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AN16-30PRC14-2

HANDBOOK

SERVICE INSTRUCTIONS

RADIO SET AN/PRC-14

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SECTION I

DESCRIPTION AND LEADING PARTICULARS

1–1. SCOPE OF HANDBOOK.

1–2. This handbook contains service and maintenance instructions for Radio Set AN/PRC–14. It is intended to be used by all echelons of maintenance except those which perform a major overhaul of the equipment. Service and maintenance as described in this handbook include trouble analysis, removal and replacement of parts found to be defective by this analysis, minor repairs and adjustments, lubrication, periodic inspection, and performance of final tests for determining whether the equipment is again suitable for operation.

1–3. TUBE COMPLEMENT. Table 1–1 lists the vacuum tube complement by function, JAN type number, and quantity.

1–4. PURPOSE OF EQUIPMENT.

1–5. The Radio Set AN/PRC–14 is an easily portable UHF transceiver designed to provide line-of-sight communication between ground personnel and aircraft. With aircraft at an altitude of 5000 feet or more operation up to 30 miles may be anticipated. With aircraft at lower altitudes terrain will control the reliability and range of operation. Emergency ground-to-ground operation is practical within the line-of-sight limitations.

TABLE 1–1. VACUUM TUBE COMPLEMENT

FUNCTION	JAN TYPE NUMBER							
	5702	5703	5719	5647	5899	5902	5675	Totals
First Mixer	..	1	..	..	..	..	..	1
54 mc IF Amplifier	1	..	..	..	..	..	..	1
Second Mixer	1	..	..	..	..	..	..	1
3.5 mc Amplifier	3	..	..	..	..	..	..	3
Second Detector	..	..	..	1	..	..	..	1
Automatic Volume Control	..	..	..	1	..	..	..	1
50.5 mc Oscillator	..	1	..	..	..	..	..	1
Noise Limiting and Squelch	..	..	2	2	..	..	..	4
Audio Amplifier	..	..	..	..	1	1	..	2
Automatic Modulation Control	..	..	..	1	..	..	..	1
Transmitter and Receiver Oscillator	..	1	..	..	..	..	..	1
First Doubler	..	1	..	..	..	..	..	1
Second Doubler	..	1	..	..	..	..	..	1
Transmitter Mixer	..	1	..	..	..	..	..	1
27 mc Oscillator	..	1	..	..	..	..	..	1
Third Doubler	..	1	..	..	..	..	..	1
Final Amplifier	..	..	..	..	..	..	1	1
TOTALS	5	8	2	5	1	1	1	23

1–6. REFERENCE DATA.

1–7. FREQUENCY RANGE. The frequency range is 225 to 400 megacycles, but only one of four pre-set (crystal-controlled) frequencies is selectable at one time by a four-position selector switch.

1–8. OUTPUT CHARACTERISTICS. A switch on the side of the case enables the transceiver to operate on either type A–2 (mcw) or type A–3 (speech) emission. An automatic modulation control prohibits modulation in excess of 100%. The transmitter section final amplifier has a power output of approximately one watt, unmodulated.

1–9. RECEPTION CHARACTERISTICS. The sensitivity of the receiver section with the squelch circuit inoperative is approximately 5 microvolts. However, with the squelch circuit operative, the level at which signals become audible is variable between threshold sensitivity and 10 microvolts. These characteristics make possible the elimination of background noise which the operator may find objectionable. Selectivity is 85 kc at —6 db and 225 kc at —60 db. The receiver section audio amplifier delivers a power output of over 250 milliwatts into a pair of 500 ohm headphones.

1–10. POWER REQUIREMENTS. Power requirements for Receiver-Transmitter RT–271/PRC–14 are as follows:

a. Filament Supply: 6.3 v at 5.0 amp.
b. Plate Supply: 135 v at 155 ma (transmit); 135 v at 147 ma (receive).

These requirements are met by a Power Supply PP–855/PRC–14 using a battery BB–402/U.

1–11. CONTROLS.

1–12. GENERAL. All controls are located on Receiver-Transmitter RT–271/PRC–14.

1–13. CHANNEL SELECTOR SWITCH. The channel selector switch selects for use one of the four pre-set operating channels. It is located on one of the sidefaces of the transceiver and has a hinged knob which should be folded against the case when not in use.

1–14. POWER CONTROL SWITCH. The power control switch S101 is located on the opposite side of the case from the channel selector switch, in between the ring clamps for the carrying harness. In the OFF position of the switch, the 6 volt and vibrator input power lines are opened. The SQUELCH switch and the SPEECH-TONE switch are also located in this position.

1–15. SPEECH-TONE SWITCH. The Speech-Tone switch S103 determines whether the carrier will be voice-modulated by speaking into the microphone or whether it will be modulated by an internally-generated 1000 cycle tone.

1–16. SQUELCH SWITCH. The SQUELCH switch S102 controls the operation of the squelch circuit. With the switch in the OFF position the circuit is inoperative and some receiver noise is audible in the headphones at all times. In the ON position, the squelch circuit operates to block all signals which fall below a predetermined level.

1–17. SQUELCH CONTROL. The SQUELCH control R125 determines the level below which audio signals entering the squelch circuit will be blocked. The control shaft protrudes through a hole in the cover of the Radio Set and is slotted for screwdriver adjustment.

1–18. AUDIO GAIN CONTROL. The AUDIO GAIN control R144 regulates the amount of audio signal applied to the first audio amplifier. Its control shaft also protrudes through the cover and is slotted for screwdriver adjustment.

1–19. The two controls just mentioned are located one beside the other, adjacent to the lower right-hand ring clamp. The gain control is nearest the side of the case.

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2–1. GENERAL.

2–2. No special tools or test equipment are used in servicing and maintaining Radio Set AN/PRC–14; however, a listing of typical standard test equipment is shown in Table 2–1.

3–17. ITEM 11. ANTENNA BOX. Style: five panel folder. Refer to Handbook of the Fibre Box Association and Rule 41 of The Consolidated Freight Classification.

Inside dimensions: 2⅝" x 2¾" x 23¾" (lwd).
Board: 275 lb. test "B" flute corrugated fibreboard
Seal with 2" sisal tape.

3–18. ITEM 12. DIE CUT HOLDER FOR AMMETER BOX. (See Figure 3–3).

Board: 275 lb. test "A" or "C" flute corrugated fibreboard.

3–19. ITEM 18. SMALL HUMIDITY INDICATOR. Refer AN513.

3–20. ITEM 19. 8-UNIT BAG DESICCANT. Conforming to MIL–D–4364.

3–21. ITEM 20. 16-UNIT BAG DESICCANT. Conforming to MIL–D–4364.

3–22. RADIO PADS. (See figure 3–4.)

	A (inches)	*B* (inches)	*C* (inches)
ITEM 13. Radio Pad.	10 9/16	1	4 5/8
ITEM 14. Radio Pad.	10 9/16	1	3 5/8
ITEM 15. Radio Pad.	11 7/16	1	4 5/8
ITEM 16. Radio Pad.	8 9/16	1	23
ITEM 17. Radio Pad.	10 13/16	1	3
ITEM 21. Radio Pad.	8 9/16	¾	10 9/16
ITEM 22. Spare Parts Box. Same as item 4			

SECTION IV

THEORY OF OPERATION

4–1. GENERAL.

4–2. Radio Set AN/PRC–14 is designated a transceiver because the tubes in the transmitter and receiver oscillator, the first two doublers, and the two AF amplifiers operate in both transmission and reception. These tubes are connected directly to the power supply. Plate voltage to the remaining tubes is supplied through the transmit-receive relay K102. A functional block diagram of the equipment is shown in Figure 4–1.

4–3. TRANSMITTER.

4–4. OSCILLATOR AND TURRET DOUBLERS. The oscillator is a cathode-coupled circuit in which the crystal (Y102, Y103, Y104, or Y105, depending upon which channel is in use) is inserted between the cathode of the grounded-grid oscillator tube V117 and the cathode of the doubler tube V118. Plate voltage is furnished to the oscillator through resistor R158, which decouples the oscillator tank from the power supply. RF by-pass to ground is through capacitor C157. Bias for the oscillator cathode is developed across resistor R157.

4–5. The oscillator turret tank resonates at the crystal frequency. The tank circuit consists of fixed capacitor C156 and variable inductance L118, L119, L120, or L121, depending upon the channel in use. The RF energy developed in this circuit is coupled to the first doubler grid by capacitor C158. A dc path to ground is maintained by resistors R159 and R160 in series. A phone-tip jack J111 is inserted in this circuit at the junction of R159 and R160 to provide a test point for the oscillator stage. C160 provides an RF by-pass for Ammeter ME–68/PRC–14, and R160 acts as the instrument shunt.

4–6. The first doubler turret resonates at twice the crystal frequency. The tank circuit consists of fixed capacitor C161 and variable inductance L122, L123, L124, or L125, depending upon the channel in use. Plate voltage is supplied to this stage through decoupling resistor R162, which effectively isolates the plate supply from the doubler tank with respect to RF. The tank is by-passed to ground for RF by capacitor C162. Cathode resistor R161 is the impedance across which the feedback voltage is developed to maintain oscillation in the crystal circuit.

4–7. The first doubler turret is coupled to the second doubler V119 by capacitor C163. The second doubler is tuned to four times the oscillator frequency. This VHF circuit has considerable stray capacitance which, with one of the variable inductances L126, L127, L128, or L129, is sufficient to produce a resonant tank circuit. Resistors R163 and R164 are the grid resistors for V119. R164 also serves as a meter shunt when Ammeter ME–68/PRC–14 is connected between test jack J112 and ground to determine first doubler performance. Capacitor C164 by-passes the test instrument. Plate voltage is supplied through decoupling resistor R165, which is by-passed by capacitor C168. The performance of this stage

can be determined by connecting Ammeter ME–68/PRC–14 between the second doubler test point J113 in the grid circuit of the transmitter mixer and ground.

4–8. 27 MC CRYSTAL OSCILLATOR. The 27 mc crystal oscillator provides a stable, fixed frequency with which the doubler signals are mixed to supply the final transmitter stages with signals of the proper frequency. A quartz crystal Y106 supplies a 27 mc signal to the grid of the oscillator tube V121. Resistor R169 completes the dc grid circuit. The plate circuit of the tube is adjusted to the crystal frequency by slug-tuned inductor L131, in parallel with fixed capacitor C173. Plate voltage is applied through decoupling resistor R170 which is by-passed by capacitor C174.

4–9. TRANSMITTER MIXER. The transmitter mixer tube V120 combines the signals from the second doubler and the 27 mc oscillator. The doubler output is coupled to the mixer grid by capacitor C167, and the oscillator output is coupled to the mixer grid by C172. The mixer tank is tuned by variable capacitor C170 in parallel with inductor L130 to the sum of the two mixer input signals. The plate voltage resistor R168 and the plate circuit are dc-isolated from ground by capacitor C171 while capacitor C179 provides additional by-passing. Resistors R166 and R167 provide a dc path to ground for the mixer grid. R167 also serves as a shunt for Ammeter ME–68/PRC–14, used to determine second doubler performance. Capacitor C169 by-passes the shunt for RF.

4–10. THIRD DOUBLER. The mixer output is coupled to the third doubler V122 by capacitor C165. Here the signal is again doubled. The crystal frequency has now been doubled twice, mixed with the signal from a 27 mc local oscillator and doubled again. The formula for finding the output frequency from the original crystal frequency is accordingly:

$$F = 8f + 54$$

where f = crystal frequency and F = output frequency. The third doubler tuned circuit is a cavity T111 containing the main tuning capacitor C175, two feed-

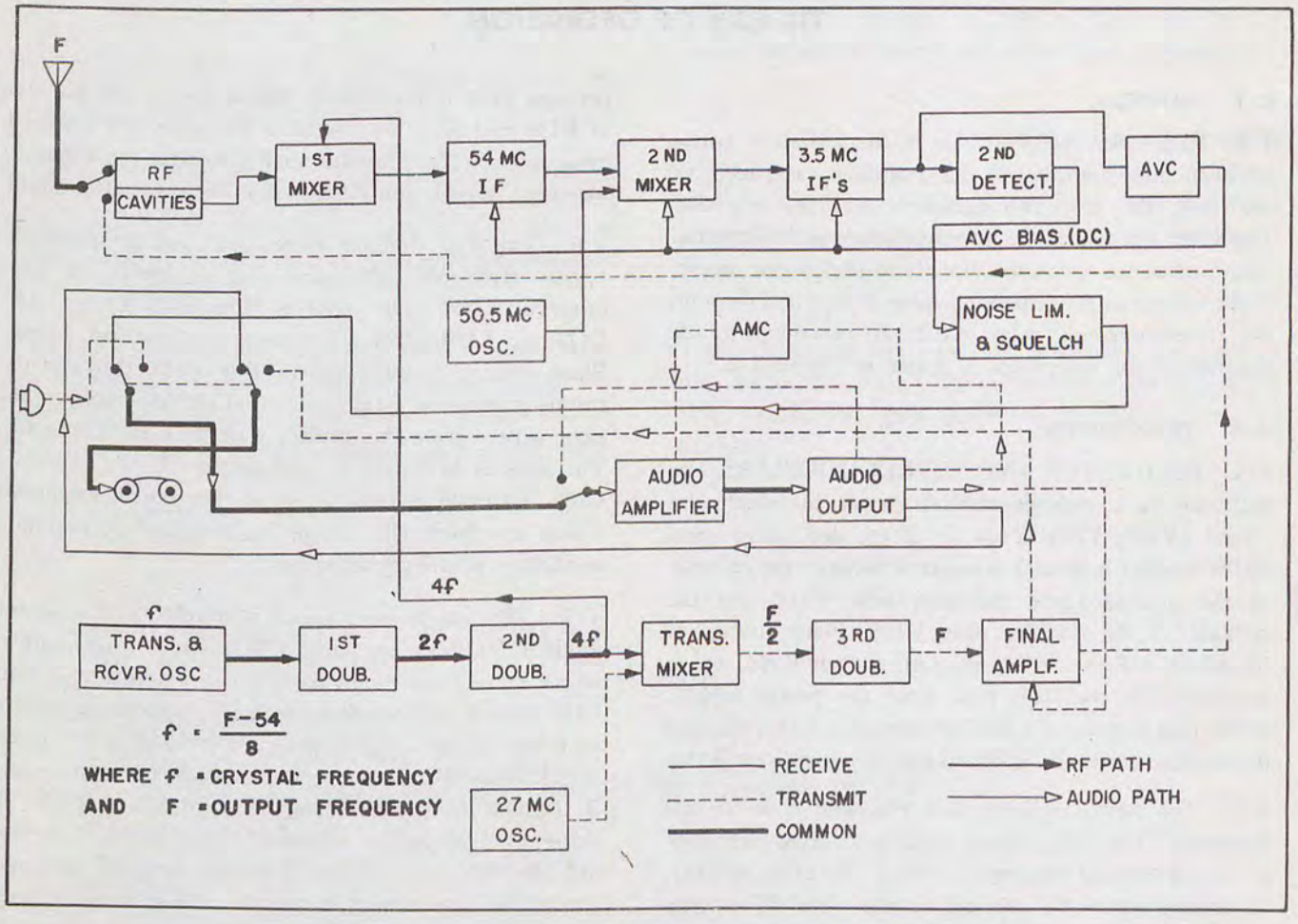

Figure 4–1. Radio Set AN/PRC–14, Functional Block Diagram

through capacitors, and inductive and capacitive trimmers for tracking of all channels. Plate voltage is supplied through decoupling choke L133. The grid circuit return to ground is provided by resistor R171.

4–11. FINAL AMPLIFIER. The power output stage of the transmitter utilizes a pencil type tube V123 in a grounded-grid amplifier circuit. The tank circuit consists of another cavity with characteristics similar to those of the third doubler cavity. Most of the RF energy developed by the cavity is fed through coaxial cables and connectors to the antenna; however, a small portion is rectified by crystal diode CR101 and appears as a side tone in the headphones to provide the operator with an indication that he is transmitting. Jack J114 provides a connection for Ammeter ME–68/PRC–14, so that an indication of transmitter output can be obtained. Resistor R174 is the load for the crystal diode.

4–12. AUDIO FREQUENCY AMPLIFIERS. The transmitter signal is amplitude modulated by either speech or 1000 cycle tone, which is applied to the plate of the third doubler and final amplifier stage through output transformer T110. Two stages of resistance-coupled amplification are used to bring the audio level up to modulating strength. The speech input is coupled to the amplifiers by input transformer T109. The tone is generated by resistance coupling between the first audio amplifier grid and the secondary of output transformer T110. Switch S103 permits the selection of either type of modulation.

4–13. Speech frequencies generated by a carbon microphone are applied to the input transformer T109 through telephone relay K102 and SPEECH-TONE switch S103. Resistor R131 provides a load for the secondary of T109. Capacitors C142, C143 and resistor R132 filter out unnecessary speech frequencies.

4–14. The first audio amplifier tube V114 is a conventional Class A amplifier using a subminiature pentode tube. Resistor R146 in the cathode circuit supplies bias voltage for the tube. Resistors R147 and R148 serve as the screen and plate load resistances respectively, while capacitor C149 grounds the screen for audio frequencies. Decoupling from the power supply is provided by resistor R177 and capacitor C188.

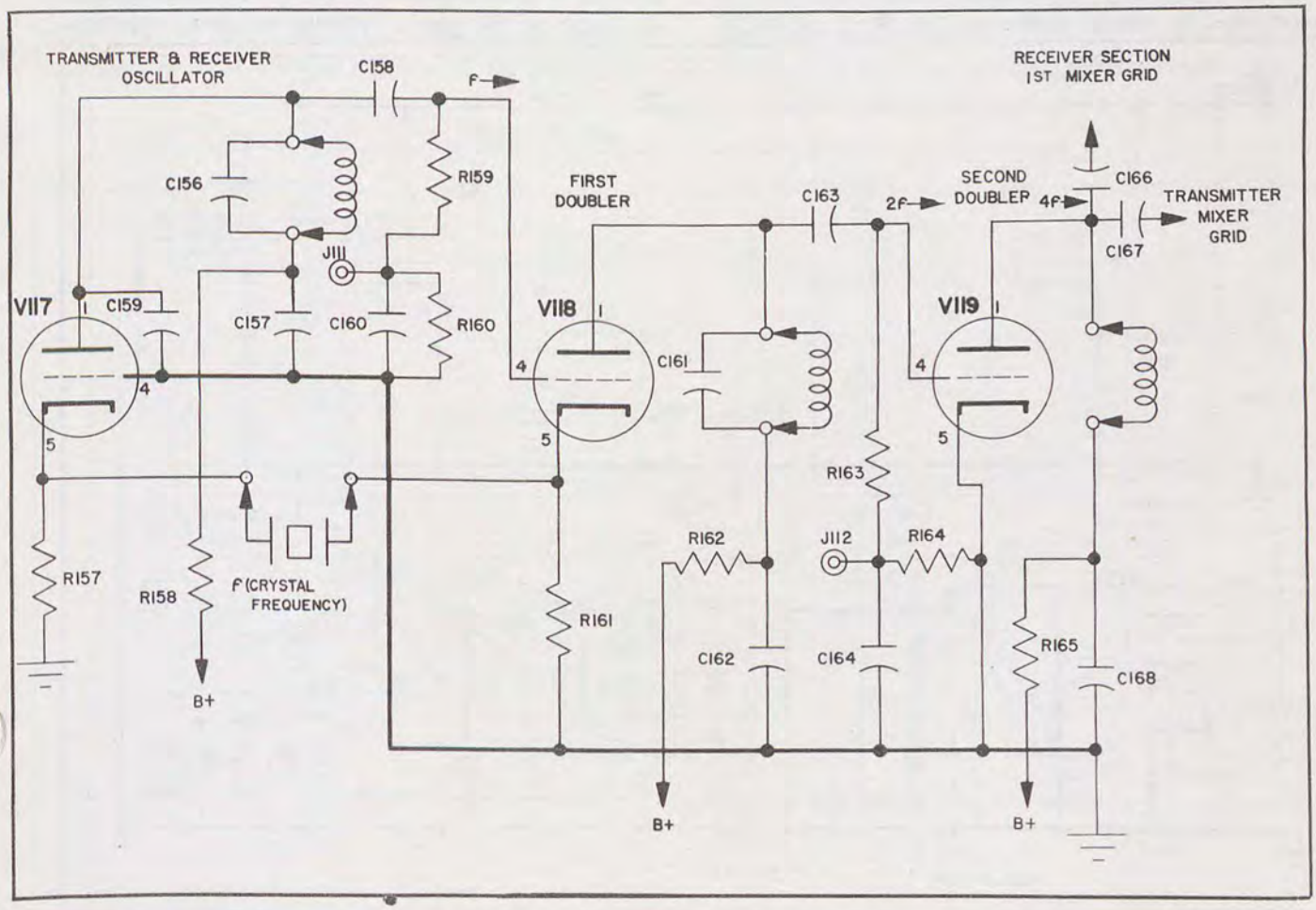

Figure 4–2. Radio Receiver-Transmitter RT–271/PRC–14, Oscillator and Doubler Circuits

4–15. Capacitor C150 couples the output of the first audio amplifier to the grid of the second audio amplifier tube V115. Resistor R149 constitutes the grid load, and resistor R151 develops the cathode bias voltage. Capacitors C152 and C153 shunt the primary of the audio output transformer T110 to provide it with the correct band-pass characteristics.

4–16. When the SPEECH-TONE switch is in the TONE position, the first audio amplifier grid is connected to the 500 ohm secondary winding of output transformer T110 at the junction of the voltage divider formed by resistors R150 and R173. A portion of the voltage developed across this secondary is thus fed back in phase to the first audio amplifier grid producing the 1000 cycle oscillation needed for tone modulation.

4–17. An automatic modulation control is included in the audio amplifier to limit the modulation percentage to no more than 100%. When the audio frequency voltage from the secondary of output transformer T110 rises to a value corresponding to 100% modulation, the plate voltage on diode V116, which is coupled to the output transformer T110 by capacitor C154, becomes high enough for it to conduct. Conduction level is established by voltage divider resistors R152 and R153. The current flowing through load resistance R154 produces a pulsating voltage at the plate of V116 which is filtered by resistance-capacity network R155, R156, and C155 and applied through switch S103 and relay K102 to the grid of the first audio amplifier V114. Tube V114 is thus biased so that the amplified signal is held to a value corresponding to 100% modulation.

4–18. RECEIVER.

4–19. RF INPUT CIRCUITS. The signal to be received enters the receiver section from the antenna through antenna cable W104, coaxial connector, and coaxial antenna relay K101. The signal enters input cavity T101 through coaxial connector J101 and is inductively coupled by a short length of busbar to the tuned circuit, which consists of a length of silver-plated brass rod fastened to the grounded shell and variable capacitor C102. Grounded loop L101 can be rotated about the brass rod to vary its effective inductance and trimmer capacitor C101 is connected in parallel with C102 for tracking adjustment.

4–20. The second cavity is similar to the first and is coupled to it by capacitor C116. Two cavities in series are employed for good selectivity and image rejection.

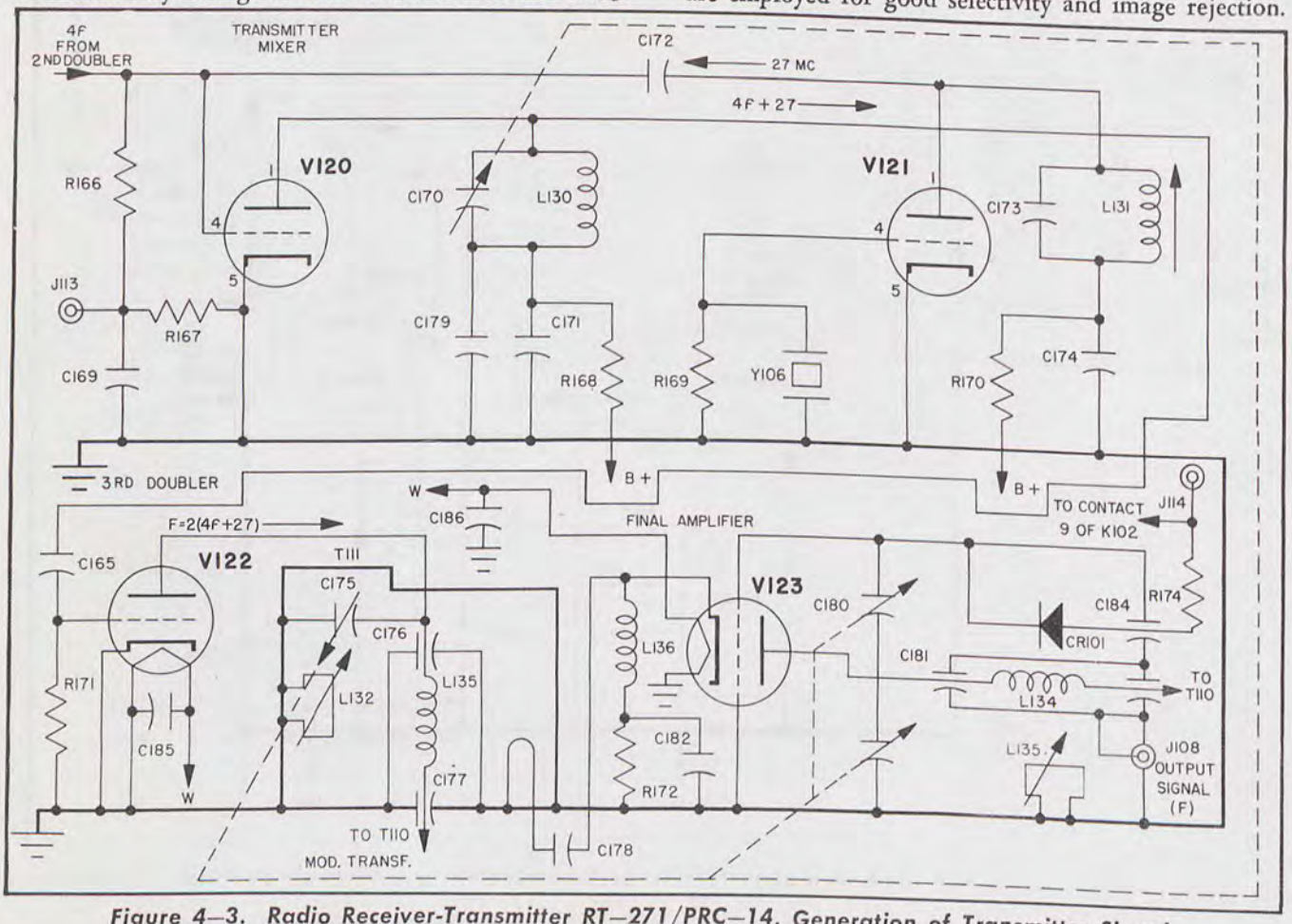

Figure 4–3. Radio Receiver-Transmitter RT–271/PRC–14, Generation of Transmitter Signal

4–21. FIRST MIXER CIRCUIT. The signal from the second cavity is coupled to the grid of the first mixer tube V101 by capacitor C105. The signal from the second doubler circuit, whose operation is the same in both transmission and reception, is also coupled to the mixer grid by capacitor C166. The RF input circuit is tuned so that the RF signal arriving via the antenna is always twice the frequency of the output signal from the second doubler plus 54 megacycles. The two signals are combined in the mixer grid circuit. The mixer plate tank is tuned to 54 megacycles. This tank circuit consists of the primary winding L105 of RF transformer T103 and fixed capacitor C107. Inductance L104 is inserted between the mixer plate and the tank circuit to present a high impedance to any harmonics of the 54 mc signal. Inductive coupling to the next stage is provided by the secondary winding L106 of T103 and fixed capacitor C109. The primary and secondary windings of T103 are tuned by movable powdered iron cores. Plate voltage is supplied to the circuit through resistor R103, which together with capacitor C108 as a by-pass to ground, keeps RF from the power supply. Resistor R102 biases the cathode while capacitor C106 grounds it for RF.

4–22. 54 mc IF AMPLIFIER. The signal on the secondary of T103 is applied directly to the grid of the 54 mc amplifier tube V102. Capacitor C110 isolates from ground the AVC bias applied to V102. Capacitor C111 grounds the screen for RF. Resistor R105 reduces the screen supply voltage. Resistor R106 and capacitor C113 decouple the supply from the plate tank. The tank circuit T104 is exactly the same as the mixer tank except that no decoupling inductance is used.

4–23. SECOND MIXER CIRCUITS. The second mixer obtains its input signals from two sources: the output of the 54 mc amplifier and the output of a 50.5 mc crystal oscillator tube V109. The oscillator utilizes a conventional tuned-grid tuned-plate circuit, with a 50.5 mc crystal replacing the tuned grid. Inductor L138 helps to maintain oscillation, and resistor R128 completes the dc grid circuit. The plate tank consists of variable powdered iron core coil L117 and fixed capacitor C140. The tank is by-passed by capacitor C141. Resistor R129 decouples the tank from the power supply. The oscillator output is coupled to the mixer screen by resistor R109 and the 54 mc signal is coupled to the grid by capacitor C115. The mixer plate tank is tuned to the difference of the two signals, or 3.5 mc, by the primary of IF transformer T105, consisting of variable powdered iron core inductance L109 and fixed capacitor C119. Cathode bias is furnished to the stage by resistor R108, while resistor

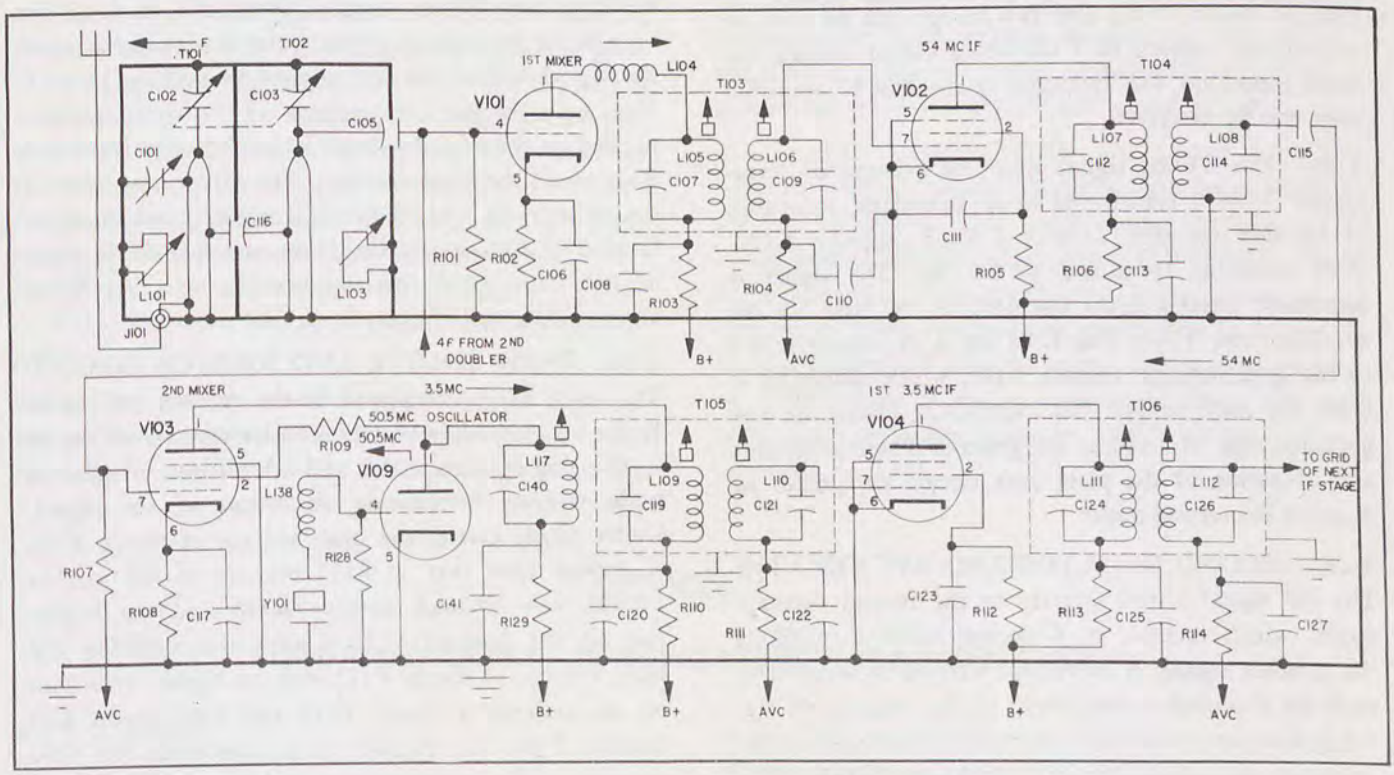

Figure 4–4. Radio Receiver-Transmitter RT–271/PRC–14, Receiver Double Conversion Circuits

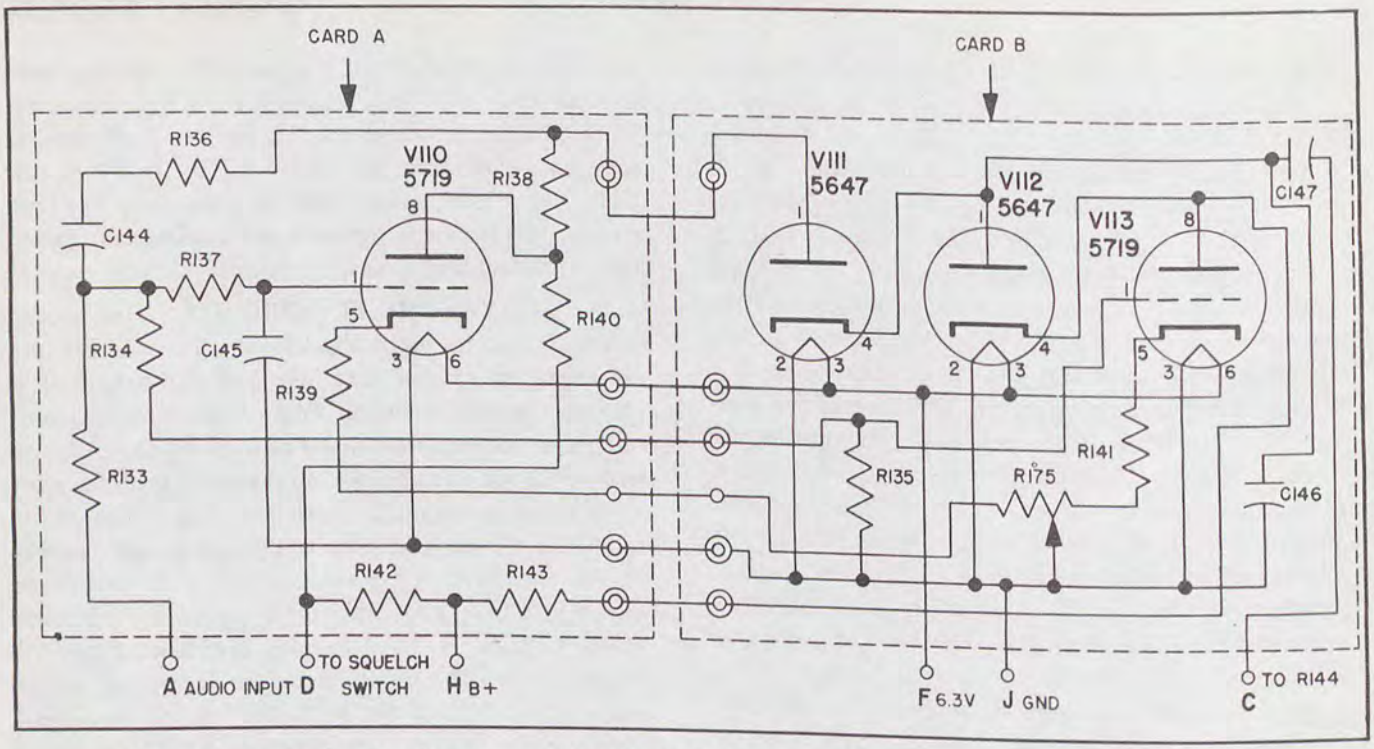

Figure 4–5. Radio Receiver-Transmitter RT–271/PRC–14, Noise Limiter and Squelch Circuits

R107 decouples the grid from the AVC supply. Capacitor C117 grounds the cathode for RF. Resistor R110 and capacitor C120 isolate the plate tank from the power supply.

4–24. 3.5 mc IF AMPLIFIERS. The first two IF amplifiers have exactly the same characteristics and the third is similar to the first two except that no AVC is needed, the cathode of V106 being biased instead. To avoid repetition, the operation of the first IF amplifier only will be described.

4–25. The 3.5 mc signal from the primary of transformer T105 is transferred to its secondary, consisting of variable inductor L110 and fixed capacitor C121. Both windings are tuned to 3.5 mc. The signal is impressed directly upon the grid of the first 3.5 mc amplifier tube V104. Bias from the AVC supply is fed to the grid through resistor R111, which decouples it from the AVC supply. Capacitor C122 places the low potential side of L110 at RF ground. The components and operation of the plate tank circuit are similar to those of the second mixer.

4–26. SECOND DETECTOR AND AVC CIRCUITS. The RF signal is fed directly to the second detector diode, which rectifies it. Capacitor C137 then filters the rectified signal. A dc voltage varying in accordance with the modulation component of the original RF signal thus appears across terminals of the load system consisting of resistors R120, R133, R134 and R135 and is fed into the noise limiting and squelch circuits.

4–27. The IF signal is also fed to the AVC diode V108 through capacitor C138, which couples the diode to the IF circuits. Up to a level depending on the setting of variable resistor R125, the diode does not conduct because of the positive voltage upon its cathode, and the AVC line carries a moderate amount of fixed negative bias. When a signal above the level of the voltage on the cathode appears, the diode conducts and the signal follows its low-impedance path to ground. Thus only the positive portions of the signal are impressed on the load resistance R126. Resistors R123 and R124 limit the diode current. The RF components of the voltage are filtered by resistor R127 and capacitor C139. The AVC supply line is connected to the junction of R127 and C139 and supplies bias to tubes V102, V103, V104, and V105.

4–28. NOISE LIMITER AND SQUELCH CIRCUIT. The noise limiter employed in the receiver section of Radio Set AN/PRC–14 serves as an effective means of suppressing ignition, static, and other forms of spurious noise without introducing distortion of the signal. Under steady carrier the plate voltage of triode V110 is greater than that of V113 because of the smaller current flow through resistor R140 and the higher bias on the grid of V110. Under this condition the plate voltage of diode V111 will be higher than that on the cathode of diode V112 and both diodes will conduct. Upon the reception of a noise pulse, the plate voltage on V113 increases, but the plate voltage on V110 remains momentarily the same because of the

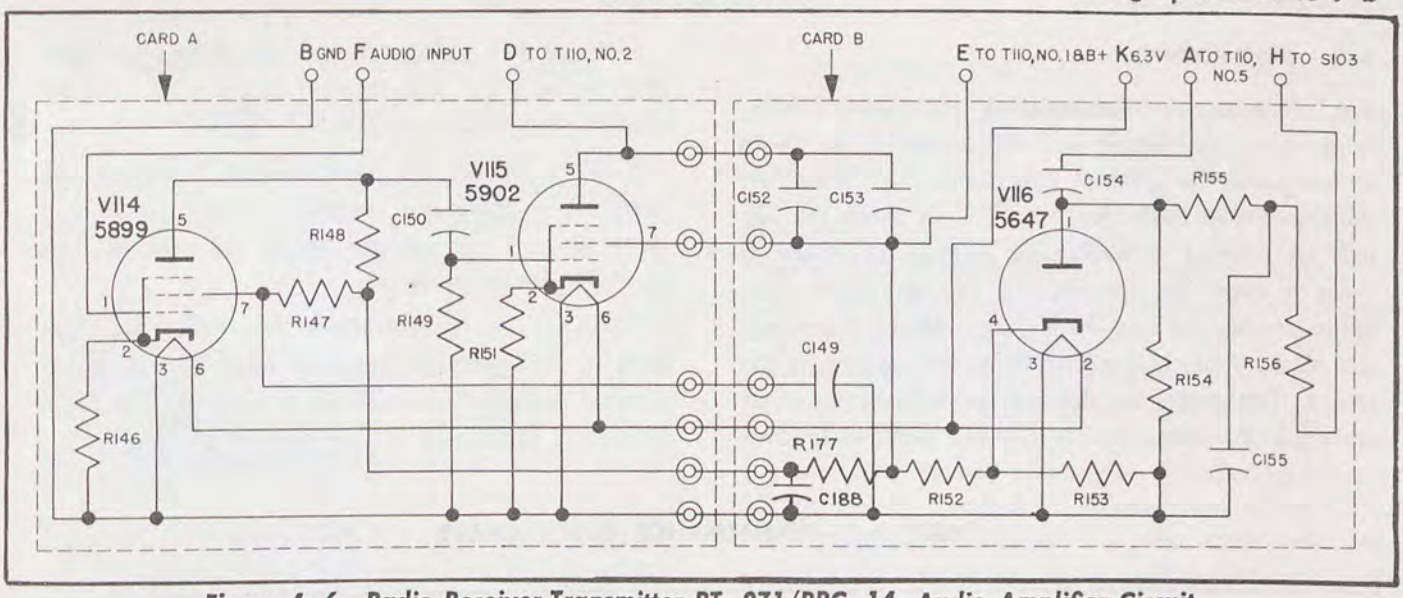

Figure 4–6. Radio Receiver-Transmitter RT–271/PRC–14, Audio Amplifier Circuit

time constant of resistor R137 and capacitor C145 in the grid circuit of V110. When the plate voltage on V113 exceeds the plate voltage on V110, the diodes stop conducting, and the AF input is cut off for the duration of the pulse. Connection of capacitor C144 and resistor R136 from the junction of diode load resistors R133 and R134 to the plate of diode V111 provides a low impedance noise path. This produces an accelerating action tending to amplify the effectiveness of the noise limiter. Since the application of a noise pulse to the circuit places the plate of V110 at a lower potential than that of V113, a negative potential relative to V113 is impressed upon the plate of V110, assuring a simultaneous stop when the diodes cease conducting. The modulation voltage at that instant will be held stationary, as there is no path for a discharge current through capacitor C146. When noise ceases, the diodes again conduct, and the voltage across C146 follows the instantaneous level. Potentiometer R175 is adjusted, when replacing V110 and/or V113, to correct for any changes in tube characteristics.

4–29. The squelch action in this circuit is characteristic of the type of noise limiter described above. Under zero signal conditions with the squelch switch S102 open (squelch ON), resistor R142 is added in series with resistor R140, which then comprise the plate load of V110. The plate voltage of V110 is now lower than the plate voltage of V113, and the diodes V111 and V112 do not conduct. Upon arrival of a carrier of predetermined strength, the voltage drop in the plate circuit of V110 becomes less than the corresponding drop in the circuit of V113, which causes the anode voltage of diode V111 to exceed the cathode voltage of diode V112, and the diodes conduct intelligence in the normal manner. The squelch threshold control, potentiometer R125, permits muting the receiver output over a range of carrier strengths from 2.5 to 5 microvolts when the SQUELCH switch is ON.

4–30. AUDIO AMPLIFIERS. The output from the noise limiting and squelch circuit is transferred through the volume control R144 and coupling capacitor C147 to the grid of the first audio amplifier tube V114. Both audio amplifiers work exactly the same in reception as they do in speech transmission, except that their output is now inductively coupled to the 500 ohm secondary of T110 instead of the modulation winding. The 500 ohm winding is connected to a pair of head-phone terminals on J107.

SECTION V

ORGANIZATIONAL AND SQUADRON MAINTENANCE

5–1. GENERAL.

5–2. This section describes maintenance procedures to be followed by organizational and squadron personnel. Maintenance not described in this section should not be attempted.

5–3. TEST POINTS.

5–4. Procedures for determining and isolating faulty components, assemblies, and sub-assemblies by means of test points are given in this section. Test points are those points in Radio Set AN/PRC–14 where test signals are injected or instrument readings are taken in order to check the operation of the equipment. Test points are divided into three classes: Major, Secondary, and Minor. Only Major Test Points will appear in this section. Test points are denoted symbolically upon the schematic diagrams (figures 7–3 and 7–6), as follows:

1. Major Test Points—Major Test Points are identified by an arabic numeral enclosed in a star and are referred to in the text as Test Point ① etc.

2. Secondary Test Points—Secondary Test Points are identified by upper case (capital) letters enclosed in a circle Ⓑ and are referred to in the text as Test Point Ⓐ Test Point Ⓑ etc.

3. Minor Test Points—Minor Test Points are identified by an upper case (capital) letter and an arabic numeral subscript enclosed in a circle (C_2) and are referred to in the text as Test Point (A_1) (A_2) etc.

TABLE 5–1. PERFORMANCE CHECK CHART

Step	Test Point	Test Equipment Control Position	AN/PRC–14 Control Position	Normal Indication	Possible Cause of Abnormal Indication
1	Terminal A of J105 ①	Set volt-ohm-milliammeter on 250 volt dc range.	PP–855/PRC–14. POWER switch S101 ON.	135 v dc	Battery BB–402/U requires charging. Follow battery instructions when recharging. Vibrator power pack Z201 faulty.
2	Terminal B of J105 ②	Set volt-ohm-milliammeter on 10 volt dc range.	Same as Step 1.	−6 v dc	Battery BB–402/U requires charging. Follow battery instructions when recharging.
3	Tip Jack J111 (red) ③	Connect Ammeter ME–68/PRC–14 to audio jack J107	Connect Power Cable W105. Plug connector P109 on end of W106 into J111. Set POWER switch S101 in ON position. Wait 30 seconds for tubes to warm up and read ME–68/PRC–14.	As indicated by Figure 5–2, Curve A.	Faulty or mistuned oscillator circuit.
4	Tip Jack J112 ④ (brown)	Same as Step 3.	Transfer P109 to J112. Read ME–68/PRC–14.	As indicated by Figure 5–2, Curve B.	Faulty or mistuned first doubler circuit.
5	Tip Jack J113 ⑤ (green)	Same as Step 3.	Transfer P109 to J113. Read ME–68/PRC–14.	As indicated by Figure 5–2, Curve C.	Faulty or mistuned second doubler circuit.
6	Tip Jack J114 ⑥ (blue)	Same as Step 3.	Transfer P109 to J114, SPEECH-TONE switch to SPEECH. Read ME–68/PRC–14.	As indicated by Figure 5–2, Curve D.	Faulty or mistuned final amplifier circuit or third doubler.
7		Connect cable assembly CX–2098/U to J107. Connect microphone to jack JJ–033 and headset to JJ–026. Operate PUSH-TO-TALK switch on microphone.	Set SPEECH-TONE switch in TONE position.	1000 cycle tone heard in phones.	Faulty audio amplifier. Faulty CR-107.
8		Release PUSH-TO-TALK switch.	Set SQUELCH switch to OFF and audio control fully clockwise.	Thermal noise (hissing or frying noise) heard in phones.	Faulty squelch circuit or receiver.

5–5. MINIMUM PERFORMANCE STANDARDS.

5–6. The following check chart, Table 5–1, provides minimum performance standards by which operating personnel may determine if Radio Set AN/PRC–14 is operating satisfactorily. The only instruments needed are Ammeter ME–68/PRC–14, supplied with the Radio Set, and a Simpson Model 260 volt-ohm-milliammeter. All measurements are from the designated test points to ground unless otherwise specified. (The cover of RT–271/PRC–14 must be removed to reach Test Points 3, 4, 5, and 6. For removal procedure see applicable Handbook of Overhaul Instructions.)

5–7. The check chart, Table 5–1, verifies that the transmitter section of RT–271/PRC–14 is operating satisfactorily. As the RF sections of the receiver are pretracked with those of the transmitter section during manufacture, normal operation of the transmitter section is an indirect indication of receiver RF alignment.

5–8. MINOR REPAIR AND ADJUSTMENT.

5–9. POWER SUPPLY PP–855/PRC–14. Examine fuse F201 when replacing vibrator cartridge Z202 because of failure. When vibrator fails, it is likely that F201 will blow because of excessive current flow throughout. A spare fuse F201A and a vibrator cartridge Z202A will be found in the Power Supply. Tune capacitors C203 and C204 alternately for minimum noise output from power supply after connecting AN/PRC–14 equipment for operation in RECEIVE position, with no signal input from antenna and with SQUELCH switch OFF.

CAUTION

When wiring Battery BB–402/U to Power Supply PP–855/PRC–14, connect black battery lead to the Positive (+) terminal of the battery only.

5–10. ANTENNA AT–387/PRC–14. The upper and lower antenna sections E109 and E110, respectively, may be repaired if damaged by pulling them out of the base assembly E111 and inserting replacements. A view of the complete antenna assembly E113 is shown in Figure 4–2. of the Handbook of Overhaul Instructions.

5–11. RECEIVER-TRANSMITTER RT–271/PRC–14. Tubes found to be defective may be replaced if they mount in sockets. Do not attempt to replace wired-in tubes in the noise limiter and squelch assembly and the audio amplifier assembly; but replace the whole assembly and retain defective assemblies for repair by higher echelons of maintenance. Both assemblies are plug-in units. Check performance of transceiver by listening to a signal after replacing tubes in IF stages, as tube replacements may change IF alignment. Most tube replacements will alter performance only slightly; however, if receiver sensitivity is adversely affected, the equipment should be realigned, as described in Section VI, by higher echelons of maintenance. Crystals are also replaceable. When returning tubes V107 and V108 to their respective sockets, care should be taken to match the tube pins to the socket. Tubes in sets received from the factory are indexed by the way in which the leads have been cut. The longest lead is number one and proportionately down to number four, the shortest lead. If replacement of either or both tubes is required, the leads should be extended vertically to their full length and then cut so that they form the same pattern as the defective tube, that is lead one (blue) the longest, lead 2 (yellow) proportionately shorter, lead 3 (plain) shorter again and lead 4 (plain) shortest.

To remove final power amplifier tube V123 for testing or replacement, remove cathode clip which connects inductor L136 and coupling capacitor C178 to the cathode. Remove filament socket X123. Remove the tube from the grid spring on cavity T112 by applying a steady pull along the longitudinal axis of the tube.

NOTE

If the grid spring on T112 is very stiff, removal of V123 may be accomplished by gently prying between the grid of V123 and the grid spring on T112.

5–12. LUBRICATION.

5–13 .No lubrication is required except upon overhaul.

5–14. INSPECTION SCHEDULE.

5–15. Table 5–2. lists components and parts of Radio Set AN/PRC–14 which require regular inspection.

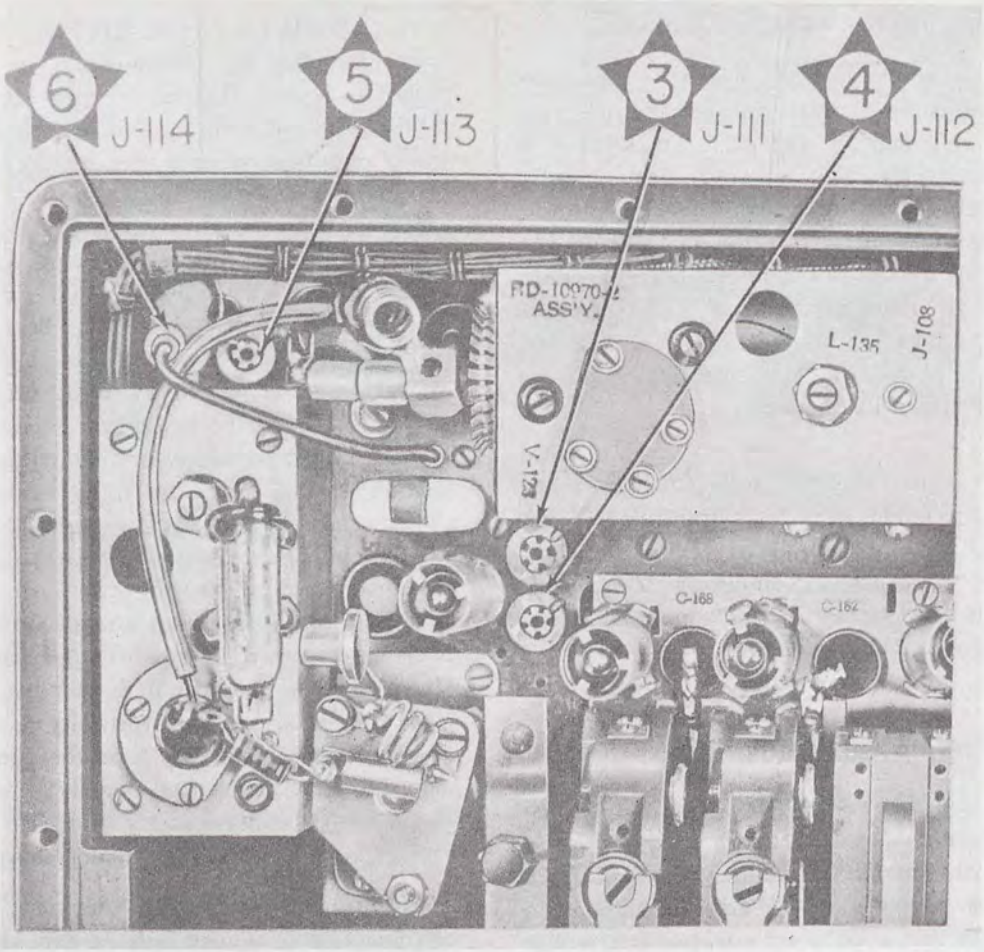

Figure 5–1. Radio Set AN/PRC–14, Test Points for Organization and Squadron Maintenance

TABLE 5–2. INSPECTION SCHEDULE

Component	Inspection	Time
Power Supply PP–855/PRC–14		
1. Battery BB–402/U.	1. Follow battery instructions.	10 hours
2. Vibrator Z202.	2. Output voltage approximately 135 V. Replace if there is no output and battery voltage is 5.7 v dc. or above. Also replace if Fuse F201 blows.	100 hours
3. Fuse F201.	3. Inspect for continuity.	As required.
Antenna AT–387/PRC–14		
1. Upper and lower sections.	1. No bends, dents, or other damage to metal.	10 hours
2. Base.	2. Strap assembly E112 securely anchored to base.	10 hours
Receiver-Transmitter RT–271/PRC–14		
1. Connections.	1. Mechanically secure and not corroded.	100 hours
2. Tubes, Crystals, and Plug-in Assemblies.	2. Firmly seated in sockets.	100 hours
Cable Assemblies. CX–2097/U and CX–2098/U	Verify function by use in equipment. If equipment function is faulty, inspect carefully for continuity and connector shorts.	100 hours

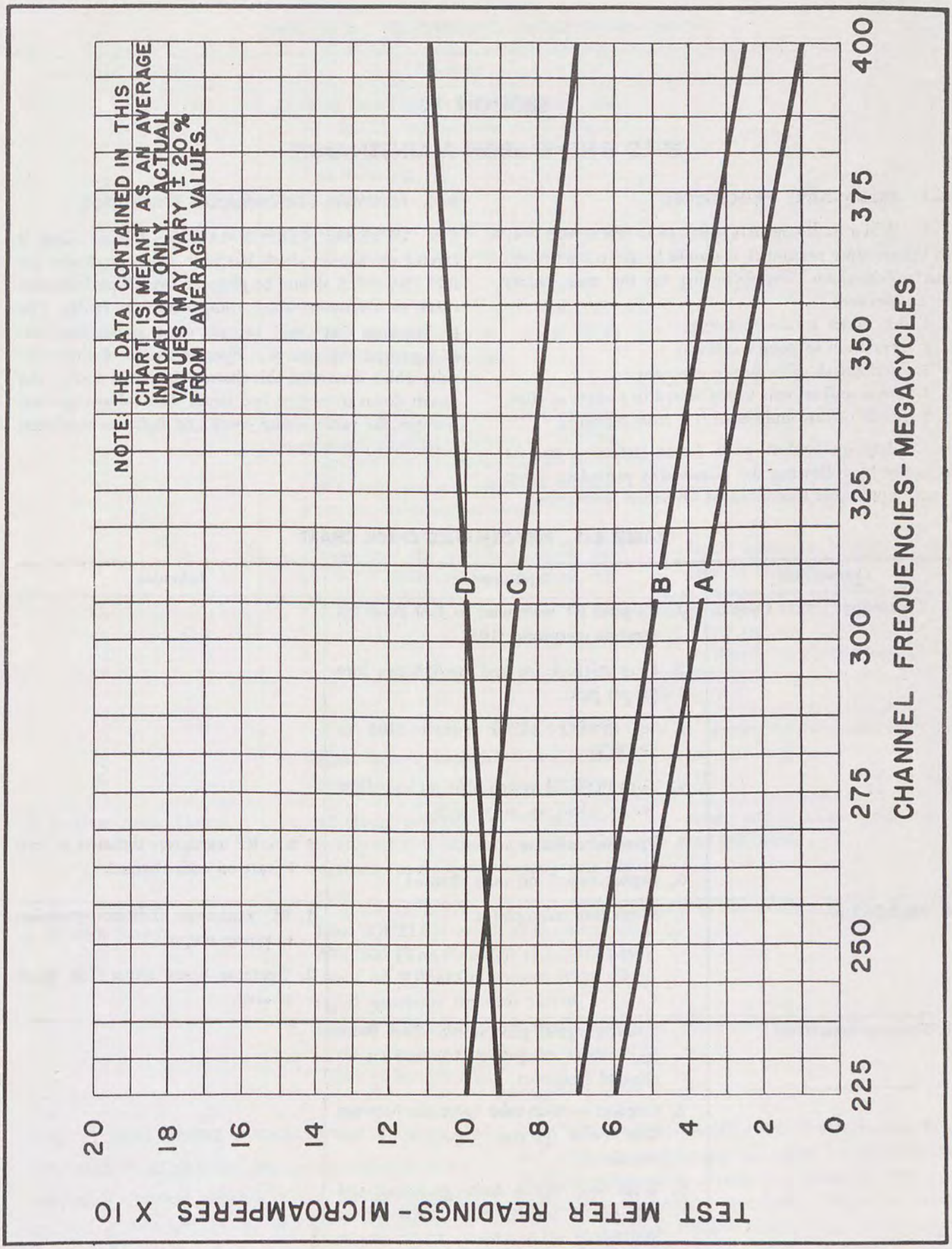

Figure 5–2. Radio Receiver-Transmitter RT–271/PRC–14, Tuning Curve

SECTION VI

FIELD AND FASRON MAINTENANCE

6–1. PRELIMINARY PROCEDURES.

6–2. When Radio Set AN/PRC–14 is first turned over to maintenance personnel, it should be given a thorough mechanical check. The following are the main points to be checked:

1. All solder connections firm.
2. Insulation in good condition.
3. Mechanical parts firmly mounted.
4. Tubes and crystals firmly seated in sockets or clips.
5. Inside of case and chasis free from moisture.

6–3. Any mechanical parts found defective can be removed by following the disassembly procedure given in the applicable Handbook of Overhaul Instructions.

6–4. MINIMUM PERFORMANCE STANDARDS.

6–5. OVERALL PERFORMANCE CHECK. After a careful mechanical check has been made on Radio Set AN/PRC–14, it should be given an overall performance check to determine which components are faulty. The performance check will, in most cases, isolate the fault to a general characteristic. Specific checks of those circuits which determine this characteristic will narrow the search down to one or two items. The following chart outlines the performance check and indicates minimum performance standards.

TABLE 6–1. PERFORMANCE CHECK CHART

Characteristic	Procedure	Indication
a. Transmitter Power Output.	1. Connect RF wattmeter to Test Point Ⓐ, antenna receptacle J103. 2. Plug microphone and headphones into proper jacks. 3. Set SPEECH-TONE switch S103 to SPEECH. 4. Turn POWER switch S101 on and allow Set to warm up 30 seconds. 5. Press microphone button. 6. Repeat step 5 on each channel.	5 & 6. RF wattmeter indicates at least 1 watt on each channel.
b. Modulation.	1. Speak into microphone.	1. RF wattmeter indicates variation in power output. 2. Operator hears himself in headphones.
c. Receiver Sensitivity.	1. Connect signal generator to Test Point Ⓐ, antenna receptacle J101 and set on channel frequency. 2. Connect vacuum tube voltmeter between Test Point Ⓑ (see Figure 7–3) and chassis. 3. With zero signal from generator and SQUELCH switch S102 OFF adjust SQUELCH control for —2.7 volts at Test Point Ⓑ.	

TABLE 6–1. PERFORMANCE CHECK CHART (Cont.)

Characteristic	Procedure	Indication
	3. With zero signal from generator and SQUELCH switch S102 OFF adjust SQUELCH control for −2.7 volts at Test Point. Ⓑ	
	4. Connect audio power output meter to Test Point Ⓓ and set impedance to 500 ohms.	
	5. Adjust AUDIO GAIN control R144 for 0.5 milliwatts output.	
	6. Turn on 1000 cps plus carrier modulation and adjust percentage to 30. Tune generator for maximum audio output and adjust generator output to 50 milliwatts on audio output meter.	
	7. Repeat until the modulated audio output is 50 milliwatts and the noise output is 0.5 milliwatts.	7. Signal generator attenuator indicates as follows: *Type* *Frequency* *Indication* TS–497/URR 225-350 mc 5 microvolts or less 350-400 mc 10 microvolts or less Hewlett-Packard Model 608-A 225-350 mc 20 microvolts or less 350-400 mc 40 microvolts or less
	8. Repeat Steps 1 through 12 on the other channels.	8. Same as Step 12.
d. Receiver Audio Ouput.	1. Set signal generator to 10 microvolts, modulated 30% at 1000 cps and tune for maximum audio power output with full gain.	1. Power output meter reads 150 to 200 milliwatts.
e. Squelch Action.	1. Turn SQUELCH switch S102 on and set AVC bias (Test Point Ⓑ) at −3 volts by means of SQUELCH control R125. Set signal generator for zero output.	
	2. Increase modulated signal until squelch opens, as indicated by rush of noise and signal in headphones.	2. Generator indicates 2.5 to 5 microvolts.

6–6. SYSTEMS (TROUBLE) ANALYSIS.

6–7. PARTS REMOVAL. No special instructions for removal of electrical parts are needed. Mechanical parts removal is discussed in the applicable Handbook of Overhaul Instructions.

6–8. CIRCUIT BREAKDOWN. The following Table 6–2 provides a step-by-step procedure for determination of faulty components, circuits, and parts. All test point connections are between test point and ground unless otherwise specified. Remove chassis from case for access to some test points.

TABLE 6–2. SYSTEMS TROUBLE ANALYSIS CHART

Step	Test Point	Test Equip. Control Position	AN/PRC–14 Control Position	Normal Indication	Possible Cause of Abnormal Indication
1			POWER switch S101 in ON position.	All visible tubes lighted.	Power Supply (see step 2). Tube burnout.
2	Ⓔ ON contact of S101A	Voltmeter on 10 vdc scale.	Same as Step 1.	Voltmeter indicates −6 v dc.	Battery BB/402–U low. Faulty switch S101.
3	Ⓕ Terminal 7 K102	Voltmeter on 150 vdc scale.	Same as Step 1.	Voltmeter indicates 135 v dc.	Battery BB/40-U low. Faulty vibrator. Faulty switch S101.
4	Ⓖ Tip Jack J111	Ammeter ME/68–PRC/14 in J107	Same as Step 1.	See Fig. 5–2, Curve A.	Tube V117 or associated components. Turrets O-102 and O141 or their contacts.
5	G_1 coil L118, L119, L120 or L121.	Wavemeter coupled closely to coil.	Same as Step 1.	Wavemeter indicates crystal frequency.	Faulty crystal. Spurious harmonic.
6	Ⓗ Tip Jack J112	Same procedure as Step 4.	Same as Step 1.	See Fig. 5–2, Curve B.	Tube V118 or associated components. Turret O103 or its contacts.
7	H_1 Coil L122, L123, L124 or L125.	Same as Step 5.	Same as Step 1.	Wavemeter indicates twice crystal frequency.	Same as Step 5.
8	Ⓘ Tip Jack J113	Same procedure as Step 4.	Same as Step 1.	See Fig. 5–2, Curve C.	Tubes V119 and V121 or associated components. Turret O104 or its contacts.
9	I_1 Coil L126, L127, L128 or L129.	Same as Step 5.	Same as Step 1.	Wavemeter indicates four times crystal frequency.	Same as Step 5.
10	Ⓙ Pin 4 of V121	Same procedure as Step 3. Set VTVM to 50 v dc range.	Same as Step 1.	VTVM indicates between −17 and −17.5 v dc.	Coil L131 off alignment. Tube V121 faulty. Crystal Y106 faulty.
11	J_1 Coil L131	Same as Step 5.	Same as Step 1.	Wavemeter indicates 27 mc.	Crystal Y106 faulty.
12	Ⓚ Pin 4 of V122.	Same procedure as Step 3. Set VTVM to 50 v dc range.	Same as Step 1.	VTVM indicates at least −14 vdc.	Faulty tube V120. Faulty capacitor C165.
13	Ⓛ Receptacle J108.	Wattmeter set to 2 w scale. Connect to test point.	Same as Step 1 except W101 disconnected.	Wattmeter indicates 1 watt or more.	Cavities T111 and/or T112. Tubes V122 and/or V123.
14	Same as Step 13	Same as Step 13.	Whistle loudly into microphone.	Watttmeter drops slightly.	Audio system. Tube V116. Bad microphone.
15	M_1 Junction of R127 and C139	VTVM set to 10 v dc range.	SQUELCH switch S102 off, set AVC bias at test point to −2.7 volts with SQUELCH control R125.		Tubes V103, V104, V105 and/or V106. Incorrect alignment.

TABLE 6–2. SYSTEMS TROUBLE ANALYSIS CHART (Cont.)

Step	Test Point	Test Equip. Control Position	AN/PRC-14 Control Position	Normal Indication	Possible Cause of Abnormal Indication
15 Cont'd	Ⓜ Pin 7 of V103 (M_2) AVC Terminal of T108	Signal generator connected to test point through 0.001 uf capacitor; modulation OFF; frequency set to 3.5 mc ± 1 kc.	Transfer VTVM to Test Point (M_2) Set generator attenuator so that VTVM indicates at least −2 volts at test point.	Signal generator attenuator indicates 70 microvolts or less.	
16	Ⓝ Pin B of Receptacle J107	Same, attenuator setting as Step 15; signal generator modulation on; set modulation to 30%, at 1000 cps; audio power output meter connected to test point.	Same as Step 15; volume control R144 at maximum.	Output meter indicates 250 milliwatts or more.	Noise limiter assembly. Audio amplifier.
17	Ⓞ Pin 4 of V109	VTVM set to −30 vdc range. 1 megohm resistor in series with probe.	Receiver section ON.	VTVM indicates −14 volts.	Tube V109. Crystal Y101. Coil L117 adjusted improperly.
18	Ⓟ Pin 4 of V101	Signal generator set at 54 mc ± 1 kc. Use 0.001 uf capacitor in series with generator.	Same as Step 15.	Signal generator attenuator indicates approximately 5 microvolts.	Tube V102. Transformer T104 alignment. Cavities T101 and T102.
19	Ⓠ Receptacle J103	Signal generator set to channel frequency. 1000 cps 30% modulation ON. Zero output. Audio power output meter connected to Test Point Ⓝ.	Squelch switch S102 ON. Bias at Test Point (M_1) −2.7v Volume control R144 at maximum.	Noise output 1 milliwatt or less.	
		Increase output by adjusting attenuator.	Bridge crystal headphone across output meter.	Squelch opens (rush of noise and signal) at 2.5 to 5 microvolts. Audio power output meter reading increases suddenly.	Tube V110 or associated components.
20	Ⓡ Terminal 4 of K102	Audio oscillator set to 1000 cps at amplitude of 0.9 volts rms at test point.	Same as Step 17.	Output meter indicates 1000 milliwatts or more.	Tube V114.
21	Ⓢ Terminal C of J107	Audio oscillator set to 1000 cps at amplitude of 0.1 volt rms at test point.	Terminals F & H of J107 shorted. S103 on SPEECH.	AF voltmeter measures 0.55 volt at Test Point Ⓡ.	Transformer T109 and associated filter components. Relay K102.
22	Terminal 4 of K102	AF voltmeter set on 3 volt rms scale.	Terminals F & H shorted. S103 on TONE.	AF voltmeter measures 1.0 volt rms at test point Ⓡ.	Tube V115. Resistor R150 and/or R173. Switch S103.

6–9. TUBE SOCKET VOLTAGE AND RESISTANCE CHART. (See Figure 7–2.)

6–10. ALIGNMENT AND ADJUSTMENT.

6–11. IF ALIGNMENT. Whenever a tube is changed in the IF stages of the receiver, the stages should be checked and realigned if necessary. With the AVC bias at Test Point (M1) set to –2.7 volts with the dc vacuum tube voltmeter, the 3.5 mc. signal generator output required at the grids of the IF tubes for a reading of —2 volts at Test Point (M2) (AVC Terminal of T108) should be as follows:

V106 (3rd IF)	70000 microvolts
V105 (2nd IF)	3000 microvolts
V104 (1st IF)	150 microvolts
V103 (2nd mixer)	70 microvolts

Input levels appreciably greater than those given above indicate the need for IF alignment. IF stages should be aligned from transformer T108 backward. The procedure is as follows:

1. Connect signal generator to grid of tube preceding transformer to be aligned. Clip 1000 ohm resistor across grid and ground terminals (secondary) of transformer. Adjust top core of transformer for maximum voltage at Test Point (M2) with alignment tool.

2. Remove power, transfer 1000 ohm resistor to plate and B+ terminals of transformer and again apply power. Adjust bottom core for maximum voltage at Test Point (M2). Remove the 1000 ohm resistor. This completes alignment of the stage.

NOTE

Always adjust generator to keep maximum voltage at Test Point (M2) at —3 volts or below and generator frequency within ±2 kc of 3.5 mc. Adjustment of the 54 mc IF amplifier stages is the same except that the signal generator should be set to 54 mc ±10 kc and its output applied between Test Point (P) and ground. The 1000 ohm resistors are not required across the 59 mc transformers. Signal generator output should be approximately 5 microvolts with voltages at Test Points (M1) and (M2).

6–12. CHANNEL SELECTOR AND TURRET ADJUSTMENT. Channel selector adjustment will become necessary if channel frequency assignments are changed. Following is the adjustment procedure. (Refer to Figure 6–1.)

1. Remove the cover, exposing the top of the chassis.

2. Plug Ammeter ME–68/PRC–14 into Jack J107.

3. Set CHANNEL SELECTOR switch on Channel 3. This brings Channel #1 crystal into position for replacement.

4. Select the proper channel crystal and plug in. The crystal frequency can be determined by the following formula:

$$f = \frac{F - 54}{8}$$

where f = crystal frequency
and F = channel frequency.

5. Rotate CHANNEL SELECTOR switch to Channel #1.

6. Insert plug P109 (normally in J114) into J111. Apply power and allow Transceiver to warm up 60 seconds.

NOTE

All clockwise movements of coils and channel selector lead screw represent increases in frequency.

7. Adjust oscillator turret coil with alignment tool through hole A in bottom of case nearest channel selector assembly. Maximum reading on Ammeter ME–68/PRC–14 is an indication of correct adjustment. This reading should agree closely with that given by Curve A of Figure 5–2.

8. Transfer P109 to J112 and adjust ceramic coil form in doubler turret (use middle hole marked B in bottom of case) for a maximum indication on the Ammeter. This should agree closely with that given by Curve B of Figure 5–2.

9. Transfer P109 to J113 and adjust second doubler coil (use hole C in case, farthest away from channel selector assembly) for a maximum indication on the Ammeter. This should agree closely with that given by Curve C of Figure 5–2.

10. Transfer P109 to J114. Adjust channel selector screw with screwdriver through hole in housing. This is reached by removing the yellow plug in the hub of the channel selector knob. Adjust for maximum power output, indicated by a peak reading on the Ammeter. This reading should agree closely with that given by Curve D of Figure 5–2.

6–13. This completes the channel selector and turret adjustment for the first channel. The other channels should be adjusted, in numerical order, in the same manner as above.

6–14. TRACKING PROCEDURE FOR RECEIVER-TRANSMITTER-271/PRC–14. In the event that it becomes necssary to repair or replace belts, pulleys, cavities, or channel selector, the transceiver will require some degree of retracking according to the procedure below:

1. Mount uncased Receiver-Transmitter on solid base to simulate bolting to case bosses.
2. Loosen all pulley set screws.
3. Rotate channel selector until cam follower pin is on the highest point of the channel selector cam.
4. Manually set all variable capacitors to maximum capacity (rotor plates fully meshed with stator plates.)
5. Lock all pulley set screws.
6. Set L101, L103, I.132, L135, at a 45° angle to the transmission bar with which they are associated. Lock in place.
7. Make sure that the output coupling loop in the third doubler cavity T111 is positioned so that its outer edge points directly at the lower inside long edge of the cavity.
8. Rotate channel selector until crystal socket Y104 and coils I120, L124 and L128 are in contact with the oscillator-doubler chassis.
9. Insert a 43.25 mc crystal in Y104. Insert additional crystals into Y102, Y103 and Y105. These crystals should have frequencies which will divide the band into approximately equal segments.

6–15. This completes the general procedure. The transmitter procedure is given below:

1. Connect wattmeter to J108 (test point Ⓛ)
2. Connect pin 2 of relay K102 to ground (Blue-Orange lead).
3. With Y104 in position, turn the channel selector lead screw until all variable capacitors are at minimum capacity (rotor plates completely unmeshed with stator plates.)
4. Using Test Oscillator Set AN/PRN–10, roughly tune the mixer tank circuit to 200 mc by compressing or spreading L130 as required.
5. Using Test Oscillator Set AN/PRN–10, roughly tune the third doubler tank circuit T111 and the final power amplifier T112 to 400 mc. by bending the silver straps which connect the stator bars with the center points of C176 and C181 respectively.

CAUTION

The silver straps should not be allowed to touch any points in their respective cavities other than the stator bars and the center points of C176 and C181. Failure to observe this caution will result in a high voltage short circuit.

6. Pull channel selector rocker arm fully back and verify, by using Test Oscillator Set AN/PRN–10, that the mixer tank circuit tunes to at least 110 mc and that the third doubler and final power amplifier tune to at least 225 mc.
7. Apply power to the Receiver-Transmitter.
8. Tune oscillator, first doubler, second doubler and 27 mc oscillator for maximum indication on a DC vacuum tube Voltmeter connected between the grid and ground of the stage following the one being tuned. After tuning 27 mc oscillator to maximum output, back off on the slug of L131 one-half turn.
9. Some power should now be indicated on the wattmeter. Maximize power by readjusting L130 and the silver straps and by either spreading or compressing cathode coil L136 of the final power amplifier.

NOTE

From this point onward, L130, L136 and the silver sraps should not be touched.

10. Rotate channel selector to next lower channel and tune oscillator and doubler circuits as described in step 7.
11. Connect DC vacuum tube voltmeter between the third doubler grid (V122) and ground.
12. Turn channel selector lead screw until maximum indication is obtained on vacuum tube voltmeter.

Depending upon the frequency range traversed, several false resonances may be encountered. The correct position of the capacitor plates will give the highest indication on the vacuum tube voltmeter. The position of the pointer on the top of the channel selector will also give an approximate indication of the correct point of tuning.

13. Power output may be maximized by bending those sectors of the rotor plates in the third doubler and final amplifier cavities which have just meshed with their respective stators. Bending should be done gently and with a non-conductive tool. Sectors are bent either towards the stator plates to increase capacity or away from the stator plates to reduce capacity as required.
14. Repeat steps 10-13 on the remaining channels.

6–16. This completes the transmitter procedure and the receiver procedure is given below:

1. Disconnect pin 2 of relay K102 from ground.
2. Connect signal generator tuned to 400 mc to J101.
3. Rotate channel selector so that Y104 is in contact with the oscillator-doubler chassis.
4. Connect DC vacuum tube voltmeter between the grid of the 50.5 mc oscillator (V109) and ground (Test Point Ⓞ).
5. Tune 50.5 mc oscillator by varying the position of the slug in L117 until a maximum indication is obtained on the vacuum tube voltmeter. After maximum indica-

tion is obtained, back off on the slug of L117 one-half turn.

6. Connect audio power output meter between pin 11 of relay K102 and ground.

7. Tune cavities for desired sensitivity at 400 mc by varying C101 in the 1st Receiver Cavity (T101) and the silver srap in T102 (L103 may also be used.)

8. Turn channel selector to next lower channel and retune signal generator.

9. Sensitivity may be maximized by bending the sectors of the rotor plates in the appropriate direction.

NOTE

Do not change the positions of the channel selector lead screw, C101, L103 or the silver strap.

10. Repeat steps 8 and 9 for the remaining channels.

6–17. Final trimming can be accomplished as indicated below:

1. Replace set in case.

2. Connect wattmeter or signal generator to J103 (test points A & Q). Set controls for either receive or transmit as required.

3. Rotate channel selector to channel 4 (400 mc).

4. Since proximity effects caused by the cover and the sides of the case tend to reduce the power, final trimming may be required. For the transmitter cavities, L132, L135 are the devices to be used for final trimming. For the receiver cavities, L101 and C201 are the final trimming devices.

5.Observe the effect of the cover on the mixer tank circuit by watching the variation in power output as the cover is placed on the set. Adjust L130 as outlined in step 4 of the transmitter section until maximum power is obtained with the cover on.

6–18. ADJUSTMENT OF BALANCING POTENTIOMETER R175.

1. With squelch ON, set voltage at Test Point (M1) to –2.7 V dc.

2. Connect Signal Generator to jack J103.

3. Turn on 30% modulation and adjust generator output to approximately 2.5 uv.

4. Adjust R175 until "rush noise" and signal disappear.

5. Check adjustment by increasing generator output to 5 uv. Noise and signal should return.

6–19. LUBRICATION. No lubrication is required except upon overhaul.

6–20. MAINTENANCE AND INSPECTION.

Table 6–3 indicates components and parts over and above those listed in Section 5 which require inspection, maintenance, and replacement at specific times.

TABLE 6–3.MAINTENANCE AND INSPECTION SCHEDULE

Component	Inspection or Maintenance	Time
TRANS-CEIVER		
1. Turrets	1. Inspect contacts and clean if necessary.	500 hours
2. Tubes	2. Check on Tube Tester.	500 hours

6–21. OVERHAUL SCHEDULE. Radio Set AN/PRC–14 should be overhauled every 1000 hours of operation.

SECTION VII
DIAGRAMS

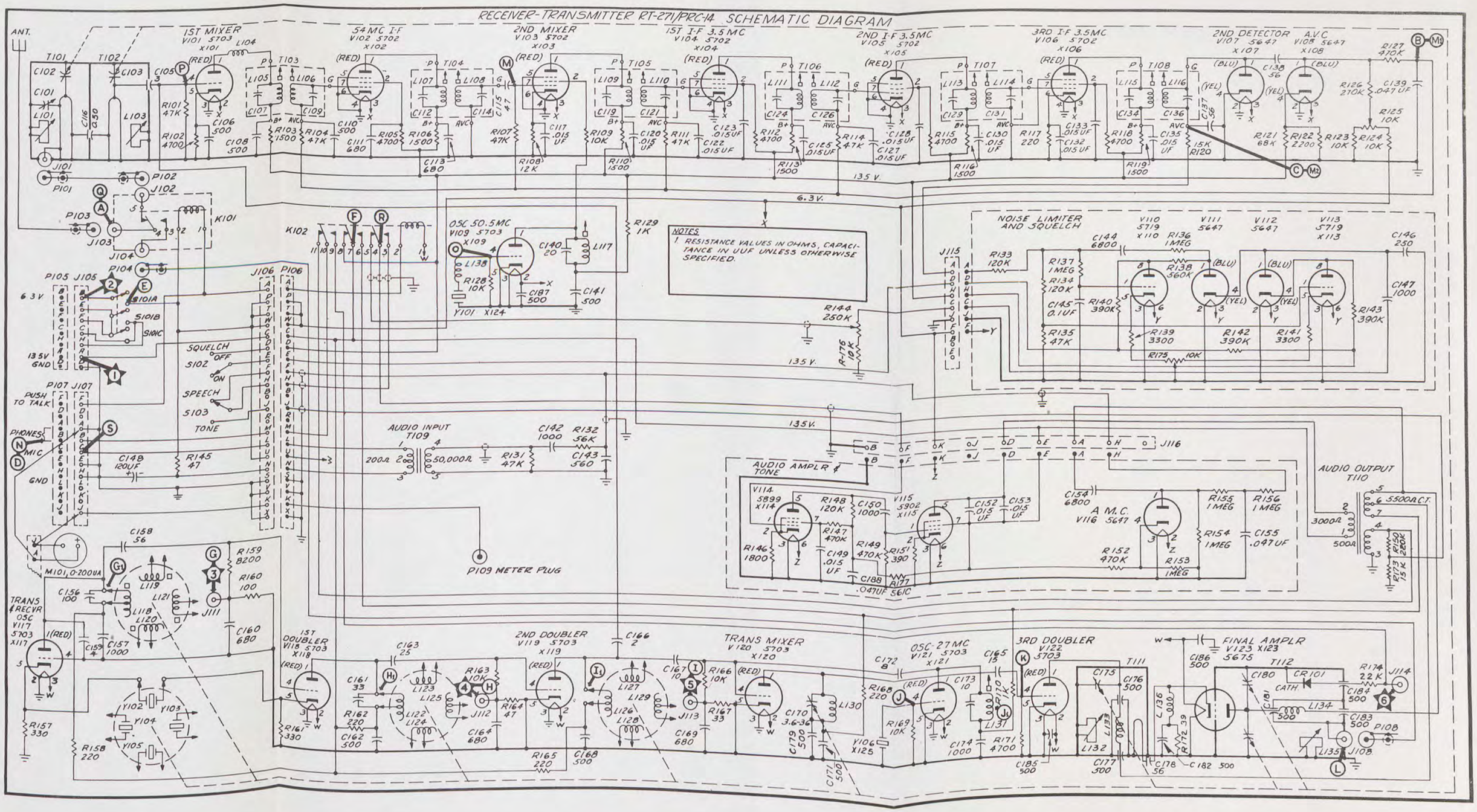

Figure 7–3. Radio Receiver-Transmitter RT–271/PRC–14, Schematic Diagram

REVISED 15 DECEMBER 1953

ALPHABETICAL INDEX—(cont.)

ALPHABETICAL INDEX—(cont.)

AN16–30PRC14–2

HANDBOOK

SERVICE INSTRUCTIONS

RADIO SET AN/PRC-14

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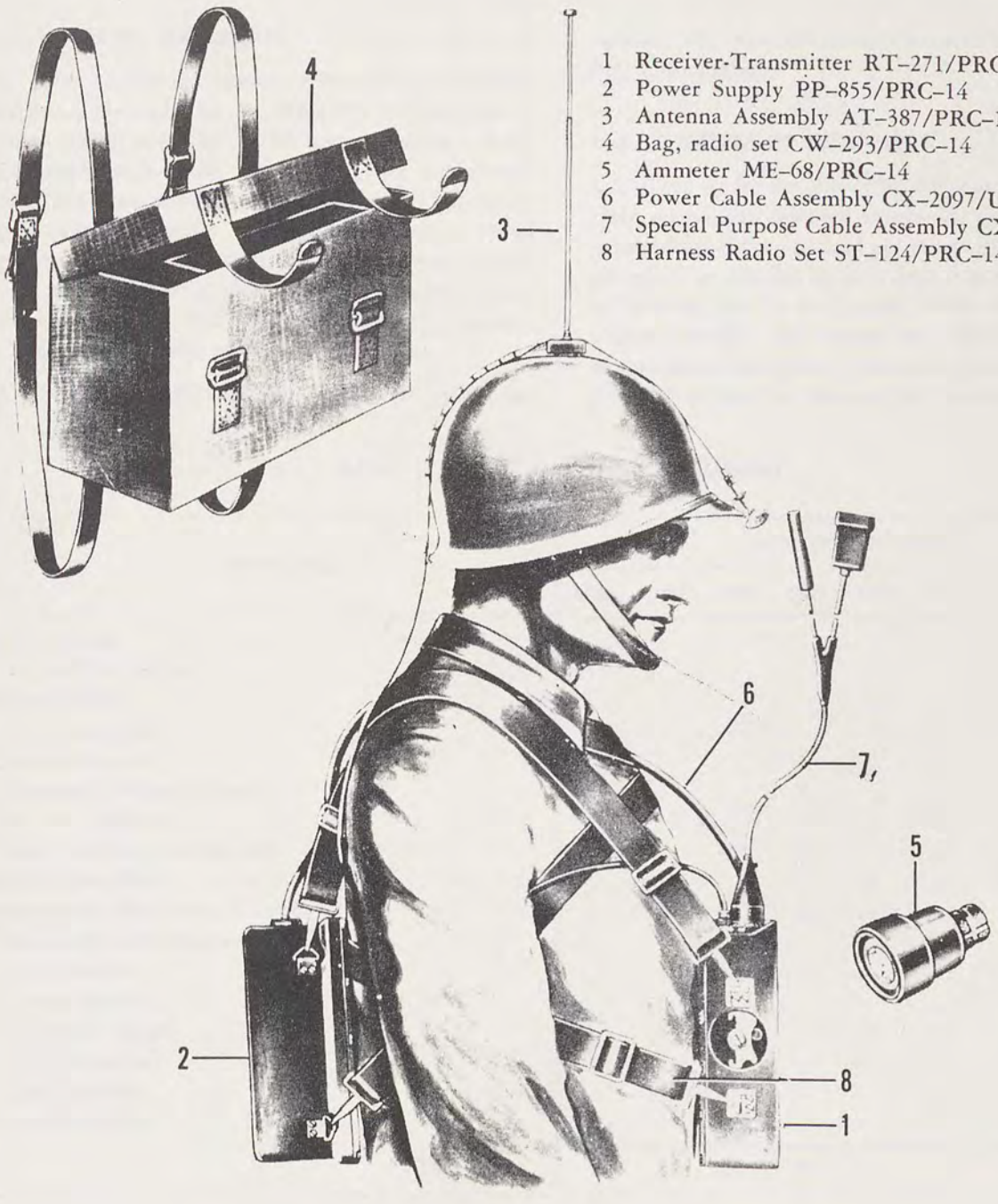
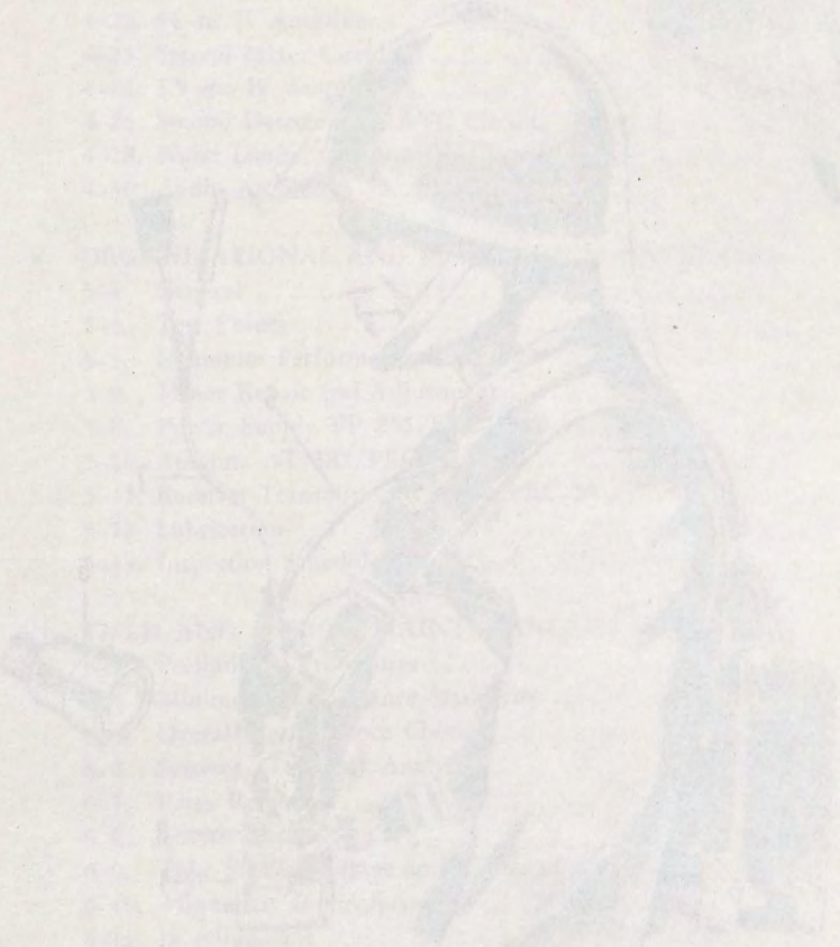


Figure 1–1. Radio Set AN/PRC–14, Components of



SECTION I

DESCRIPTION AND LEADING PARTICULARS

1–1. SCOPE OF HANDBOOK.

1–2. This handbook contains service and maintenance instructions for Radio Set AN/PRC–14. It is intended to be used by all echelons of maintenance except those which perform a major overhaul of the equipment. Service and maintenance as described in this handbook include trouble analysis, removal and replacement of parts found to be defective by this analysis, minor repairs and adjustments, lubrication, periodic inspection, and performance of final tests for determining whether the equipment is again suitable for operation.

1–3. TUBE COMPLEMENT. Table 1–1 lists the vacuum tube complement by function, JAN type number, and quantity.

1–4. PURPOSE OF EQUIPMENT.

1–5. The Radio Set AN/PRC–14 is an easily portable UHF transceiver designed to provide line-of-sight communication between ground personnel and aircraft. With aircraft at an altitude of 5000 feet or more operation up to 30 miles may be anticipated. With aircraft at lower altitudes terrain will control the reliability and range of operation. Emergency ground-to-ground operation is practical within the line-of-sight limitations.

TABLE 1–1. VACUUM TUBE COMPLEMENT

FUNCTION	JAN TYPE NUMBER							
	5702	5703	5719	5647	5899	5902	5675	Totals
First Mixer	..	1	..	..	..	..	..	1
54 mc IF Amplifier	1	..	..	..	..	..	..	1
Second Mixer	1	..	..	..	..	..	..	1
3.5 mc Amplifier	3	..	..	..	..	..	..	3
Second Detector	..	..	..	1	..	..	..	1
Automatic Volume Control	..	..	..	1	..	..	..	1
50.5 mc Oscillator	..	1	..	..	..	..	..	1
Noise Limiting and Squelch	..	..	2	2	..	..	..	4
Audio Amplifier	..	..	..	..	1	1	..	1
Automatic Modulation Control	..	..	..	1	..	..	..	1
Transmitter and Receiver Oscillator	..	1	..	..	..	..	..	1
First Doubler	..	1	..	..	..	..	..	1
Second Doubler	..	1	..	..	..	..	..	1
Transmitter Mixer	..	1	..	..	..	..	..	1
27 mc Oscillator	..	1	..	..	..	..	..	1
Third Doubler	..	1	..	..	..	..	..	1
Final Amplifier	..	..	..	..	..	..	1	1
TOTALS	5	8	2	5	1	1	1	23

1–6. REFERENCE DATA.

1–7. FREQUENCY RANGE. The frequency range is 225 to 400 megacycles, but only one of four pre-set (crystal-controlled) frequencies is selectable at one time by a four-position selector switch.

1–8. OUTPUT CHARACTERISTICS. A switch on the side of the case enables the transceiver to operate on either type A–2 (mcw) or type A–3 (speech) emission. An automatic modulation control permits only 50% modulation. The transmitter section final amplifier has a power output of approximately one watt.

1–9. RECEPTION CHARACTERISTICS. The sensitivity of the receiver section with the squelch circuit inoperative is approximately 5 microvolts. However, with the squelch circuit operative, the level at which signals become audible is variable between threshold sensitivity and 10 microvolts. These characteristics make possible the elimination of background noise which the operator may find objectionable. Selectivity is 85 kc at —6 db and 225 kc at —60 db. The receiver section audio amplifier delivers a power output of 250 milliwatts into a pair of 500 ohm headphones.

1–10. POWER REQUIREMENTS. Power requirements for Receiver-Transmitter RT–271/PRC–14 are as follows:

a. Filament Supply: 6.3 v at 5.0 amp.
b. Plate Supply: 135 v at 155 ma (transmit); 135 v at 147 ma (receive).

These requirements are met by a Power Supply PP–855/PRC–14 using a battery BB–402/U.

1–11. CONTROLS.

1–12. GENERAL. All controls are located on Receiver-Transmitter RT–271/PRC–14.

1–13. CHANNEL SELECTOR SWITCH. The channel selector switch selects for use one of the four pre-set operating channels. It is located on one of the sidefaces of the transceiver and has a hinged knob which should be folded against the case when not in use.

1–14. POWER CONTROL SWITCH. The power control switch S101 is located on the opposite side of the case from the channel selector switch, in between the ring clamps for the carrying harness. In the OFF position of the switch, the 6 volt and vibrator input power lines are opened. The SQUELCH switch and the SPEECH-TONE switch are also located in this position.

1–15. SPEECH-TONE SWITCH. The Speech-Tone switch S103 determines whether the carrier will be voice-modulated by speaking into the microphone or whether it will be modulated by an internally-generated 1000 cycle tone.

1–16. SQUELCH SWITCH. The SQUELCH switch S102 controls the operation of the squelch circuit. With the switch in the OFF position the circuit is inoperative and some receiver noise is audible in the headphones at all times. In the ON position, the squelch circuit operates to block all signals which fall below a predetermined level.

1–17. SQUELCH CONTROL. The SQUELCH control R125 determines the level below which audio signals entering the squelch circuit will be blocked. The control shaft protrudes through a hole in the cover of the Radio Set and is slotted for screwdriver adjustment.

1–18. AUDIO GAIN CONTROL. The AUDIO GAIN control R144 regulates the amount of audio signal applied to the first audio amplifier. Its control shaft also protrudes through the cover and is slotted for screwdriver adjustment.

1–19. The two controls just mentioned are located one beside the other, adjacent to the lower right-hand ring clamp. The gain control is nearest the side of the case.

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2–1. GENERAL.

2–2. No special tools or test equipment are used in servicing and maintaining Radio Set AN/PRC–14; however, a listing of typical standard test equipment is shown in Table 2–1.

TABLE 2–1. TYPICAL TEST EQUIPMENT.

Name	AN and/or Mfr's. Type Designation	Application
1. Signal generator, range 2 to 400 mc.	1. (a) Signal Generator TS–497/URR. (b) Hewlett Packard Model 608A.	1. RF signal source for alignment.
2. RF wattmeter, range 0 to 2.5 w.	2. (a) Wattmeter AN/URM–43.	2. RF power output measurement.
3. DC Vacuum Tube Voltmeter, range 0 to 15 v.	3. (a) Voltmeter TS–375/U. (b) RCA Mfg. Co. Model WV–77A (Jr. Voltohmyst).	3. DC voltage and resistance measurements.
4. AF Vacuum Tube Voltmeter, range 0 to 30 v ac.	4. (a) Same as 3. (b) Electronic Multimeter ME–6/U.	4. AF voltage and resistance measurements.
5. Audio Output Power meter, range 0 to 5 w.	5. (a) Output Meter TS–585/U.	5. AF power output measurement.
6. Audio oscillator, balanced output.	6. (a) Audio Oscillator TS–382/U. (b) Hewlett Packard Co. Models 200–B, 205–AG.	6. AF signal source.
7. Wavemeter, range 20 to 400 mc.	7. (a) Test Oscillator Set AN/PRN–10.	7. Frequency measurements.
8. AC-DC volt-ohm-milliammeter, range 0-1000 v dc at 20,000 ohms/volt; 0-1000 v ac at 1000 ohms/volt.	8. (a) Voltmeter TS–189.	8. Voltage and resistance measurements not requiring the sensitivity of an electronic multimeter.

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3–1. GENERAL.

3–2. Radio Set AN/PRC–14 is packed as illustrated in figure 3–1. For overseas shipment the equipment is protected by a wooden packing box. A fiber board packing box replaces the wooden box for domestic shipment.

NOTE

Do not destroy packaging materials after unpacking equipment, but save for possible future use in case of reshipment.

3–3. UNPACKING. The following is the unpacking procedure:

1. Remove nails from top of export container (item 1). Invert container so that outer fiber container (item 9) drops out.

2. Carefully rip open flaps of outer fiber container and tilt so that contents slide out. Open other end of container and collapse for storage.

3. Cut seam of barrier (item 6) directly in back of seal. Slide barrier away.

4. Slit tape on intermediate container (item 8) and open flaps. (After contents have been removed, tape on bottom can be slit and container collapsed.)

5. Lift out carrying bag and remove desiccant from top layer. Lift out tray (item 10). Tray can be collapsed by breaking stapled joint.

6. Remove all boxes from middle layer and open by slitting tape. These boxes contain antenna, cables, harness and ammeter. Ammeter is in folding carton (item 3) which is set in die-cut holder (item 12). Ammeter box is collapsed by opening both ends; holder is collapsed by breaking stapled joint.

7. Open bottom of intermediate container and permit transceiver and power supply box (item 2) to drop out.

8. Open transceiver and power supply box by slitting tape. Remove flat pad (item 7). Transceiver and power supply are then easily accessible. Do not collapse radio pads (items 13, 14, 15, 16, 17, and 21), as they store well in set-up form.

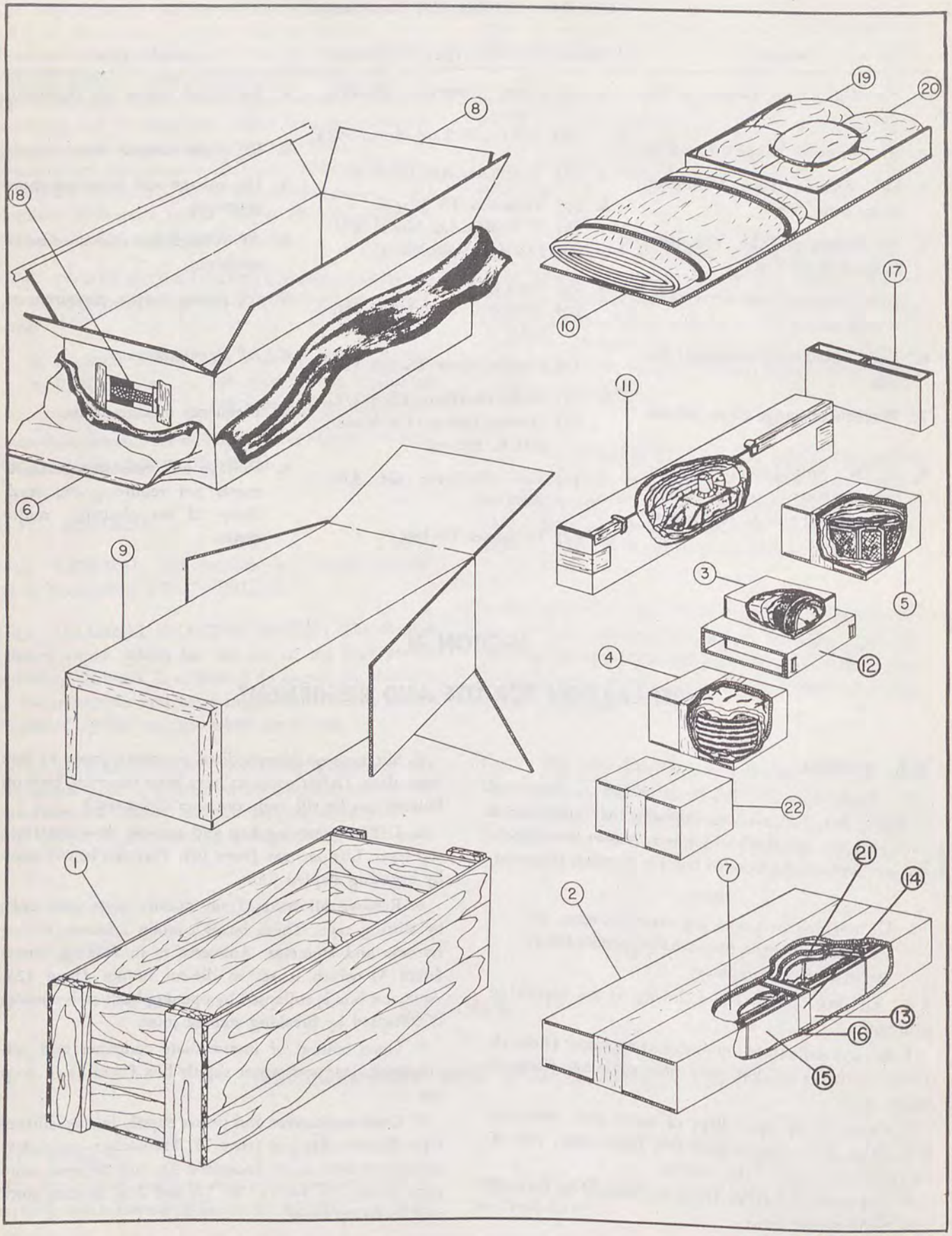


Figure 3–1. Radio Set AN/PRC–14, Unpacking and Packing Procedures

3–4. All components should now be placed in Radio Set Bag CW–293/PRC–14 for distribution to operating personnel.

3–5. PREPARATION FOR USE. Instructions on preparing Radio Set AN/PRC–14 for use after receipt by operating personnel will be found in the applicable handbook of Operating Instructions.

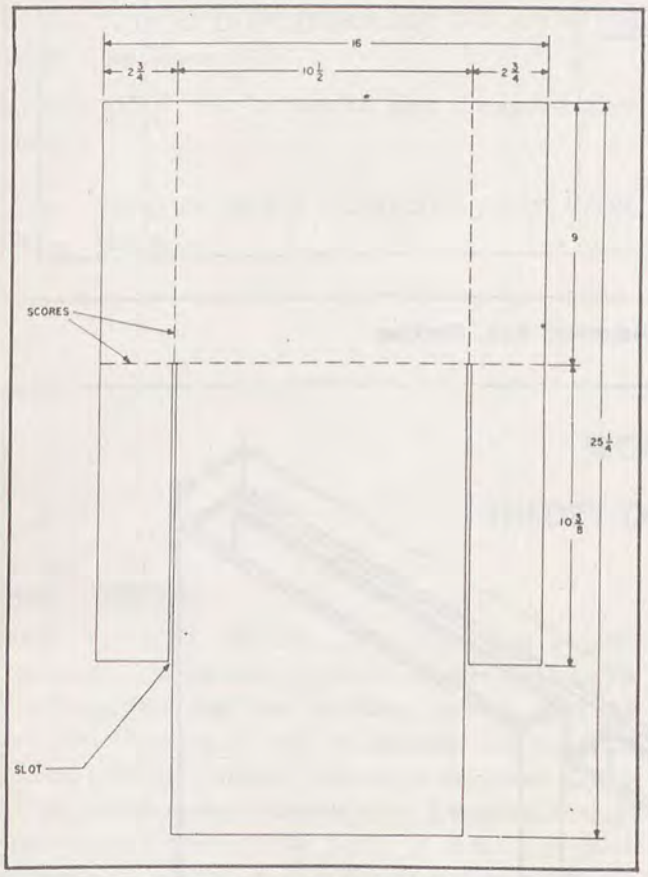


Figure 3–2. Tray, Packing

3–6. RESHIPMENT. Packing of Radio Set AN/PRC–14 for reshipment to higher echelons of maintenance is the reverse of unpacking. For the convenience of the shipping echelon, a bill of packaging material follows (all dimensions are in inches).

3–7. ITEM 1. EXPORT CONTAINER. Style #4 wooden box per JAN–P–106A for wt. 70 lbs.

Inside dimensions: 28¼" x 13¾" x 13¼" (lwd).
Board: #4 common Northern White Pine sides, top and bottom—½"; ends—¾"; cleats—¾" x 2½".

NOTE

For domestic shipment Item 1 is replaced by a fibreboard container identical to Item 8 except that the inside dimensions are 28¼" x 13½" x 13" (lwd).

3–8. ITEM 2. RADIO & POWER SUPPLY BOX. Style: regular slotted container per spec. LLL–B–631c.

Inside Dimensions: 25⅛" x 10$^{11}/_{16}$" x 4¾" (lwd).

Board: 275 lb. test "B" flute corrugated fibreboard.
Mfr's joint: 2" sisal tape.
Seal with 2" acetate fibre tape.

3–9. ITEM 3. AMMETER BOX. Folding carton with reverse tuck, notched outer flaps, Arthur locks top and bottom.

Inside dimensions: 3" x 2¾" x 4" (lwd).
Board: .036" solid kraft.
Cartons to conform to JAN–P–120, style II, type A, class b.

3–10. ITEM 4. CABLE BOX. Style: regular slotted container per LLL–B–631c.

Inside dimensions: 7$^{9}/_{16}$" x 4¾" x 2½" (lwd).
Board: 200 lb. test "B" flute corrugated fibreboard.
Mfr's joint: 2" sisal tape.
Seal with 2" acetate fibre tape.

3–11. ITEM 5. HARNESS BOX. Style: regular slotted container per LLL–B–631c.

Inside dimensions: 7$^{9}/_{16}$" x 6¾" x 2½" (lwd).
Board: 200 lb. test "B" flute corrugated fibreboard.
Mfr's joint: 2" sisal tape.
Seal with 2" acetate fibre tape.

3–12. ITEM 6. BARRIER. Material conforming to MIL–B–131A, Class B 40 lb. load limit.
Inside dimensions: 28" opening x 43" depth.

3–13. ITEM 7. FLAT PAD. Dimensions: 25" x 10$^{9}/_{16}$".
Board: 200 lb. test "B" flute corrugated fibreboard.

3–14. ITEM 8. INTERMEDIATE CONTAINER. Style: regular slotted container per LLL–B–631c.

Inside dimensions: 25½" x 11$^{1}/_{16}$" x 11⅜" (lwd).
Board: 275 lb. test "A" or "C" flute corrugated fibreboard.
Mfr's Joint: Stitched.
Seal with 2" acetate fibre tape.

3–15. ITEM 9. OUTER CONTAINER. Style: full flap slotted, end opening.

Inside dimensions: 13" x 12½" x 26½" (lwd).
Board: V3c per JAN–P–108.
Mfr's Joint: stitched per JAN–P–108.
Seal with waterproof liquid adhesive.

3–16. ITEM 10. TRAY (See figure 3–2). Board: 275 lb. Test "B" flute corrugated fibreboard.

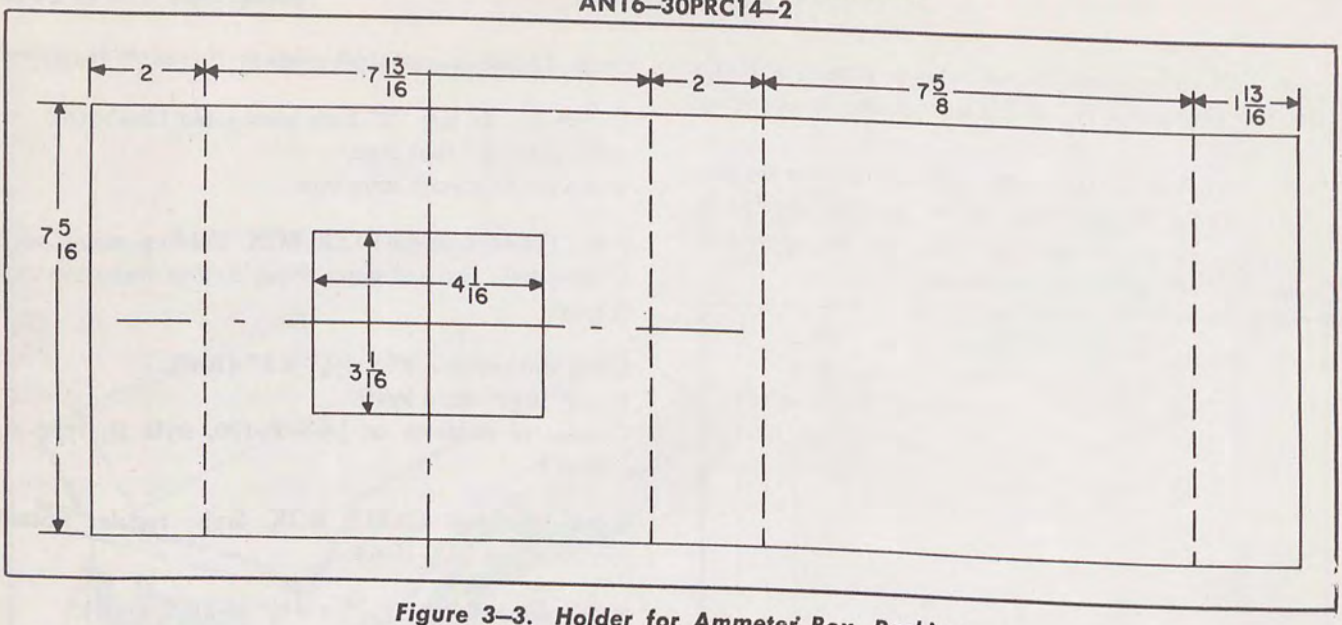


Figure 3–3. Holder for Ammeter Box, Packing

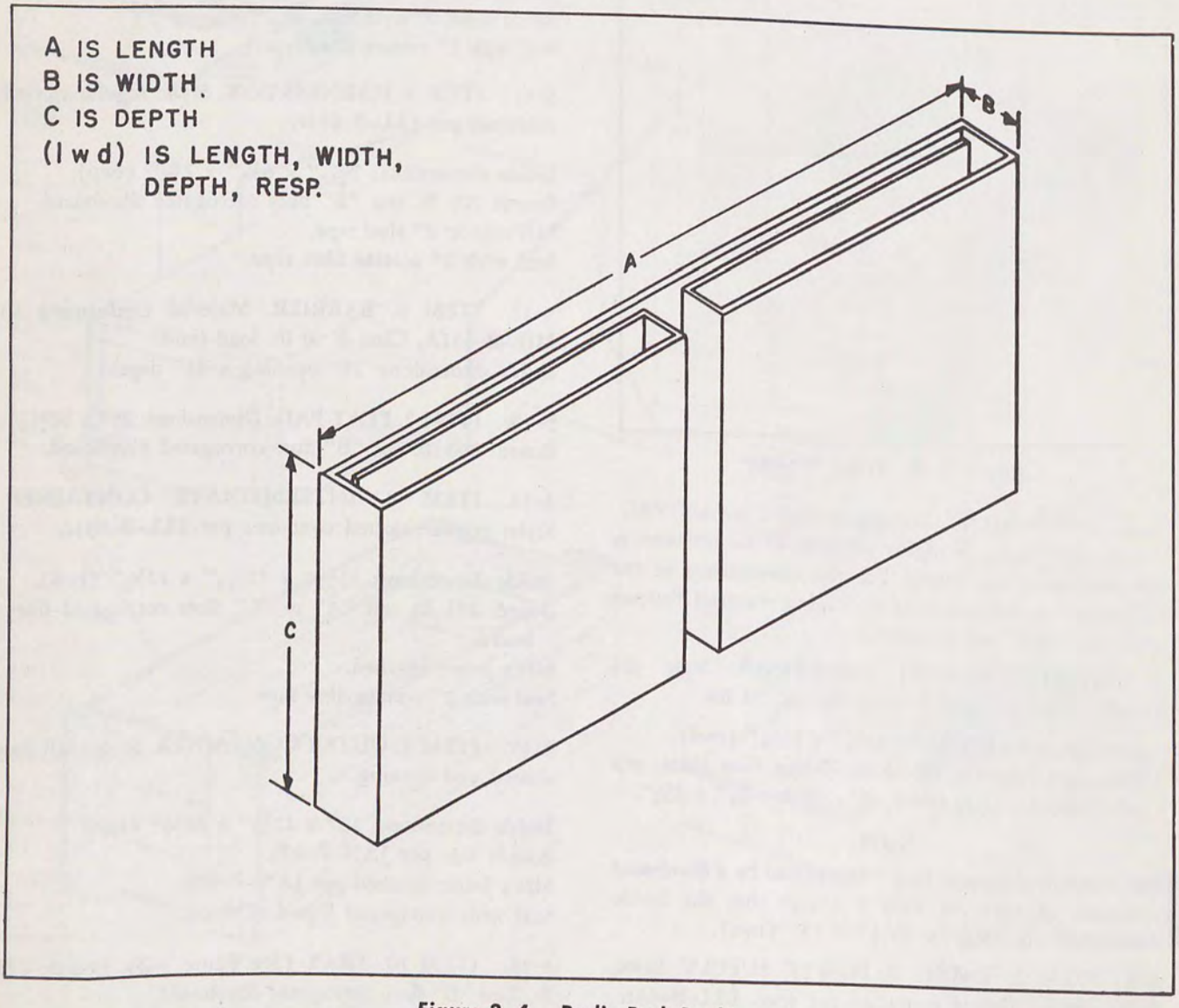


Figure 3–4. Radio Pad, Packing

3–17. ITEM 11. ANTENNA BOX. Style: five panel folder. Refer to Handbook of the Fibre Box Association and Rule 41 of The Consolidated Freight Classification.

Inside dimensions: 2⅝" x 2¾" x 23¾" (lwd).
Board: 275 lb. test "B" flute corrugated fibreboard
Seal with 2" sisal tape.

3–18. ITEM 12. DIE CUT HOLDER FOR AMMETER BOX. (See Figure 3–3).

Board: 275 lb. test "A" or "C" flute corrugated fibreboard.

3–19. ITEM 18. SMALL HUMIDITY INDICATOR. Refer AN513.

3–20. ITEM 19. 8-UNIT BAG DESICCANT. Conforming to MIL–D–4364.

3–21. ITEM 20. 16-UNIT BAG DESICCANT. Conforming to MIL–D–4364.

3–22. RADIO PADS. (See figure 3–4.)

	A (inches)	*B* (inches)	*C* (inches)
ITEM 13. Radio Pad.	10 9/16	1	4 5/8
ITEM 14. Radio Pad.	10 9/16	1	3 5/8
ITEM 15. Radio Pad.	11 7/16	1	4 5/8
ITEM 16. Radio Pad.	8 9/16	1	23
ITEM 17. Radio Pad.	10 13/16	1	3
ITEM 21. Radio Pad.	8 9/16	¾	10 9/16
ITEM 22. Spare Parts Box. Same as item 4			

SECTION IV

THEORY OF OPERATION

4–1. GENERAL.

4–2. Radio Set AN/PRC–14 is designated a transceiver because the tubes in the transmitter and receiver oscillator, the first two doublers, and the two AF amplifiers operate in both transmission and reception. These tubes are connected directly to the power supply. Plate voltage to the remaining tubes is supplied through the transmit-receive relay K102. A functional block diagram of the equipment is shown in Figure 4–1.

4–3. TRANSMITTER.

4–4. OSCILLATOR AND TURRET DOUBLERS. The oscillator is a cathode-coupled circuit in which the crystal (Y102, Y103, Y104, or Y105, depending upon which channel is in use) is inserted between the cathode of the grounded-grid amplifier tube V117 and the cathode of the doubler tube V118. Plate voltage is furnished to the oscillator through resistor R158, which decouples the oscillator tank from the power supply. RF by-pass to ground is through capacitor C157. Bias for the oscillator cathode is developed across resistor R157.

4–5. The oscillator turret tank resonates at the crystal frequency. The tank circuit consists of fixed capacitor C156 and variable inductance L118, L119, L120, or L121, depending upon the channel in use. The RF energy developed in this circuit is coupled to the first doubler grid by capacitor C158. A dc path to ground is maintained by resistors R159 and R160 in series. A phone-tip jack J111 is inserted in this circuit at the junction of R159 and R160 to provide a test point for the oscillator stage. C160 provides an RF by-pass for Ammeter ME–68/PRC–14, and R160 acts as the instrument shunt.

4–6. The first doubler turret resonates at twice the crystal frequency. The tank circuit consists of fixed capacitor C161 and variable inductance L122, L123, L124, or L125, depending upon the channel in use. Plate voltage is supplied to this stage through decoupling resistor R162, which effectively isolates the plate supply from the doubler tank with respect to RF. The tank is by-passed to ground for RF by capacitor C162. Cathode resistor R161 is the impedance across which the feedback voltage is developed to maintain oscillation in the crystal circuit.

4–7. The first doubler turret is coupled to the second doubler V119 by capacitor C163. The second doubler is tuned to four times the oscillator frequency. This VHF circuit has considerable stray capacitance which, with one of the variable inductances L126, L127, L128, or L129, is sufficient to produce a resonant tank circuit. Resistors R163 and R164 are the grid resistors for V119. R164 also serves as a meter shunt when Ammeter ME–68/PRC–14 is connected between test jack J112 and ground to determine first doubler performance. Capacitor C164 by-passes the test instrument. Plate voltage is supplied through decoupling resistor R165, which is by-passed by capacitor C168. The performance of this stage

can be determined by connecting Ammeter ME–68/PRC–14 between the second doubler test point J113 in the grid circuit of the transmitter mixer and ground.

4–8. 27 MC CRYSTAL OSCILLATOR. The 27 mc crystal oscillator provides a stable, fixed frequency with which the doubler signals are mixed to supply the final transmitter stages with signals of the proper frequency. A quartz crystal Y106 supplies a 27 mc signal to the grid of the oscillator tube V121. Resistor R169 completes the dc grid circuit. The plate circuit of the tube is adjusted to the crystal frequency by slug-tuned inductor L131, in parallel with fixed capacitor C173. Plate voltage is applied through decoupling resistor R170 which is by-passed by capacitor C174.

4–9. TRANSMITTER MIXER. The transmitter mixer tube V120 combines the signals from the second doubler and the 27 mc oscillator. The doubler output is coupled to the mixer grid by capacitor C167, and the oscillator output is coupled to the mixer grid by C172. The mixer tank is tuned by variable capacitor C170 in parallel with inductor L130 to the sum of the two mixer signals. The plate voltage resistor R168 and the plate circuit are dc-isolated from ground by capacitor C171. Resistors R166 and R167 provide a dc path to ground for the mixer grid. R167 also serves as a shunt for Ammeter ME–68/PRC–14, used to determine second doubler performance. Capacitor C169 by-passes the shunt for RF.

4–10. THIRD DOUBLER. The mixer output is coupled to the third doubler V122 by capacitor C165. Here the input signal is again doubled. The crystal frequency has now been doubled twice, mixed with the signal from a 27 mc local oscillator and doubled again. The formula for finding the output frequency from the original crystal frequency is accordingly:

$$F = 8f + 54$$

where f = crystal frequency and F = output frequency. The third doubler tuned circuit is a cavity T111 containing the main tuning capacitor C175, two feed-

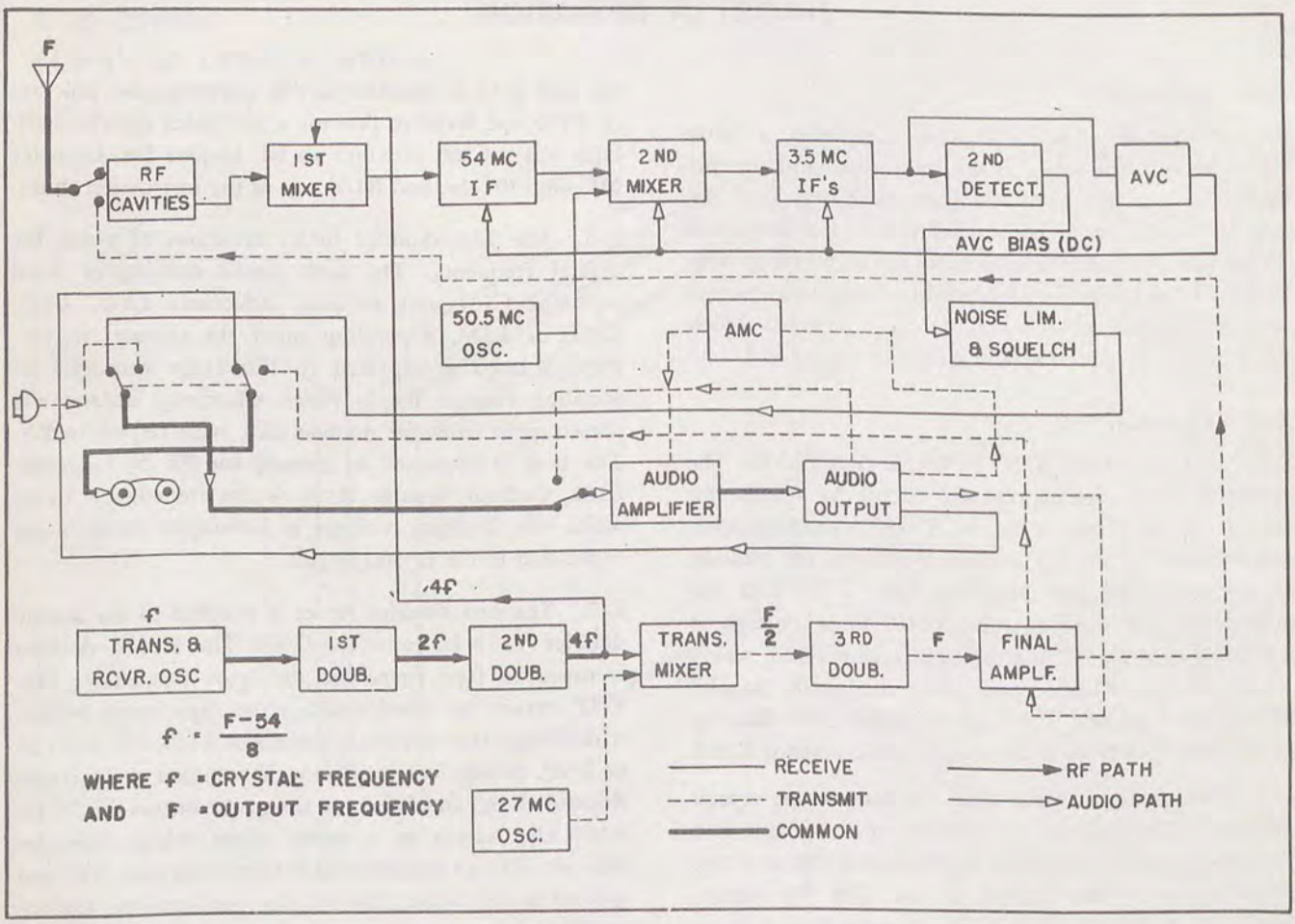


Figure 4–1. Radio Set AN/PRC–14, Functional Block Diagram

through capacitors, and inductive and capacitive trimmers for tracking of all channels. Plate voltage is supplied through decoupling choke L133. The grid circuit resistance to ground is provided by resistor R171.

4–11. FINAL AMPLIFIER. The power output stage of the transmitter utilizes a pencil type tube V123 in a grounded-grid amplifier circuit. The tank circuit consists of another cavity with characteristics similar to those of the second doubler cavity. Most of the RF energy developed by the cavity is fed through coaxial cables and connectors to the antenna; however, a small portion is rectified by crystal diode CR101 and appears as a side tone in the headphones to provide the operator with an indication that he is transmitting. Jack J114 provides a connection for Ammeter ME–68/PRC–14, so that an indication of transmitter output can be obtained. Resistor R174 is the load for the crystal diode.

4–12. AUDIO FREQUENCY AMPLIFIERS. The transmitter signal is amplitude modulated by either speech or 1000 cycle tone, which is applied to the plate of the final amplifier stage through output transformer T110. Two stages of resistance-coupled amplification are used to bring the audio level up to modulating strength. The speech input is coupled to the amplifiers by input transformer T109. The tone is generated by resistance-capacity coupling between the first audio amplifier grid and the second audio amplifier plate. Switch S103 permits the selection of either type of modulation.

4–13. Speech frequencies generated by a carbon microphone are applied to the input transformer T109 through telephone relay K102 and SPEECH-TONE switch S103. Resistors R130 and R131 provide a load for the secondary of T109. The amplifier input is tapped down on the load to prevent overloading of the first audio stage. Capacitors C142 and C143 and resistor R142 filter out unnecessary speech frequencies.

4–14. The first audio amplifier tube V114 is a conventional Class A amplifier using a subminiature pentode tube. Resistor R146 in the cathode circuit supplies bias voltage for the tube. Resistors R147 and R148 serve as the screen and plate load resistances respectively, while capacitor C149 grounds the screen for audio frequencies.

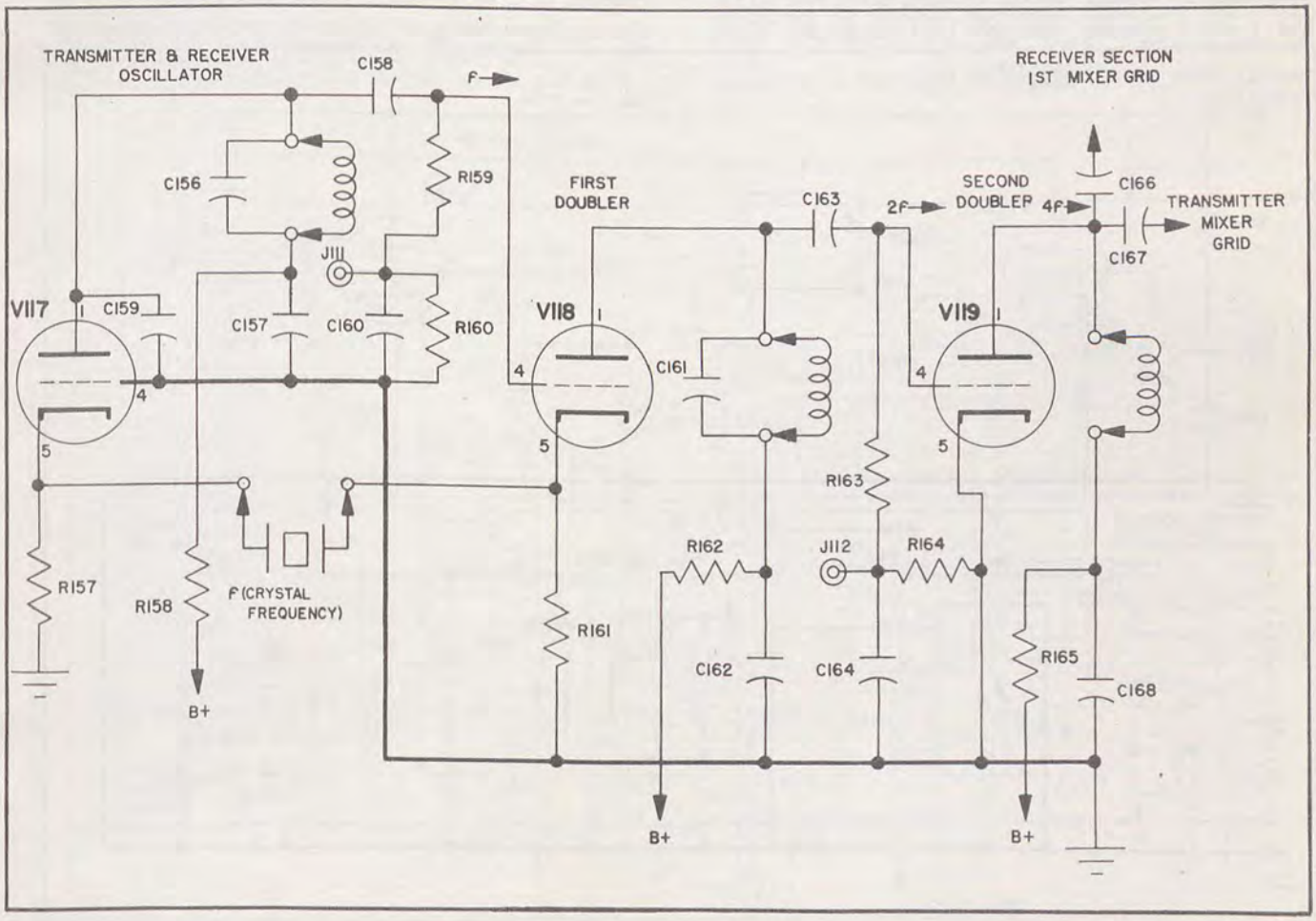


Figure 4–2. Radio Receiver-Transmitter RT–271/PRC–14, Oscillator and Doubler Circuits

4–15. Capacitor C150 couples the output of the first audio amplifier to the grid of the second audio amplifier tube V115. Resistor R149 constitutes the grid load, and resistor R151 develops the grid bias voltage. Capacitors C152 and C153 shunt the primary of the audio output transformer T110 to provide it with the correct band-pass characteristics.

4–16. Resistor R150 and capacitor C151 are inserted between the first audio amplifier grid and the second audio amplifier plate when the SPEECH-TONE switch is in the TONE position. Feedback resistance R150 causes the first audio amplifier to oscillate at approximately 1000 cps. C151 isolates the feedback circuit from the second audio plate circuit.

4–17. An automatic modulation control is included in the audio amplifier to limit the modulation percentage to approximately 50%. When the audio frequency voltage from the secondary of output transformer T110 rises to a value corresponding to 50% modulation, the plate voltage on diode V116, which is coupled to the output transformer T110 by capacitor C154, becomes high enough for it to conduct. Conduction level is established by voltage divider resistors R152 and R153. The current flowing through load resistance R154 produces a pulsating voltage at the plate of V116 which is filtered by resistance-capacity network R155, R156, and C155 and applied through switch S103 and relay K102 to the grid of the first audio amplifier V114. Tube V114 is thus biased so that the amplified signal is held to a value corresponding to 50% modulation.

4–18. RECEIVER.

4–19. RF INPUT CIRCUITS. The signal to be received enters the receiver section from the antenna through antenna cable W104, coaxial connector, and coaxial antenna relay K101. The signal enters input cavity T101 through coaxial connector J101 and is inductively coupled by a short length of busbar to the tuned circuit, which consists of a length of silver-plated brass rod fastened to the grounded shell and variable capacitor C102. Grounded loop L101 can be rotated about the brass rod to vary its effective inductance and trimmer capacitor C101 is connected in parallel with C102 for tracking adjustment.

4–20. The second cavity is similar to the first and is coupled to it by capacitor C116. Two cavities in series are employed for good selectivity and image rejection.

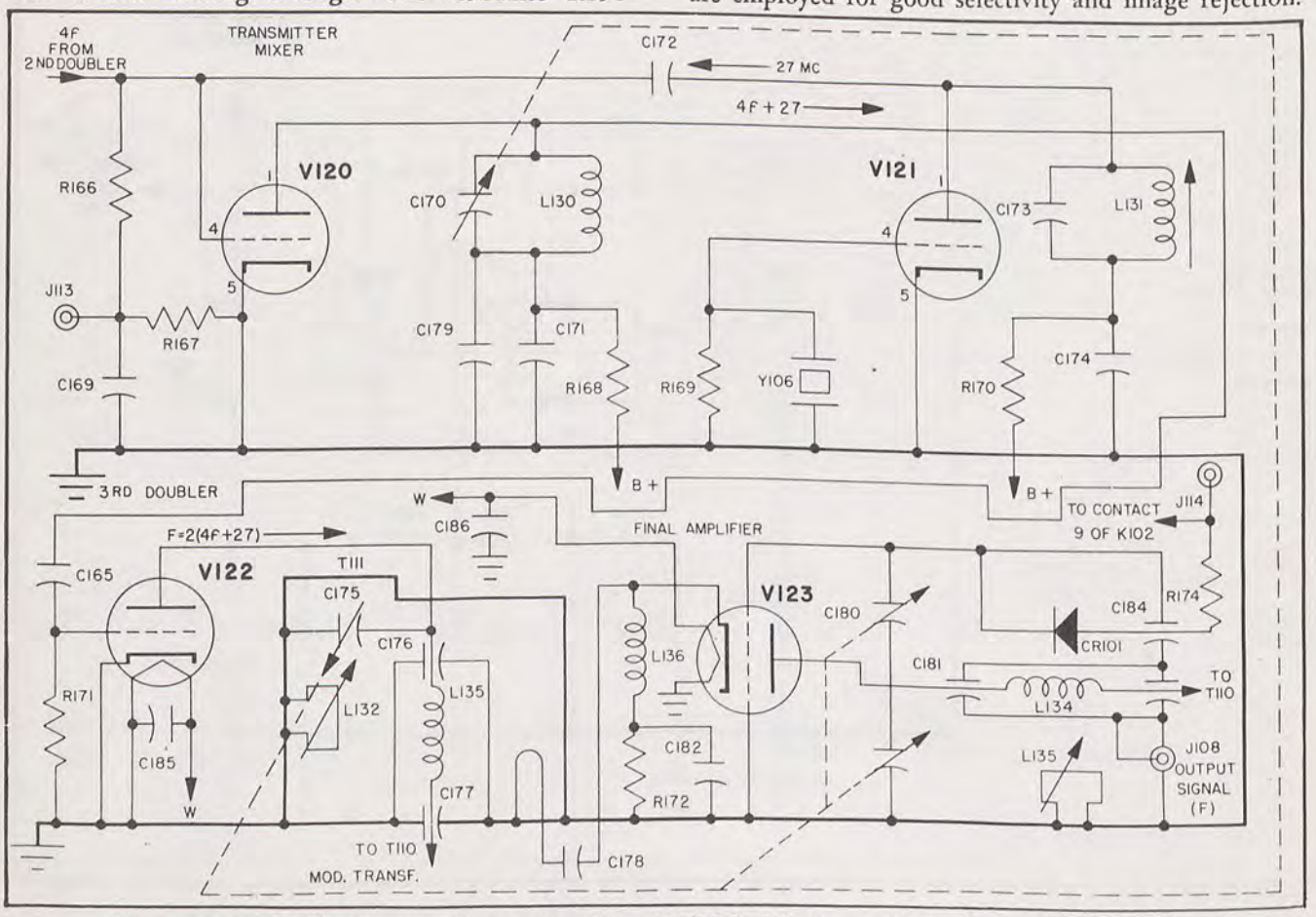


Figure 4–3. Radio Receiver-Transmitter RT–271/PRC–14, Generation of Transmitter Signal

4–21. FIRST MIXER CIRCUIT. The signal from the second cavity is coupled to the grid of the first mixer tube V101 by capacitor C105. The signal from the second doubler circuit, whose operation is the same in both transmission and reception, is also coupled to the mixer grid by capacitor C166. The RF input circuit is tuned so that the RF signal arriving via the antenna is always twice the frequency of the output signal from the second doubler plus 54 megacycles. The two signals are combined in the mixer grid circuit. The mixer plate tank is tuned to 54 megacycles. This tank circuit consists of the primary winding L105 of RF transformer T103 and fixed capacitor C107. Inductance L104 is inserted between the mixer plate and the tank circuit to present a high impedance to any harmonics of the 54 mc signal. Inductive coupling to the next stage is provided by the secondary winding L106 of T103 and fixed capacitor C109. The primary and secondary windings of T103 are tuned by movable powdered iron cores. Plate voltage is supplied to the circuit through resistor R103, which together with capacitor C108 as a by-pass to ground, keeps RF from the power supply. Resistor R102 biases the cathode while capacitor C106 grounds it for RF.

4–22. 54 mc IF AMPLIFIER. The signal on the secondary of T103 is applied directly to the grid of the 54 mc amplifier tube V102. Capacitor C110 isolates from ground the AVC bias applied to V102. Capacitor C111 grounds the screen for RF. Resistor R105 reduces the screen supply voltage. Resistor R106 and capacitor C113 decouple the supply from the plate tank. The tank circuit T104 is exactly the same as the mixer tank except that no decoupling inductance is used.

4–23. SECOND MIXER CIRCUITS. The second mixer obtains its input signals from two sources: the output of the 54 mc amplifier and the output of a 50.5 mc crystal oscillator tube V109. The oscillator utilizes a conventional tuned-grid tuned-plate circuit, with a 50.5 mc crystal replacing the tuned grid. Inductor R138 helps to maintain oscillation, and resistor R128 completes the dc grid circuit. The plate tank consists of variable powdered iron core coil L117 and fixed capacitor C140. The tank is by-passed by capacitor C141. Resistor R129 decouples the tank from the power supply. The oscillator output is coupled to the mixer screen by resistor R109 and the 54 mc signal is coupled to the grid by capacitor C115. The mixer plate tank is tuned to the difference of the two signals, or 3.5 mc, by the primary of IF transformer T105, consisting of variable powdered iron core inductance L109 and fixed capacitor C119. Cathode bias is furnished to the stage by resistor R108, while resistor

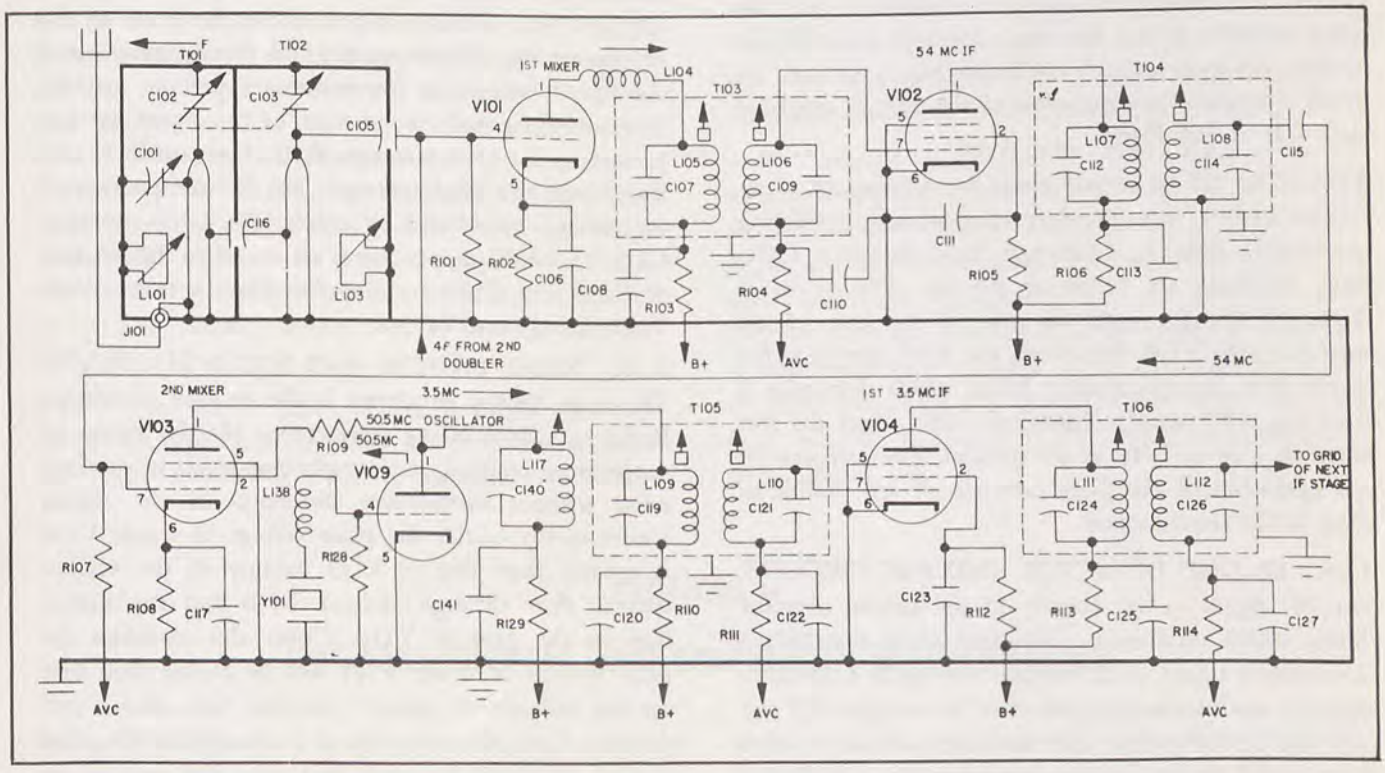


Figure 4–4. Radio Receiver-Transmitter RT–271/PRC–14, Receiver Double Conversion Circuits

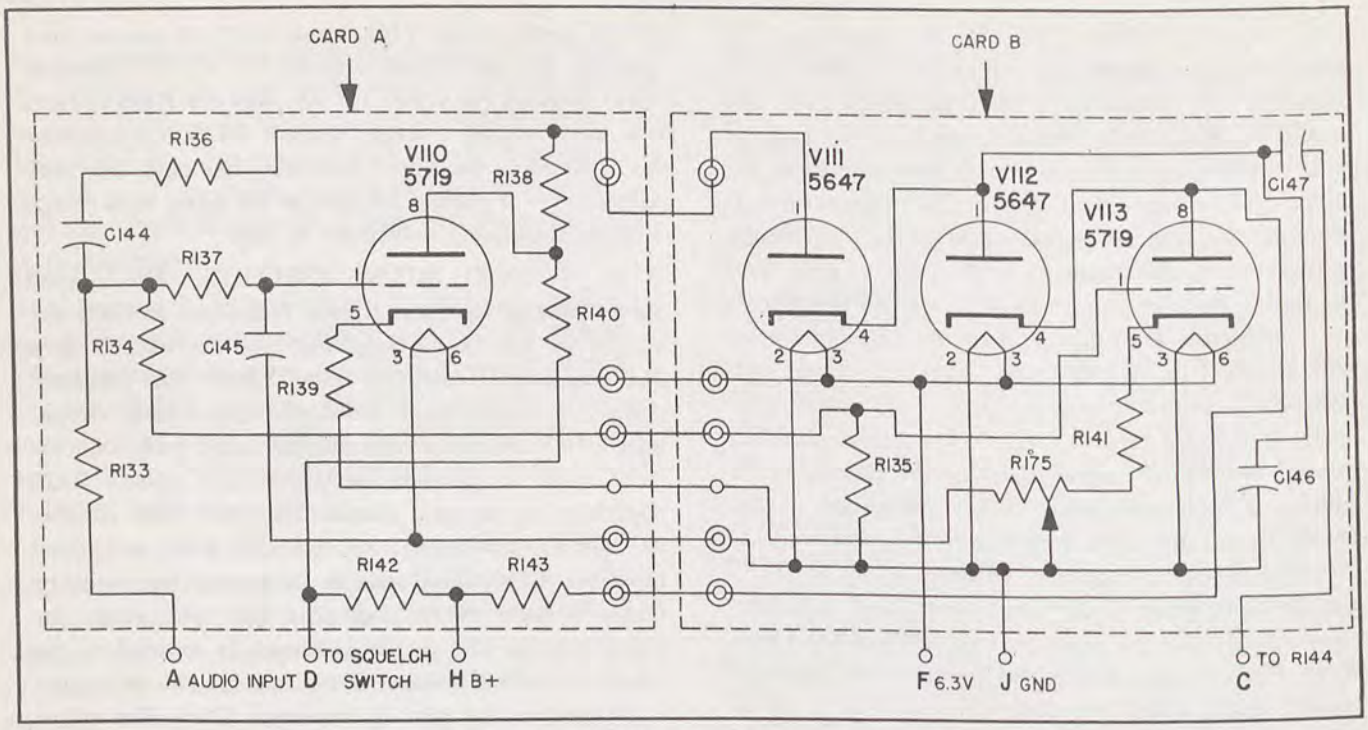


Figure 4–5. Radio Receiver-Transmitter RT–271/PRC–14, Noise Limiter and Squelch Circuits

R107 decouples the grid from the AVC supply. Capacitor C117 grounds the cathode for RF. Resistor R110 and capacitor C120 isolate the plate tank from the power supply.

4–24. 3.5 mc IF AMPLIFIERS. The first two IF amplifiers have exactly the same characteristics and the third is similar to the first two except that no AVC is needed, the cathode of V106 being biased instead. To avoid repetition, the operation of the first IF amplifier only will be described.

4–25. The 3.5 mc signal from the primary of transformer T105 is transferred to its secondary, consisting of variable inductor L110 and fixed capacitor C121. Both windings are tuned to 3.5 mc. The signal is impressed directly upon the grid of the first 3.5 mc amplifier tube V104. Bias from the AVC supply is fed to the grid through resistor R111, which decouples it from the AVC supply. Capacitor C122 places the low potential side of L110 at RF ground. The components and operation of the plate tank circuit are similar to those of the second mixer.

4–26. SECOND DETECTOR AND AVC CIRCUITS. The RF signal is fed directly to the second detector diode, which rectifies it. Capacitor C137 then filters the rectified signal. A dc voltage varying in accordance with the modulation component of the original RF signal thus appears across the terminals of load resistor R120 and is fed into the noise limiting and squelch circuits.

4–27. The IF signal is also fed to the AVC diode V108 through capacitor C138, which couples the diode to the IF circuits. Up to a level depending on the setting of variable resistor R125, the diode does not conduct because of the positive voltage upon its cathode, and the AVC line carries a moderate amount of fixed negative bias. When a signal above the level of the voltage on the cathode appears, the diode conducts and the signal follows its low-impedance path to ground. Thus only the positive portions of the signal are impressed on the load resistance R126. Resistors R123 and R124 limit the diode current. The RF components of the voltage are filtered by resistor R127 and capacitor C139. The AVC supply line is connected to the junction of R127 and C139 and supplies bias to tubes V102, V103, V104, and V105.

4–28. NOISE LIMITER AND SQUELCH CIRCUIT. The noise limiter employed in the receiver section of Radio Set AN/PRC–14 serves as an effective means of suppressing ignition, static, and other forms of spurious noise without introducing distortion of the signal. Under steady carrier the plate voltage of triode V110 is greater than that of V113 because of the smaller current flow through resistor R140 and the higher bias on the grid of V110. Under this condition the plate voltage of diode V111 will be higher than that on the cathode of diode V112 and both diodes will conduct. Upon the reception of a noise pulse, the plate voltage on V113 increases, but the plate voltage on V110 remains momentarily the same because of the

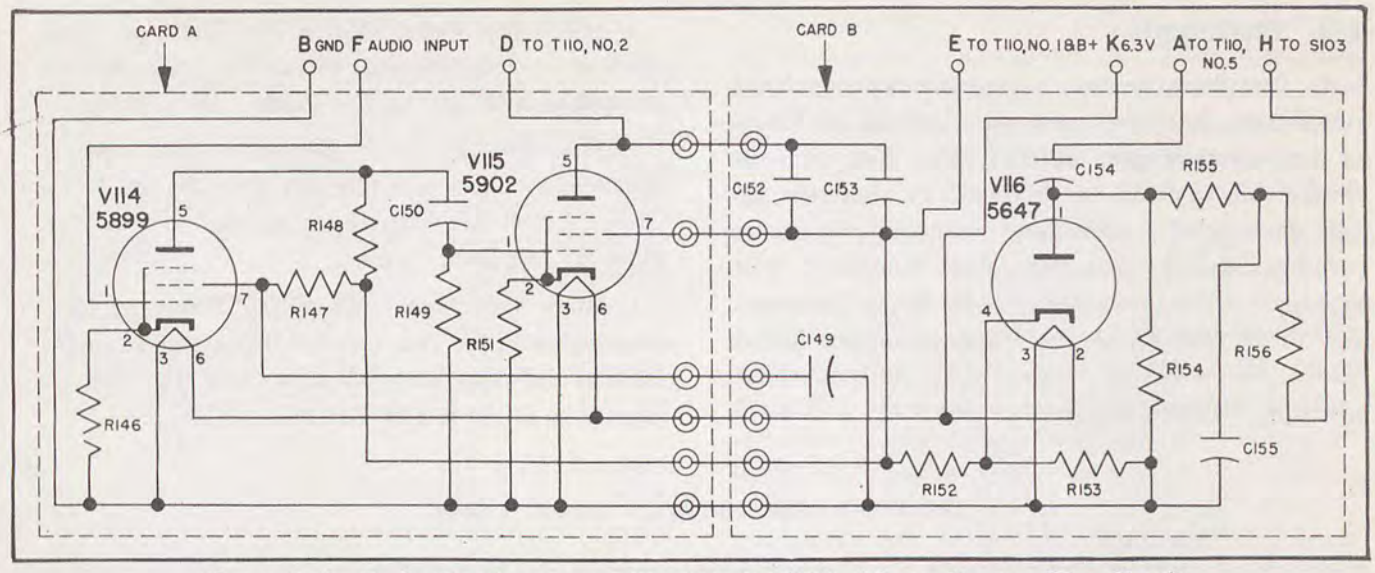


Figure 4–6. Radio Receiver-Transmitter RT–271/PRC–14, Audio Amplifier Circuit

time constant of resistor R137 and capacitor C145 in the grid circuit of V110. When the plate voltage on V113 exceeds the plate voltage on V110, the diodes stop conducting, and the AF input is cut off for the duration of the pulse. Connection of capacitor C144 and resistor R136 from the junction of diode load resistors R133 and R134 to the plate of diode V111 provides a low impedance noise path. This produces an accelerating action tending to amplify the effectiveness of the noise limiter. Since the application of a noise pulse to the circuit places the plate of V110 at a lower potential than that of V113, a negative potential relative to V113 is impressed upon the plate of V110, assuring a simultaneous stop when the diodes cease conducting. The modulation voltage at that instant will be held stationary, as there is no path for a discharge current through capacitor C146. When noise ceases, the diodes again conduct, and the voltage across C146 follows the instantaneous level. Potentiometer R175 is adjusted, when replacing V110 and/or V113, to correct for any changes in tube characteristics.

4–29. The squelch action in this circuit is characteristic of the type of noise limiter described above. Under zero signal conditions with the squelch switch S102 open (squelch ON), resistor R142 is added in series with resistor R140, which then comprise the plate load of V110. The plate voltage of V110 is now lower than the plate voltage of V113, and the diodes V111 and V112 do not conduct. Upon arrival of a carrier of predetermined strength, the voltage drop in the plate circuit of V110 becomes less than the corresponding drop in the circuit of V113, which causes the anode voltage of diode V111 to exceed the cathode voltage of diode V112, and the diodes conduct intelligence in the normal manner. The squelch threshold control, potentiometer R125, permits muting the receiver output over a range of carrier strengths from 2.5 to 5 microvolts when the SQUELCH switch is ON.

4–30. AUDIO AMPLIFIERS. The output from the noise limiting and squelch circuit is transferred through the volume control R144 and coupling capacitor C147 to the grid of the first audio amplifier tube V114. Both audio amplifiers work exactly the same in reception as they do in speech transmission, except that their output is now inductively coupled to the 500 ohm secondary of T110 instead of the modulation winding. The 500 ohm winding is connected to a pair of head-phone terminals on J107.

SECTION V

ORGANIZATIONAL AND SQUADRON MAINTENANCE

5–1. GENERAL.

5–2. This section describes maintenance procedures to be followed by organizational and squadron personnel. Maintenance not described in this section should not be attempted.

5–3. TEST POINTS.

5–4. Procedures for determining and isolating faulty components, assemblies, and sub-assemblies by means of test points are given in this section. Test points are those points in Radio Set AN/PRC–14 where test signals are injected or instrument readings are taken in order to check the operation of the equipment. Test points are divided into three classes: Major, Secondary, and Minor. Only Major Test Points will appear in this section. Test points are denoted symbolically upon the schematic diagrams (figures 7–3 and 7–6), as follows:

1. Major Test Points—Major Test Points are identified by an arabic numeral enclosed in a star and are referred to in the text as Test Point etc.

2. Secondary Test Points—Secondary Test Points are identified by upper case (capital) letters enclosed in a circle Ⓑ and are referred to in the text as Test Point Ⓐ Test Point Ⓑ etc.

3. Minor Test Points—Minor Test Points are identified by an upper case (capital) letter and an arabic numeral subscript enclosed in a circle (C_2) and are referred to in the text as Test Point (A_1) (A_2) etc.

TABLE 5–1. PERFORMANCE CHECK CHART

Step	Test Point	Test Equipment Control Position	AN/PRC–14 Control Position	Normal Indication	Possible Cause of Abnormal Indication
1	Terminal A of J105 ①	Set volt-ohm-milliammeter on 250 volt dc range.	PP–855/PRC–14. POWER switch S101 ON.	135 v dc	Battery BB–402/U requires charging. Follow battery instructions when recharging. Vibrator power pack Z201 faulty.
2	Terminal B of J105 ②	Set volt-ohm-milliammeter on 10 volt dc range.	Same as Step 1.	–6 v dc	Battery BB–402/U requires charging. Follow battery instructions when recharging.
3	Tip Jack J111 (red) ③	Connect Ammeter ME–68/PRC–14 to audio jack J107	Connect Power Cable W105. Plug connector P109 on end of W106 into J111. Set POWER switch S101 in ON position. Wait 30 seconds for tubes to warm up and read ME–68/PRC–14.	As indicated by Figure 5–2, Curve A.	Faulty or mistuned oscillator circuit.
4	Tip Jack J112 ④ (brown)	Same as Step 3.	Transfer P109 to J112. Read ME–68/PRC–14.	As indicated by Figure 5–2, Curve B.	Faulty or mistuned first doubler circuit.
5	Tip Jack J113 ⑤ (green)	Same as Step 3.	Transfer P109 to J113. Read ME–68/PRC–14.	As indicated by Figure 5–2, Curve C.	Faulty or mistuned second doubler circuit.
6	Tip Jack J114 ⑥ (black)	Same as Step 3.	Transfer P109 to J114. Read ME–68/PRC–14.	As indicated by Figure 5–2, Curve D.	Faulty or mistuned final amplifier circuit.
7		Connect cable assembly CX–2098/U to J107. Connect microphone to jack JJ–033 and headset to JJ–026. Operate PUSH-TO-TALK switch on microphone.	Set SPEECH-TONE switch in TONE position.	1000 cycle tone heard in phones.	Faulty audio amplifier.
8		Release PUSH-TO-TALK switch.	Set SQUELCH switch to OFF.	Thermal noise (hissing or frying noise) heard in phones.	Faulty squelch circuit or receiver.

5–5. MINIMUM PERFORMANCE STANDARDS.

5–6. The following check chart Table 5–1, provides minimum performance standards by which operating personnel may determine if Radio Set AN/PRC–14 is operating satisfactorily. The only instruments needed are Ammeter ME–68/PRC–14, supplied with the Radio Set, and a Simpson Model 260 volt-ohm-milliammeter. All measurements are from the designated test points to ground unless otherwise specified. (The cover of RT–271/PRC–14 must be removed to reach Test Points 3, 4, 5 and 6. For removal procedure see applicable Handbook of Overhaul Instructions.)

5–7. The check chart, table 5–1, verifies that the transmitter section of RT–271/PRC–14 is operating satisfactorily. As the RF sections of the receiver are pretracked with those of the transmitter section during manufacture, normal operation of the transmitter section is an indirect indication of receiver RF alignment.

5–8. MINOR REPAIR AND ADJUSTMENT.

5–9. POWER SUPPLY PP–855/PRC–14. Examine fuse F201 when replacing vibrator cartridge Z202 because of failure. When vibrator fails, it is likely that F201 will blow because of excessive current flow throughout. A spare fuse F201A and a vibrator cartridge Z202A will be found in the Power Supply.

5–10. ANTENNA AT–387/RC–14. The upper and lower antenna sections E109 and E110, respectively, may be repaired if damaged by pulling them out of the base assembly E111 and inserting replacements. A view of the complete antenna assembly E113 is shown in Figure 4–2 of the Handbook of Overhaul Instructions.

5–11. RECEIVER-TRANSMITTER RT–271/PRC–14. Tubes found to be defective may be replaced if they mount in sockets. Do not attempt to replace wired-in tubes in the noise limiter and squelch assembly and the audio amplifier assembly; but replace the whole assembly and retain defective assemblies for repair by higher echelons of maintenance. Both assemblies are plug-in units. Check performance of transceiver by listening to a signal after replacing tubes in IF stages, as tube replacements may change IF alignment. Most tube replacements will alter performance only slightly; however, if receiver sensitivity is adversely affected, the equipment should be realigned, as described in Section VI, by higher echelons of maintenance. Crystals are also replaceable.

5–12. LUBRICATION.

5–13. No lubrication is required except upon overhaul.

5–14. INSPECTION SCHEDULE.

5–15. Table 5–2 lists components and parts of Radio Set AN/PRC–14 which require regular inspection.

TABLE 5–2. INSPECTION SCHEDULE

Component	Inspection	Time
Power Supply PP–855/PRC–14		
1. Battery BB–402/U.	1. Follow battery instructions.	10 hours
2. Vibrator Z202.	2. Output voltage approximately 135 V. Replace if there is no output and battery voltage is 5.7 v dc. or above. Also replace if Fuse F201 blows.	100 hours
3. Fuse F201.	3. Inspect for continuity.	As required.
Antenna AT–387/PRC–14		
1. Upper and lower sections.	1. No bends, dents, or other damage to metal.	10 hours
2. Base.	2. Strap assembly E112 securely anchored to base.	10 hours
Receiver-Transmitter RT–271/PRC–14		
1. Connections.	1. Mechanically secure and not corroded.	100 hours
2. Tubes, Crystals, and Plug-in Assemblies.	2. Firmly seated in sockets.	100 hours
Cable Assemblies. CX–2097/U and CX–2098/U	Verify function by use in equipment. If equipment function is faulty, inspect carefully for continuity and connector shorts.	100 hours

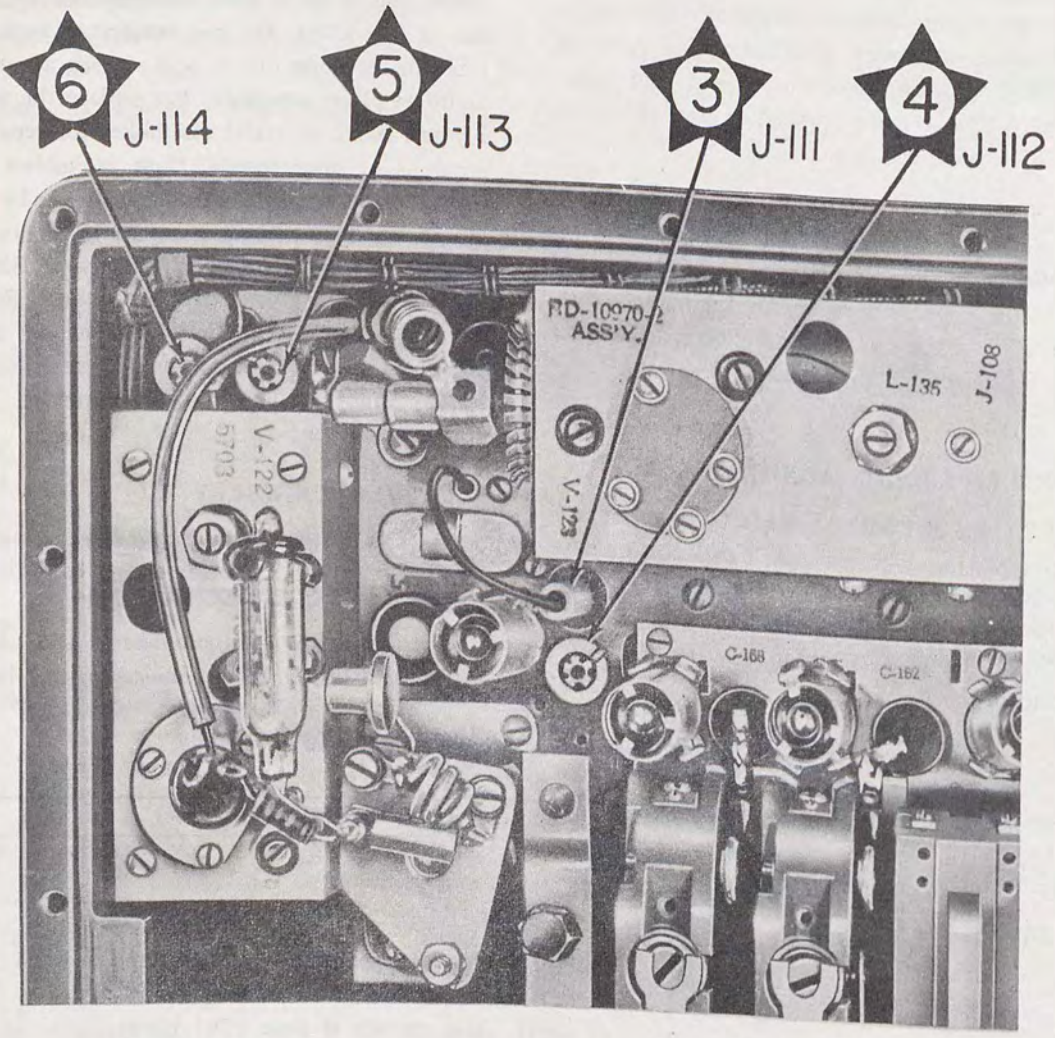


Figure 5–1. Radio Set AN/PRC–14, Test Points for Organization and Squadron Maintenance

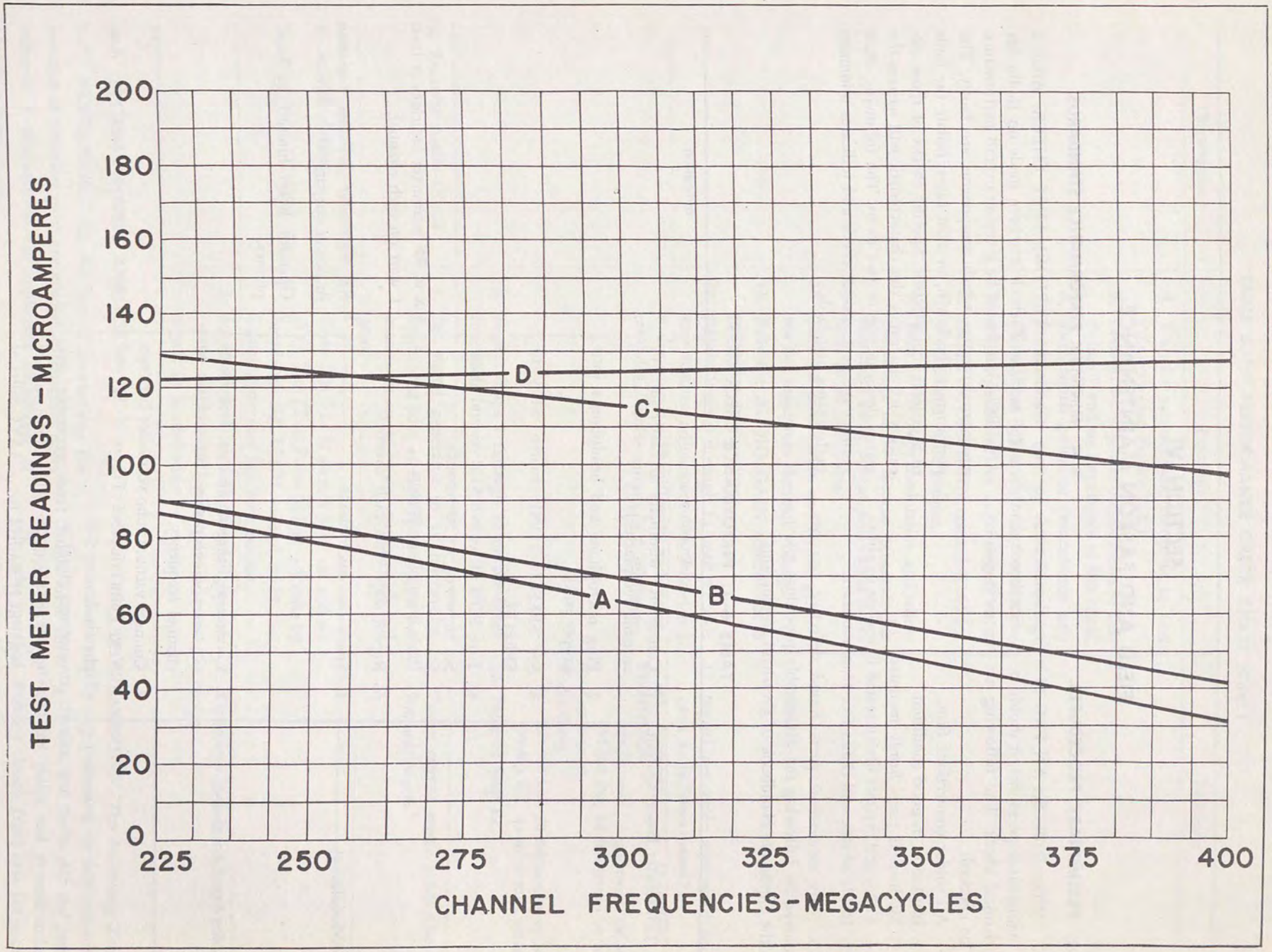


Figure 5–2. Radio Receiver-Transmitter RT–271/PRC–14, Tuning Curve

SECTION VI

FIELD AND FASRON MAINTENANCE

6–1. PRELIMINARY PROCEDURES.

6–2. When Radio Set AN/PRC–14 is first turned over to maintenance personnel, it should be given a thorough mechanical check. The following are the main points to be checked:

1. All solder connections firm.
2. Insulation in good condition.
3. Mechanical parts firmly mounted.
4. Tubes and crystals firmly seated in sockets or clips.
5. Inside of case and chasis free from moisture.

6–3. Any mechanical parts found defective can be removed by following the disassembly procedure given in the applicable Handbook of Overhaul Instructions.

6–4. MINIMUM PERFORMANCE STANDARDS.

6–5. OVERALL PERFORMANCE CHECK. After a careful mechanical check has been made on Radio Set AN/PRC–14, it should be given an overall performance check to determine which components are faulty. The performance check will, in most cases, isolate the fault to a general characteristic. Specific checks of those circuits which determine this characteristic will narrow the search down to one or two items. The following chart outlines the performance check and indicates minimum performance standards.

TABLE 6–1. PERFORMANCE CHECK CHART

Characteristic	Procedure	Indication
a. Transmitter Power Output.	1. Connect RF wattmeter to Test Point Ⓐ, antenna receptacle J103. 2. Plug microphone and headphones into proper jacks. 3. Set SPEECH-TONE switch S103 to SPEECH. 4. Turn POWER switch S101 on and allow Set to warm up 30 seconds. 5. Press microphone button. 6. Repeat step 5 on each channel.	5 & 6. RF wattmeter indicates at least 1 watt on each channel.
b. Modulation.	1. Speak into microphone.	1. RF wattmeter indicates variation in power output. 2. Operator hears himself in headphones.
c. Receiver Sensitivity.	1. Connect signal generator to Test Point Ⓐ, antenna receptacle J101 and set on channel frequency. 2. Connect vacuum tube voltmeter between Test Point Ⓑ (see Figure 7-3) and chassis. 3. With zero signal from generator and SQUELCH switch S102 OFF adjust SQUELCH control for –3AVC volts at Test Point Ⓑ.	

TABLE 6–1. PERFORMANCE CHECK CHART (Cont.)

Characteristic	Procedure	Indication
	4. Transfer vacuum tube voltmeter to Test Point Ⓒ (see Figure 7–3.). 5. Connect audio power output meter to Test Point Ⓓ and set impedance to 500 ohms. 6. Turn signal generator (modulation off) for maximum receiver detector voltage (Test Point Ⓒ) at channel frequency. 7. Adjust generator for —3 detector volts. 8. Adjust AUDIO GAIN control R144 for 5 milliwatts noise output. 9. Turn on 1000 cps modulation and adjust percentage to 30. Retune generator for maximum audio output, and adjust audio level to 50 milliwatts. 10. Turn off modulation and retune generator for maximum detector voltage. 11. Readjust AUDIO GAIN control for 5 milliwatts audio output. 12. Repeat Steps 9 through 11 until without any further adjustment the modulated audio output is 50 milliwatts and the unmodulated noise output is 5 milliwatts. 13. Repeat Steps 1 through 12 on the other channels.	12. Signal generator attenuator indicates as follows: *Type* *Frequency* *Indication* TS–497/URR 225-350 mc 5 microvolts or less 350-400 mc 10 microvolts or less Hewlett-Packard Model 608-A 225-350 mc 20 microvolts or less 350-400 mc 40 microvolts or less 13. Same as Step 12.
d. Receiver Audio Ouput.	1. Set signal generator to 10 microvolts, modulated 30% at 1000 cps and tune for maximum audio power output with full gain.	1. Power output meter reads 150 to 200 milliwatts.
e. Squelch Action.	1. Turn SQUELCH switch S102 on and set AVC bias (Test Point Ⓑ) at —3 volts by means of SQUELCH control R125. Set signal generator for zero output. 2. Increase modulated signal until squelch opens, as indicated by rush of noise and signal in headphones.	2. Generator indicates 2.5 to 5 microvolts.

6–6. SYSTEMS (TROUBLE) ANALYSIS.

6–7. PARTS REMOVAL. No special instructions for removal of electrical parts are needed. Mechanical parts removal is discussed in the applicable Handbook of Overhaul Instructions.

6–8. CIRCUIT BREAKDOWN. The following Table 6–2 provides a step-by-step procedure for determination of faulty components, circuits, and parts. All test point connections are between test point and ground unless otherwise specified. Remove chassis from case for access to some test points.

TABLE 6–2. SYSTEMS TROUBLE ANALYSIS CHART

Step	Test Point	Test Equip. Control Position	AN/PRC–14 Control Position	Normal Indication	Possible Cause of Abnormal Indication
1			POWER switch S101 in ON position.	All visible tubes lighted.	Power Supply (see step 2). Tube burnout.
2	Ⓔ ON contact of S101A	Voltmeter on 10 vdc scale.	Same as Step 1.	Voltmeter indicates −6 v dc.	Battery BB/402–U low. Faulty switch S101.
3	Ⓕ Terminal 7 K102	Voltmeter on 150 vdc scale.	Same as Step 1.	Voltmeter indicates 135 v dc.	Battery BB/40-U low. Faulty vibrator. Faulty switch S101.
4	Ⓖ Tip Jack J111	Ammeter ME/68–PRC/14 in J107	Same as Step 1.	See Fig. 5–2, Curve A.	Tube V117 or associated components. Turrets O-102 and O141 or their contacts.
5	Ⓖ coil L118, L119, L120 or L121.	Wavemeter coupled closely to coil.	Same as Step 1.	Wavemeter indicates crystal frequency.	Faulty crystal. Spurious harmonic.
6	Ⓗ Tip Jack J112	Same procedure as Step 4.	Same as Step 1.	See Fig. 5–2, Curve B.	Tube V118 or associated components. Turret O103 or its contacts.
7	(H_1) Coil L122, L123, L124 or L125.	Same as Step 5.	Same as Step 1.	Wavemeter indicates twice crystal frequency.	Same as Step 5.
8	Ⓘ Tip Jack J113	Same procedure as Step 4.	Same as Step 1.	See Fig. 5–2, Curve C.	Tubes V119 and V121 or associated components. Turret O104 or its contacts.
9	(I_1) Coil L126, L127, L128 or L129.	Same as Step 5.	Same as Step 1.	Wavemeter indicates four times crystal frequency.	Same as Step 5.
10	Ⓙ Pin 4 of V121	Same procedure as Step 3. Set VTVM to 50 v dc range.	Same as Step 1.	VTVM indicates between 17 and 17.5 v dc.	Coil L131 off alignment. Tube V121 faulty. Crystal Y106 faulty.
11	(J_1) Coil L131	Same as Step 5.	Same as Step 1.	Wavemeter indicates 27 mc.	Crystal Y106 faulty.
12	Ⓚ Pin 4 of V122.	Same procedure as Step 3. Set VTVM to 50 v dc range.	Same as Step 1.	VTVM indicates at least 14 vdc.	Faulty tube V120. Faulty capacitor C165.
13	Ⓛ Receptacle J108.	Wattmeter set to 2 w scale. Connect to test point.	Same as Step 1 except W101 disconnected.	Wattmeter indicates 1 watt or more.	Cavities T111 and/or T112. Tubes V122 and/or V123.
14	Same as Step 13	Same as Step 13.	Whistle loudly into microphone.	Watttmeter drops slightly.	Audio system. Tube V116. Bad microphone.
15	(M_1) Junction of R127 and C139	VTVM set to 10 v dc range.	SQUELCH switch S102 off, set AVC bias at test point to −3 volts with SQUELCH control R125.		Tubes V103, V104, V105 and/or V106. Incorrect alignment.

TABLE 6–2. SYSTEMS TROUBLE ANALYSIS CHART (Cont.)

Step	Test Point	Test Equip. Control Position	AN/PRC–14 Control Position	Normal Indication	Possible Cause of Abnormal Indication
15 Cont'd	Ⓜ Pin 7 of V103 (M_2) AVC Terminal of T108	Signal generator connected to test point through 0.001 uf capacitor; modulation OFF; frequency set to 3.5 mc ± 1 kc.	Transfer VTVM to Test Point (M_2) Set generator attenuator so that VTVM indicates −3 volts at test point.	Signal generator attenuator indicates 70 microvolts or less.	
16	Ⓝ Pin B of Receptacle J107	Same, attenuator setting as Step 15; signal generator modulation on; set modulation to 30%, at 1000 cps; audio power output meter connected to test point.	Same as Step 15; volume control R144 at maximum.	Output meter indicates 250 milliwatts or more.	Noise limiter assembly. Audio amplifier.
17	Ⓞ Pin 1 of V109	VTVM set to 150 vdc range. 1 megohm resistor in series with probe.	Receiver section ON.	VTVM indicates 114 volts.	Tube V109. Crystal Y101. Coil L117 adjusted improperly.
18	Ⓟ Pin 4 of V101	Signal generator set at 54 mc ± 1 kc. Use 0.001 uf capacitor in series with generator.	Same as Step 15.	Signal generator attenuator indicates approximately 5 microvolts or less.	Tube V102. Transformer T104 alignment. Cavities T101 and T102.
19	Ⓠ Receptacle J103	Signal generator set to channel frequency. 1000 cps 30% modulation ON. Zero output. Audio power output meter connected to Test Point Ⓝ.	Squelch switch S102 ON. Bias at Test Point Ⓜ 2 v. Volume control R144 at maximum.	Noise output 1 milliwatt or less.	
		Increase output by adjusting attenuator.	Bridge crystal headphone across output meter.	Squelch opens (rush of noise and signal) at 2.5 to 5 microvolts. Audio power output meter reading increases suddenly.	Tube V110 or associated components.
20	Ⓡ Terminal 14 of K102	Audio oscillator set to 1000 cps at amplitude of 0.9 volts rms at test point.	Same as Step 17.	Output meter indicates 1000 milliwatts or more.	Tube V114.
21	Ⓢ Terminal C of J107	Audio oscillator set to 1000 cps at amplitude of 0.1 volt rms at test point.	Terminals F & H of J107 shorted. S103 on SPEECH.	AF voltmeter measures 0.55 volt at Test Point Ⓡ.	Transformer T109 and associated filter components. Relay K102.
22	Terminal 14 of K102	AF voltmeter set on 3 volt rms scale.	Terminals F & H shorted. S103 on TONE.	AF voltmeter measures 1.0 volt rms at test point Ⓡ.	Tube V115. Resistor R150. Switch S103.

6–9. TUBE SOCKET VOLTAGE AND RESISTANCE CHART. (See Figure 7–2.)

6–10. ALIGNMENT AND ADJUSTMENT.

6–11. IF ALIGNMENT. Whenever a tube is changed in the IF stages of the receiver, the stages should be checked and realigned if necessary. With the AVC bias at Test Point (M_1) set to —3 volts with the dc vacuum tube voltmeter, the 3.5 mc. signal generator output required at the grids of the IF tubes for a reading of —2 volts at Test Point (M_2) (AVC Terminal of T108) should be as follows:

V106 (3rd IF)	70000 microvolts
V105 (2nd IF)	3000 microvolts
V104 (1st IF)	150 microvolts
V103 (2nd mixer)	70 microvolts

Input levels appreciably greater than those given above indicate the need for IF alignment. IF stages should be aligned from transformer T108 backward. The procedure is as follows:

1. Connect signal generator to grid of tube preceding transformer to be aligned. Clip 1000 ohm resistor across grid and ground terminals (secondary) of transformer. Adjust top core of transformer for maximum voltage at Test Point (M_2) with alignment tool.

2. Remove power, transfer 1000 ohm resistor to plate and B+ terminals of transformer and again apply power. Adjust bottom core for maximum voltage at Test Point (M_2) Remove the 1000 ohm resistor. This completes alignment of the stage.

NOTE

Always adjust generator to keep maximum voltage at Test Point (M_2) at —3 volts or below and generator frequency within ±2 kc of 3.5 mc. Adjustment of the 54 mc IF amplifier stages is the same except that the signal generator should be set to 54 mc ±10 kc and its output applied between Test Point (P) and ground. Signal generator output should be approximately 5 microvolts with voltages at Test Points (M_1) and (M_2)

6–12. CHANNEL SELECTOR AND TURRET ADJUSTMENT. Channel selector adjustment will become necessary if channel frequency assignments are changed. Following is the adjustment procedure. (Refer to Figure 6–1.)

1. Remove the cover, exposing the top of the chassis.

2. Plug Ammeter ME–68/PRC–14 into Jack J107.

3. Set CHANNEL SELECTOR switch on Channel 3. This brings Channel #1 crystal into position for replacement.

4. Select the proper channel crystal and plug in. The crystal frequency can be determined by the following formula:

$$f = \frac{F - 54}{8}$$

where f = crystal frequency
and F = channel frequency.

5. Rotate CHANNEL SELECTOR switch to Channel #1.

6. Insert plug P109 (normally in J114) into J111. Apply power and allow Transceiver to warm up 60 seconds.

7. Adjust oscillator turret coil with alignment tool through hole A in bottom of case nearest channel selector assembly. Maximum reading on Ammeter ME–68/PRC–14 is an indication of correct adjustment. This reading should agree closely with that given by Curve A of Figure 5–2.

8. Transfer P109 to J112 and adjust ceramic coil form in doubler turret (use middle hole marked B in bottom of case) for a maximum indication on the Ammeter. This should agree closely with that given by Curve B of Figure 5–2.

9. Transfer P109 to J113 and adjust second doubler coil (use hole C in case, farthest away from channel selector assembly) for a maximum indication on the Ammeter. This should agree closely with that given by Curve C of Figure 5–2.

10. Transfer P109 to J114. Adjust channel selector screw with screwdriver through hole in housing. This is reached by removing the yellow plug in the hub of the channel selector knob. Adjust for maximum power output, indicated by a peak reading on the Ammeter. This reading should agree closely with that given by Curve D of Figure 5–2.

6–13. This completes the channel selector and turret adjustment for the first channel. The other channels should be adjusted, in numerical order, in the same manner as above.

6–14. ADJUSTMENT OF BALANCING POTENTIOMETER R175.

1. With squelch ON, set voltage at Test Point (M$_1$) to —3 v dc.

2. Connect Signal Generator to jack J103.

3. Turn on 30% modulation and adjust generator output to approximately 2.5 uv.

4. Adjust R175 until "rush noise" and signal disappear.

5. Check adjustment by increasing generator output to 5 uv. Noise and signal should return.

6–15. LUBRICATION. No lubrication is required except upon overhaul.

6–16. MAINTENANCE AND INSPECTION.

Table 6–3 indicates components and parts over and above those listed in Section 5 which require inspection, maintenance, and replacement at specific times.

TABLE 6–3. MAINTENANCE AND INSPECTION SCHEDULE

Component	Inspection or Maintenance	Time
TRANSCEIVER		
1. Turrets	1. Inspect contacts and clean if necessary.	500 hours
2. Tubes	2. Check on Tube Tester.	500 hours

6–17. OVERHAUL SCHEDULE. Radio Set AN/PRC–14 should be overhauled every 1000 hours of operation.

SECTION VII

DIAGRAMS

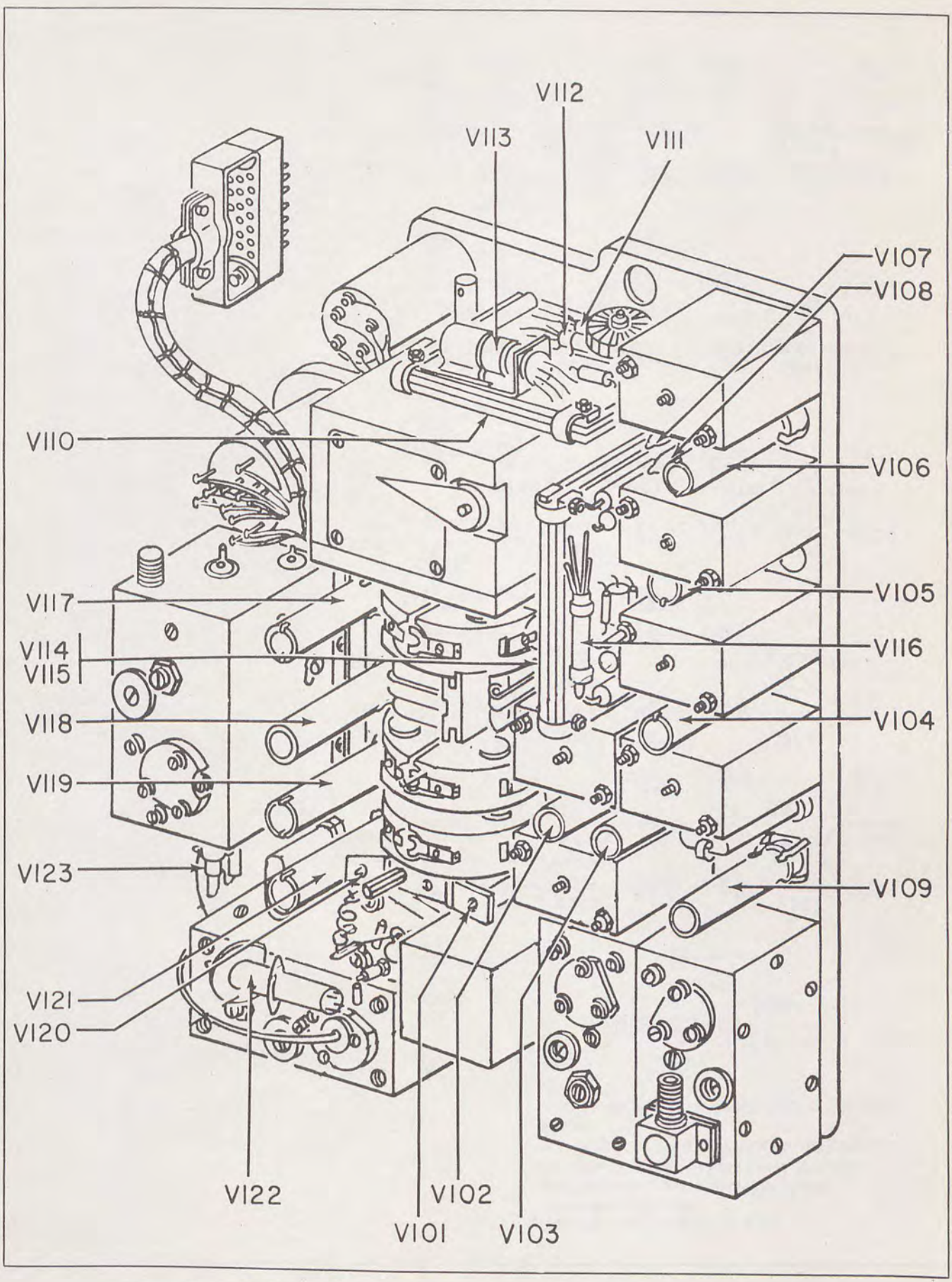
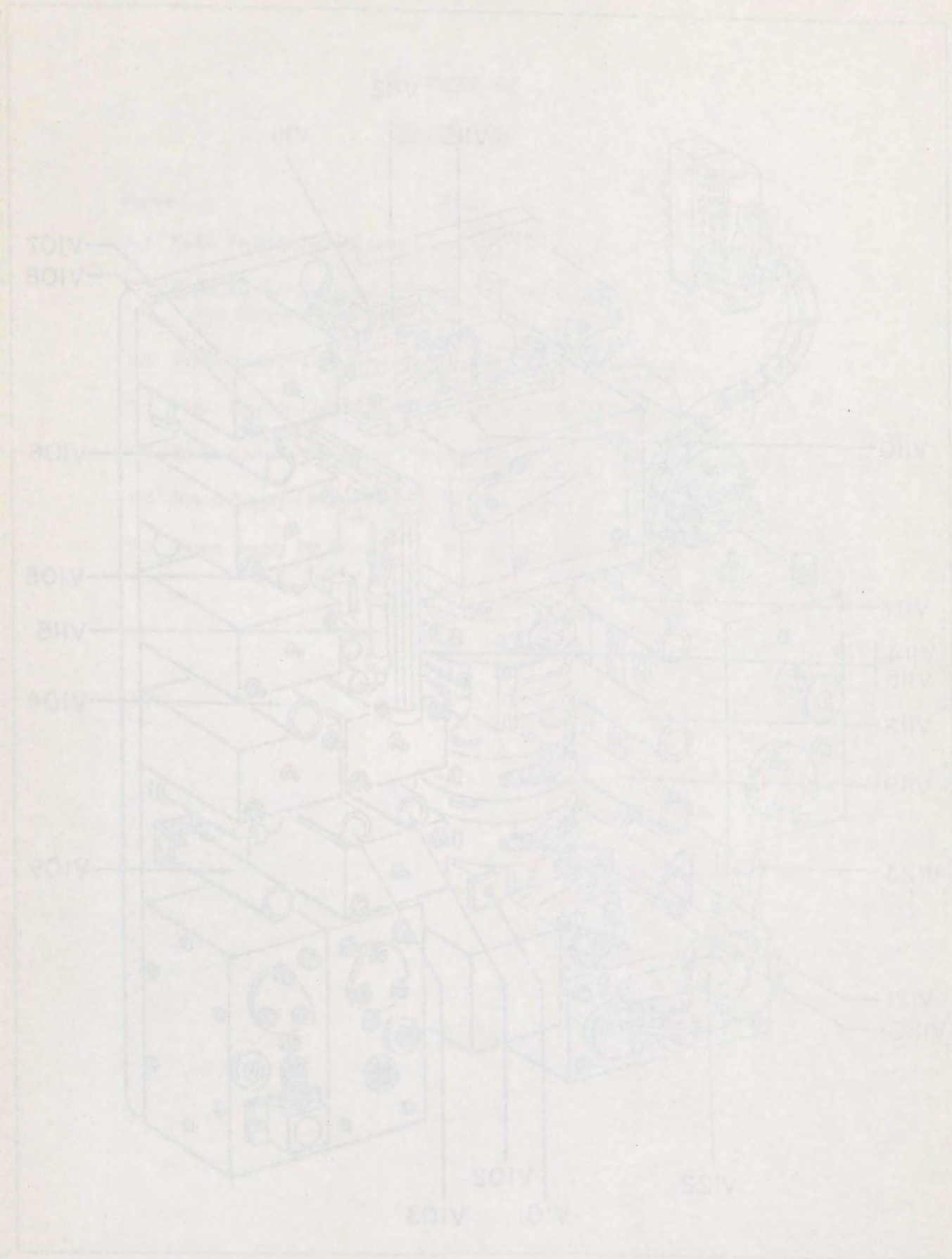


Figure 7–1. Radio Receiver-Transmitter RT–271/PRC–14, Tube Location Diagram



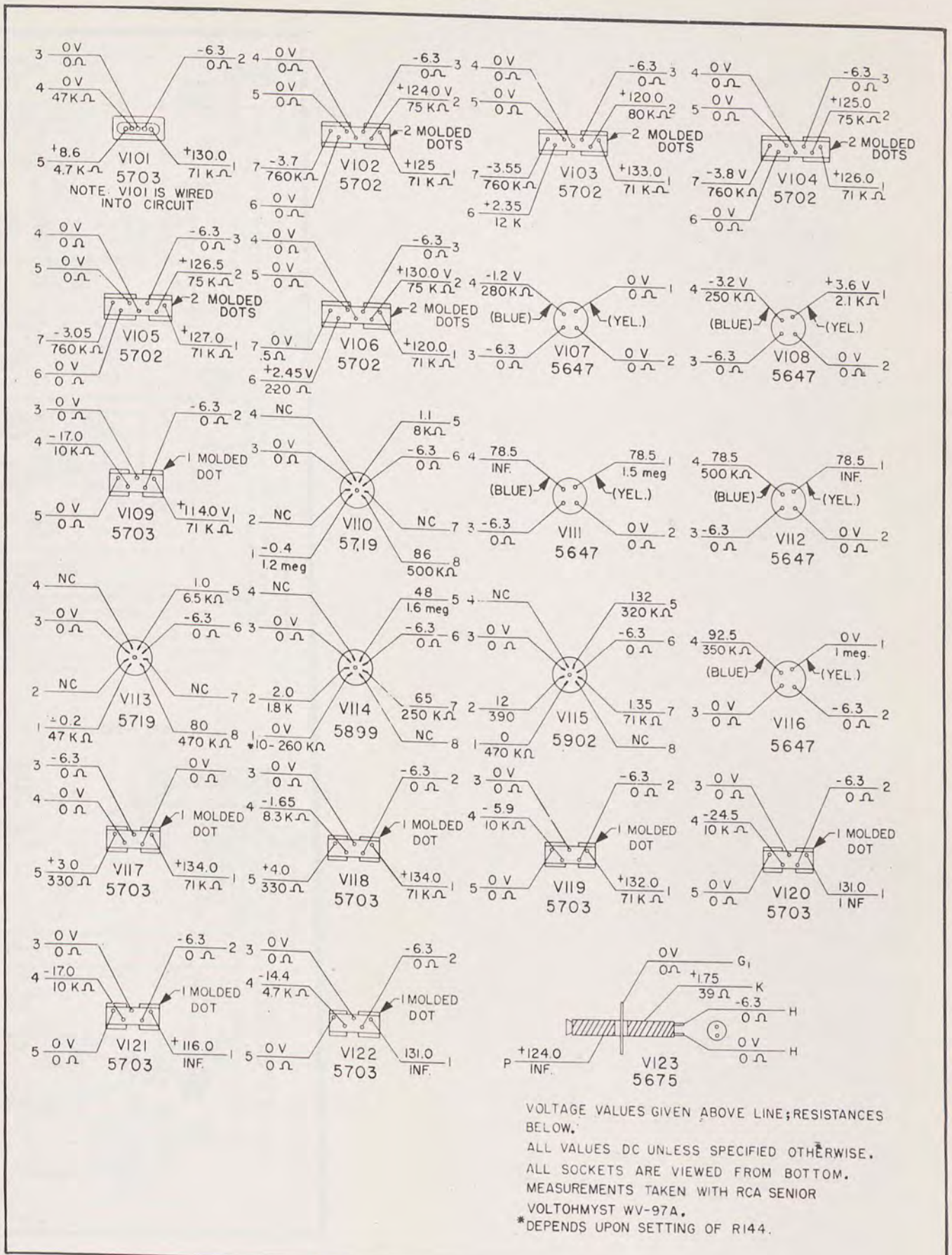
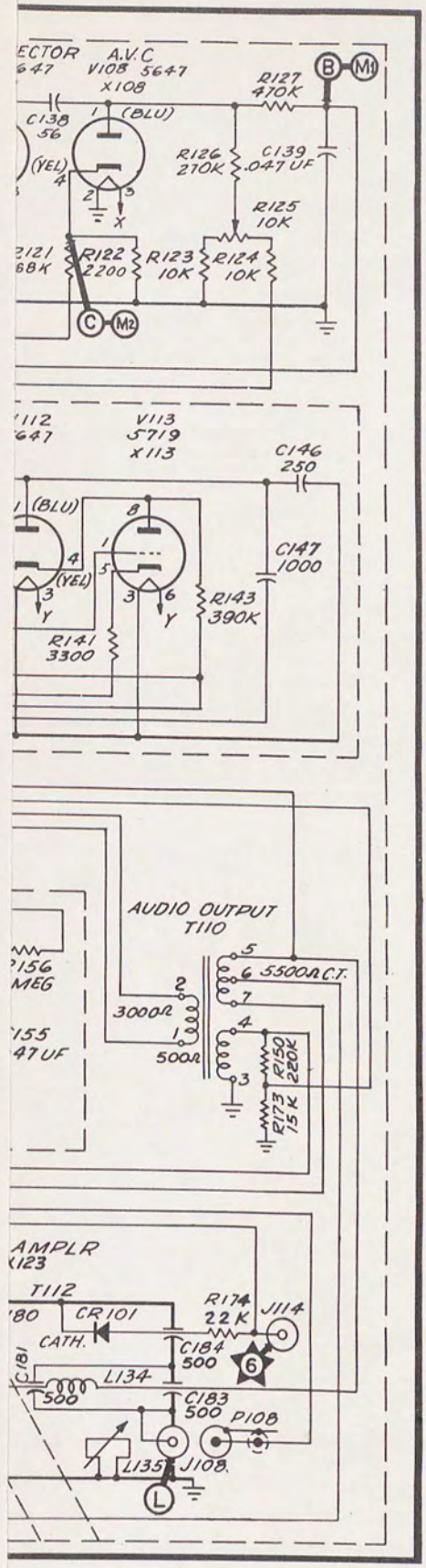


Figure 7–2. Radio Receiver-Transmitter RT–271/PRC–14, Tube Voltage and Resistance Diagram



Schematic Diagram

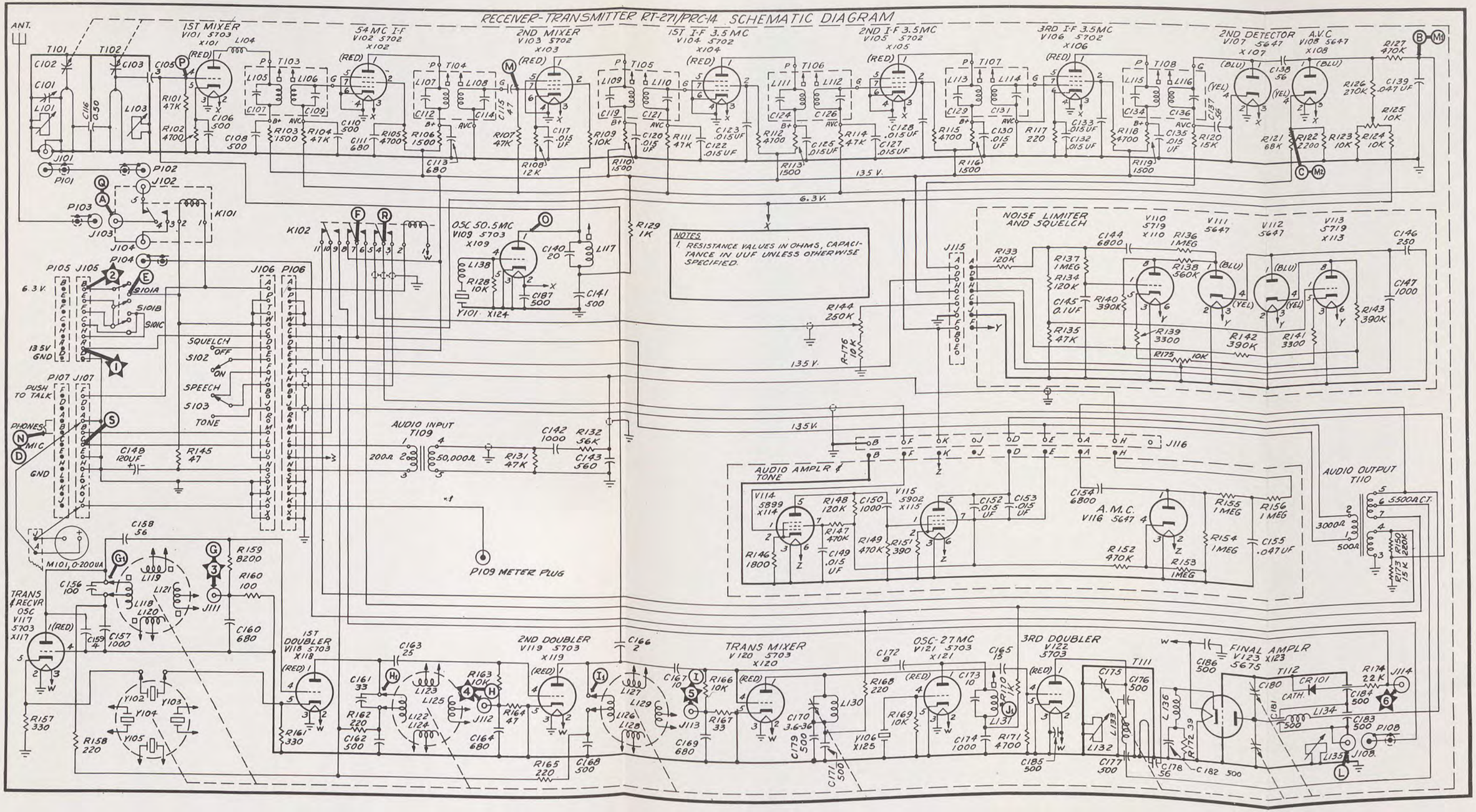


Figure 7–3. Radio Receiver-Transmitter RT–271/PRC–14, Schematic Diagram

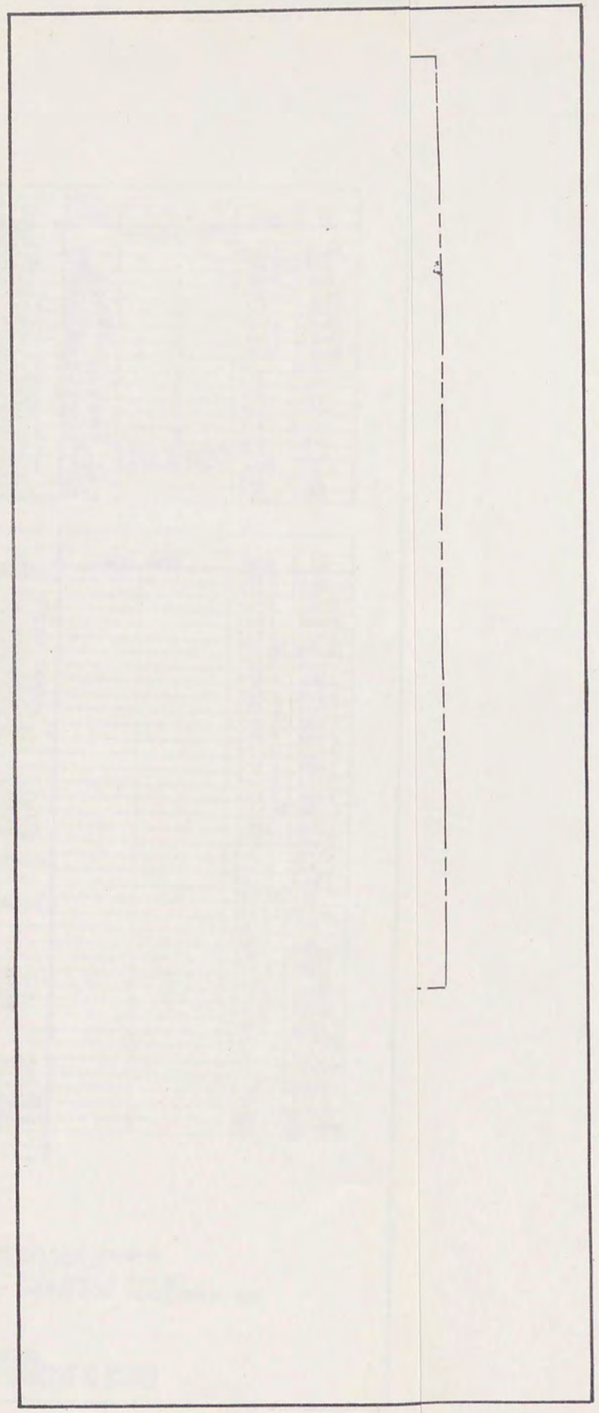
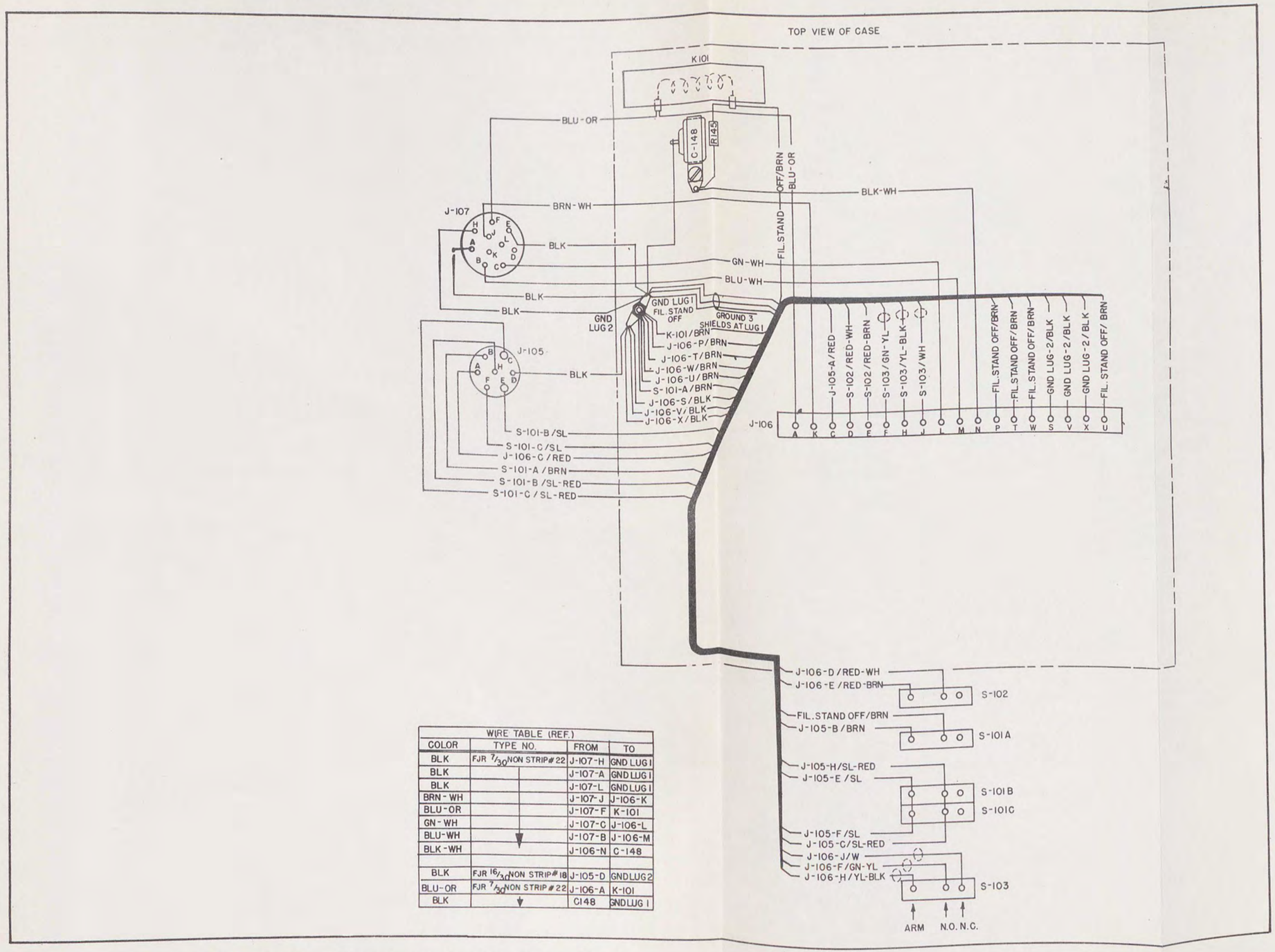


Figure 7–4. Radio Receive



WIRE TABLE (REF.)			
COLOR	TYPE NO.	FROM	TO
BLK	FJR 7/30 NON STRIP # 22	J-107-H	GND LUG 1
BLK		J-107-A	GND LUG 1
BLK		J-107-L	GND LUG 1
BRN-WH		J-107-J	J-106-K
BLU-OR		J-107-F	K-101
GN-WH		J-107-C	J-106-L
BLU-WH		J-107-B	J-106-M
BLK-WH		J-106-N	C-148
BLK	FJR 16/30 NON STRIP # 18	J-105-D	GND LUG 2
BLU-OR	FJR 7/30 NON STRIP # 22	J-106-A	K-101
BLK		C148	GND LUG 1

Figure 7–4. Radio Receiver-Transmitter RT–271/PRC–14, Wiring Diagram, Case

IRE TABLE (REF.)

	TO	COLOR	TYPE NO.	FROM	TO
	X107-4		FJR 7/30 NON STRIP #22		
	FIL #2	RED		B+ #7	B+ #8
	FIL #4	WH		T108-AVC	R120
	J116-K	RED-WH		B+ #2	B+ #3
	X105-3	RED-WH		J115-H	B+ #5
	X104-3	RED-WH		B+ #4	B+ #5
	X102-3	RED-WH		B+ #4	B+ #3
	X103-3	RED-WH		B+ #2	B+ #1
	C187	RED-WH		B+ #2	B+ #6
	X109-2	GN-WH		J 111	C160
	FIL #6	GN-WH		J 112	C164
	X118-2	GN-WH		C139	R111
	X119-2	GN-WH		R111	R104
	X119-2	BLU-WH		T110-6	C 177
	X120-2	BLU-WH		J115-C	R144
	X120-2	BRN	FJR 15/30 NON STRIP #18	FIL #2	FIL #3
	X107-5	RED	FJR 7/30 NON STRIP #22	B+ #8	T110-2
	C186	GN-YL		R166	J113
	X121-2	BLK.		T110-3	GND

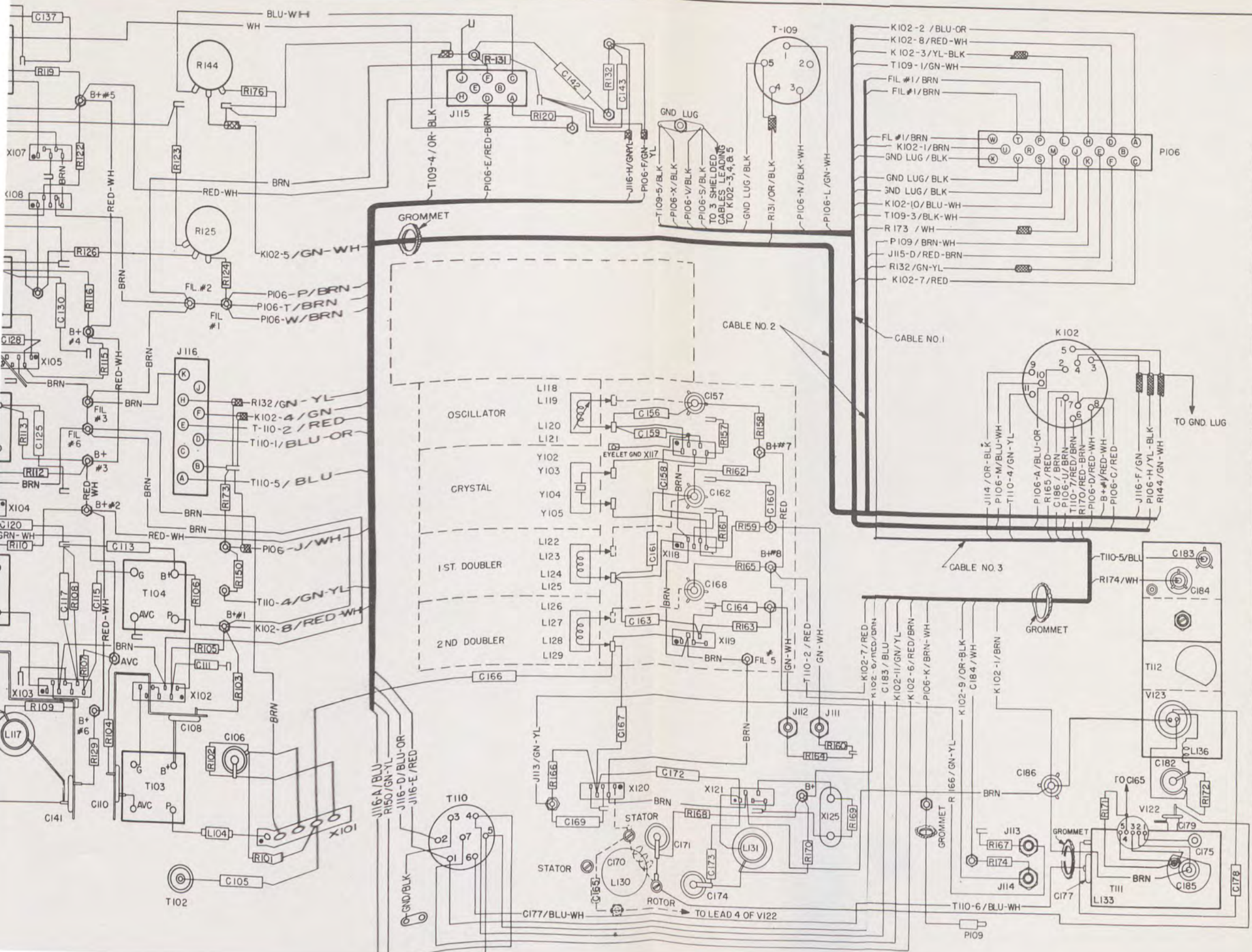
:F)

	TO	SELF LEADS	FROM	TO
	GND LUG		T108-P	X106-1
			T108-G	X107-1
	GND LUG		X107-2	X107-3
	GND LUG		X106-4	X106-5
	GND LUG		X108-4	X108-5
4	GND LUG		T107-AVC	GND LUG
	R127		T107-P	X105-1
	GND LUG		X105-4	SHIELD
	GND LUG		X105-5	SHIELD
	GND LUG		T106-G	X105-7
	FIL #4		T106-P	X104-1
	FIL #6		X104-4	X104-5
			X104-6	X104-5
			T105-G	X104-7
			T105-P	X103-1
	FIL #2		X103-4	X103-5
	X101-3		T104-AVC	GND LUG
	X101-5		T104-P	X102-1
	GND LUG		X102-4	X102-5
			X102-5	SHIELD
	C170 ROTOR		X102-6	SHIELD
	C174		T103-G	X102-7
			T103-AVC	C110
	GND LUG		X117-2	X117-4
			V122-1	C175
			V122-2	C185
			V122-3	T111 GND
			T107-G	X106-7
	GND LUG		V122-5	T111 GND
	GND LUG		X119-3	X119-5
NT.	X118-5		V101-4	X101-6
			X105-6	SHIELD
			V120-1	C170 STATOR
			L131	X121-1
	OSC. CONT.		C157	OSC. CONT.
	XTAL CONT.		C159	OSC. CONT.
4	EYELET GND		C159	X117-4
			C162	
			C166	

OTES:
ER WIRE PER SPEC. JAN-C-76.
PER SPEC. QQ-W-341a.
SPEC. #72-53 TABLE II, TYPE II.
ROUNDS ARE #22 BARE TINNED COPPER WIRE.

OF CHASSIS.
OP OF UNDERSIDE OF CHASSIS.
OP OF UNDERSIDE OF CHASSIS.

4, Wiring Diagram, Chassis



WIRE TABLE (REF.)							
COLOR	TYPE NO.	FROM	TO	COLOR	TYPE NO.	FROM	TO
BRN	FJR 7/30 NON STRIP #22	X106-3	X107-4		FJR 7/30 NON STRIP #22		
BRN		X108-4	FIL #2	RED		B+ #7	B+ #8
BRN		FIL #2	FIL #4	WH		T108-AVC	R120
BRN		FIL #3	J116-K	RED-WH		B+#2	B+#3
BRN		FIL #3	X105-3	RED-WH		J115-H	B+#5
BRN		FIL #6	X104-3	RED-WH		B+#4	B+#5
BRN		FIL #6	X102-3	RED-WH		B+#4	B+#3
BRN		X102-3	X103-3	RED-WH		B+#2	B+#1
BRN		X103-3	C187	RED-WH		B+#2	B+#6
BRN		C187	X109-2	GN-WH		J 111	C160
BRN		X101-2	FIL #6	GN-WH		J 112	C164
BRN		X117-3	X118-2	GN-WH		C139	R111
BRN		X118-2	X119-2	GN-WH		R111	R104
BRN		FIL #5	X119-2	BLU-WH		T110-6	C177
BRN		FIL #5	X120-2	BLU-WH		J115-C	R144
BRN		X121-2	X120-2	BRN	FJR 16/30 NON STRIP #18	FIL #2	FIL #3
BRN		X108-5	X107-5	RED	FJR 7/30 NON STRIP #22	B+#8	T110-2
BRN		C185	C186	GN-YL BLK.		R166	J113
BRN		C186	X121-2			T110-3	GND

BARE WIRE TABLE (REF)							
WIRE TYPE	FROM	TO	SELF LEADS			FROM	TO
#22 BARE TINNED COPPER WIRE	J115-J	GND LUG				T108-P	X106-1
						T108-G	X107-1
	X107-3	GND LUG				X107-2	X107-3
	J116-B	GND LUG				X106-4	X106-5
	X108-3	GND LUG				X108-4	X108-5
	X106-4	GND LUG				T107-AVC	GND LUG
	X108-1	R127				T107-P	X105-1
	X104-4	GND LUG				X105-4	SHIELD
	X103-4	GND LUG				X105-5	SHIELD
	X109-5	GND LUG				T106-G	X105-7
	J115-F	FIL #4				T106-P	X104-1
	FIL #3	FIL #6				X104-4	X104-5
						X104-6	X104-5
						T105-G	X104-7
						T105-P	X103-1
	FIL #1	FIL #2				X103-4	X103-5
	C106	X101-3				T104-AVC	GND LUG
	C106	X101-5				T104-P	X102-1
	X120-5	GND LUG				X102-4	X102-5
						X102-5	SHIELD
	C171	C170 ROTOR				X102-6	SHIELD
	L131	C174				T103-G	X102-7
						T103-AVC	C110
	X121-3	GND LUG				X117-2	X117-4
						V122-1	C175
						V122-2	C185
						V122-3	T111 GND
						T107-G	X106-7
	X118-3	GND LUG				V122-5	T111 GND
	X119-3	GND LUG				X119-3	X119-5
	XTAL CONT.	X118-5				V101-4	X101-6
						X105-6	SHIELD
						V120-1	C170 STATOR
.012 X 3/32 COPPER SILVER PLATED .0005-.0003 THK						L131	X121-1
	X117-1	OSC. CONT.				C157	OSC. CONT.
	X117-5	XTAL CONT.				C159	OSC. CONT.
	X117-284	EYELET GND				C159	X117-4
	X118-1	1ST DOUBLER				C162	2ND DOUBLER CON.
	X119-1	2ND DOUBLER				C166	2ND DOUBLER CON.

NOTES:
1. ALL BARE TINNED COPPER WIRE PER SPEC. JAN-C-76.
2. ALL COPPER FLAT WIRE PER SPEC. QQ-W-341a.
3. ALL SILVER PLATE PER SPEC. #72-53 TABLE II, TYPE II.
4. ALL SHIELDED CABLE GROUNDS ARE #22 BARE TINNED COPPER WIRE.

CABLE NO. 1 RUNS ON TOP OF CHASSIS.
CABLE NO 2 RUNS FROM TOP OF UNDERSIDE OF CHASSIS.
CABLE NO. 3 RUNS ON UNDERSIDE OF CHASSIS.

COLOR	TYPE NO.	FROM
BRN	FJR 7/30 NON STRIP 22	X106-1
BRN		X108-4
BRN		FIL #2
BRN		FIL #3
BRN		FIL #3
BRN		FIL #6
BRN		FIL #6
BRN		X102-3
BRN		X103-3
BRN		C187
BRN		X101-2
BRN		X117-3
BRN		X118-2
BRN		FIL #5
BRN		FIL #5
BRN		X121-2
BRN		X108-5
BRN		C185
BRN		C186

BARE WIRE TABLE (R	
WIRE TYPE	FRO
22 BARE TINNED COPPER WIRE	J115-
	X107-
	J116-
	X108-
	X106-
	X108-
	X104-
	X103-
	X109-
	J115-
	FIL #
	FIL #
	C106
	C106
	X120
	C171
	L131
	X121-
	X118-
	X119-
	XTAL C
012 X 3/32 COPPER SILVER PLATED .0005-.0003 THK	X117-
	X117-
	X117-5
	X118-
	X119-

1. ALL BARE TINNED COPP
2. ALL COPPER FLAT WIR
3. ALL SILVER PLATE PE
4. ALL SHIELDED CABLE

CABLE NO. 1 RUNS ON TO
CABLE NO 2 RUNS FROM
CABLE NO 3 RUNS FROM

Figure 7–5. Radio Receiver-Transmitter RT–271/PRC–

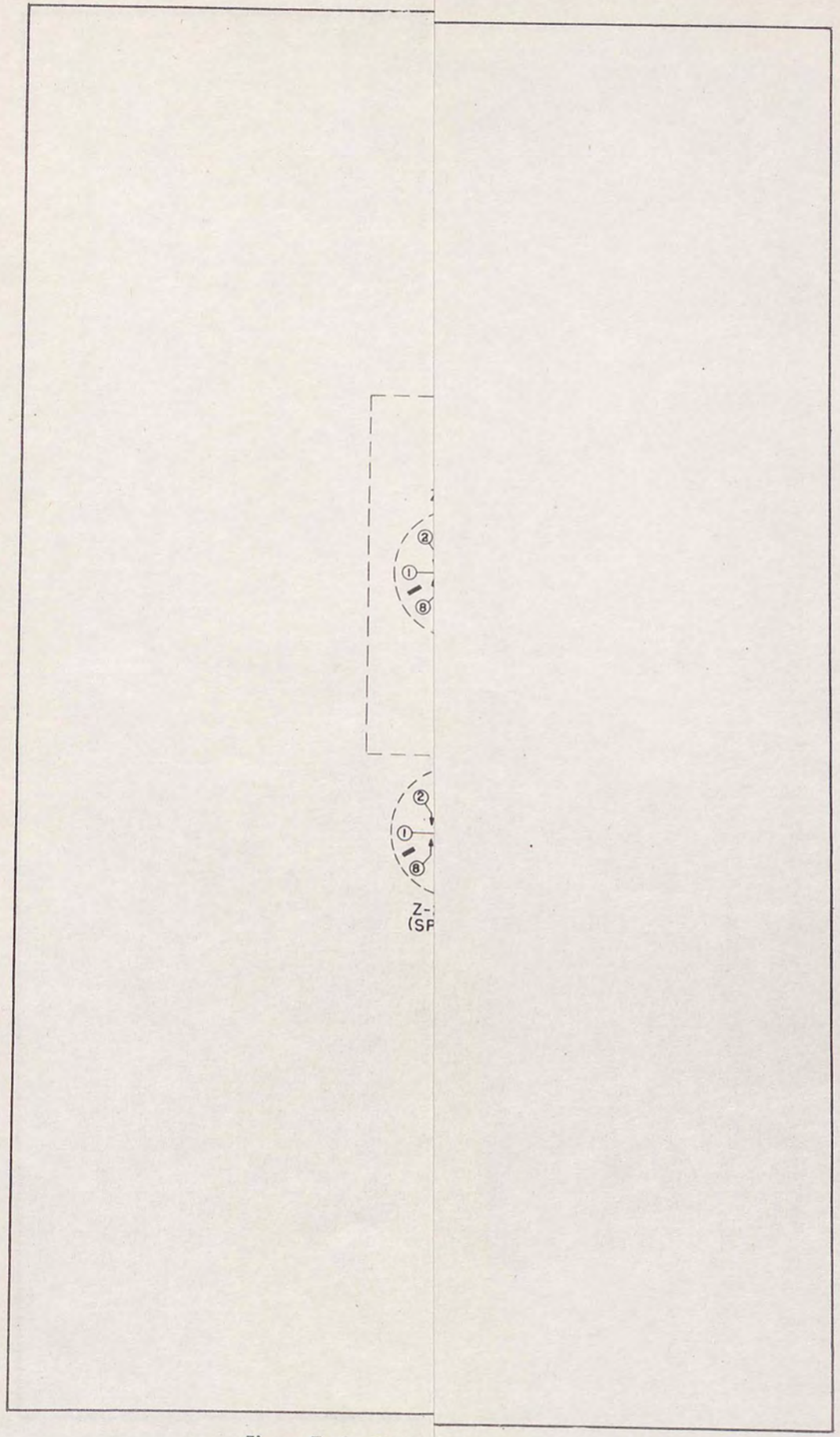


Figure 7–6. Power

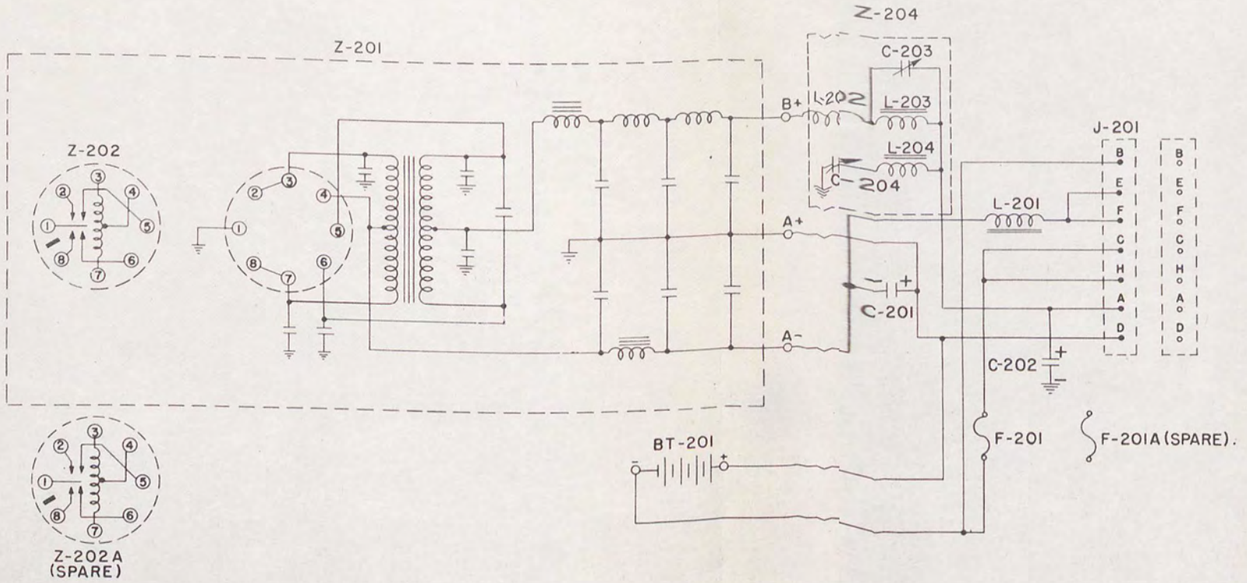
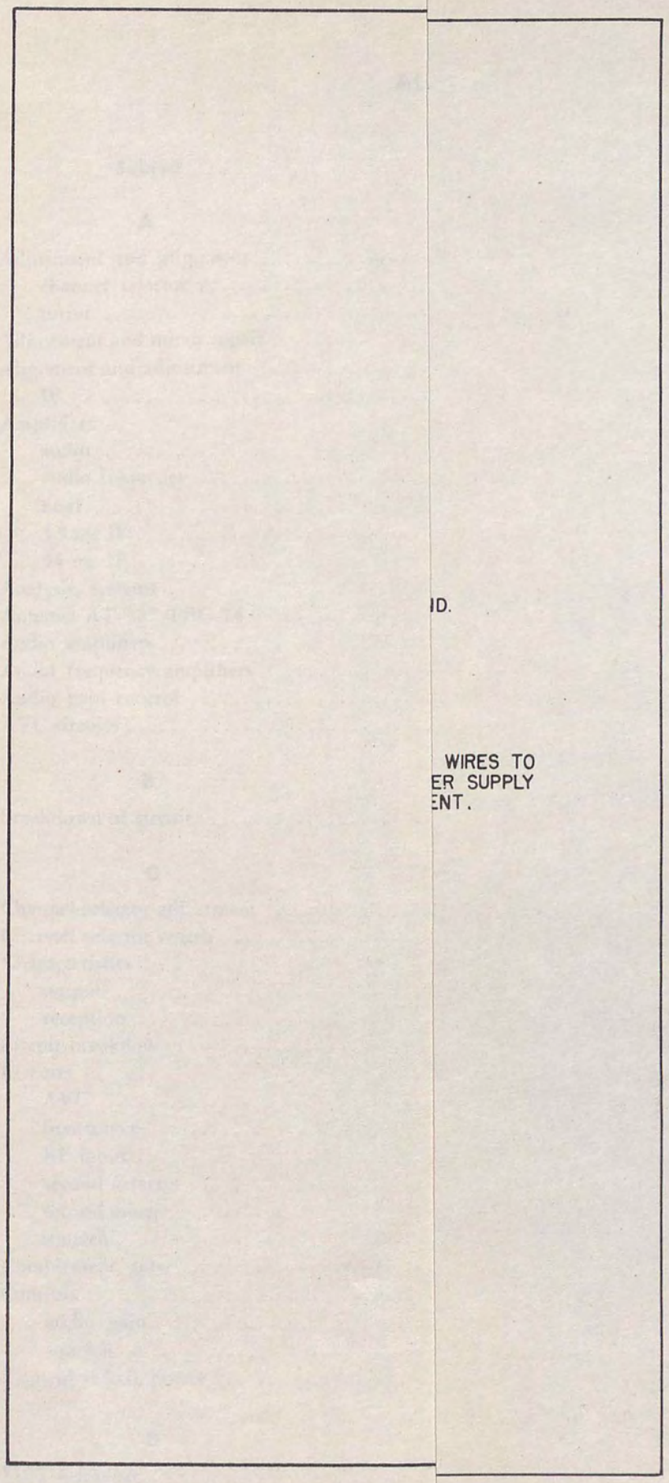


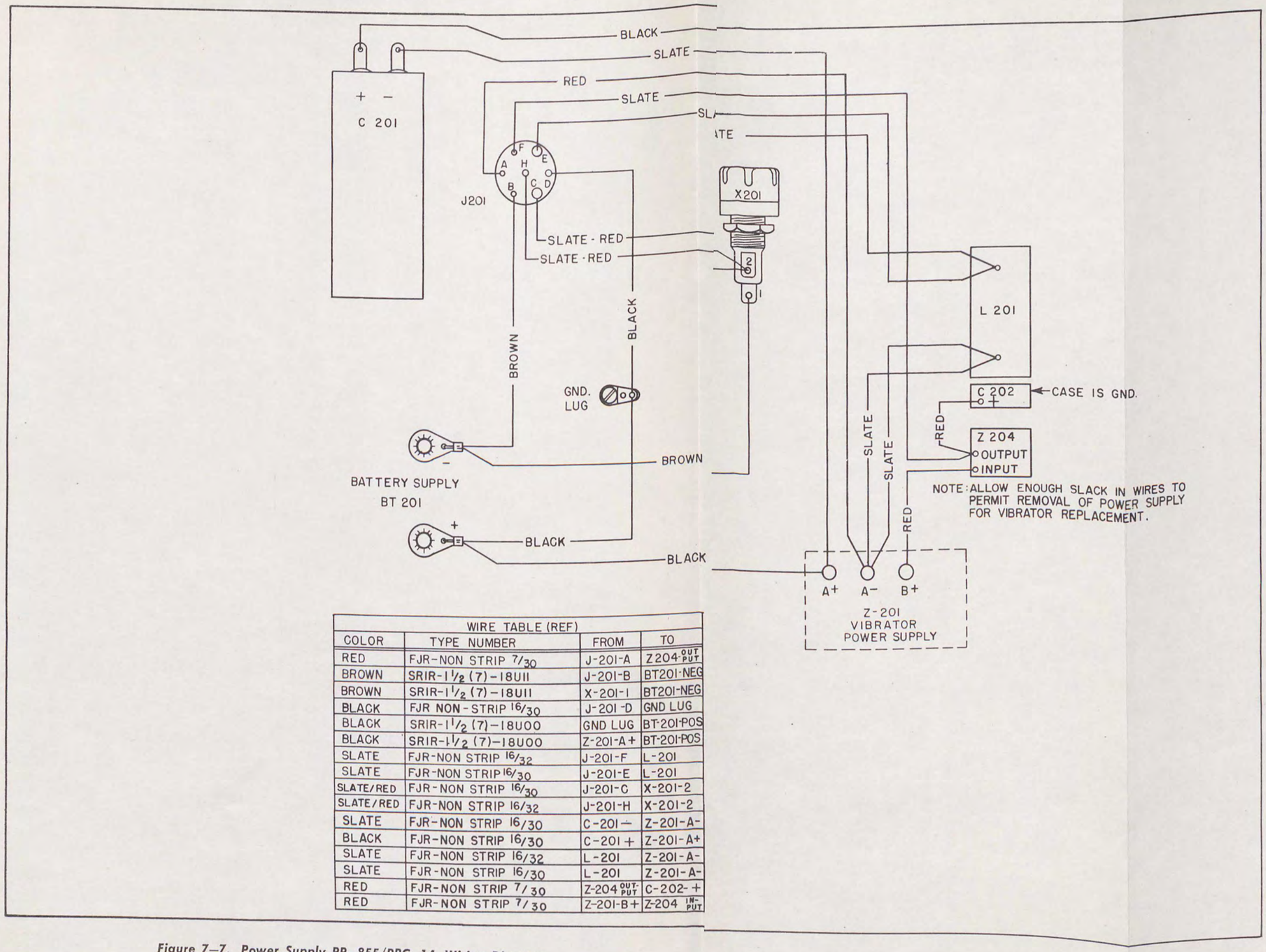
Figure 7–6. Power Supply PP–855/PRC–14, Schematic Diagram



ID.

WIRES TO
ER SUPPLY
ENT.

Figure 7–7. Powe



WIRE TABLE (REF)			
COLOR	TYPE NUMBER	FROM	TO
RED	FJR-NON STRIP 7/30	J-201-A	Z204 OUTPUT
BROWN	SRIR-1 1/2 (7)-18UII	J-201-B	BT201-NEG
BROWN	SRIR-1 1/2 (7)-18UII	X-201-1	BT201-NEG
BLACK	FJR NON-STRIP 16/30	J-201-D	GND LUG
BLACK	SRIR-1 1/2 (7)-18U00	GND LUG	BT-201-POS
BLACK	SRIR-1 1/2 (7)-18U00	Z-201-A+	BT-201-POS
SLATE	FJR-NON STRIP 16/32	J-201-F	L-201
SLATE	FJR-NON STRIP 16/30	J-201-E	L-201
SLATE/RED	FJR-NON STRIP 16/30	J-201-C	X-201-2
SLATE/RED	FJR-NON STRIP 16/32	J-201-H	X-201-2
SLATE	FJR-NON STRIP 16/30	C-201 –	Z-201-A-
BLACK	FJR-NON STRIP 16/30	C-201 +	Z-201-A+
SLATE	FJR-NON STRIP 16/32	L-201	Z-201-A-
SLATE	FJR-NON STRIP 16/30	L-201	Z-201-A-
RED	FJR-NON STRIP 7/30	Z-204 OUTPUT	C-202-+
RED	FJR-NON STRIP 7/30	Z-201-B+	Z-204 INPUT

Figure 7–7. Power Supply PP–855/PRC–14, Wiring Diagram

ALPHABETICAL INDEX

ALPHABETICAL INDEX—(cont.)

ALPHABETICAL INDEX—(cont.)

ALPHABETICAL INDEX—(cont.)