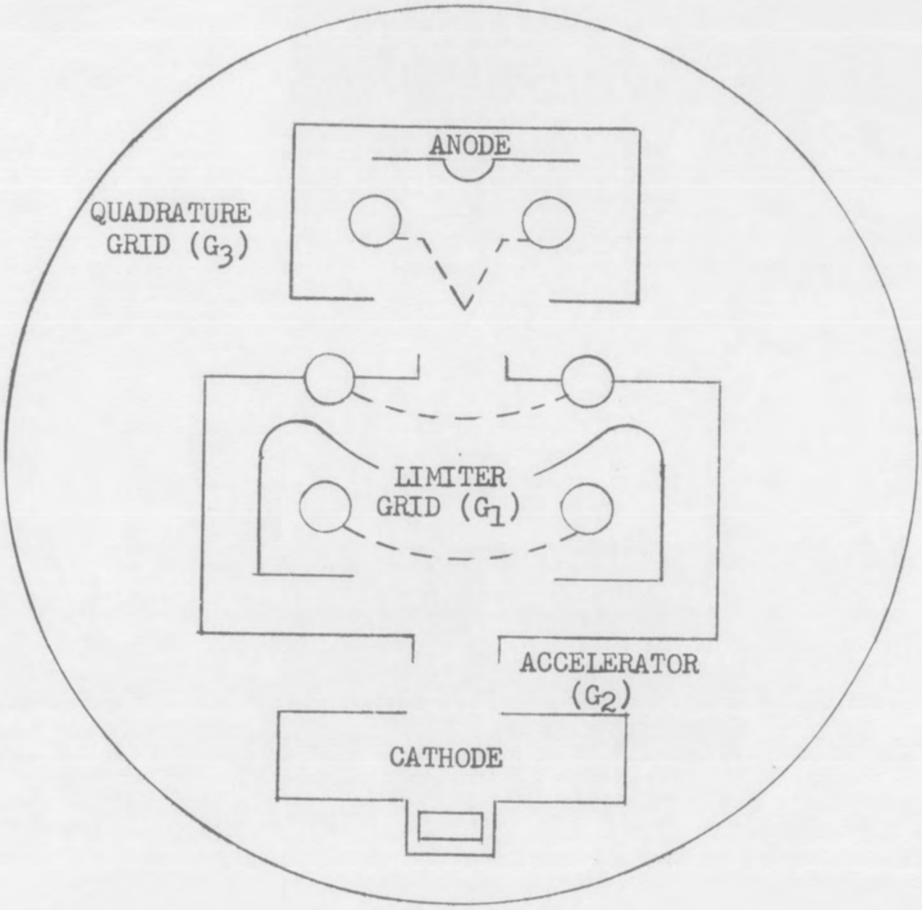


Figure 13. Internal Construction of 6BN6 Tube

SECTION 2

THEORY OF OPERATION

1. INPUT

The COR unit is sensitive to the I-F frequency of the G-110B receiver. The two I-F frequencies are 21.4 Mc in the 300KC AM-FM mode of operation and 1.0 Mc in the 10KC AM mode of operation. The correct input to the COR unit is automatically selected by the operation of the K-102 relay which is controlled by switch S-104C of the G-110B receiver. The sensitivity of the COR unit is determined by the setting of the bias resistor R-401 (a 1K 2W potentiometer) in the G-110B receiver. The I-F signal of the G-110B receiver is fed to the quadrature grid (pin 6) of V-101 (6BN6). The 6BN6 tube comprises the functions of limiter, discriminator, and amplifier in one envelope.

2. THEORY, 6BN6 TUBE

The 6BN6's internal construction is diagrammed in Figure 13. It will be observed from this diagram that the grated beam tube differs radically from the conventional tube. One of the most significant departures is that the electrons pass from the cathode to the plate through the various control electrodes in the form of a vertical sheet or beam.

Referring to Figure 13, the electrons are accelerated toward the accelerating electrode as they leave the cathode. Whether or not they pass through the box-like accelerator structure depends on the potential of the limiter grid. If the limiter grid is negative, in the order of a few volts, the electrons will be repelled and will fall back inside the front of the accelerator box. If the limiter grid is made less negative, some of the electrons will pass through the accelerator box and approach the quadrature grid. Here again, depending on the potential of the quadrature grid, electrons will either be repelled, to fall on the outside of the accelerator structure, or allowed to pass to the plate. It can be seen by this action that the limiter and the quadrature grids act like gates depending upon their relative instantaneous voltages. If either of the grids is below the point at which the electrons are passed to the plate, the plate current is reduced or cut-ff regardless of the potential on the other grid. Because of the arrangement of the electrodes within the tube, the cathode is shielded from the electrostatic fields of the gating grids. This means that the amount of current flowing from the cathode is not affected by the voltages on the gating grids. Therefore, the cathode current is essentially constant, and the value is dependent upon the accelerator voltage. The action of the grids is merely to shift the current from the accelerator to the plate depending upon the relative grid potential. This makes it possible to completely cut off the plate current by the use of a cathode resistor. This is impossible in the conventional type of vacuum tube. In the 6BN6, because of its constant cathode current, either or both of the gating grids may be driven highly positive without damage to the tube since only a limited amount of current can be drawn by the grids and the plate current is automatically limited. A few volts change in the potential of the grids will vary the plate current from saturation to cut-off. The plate saturation value is determined by the available cathode current.

3. CIRCUITRY

Signals of frequencies other than the I-F frequencies are discriminated against by the action of the tuned circuits (L-101, C-108 and L-102, C-105). This allows the 6BN6 plates to pass a maximum amount of current when the I-F signal is present on the quadrature grid and is exciting the corresponding tuned circuit. The plate of the 6BN6 is directly connected to the input grid (pin 2) of V-102A (the pentode section of 6U8). The output signal of the 6BN6 is developed across the 5.6 megohm resistor, R-104.

This resistor also serves as the grid resistor for the pentode section of V-102A. The D-C voltage appearing on the grid of this section is decreased when the current in the plate of the 6BN6 increases. This causes an increase in the grid voltage applied to the triode. The increased plate current actuates relay K-101. The R-103 potentiometer is used to adjust the leakage current through the triode section of the 6U8, this is variable to compensate for changes in the component characteristics due to aging or replacement. The plate leakage current of V-102B (6U8), with V-101 biased to cut-off, should be lower than the drop-out current of the relay K-101. This current may be measured by connecting a 0-10 MA meter between output connectors TP-101 and TP-102 and then depressing switch S-101. The entire 6U8 tube constitutes a highly sensitive direct current amplifier. It will be noted that two high value resistors (R-104, 5.6 megohm and R-108, 3.9 megohm) are used in this circuit. These high values are required because of the very small change in the plate current of these circuits. The total plate current of the 6BN6 is only a few microamperes. A high resistance is necessary in this circuit in order to produce the voltage necessary to operate the D-C amplifier. Because of these high resistance values, voltage measurements in these circuits should be made only with a VTVM having an input impedance of 11 megohms or more.

SECTION 3

OPERATION

To place the COR unit in operation, supply power to the G-110B receiver. This automatically supplies power to the COR unit, readying it for operation when the COR SENSITIVITY control is correctly adjusted. The COR SENSITIVITY control must be adjusted for each signal. The procedure for adjusting the COR SENSITIVITY control is as follows:

1. Turn the COR SENSITIVITY control clockwise until the COR indicator lamp glows.
2. Back the control off until the lamp goes out.
3. Tune in the desired signal and the lamp will glow, indicating that the COR unit is operating and the the relay K-101 is closed.

SECTION 4

INSTALLATION AND MAINTENANCE

1. INSTALLATION

There are no special installation requirements for the COR unit as it is mounted internally on the G-110B receiver. The two I-F input cables and one electrical cable are supplied with mating connectors.

2. MAINTENANCE

Maintenance on the COR unit consists of periodic visual checks and tube checks. The tubes should be replaced if the cathode emmission is low. If a tube is replaced, readjustment of the COR unit is necessary. The procedure for readjustment is as follows:

1. Connect a 0-10 MA meter to the two output connectors (TP-101 and TP-102).
2. Supply the COR unit with power by placing the G-110B receiver power switch to ON.
3. Depress switch S-101 on the COR unit and adjust R-103 for a minimum current drain under a no-signal condition.
4. Release S-101 and disconnect electrical power by placing the G-110B receiver power switch to OFF. Disconnect the MA meter.

CAUTION

Use extreme care not to ground either probe of the MA meter while connected to outputs TP-101 and TP-102. To do so will destroy the meter.

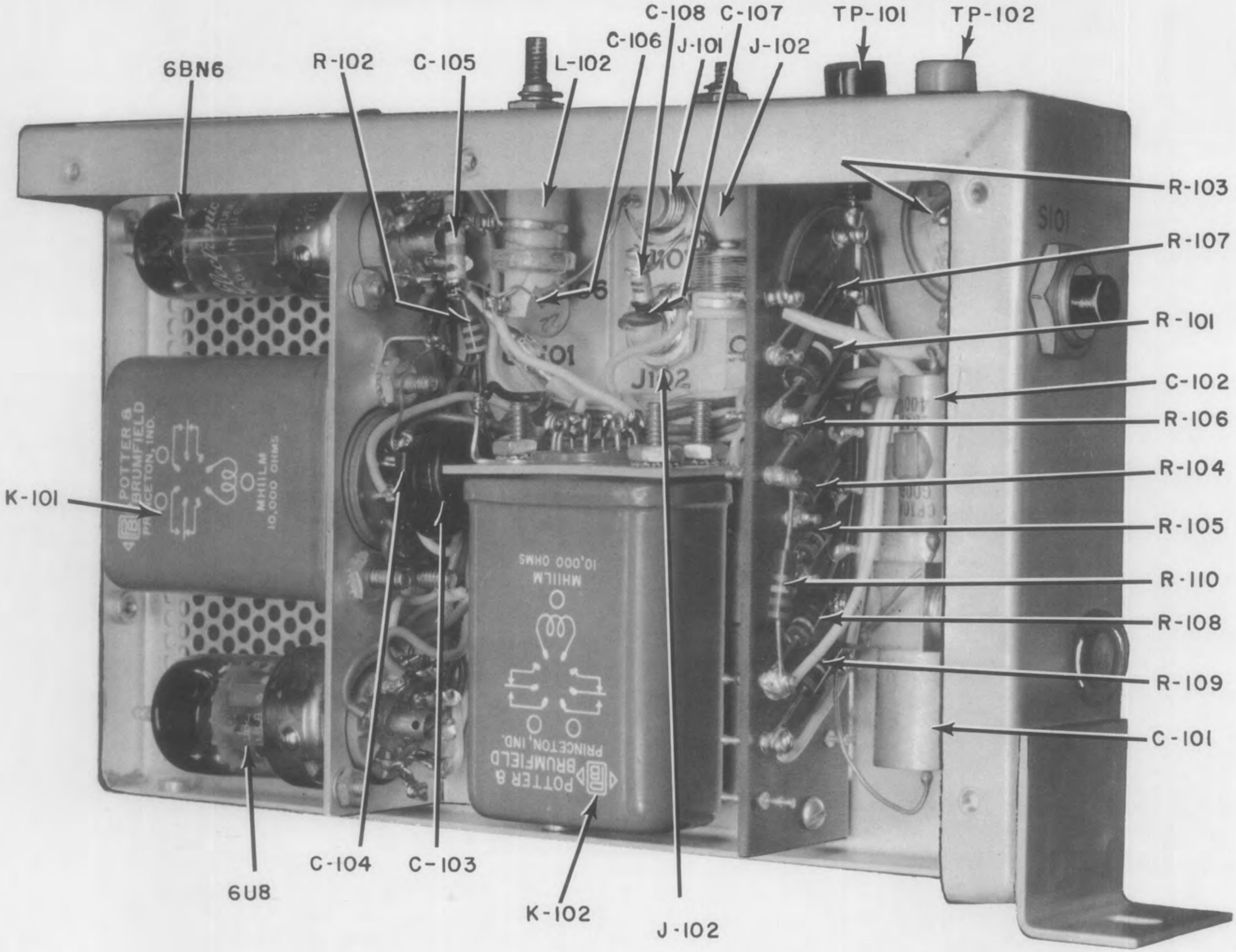


Figure 14. Internal View of COR Unit, Showing Components

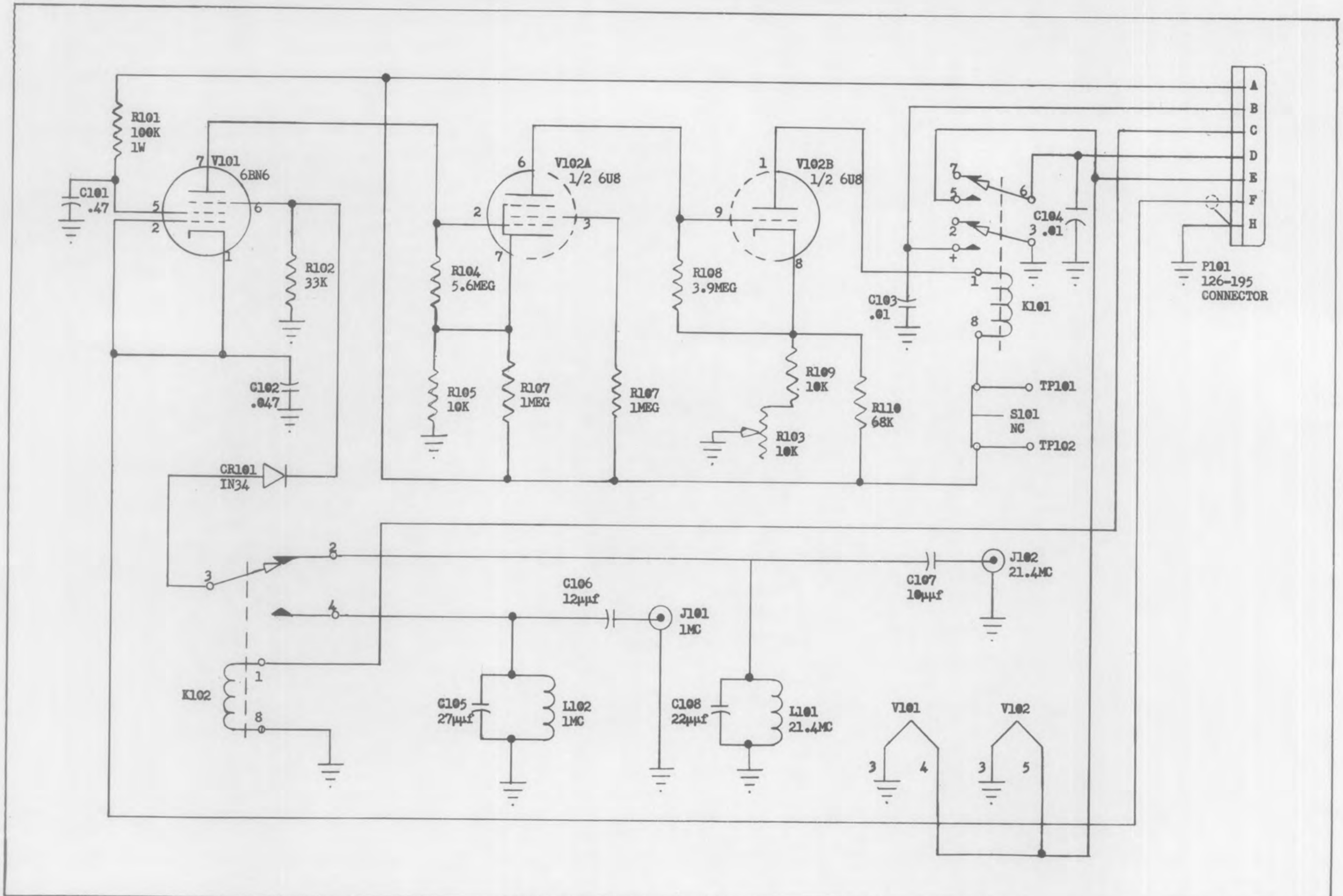


Figure 15. Model G-116 COR Unit, Schematic Diagram

SECTION 5

PARTS LIST

SYMBOL NO.	DESCRIPTION
C-101	CAPACITOR: .47 µf
C-102	CAPACITOR: .047 µf
C-103	CAPACITOR: .01 µf
C-104	CAPACITOR: .01 µf
C-105	CAPACITOR: 27 µf
C-106	CAPACITOR: 22 µµf
C-107	CAPACITOR: 10 µµf
C-108	CAPACITOR: 22 µf
CR-101	RECTIFIER: 1N34
J-101	CONNECTOR
J-102	CONNECTOR
K-101	RELAY: 10,000 Ω
K-102	RELAY: 10,000 Ω
L-101	VARIABLE INDUCTANCE COIL: 21.4 Mc
L-102	VARIABLE INDUCTANCE COIL: 1 Mc
P-101	CONNECTOR: 126-195
R-101	RESISTOR: 100K, 1W
R-102	RESISTOR: 33K
R-103	POTENTIOMETER: 10K
R-104	RESISTOR: 5.6 Meg.
R-105	RESISTOR: 10K
R-106	RESISTOR: 100K
R-107	RESISTOR: 1 Meg.
R-108	RESISTOR: 3.9 Meg.

SYMBOL NO.	DESCRIPTION
R-109	RESISTOR: 10K
R-110	RESISTOR: 68K
S-101	SWITCH
TP-101	TERMINAL
TP-102	TERMINAL
V-101	TUBE: 6BN6
V-102	TUBE: 6U8