frequency, or one-half the value of the desired output frequency (par. 14), and insert it in the CRYSTAL receptacle near the upper right-hand corner of the transceiver panel.

b. Transmitter Coils. Four transmitting coils (L12 and L14) are furnished with Radio Set AN/PRC-5 (par. 15). To operate on a given frequency, determine the coils required for operation at that frequency from the following table, and insert the coils selected in the OSC COIL and AMP COIL receptacles, respectively.

c. Frequency-coil Table.

| Output frequency (mc) | Crystal frequency (mc) | Oscillator coil | Amplifier coil |
|---|---|---|---|
| 4.0 to 6.0 | 4.0 to 6.0 | Band C | Band B |
| 6.0 to 8.0 | 6.0 to 8.0 | Band D | Band C |
| 8.0 to 12.0 | 4.0 to 6.0 | Band C | Band D |
| 12.0 to 16.0 | 6.0 to 8.0 | Band D | Band D |

d. Example. If the desired transmitting frequency is 5,263 kilocycles, proceed as follows:

(1) Insert the crystal marked 5,263 kc into the CRYSTAL receptacle.

(2) Use the above table to determine the proper coils:

(a) 5,263 kc lies between 4.0 and 6.0 mc.

(b) The 4.0 to 6.0 mc band requires BAND C coil for the oscillator and BAND B coil for the amplifier.

(3) Insert the BAND C coil in the OSC COIL receptacle.

(4) Insert the BAND B coil in the AMP COIL receptacle.

21. RECEIVER OPERATION.

a. Throw the BAND switch (SW3) to the desired position.

(1) Position 1 for frequencies between 4,500 and 8,000 kilocycles.

(2) Position 2 for frequencies between 8,000 and 16,000 kilocycles.

b. The frequency received is indicated on the dial, visible through the small window located above the d-c milliammeter. Rotate the RECEIVER TUNING knob to the desired receiving frequency.

c. Adjust the BFO OFF-ON switch (SW4) for the desired operation:

(1) Throw to ON when receiving c-w signals.

(2) Throw to OFF when receiving voice-modulated signals.

d. Turn the VOLUME control to the right (clockwise) to the maximum volume position. With the receiver in operation the volume level may be adjusted to suit the convenience of the operator.

e. Plug Headset HS-30 into the PHONES jack.

f. Throw the OFF-REC-SEND switch to the REC position.

g. Allow approximately 1 minute for the vacuum tube filaments to reach their proper operating temperature. The receiver now should be in operating condition, which will be evidenced by the presence of hiss and crackling sounds due to static and other forms of interference. If signals are not heard at the setting of the RECEIVER TUNING knob, try other settings until a signal is picked up. If it is impossible to pick up any signals or if the headset is dead, refer to paragraph 42.

22. TRANSMITTER OPERATION (fig. 2).

a. Plug telegraph Key J-47 into the KEY jack.

b. Throw the OFF-REC-SEND switch to the SEND position.

c. Tune the crystal oscillator as follows:

(1) Throw the OSC-AMP switch (SW5) to the OSC position.

(2) Press Key J-47 while rotating the OSC TUNING knob. Rotate the knob

until a pronounced dip is indicated by the d-c millimmeter. This dip in current indicates that the oscillator is operating.

(3) In order to insure rapid starting of the crystal oscillator while keying, rotate the knob slightly away from the minimum current position in the low-capacitance direction (towards 0 on the dial scale).

d. Tune the power amplifier as follows:

(1) Throw the OSC-AMP switch to the AMP position.

(2) Rotate the ANT COUPLING control knob to the maximum-capacitance position (knob pointer at 5 on the dial scale).

(3) Press Key J-47 while rotating the AMP TUNING knob. Rotate the knob until a pronounced dip is indicated by the d-c milliammeter. This dip in current indicates that the power-amplifier plate circuit is in resonance with the output frequency of the crystal oscillator or with the second harmonic of the crystal frequency.

(4) Set the AMP TUNING knob for a minimum current indication on the milliammeter.

NOTE: THE PLATE-TANK CIRCUIT OF THE CRYSTAL OSCILLATOR IS ALWAYS TUNED TO RESONANCE AT THE FREQUENCY OF THE CRYSTAL. THE PLATE-TANK CIRCUIT OF THE POWER AMPLIFIER MAY BE TUNED TO EITHER THE CRYSTAL FREQUENCY OR TO TWICE THE CRYSTAL FREQUENCY (SECOND HARMONIC), DEPENDING ON THE COIL IN USE IN THE POWER-AMPLIFIER STAGE.

e. Tune the antenna circuit as follows:

(1) Rotate the ANT COUPLING knob to the left (counterclockwise) until the milliammeter indication is approximately 80 milliamperes.

(2) Readjust the AMP TUNING control knob for a minimum indication on the

milliammeter.

(3) Then repeat steps (1) and (2) above until the minimum current indication on the milliammeter, while performing step (2), is 80 milliamperes.

CAUTION: DO NOT ALLOW THE HAND OR FINGERS TO FALL ACROSS BOTH SIDES OF KEY J-47. APPROXIMATELY 45 VOLTS ARE PRESENT. ALTHOUGH NOT PARTICULARLY HARMFUL THIS VOLTAGE CAN DELIVER A SERIOUS SHOCK UNDER CERTAIN CONDITIONS.

23. OPERATING PRECAUTIONS.

a. OFF-REC-SEND Switch.

(1) For transmitting, make sure that the switch is in the SEND position.

(2) For receiving, make sure that the switch is in the REC position.

b. OSC-AMP Switch.

(1) OSC position. This position is used only for tuning the oscillator.

(2) AMP position. The switch must be placed in this position for tuning operations on the power-amplifier and antenna circuits. It must be left in this position while transmitting.

c. ANT CURRENT Pilot Lamp. Assuming that the light filament is not open, the lamp should light every time the key is pressed, indicating that current is flowing in the antenna. If the lamp does not light under these conditions, the OSC TUNING knob has not been adjusted properly. Rotate the knob slightly toward the left (counterclockwise) until the lamp flashes every time the key is pressed (par. 22c(3)).

NOTE: THE BRIGHTNESS OF THIS LAMP WILL NOT BE THE SAME UNDER ALL CONDITIONS OF NORMAL OPERATION. THE BRIGHTNESS OF THE LAMP IS DEPENDENT ON THE POSITION OF MAXIMUM CURRENT ON THE ANTENNA

AND WILL VARY CONSIDERABLY WITH THE FREQUENCY AND THE LENGTH OF THE ANTENNA IN USE. IN ANY CASE, TUNE THE OUTPUT CIRCUITS FOR MAXIMUM BRILLIANCE OF THE LAMP WITHOUT REGARD TO THE RELATIVE BRILLIANCE OBTAINED AT ANOTHER FREQUENCY OR WITH ANOTHER ANTENNA INSTALLATION.

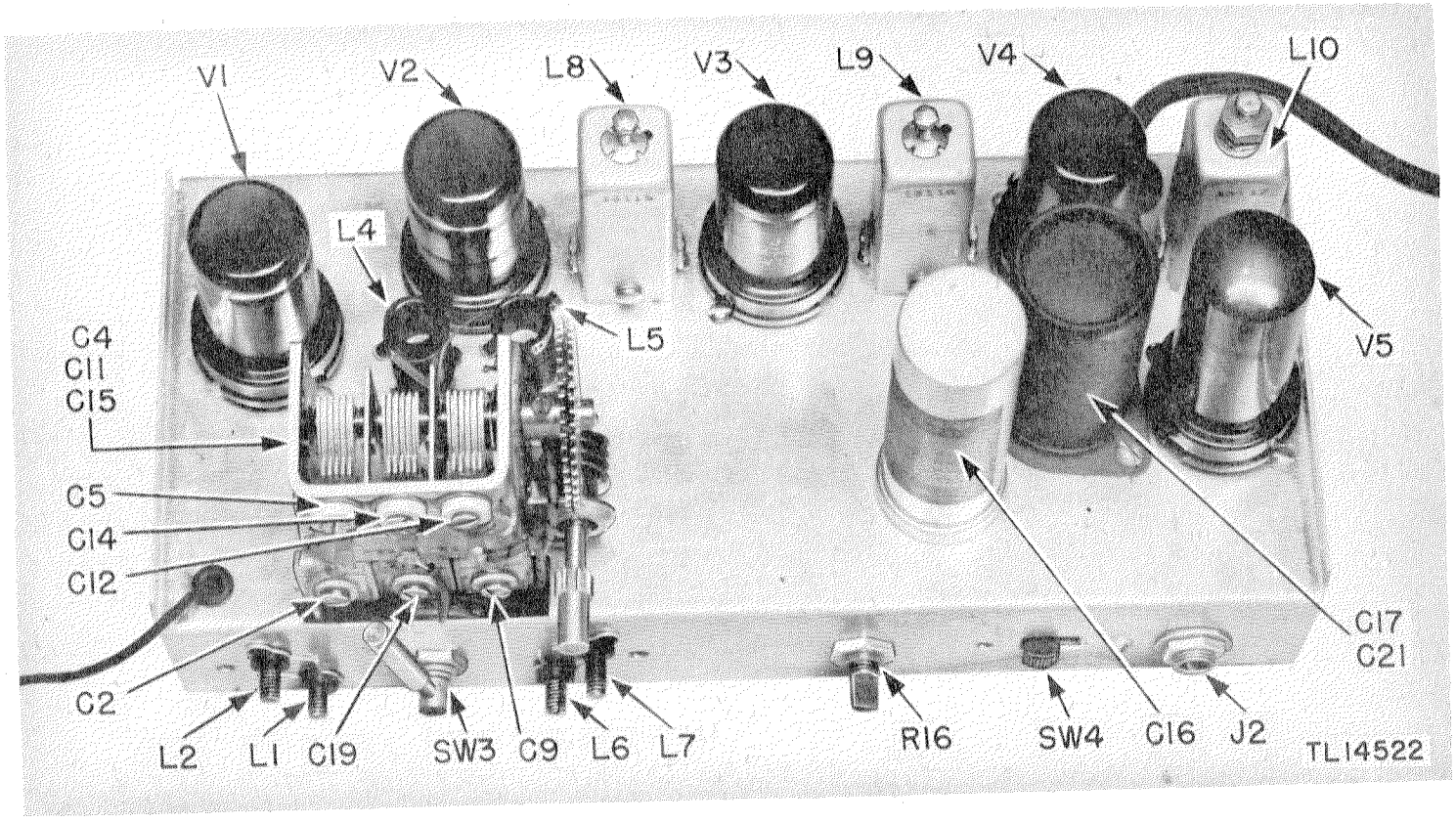


Figure 3. Radio Set AN/PRC-5, receiver chassis.

## SECTION III

## FUNCTIONING OF PARTS

24. GENERAL. The schematic diagram of Radio Set AN/PRC-5 is shown on figure 15. The symbol numbers used in the following circuit descriptions are the same as those appearing on this diagram.

25. RECEIVER FUNCTIONING (fig. 3). In the REC position of the OFF-REC-SEND switch, the set acts as a five-tube superheterodyne receiver, exclusive of the power supply which is common to both the receiver and transmitter, consisting of one r-f amplifier stage, using a 6SK7 tube; one converter stage, using a 6SA7 tube; one i-f amplifier stage, using another 6SK7 tube; one combined diode detector and beat-frequency oscillator stage, using a 6SR7 tube; and two stages of a-f amplification using both portions of a twin-triode 6N7 tube.

26. RADIO-FREQUENCY AMPLIFIER. The signal input to the receiver through the binding post marked ANT is connected through OFF-REC-SEND switch SW1 to the primary windings of antenna input transformers L1 and L2 which are connected in series to ground. The r-f signal voltages present in these primary windings are inductively coupled into the secondary windings of L1 and L2 for bands 2 and 1, respectively. The secondary winding of L1 together with section C4 of the 3-gang variable tuning capacitor, fixed capacitor C1, and trimmer capacitor C5 constitute the first tuned circuit for band 2. The secondary winding of L2 together with section C4 of the variable tuning capacitor and trimmer capacitors C2 and C5 constitute the first tuned circuit for

band 1. The signal voltage developed across the tuned circuit in use is coupled to the grid of a 6SK7 tube V1 by blocking capacitor C3. Avc bias voltage is fed to the grid of tube V1 through grid-return resistor R1. The secondary windings of transformers L1 and L2 are provided with adjustable iron cores for inductance trimming. These trimmer elements in conjunction with trimmer capacitors C2 and C5 permit accurate alignment of the tuned circuits with the succeeding tuned circuits at both ends of the frequency bands. Either transformer L2 for band 1 or transformer L1 for band 2 is placed in operation by section A of the BAND switch SW3. Note that the action of this switch is to short circuit the transformer winding not in use. Plate voltage from the high-voltage d-c supply line is applied to the plate of tube V1 through r-f choke coil L3, the lower end of which is bypassed to ground by capacitor C7. Screen grid voltage is obtained from the high-voltage supply line through a decoupling and voltage divider network consisting of resistors R2 and R3 in series with the screen grid connected to the junction of the two resistors. C6 is the screen-grid bypass capacitor to ground. The suppressor grid, cathode, one side of the heater, and the tube shell are all connected to ground.

27. CONVERTER. The amplified signal voltage from the plate of r-f amplifier tube V1 is coupled to the r-f tuned circuits using coils L4 and L5 by blocking capacitor C8. Coil L4 together with section C11 of the 3-gang variable tuning capacitor and trimmer capacitor C12 constitute the second tuned circuit for band 2. Coil L5 together with section C11 of the variable tuning capacitor and trimmer capacitors C9 and C12 constitute the second tuned circuit for band 1. The signal voltage developed across the tuned circuit in use is coupled to the signal grid of the 6SA7 converter

tube V2 by blocking capacitor C10. Avc bias voltage is fed to this same grid through grid-return resistor R4. Adjustable iron cores in coils L4 and L5 permit inductance trimming which together with trimmer capacitors C9 and C12 permits accurate alignment of these circuits with the other circuits in the receiver at both ends of the frequency bands. Either coil L5 for band 1 or coil L4 for band 2 is placed in operation by section B of the BAND switch SW3. The action of the switch is to short circuit the coil not in use. Plate voltage from the high-voltage d-c supply line is applied to the plate of tube V2 through the primary winding of intermediate frequency transformer L8, the lower end of which is bypassed to ground by capacitor C28. R5 is the screen-grid voltage-dropping and decoupling resistor and capacitor C13 bypasses the screen grid to ground. The suppressor grid, one side of the heater, and the tube shell are also connected to ground.

28. HIGH-FREQUENCY OSCILLATOR CIRCUIT. The high-frequency oscillator circuit uses the remaining elements of converter tube V2 connected in a separate and independent oscillator circuit. By this means the functions of a mixer and an oscillator are combined in the one tube V2. The signal frequency coupled into the signal grid of tube V2 and the oscillator output frequency of the oscillator circuit combine in the tube because of electron coupling to produce the intermediate frequency which is the difference between the other two frequencies. The secondary winding of oscillator transformer L6 together with section C15 of the 3-gang tuning capacitor, fixed capacitor C18, and trimmer capacitor C14 constitute the oscillator tuned circuit for band 2. The secondary winding of oscillator transformer L7 together with section C15 of the variable tuning capacitor and trimmer

capacitors C14 and C19 constitute the oscillator tuned circuit for band 1. Trimmer capacitors C14 and C19 permit capacitance trimming at the high-frequency end of both bands. An adjustable iron core in each transformer secondary winding permits variable inductance trimming for accurate alignment of the tuned circuits at the low-frequency end of each band. Fixed capacitors C20 and C37 (tracking capacitors) are used to modify the tuning of the high-frequency oscillator circuit so that it will maintain a fixed frequency difference of 455 kilocycles with respect to the signal frequency when the 3-gang tuning capacitor is varied from minimum to maximum capacitance on each band. Oscillation is caused and maintained by the feedback created by the primary windings of transformers L6 and L7. These primary coils are connected between the cathode of tube V2 and ground, and are closely coupled to the secondary windings of their respective transformers. The secondary windings are coupled to the oscillator grid of tube V2 by blocking capacitor C51. R6 is the oscillator grid-leak resistor, and develops the necessary operating grid-bias voltage by virtue of the rectified grid current flowing through it. Both the primary and secondary windings of the transformers not in use are short-circuited by sections D and C, respectively, of BAND switch SW3.

29. I-F AMPLIFIER. The signal frequency arriving at the signal grid of converter tube V2 and the high-frequency oscillator frequency developed in this same tube are mixed (or heterodyned) and the resultant difference (455 kilocycles) is fed to the input of the i-f amplifier. Transfer of i-f energy from the plate of converter tube V2 to the diode detector tube V4 is accomplished by inductive coupling through i-f transformers L8 and L9 and

amplification supplied by tube V3. I-f transformers L8 and L9 consist of two tuned circuits, primary and secondary, both of which are tuned to the i-f of 455 kilocycles by means of fixed padder capacitors and adjustable iron cores. The adjustment screws for the iron cores are accessible at the top and bottom of the transformer shield can. The high potential ends of the primary windings of both transformers connect to the plates of tubes V2 and V3, respectively. The low potential ends of both primary windings are connected to the high-voltage d-c supply line which is bypassed to ground by capacitor C28. The high-potential end of the secondary winding of transformer L8 is connected to the control grid of the 6SK7 tube V3 while the low-potential end of this same winding is connected to the avc voltage supply line, and is bypassed to ground by capacitor C26. R7 is the screen-grid voltage-dropping and decoupling resistor, and capacitor C23 bypasses the screen grid to ground. The suppressor grid, cathode, one side of the heater, and the tube shell are all connected to ground. The high-potential end of the secondary winding of transformer L9 is connected to one of the diodes in tube V4, while the low-potential end of this same winding is connected to diode load resistor R8.

30. DIODE DETECTOR. The 6SR7 tube V4 is a duo-diode-triode type. One of the diode plates is grounded while the other is connected to the high-potential end of i-f transformer L9 to detect the incoming i-f signals. Since the cathode is grounded the tube acts as a half-wave rectifier. The voltage developed across the diode-load resistors R8 and R16 is filtered by resistor R17 and capacitor C26, and the resulting direct-current avc voltage is used to control the gain of tubes V1, V2, and V3, the degree of this control being dependent upon the strength of the incoming signal. Resistor R8

together with capacitors C24 and C25 comprise a filter which prevents the i-f voltages present in the diode circuit from getting into the avc and audio-frequency circuits.

31. A-F AMPLIFIER STAGES. A dual-triode type 6N7 tube V5 is used for both stages of a-f amplification. The a-f voltage developed across diode-load resistor R16 (the receiver VOLUME control), as a result of the rectifying action of the diode circuit, is coupled to the control grid of one section of tube V5 by blocking capacitor C27. R14 is the grid-return resistor and R13 is the cathode-biasing resistor for both sections of the tube. This biasing resistor is bypassed for a-f voltages by capacitor C30. The a-f voltage developed across plate-load resistor R15 of the first section of tube V5 is coupled to the grid of the second section of the tube by blocking capacitor C31. The plate of the first section is also bypassed to ground for r-f and i-f currents by capacitor C29. R12 is the grid-return resistor of the second section. The a-f voltage developed across plate-load resistor R11 of the second section is coupled to the PHONES jack through blocking capacitor C34. The PHONES jack is bypassed for r-f and i-f currents by capacitor C35.

32. BEAT-FREQUENCY OSCILLATOR. The triode section of tube V4 is used in conjunction with transformer L10 to form an oscillator circuit operating near the intermediate frequency of 455 kc. The oscillator signal so produced is heterodyned with the i-f signal frequency because of capacitance coupling within the tube between the detector diode and the elements of the oscillator portion of the tube to produce a beat note for the reception of c-w signals. The oscillator circuit is of the tuned-grid, untuned-plate type. The plate winding of the transformer is shunted by a fixed capacitance.

The inductance of the grid winding is varied over a limited range by an adjustable iron core. The oscillator circuit is usually tuned to operate at about 1 kilocycle (1,000 cycles) difference from the intermediate frequency. The plate of tube V4 is connected to the high-voltage d-c supply line through the primary winding of L10, decoupling and voltage-dropping resistor R10, and the BFO OFF-ON switch SW4. The lower end of the primary winding is bypassed to ground by capacitor C33. The grid of tube V4 is coupled to the secondary winding of transformer L10 by capacitor C32, and R9 is the oscillator grid-leak resistor.

33. POWER SUPPLY. The proper a-c voltage for operation of all the vacuum-tube heaters in both the receiver and transmitter sections is obtained from a common secondary winding on power transformer TR. One side of this secondary is connected to ground. The cathode of the 5Z4 rectifier tube V8 is heated by another secondary winding of the proper potential. A third secondary winding supplies high-voltage alternating current to the plates of rectifier tube V8. The center tap of this high-voltage secondary winding is grounded. The rectified pulsating d-c voltage is taken from the cathode of tube V8 and is filtered (smoothed) by the capacitor-input filter composed of capacitors C16, C17, and C21, and the choke coil L16. The input capacitors C17 and C21 are connected in series so that the total voltage appearing across each will be smaller. Resistors R20 and R34 connected across these capacitors equalize the voltages appearing across them. C16 is the output capacitor. R19 is a bleeder-resistor across the filter. The filtered high-voltage d-c output of the power supply is always applied to the receiver section of the transceiver through series-dropping resistor R18 when the equipment is in use, and is applied to the trans-

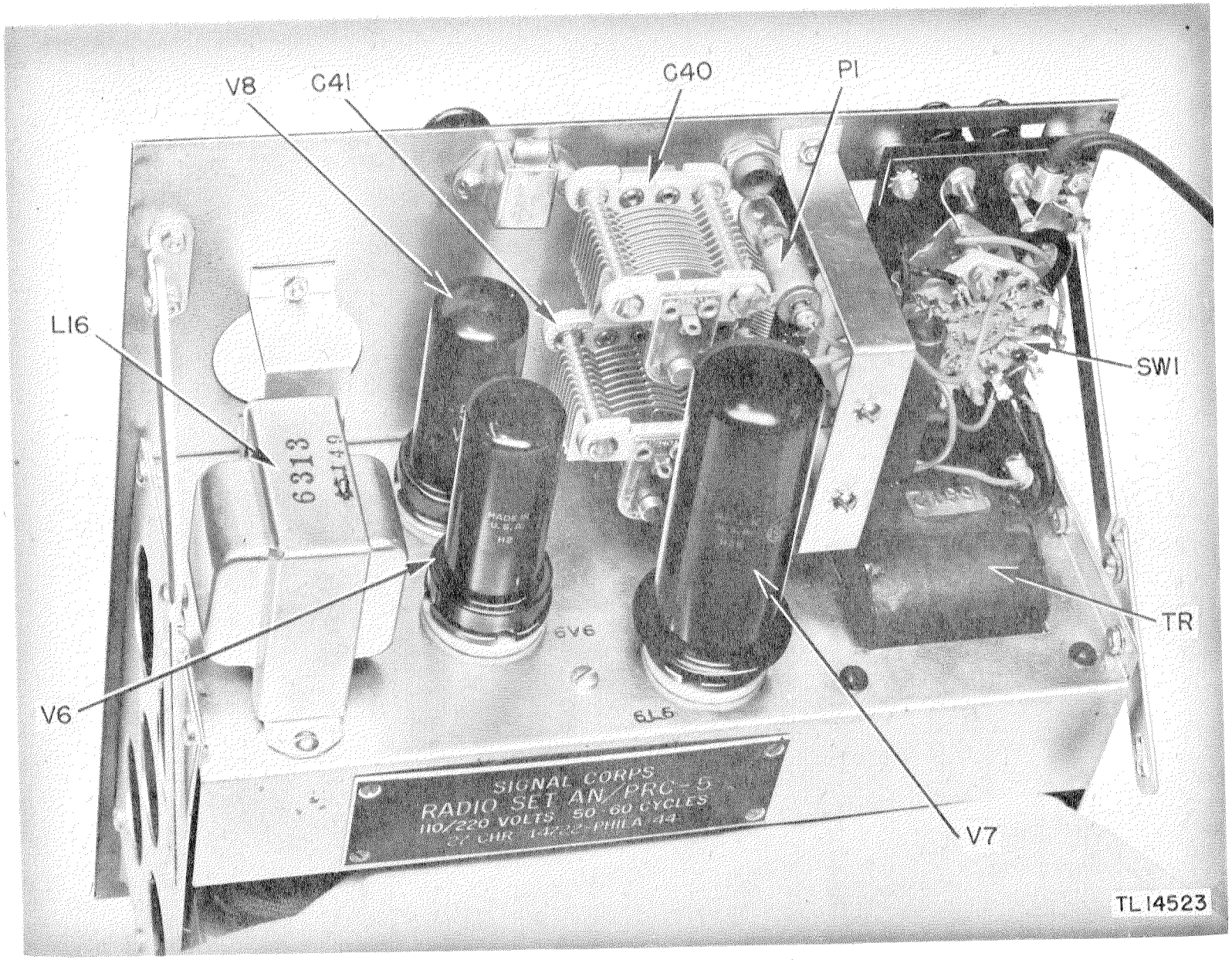


Figure 4. Radio Set AN/PRC-5, transmitter and power-supply chassis.

mitter section through OFF-REC-SEND switch SW1 only when this switch is in the SEND position. Transformer TR has two separate 110-volt primary windings. By means of the 110-220 toggle switch SW2, these primary windings are connected in parallel for operation on a 110-volt power source, and the windings are connected in series for operation on a 220-volt power source. These primary windings are disconnected from the power line by the OFF-REC-SEND switch SW1 when it is in the OFF position. A power line fuse F, in the primary circuit, provides protection from momentary overloads and short circuits. The green pilot lamp P2 is connected across the secondary winding supplying the vacuum-tube heaters to indicate when the power is on.

34. TRANSMITTER FUNCTIONING (fig. 4). In the SEND position of the OFF-REC-SEND switch, the set acts as a two-stage crystal-oscillator power-amplifier (MOPA) transmitter, exclusive of the power supply which is common to both the receiver and the transmitter. It consists of a 6V6 tube V6 in the crystal-oscillator stage, and a 6L6 tube V7 in the power-amplifier stage.

35. CRYSTAL OSCILLATOR. The oscillator circuit uses a 6V6 tube V6 in a conventional crystal-controlled tetrode-type arrangement. The quartz crystal X, ground to the operating frequency (or to one-half the output frequency), is used for increased frequency stability. Variable tuning capacitor C47 and plug-in coil L12 form a plate tank circuit which is tuned to resonance with the crystal frequency. Voltage is applied to the plate of tube V6 from the high-voltage d-c supply line through r-f choke coil L11 and voltage-dropping resistor R33. The lower end of this choke coil is bypassed to the cathode by capacitor C36. Capacitor C48 couples the plate of tube V6 to the plate tank circuit and isolates the tank circuit from the high d-c voltage so that the low-potential end of the tank circuit may be ground-

ed. This is also a safety feature in that the operator will not receive a high-voltage shock if he should touch the tank coil with the power on. The screen-grid voltage is supplied by the voltage divider network composed of resistors R28 and R29. The screen grid is bypassed to the cathode by capacitor C49. An initial bias voltage is developed across cathode-bias resistor R30, bypassed by capacitor C50, in the cathode circuit of tube V6. Additional operating bias voltage is developed in grid-leak resistor R32 by the flow of rectified grid current through it. The cathode current of tube V6 is indicated by d-c milliammeter M when it is connected in series with the cathode circuit by OSC-AMP switch SW5 in the OSC position, and the circuit is completed to ground by pressing Key J-47. The cathode circuit returns to ground through resistors R31 and R23 when the OSC-AMP switch is in the AMP position. Resistor R23, shunted around KEY jack J1, developes additional cathode bias when the key is up so that operation of the oscillator and amplifier tubes will be completely blocked.

36. POWER AMPLIFIER. The r-f voltage developed across the oscillator plate tank circuit composed of capacitor C47 and coil L12 is coupled to the grid of the 6L6 power amplifier tube V7 by blocking capacitor C45. This voltage is amplified by beam-power amplifier tube V7, the output of which is developed across the amplifier plate tank circuit consisting of plug-in coil L14 and variable tuning capacitors C40 and C41. When the proper plug-in coil L14 is used, the tank circuit may be tuned to resonance with the output frequency of the oscillator circuit (crystal frequency operation) or it may be tuned to resonance at twice the fundamental frequency of the crystal for operation on the second harmonic of the output frequency of the crystal oscillator.

Refer to paragraph 20c for selection of proper coils. Thus two output frequencies are obtainable from the power amplifier circuit for each quartz crystal used. Voltage is applied to the plate of tube V7 from the high-voltage d-c supply line through r-f choke coil L13. The lower end of this choke coil is bypassed to ground by capacitor C43. Blocking capacitor C39 couples the plate of tube V7 to the plate tank circuit and isolates the tank circuit from the high d-c voltage so that the antenna wire and the tank coil L14 will be free of this voltage.

CAUTION: IF THE ANTENNA WIRE OR TANK COIL IS TOUCHED DURING OPERATION A SEVERE R-F BURN MAY RESULT IN SPITE OF THE FACT THAT THE HIGH-VOLTAGE DIRECT CURRENT IS NOT PRESENT.

The screen-grid voltage is supplied by the voltage divider network composed of resistors R21 and R22. The screen grid is bypassed to ground by capacitor C42. An initial bias voltage is developed across cathode-bias resistor R24, bypassed by capacitor C44, in the cathode circuit of tube V7. Additional operating bias voltage is developed in grid-leak resistors R26 and R27 by the flow of rectified grid current through them. Resistor R27 is bypassed for r-f current and voltage by capacitor C46. The cathode current of tube V7 is indicated by d-c milliammeter M when it is connected in series with the cathode circuit by OSC-AMP switch SW5 in the AMP position, and the circuit is completed to ground by pressing Key J-47. When the OSC-AMP switch is placed in the OSC position, resistor R25 is connected in series with cathode-bias resistor R24 for the purpose of applying a high bias to tube V7 while the oscillator circuit is being tuned. This prevents the plate current of tube V7 from rising to high values while oscillator tuning adjustments are being made.

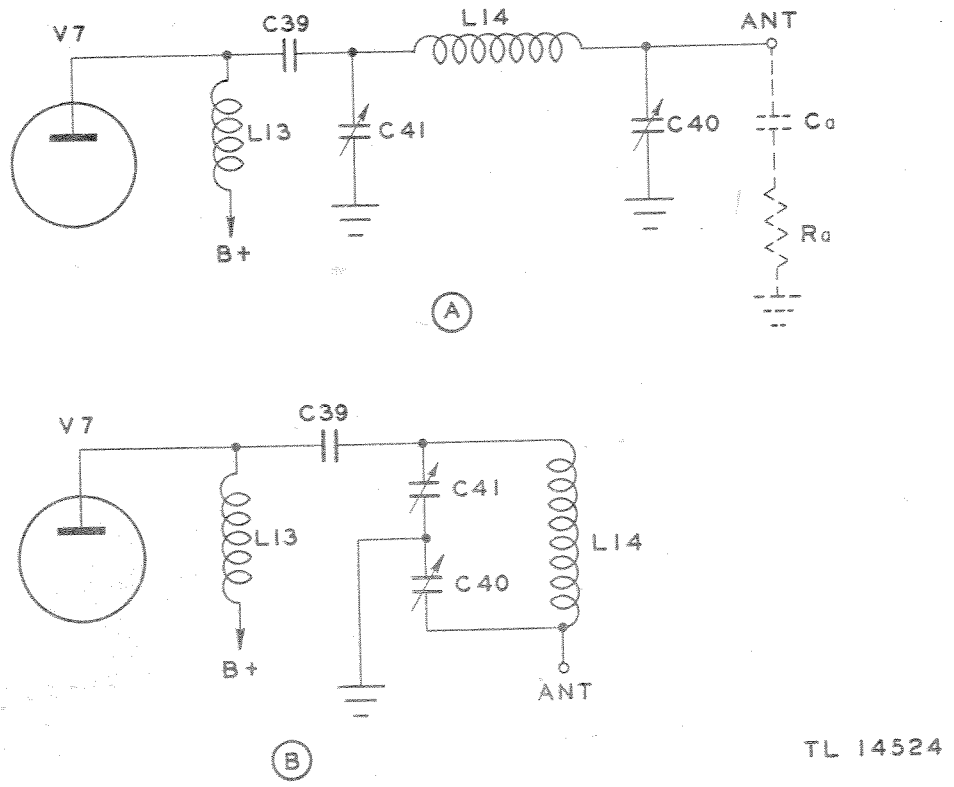


Figure 5. Radio Set AN/PRC-5, functional diagram of plate-tank and antenna circuits.

37. ANTENNA CIRCUIT. The plate output circuit is unusual because the dual function of the plate-tank and antenna-tuning circuits are combined into one simple circuit (fig. 5a). If ANT COUPLING capacitor C40 and Ca (antenna capacitance to ground) are combined into one variable capacitance C40, and the antenna resistance Ra is neglected, the circuit in figure 5a reduces to figure 5b. This can be done because the resistance Ra is very low as compared to the reactance of capacitor C40. This is recognizable as a parallel resonant circuit whose capacitive branch is made up of AMP TUNING capacitor C41 in series with ANT COUPLING capacitor C40, and whose inductive branch is coil L14. When properly tuned, this resonant circuit must satisfy the two following conditions:

a. Capacitors C41 and C40 in series must resonate L14 to the operating frequency.

b. The ratio C41: C40 must be of such value that the power-amplifier tube V7 works into the correct load impedance as viewed from the antenna. Therefore, for each setting of capacitor C40 there is also a setting of capacitor C41 which produces resonance (as indicated by a minimum value of the power-amplifier plate current). Only one value of C40 and C41 will satisfy both of the above conditions. For the proper method of tuning this circuit, refer to paragraphs 22d and e. It is possible to provide suitable loading of an antenna of given length throughout the entire frequency range of the transmitter. The antenna is connected to the transmitter portion of the transceiver, and likewise plate voltage is applied to the transmitter, only when the OFF-REC-SEND switch SW1 is in the SEND position. Antenna current is indicated by ANT CURRENT lamp P1. Coil L15 connected across this indicator lamp prevents loss of operation in case of lamp filament failure, and the size of the coil is such as to provide sufficient r-f voltage to light the lamp under normal antenna current output. The brightness of this lamp will not be the same under all conditions of normal operation. The brightness of illumination produced depends on the position of maximum current on the antenna and will vary considerably with the frequency and the length of the antenna in use. In any case, the antenna circuit is tuned for maximum brilliance of the lamp without regard to the relative brilliance obtained at another frequency or with a different antenna installation.

## SECTION IV

## MAINTENANCE

NOTE: Unsatisfactory performance of this equipment will be reported immediately on W.D., A.G.O. Form No. 468. If Form No. 468 is not available, see TM 38-250.

38. GENERAL. Adjustments, repairs, or disassembly of the equipment should not be attempted by personnel not trained to service this type of equipment. Trained personnel and suitable equipment must be available before the equipment can be tested for major faults. Adequate test equipment for the maintenance and repair of Radio Set AN/PRC-5 should include the following items:

a. An r-f standard signal generator.

b. An a-f output meter.

c. A universal analyzer capable of indicating all a-c and d-c voltages, necessary direct-current values, and the resistance value of all resistors.

d. A 400-ohm dummy antenna, transmitting type.

e. An r-f milliammeter, range 0 to 500 milliamperes.

39. OPERATIONAL INSPECTION.

a. Check the mounting of all components. Inspect all nuts, bolts, and screws for tightness. Inspect all soldered joints and wiring. Remove all traces of corrosion. Clean the equipment thoroughly and touch up scratched paint.

b. Inspect all plugs and knobs. Make sure that plugs are clean and that knobs are tight. Check headset and key cords. Check the power cord, the power-cord plug, and the adapter plugs furnished with the equipment.

c. Check the antenna wire for breaks and frayed points, and check the connection of the antenna wire at the ANT post.

d. Make sure that all tubes, plug-in coils, and the crystal are properly seated in their respective sockets.

e. Operate the equipment as a receiver. Tune in different stations in each band. Select stations providing weak signals and check the receiver sensitivity. Check the noise level in the receiver and turn on the beat-frequency oscillator and check for the beat note against incoming signals.

f. Operate the equipment as a transmitter. Make the proper tuning adjustments while using various crystals and plug-in coils. Make sure that the ANT CURRENT indicator lamp lights when the key is pressed.

g. Check the bulb of the green pilot-light lamp P2.

40. REPLACEMENT OF TUBES, FUSES, AND INDICATOR LAMPS.

a. Failure of a vacuum tube in the receiver may reduce the sensitivity of the receiver to received signals, may produce intermittent operation, may cause noise or hum, or may cause the receiver to be completely inoperative. In such cases, make substitutions for the tubes in use from the tubes supplied with the equipment as operating spares until the defective tube is located.

b. Failure of a vacuum tube in the transmitter may cause reduced power output, improper reading of the d-c milliammeter M, or complete inoperation of the transmitter. In such cases, make substitutions for the tubes in use from the tubes furnished as operating spares.

c. Failure of the rectifier tube in the power supply will cause poor operation or complete inoperation of both the receiver and the transmitter. In such a case, make a substitution from the operating spares furnished with the equipment.

d. The primary fuse F will blow when the primary circuit of transformer TR is overloaded either because of some defective tube or part in the equipment, momentary overloads, or because of the use of an improper line voltage or frequency. To replace the fuse, remove the small red insert marked FUSE, at the upper left-hand portion of the front panel, with a small screwdriver. Replace it with a new fuse supplied with the equipment as an operating spare. Replace the insert.

e. To replace the green pilot lamp, at the center left-hand side of the front panel, remove the six screws holding the chassis-supporting side plate. Push in on the lamp and turn it to the left. The lamp will now lift out easily. Replace it with a lamp of the same voltage and current rating, furnished with the equipment as an operating spare. To replace the lamp, guide protrusions on the side of the lamp base into slots in the socket, press in, and turn the lamp to the right. Replace the side plate and the six screws.

f. To replace the ANT CURRENT indicator lamp, at the center top-side of the front panel, press the lamp down into its socket and turn it slightly to the left. The lamp will now lift out easily. Replace it with a lamp of the same voltage and current rating, furnished with the equipment as an operating spare. To replace the lamp, guide protrusions on the side of the lamp base into slots in the socket, press in, and turn the lamp to the right.

41. RECEIVER ALIGNMENT. Should realignment of the receiver section of Radio Set AN/PRC-5 become necessary, the following alignment procedure should be followed.

a. General. All adjustments should be made with an output meter connected to the PHONES jack J2 with a 10,000-ohm load resistor connected across the term-

inals of the plug inserted in the jack. Make all adjustments with the BFO switch (SW4) in the OFF position and with the VOLUME control knob set for maximum volume (extreme clockwise position).

b. I-f Alignment. The intermediate frequency of the receiver is 455 kilocycles. Tuning adjustments are provided for both the primary and secondary windings of i-f transformers L8 and L9. One adjustment is made on top of each transformer while the other adjustment is made on the bottom of each. The adjusting devices consist of hexagonal-head screws which slide iron cores in and out of the coil windings. Set the standard signal generator for an output of 455 kilocycles and connect its high-potential output lead to the signal grid (terminal No. 8) of converter tube V2. Connect the low-potential output lead from the signal generator to any metal part making direct connection to the chassis. Adjust the output voltage of the signal generator for an indication of approximately 10 volts on the output meter. Adjust the i-f trimmer adjustment screws for a maximum output indication on the output meter. Readjust the output of the signal generator from time to time while making these adjustments in order to keep the output meter indication at or near 10 volts.

c. Beat-frequency Oscillator Alignment. The beat-frequency oscillator should not require adjustment except when the set has been subjected to extremely rough handling or possibly after tube V4 has been changed. The following procedure must be followed in case it is found necessary to align the beat-frequency oscillator. With the standard signal generator set for an output of 455 kilocycles, connect it to the radio set as described in subparagraph b above. Remove the plug connected to the output meter from the PHONES jack and insert the headset plug into the PHONES jack. Adjust the trimmer screw

on top of transformer L10 until the most pleasing beat note is obtained. (This adjustment is not critical. A beat-note frequency of about 1,000 cycles is found to be satisfactory in most cases.)

d. High-frequency Oscillator Alignment. Realignment of the high-frequency oscillator circuits for either frequency band is seldom necessary unless the resonant frequency of the receiver, as indicated by the reading of the tuning dial, is greatly in error with respect to the actual frequency being received. The following procedure must be followed in adjusting the high-frequency oscillator trimmers. All adjustments are made with the output of the signal generator connected to the ANT and GND posts, in the upper right-hand corner of the front panel, and with the output meter connected as described in subparagraph a above. Always make the adjustments on band 2 first, since trimmer capacitors C5, C12, and C14 are common to both bands and their adjustment will, therefore, also affect the alignment of band 1. For location of the oscillator trimmer adjusting screws refer to figures 3 and 6.

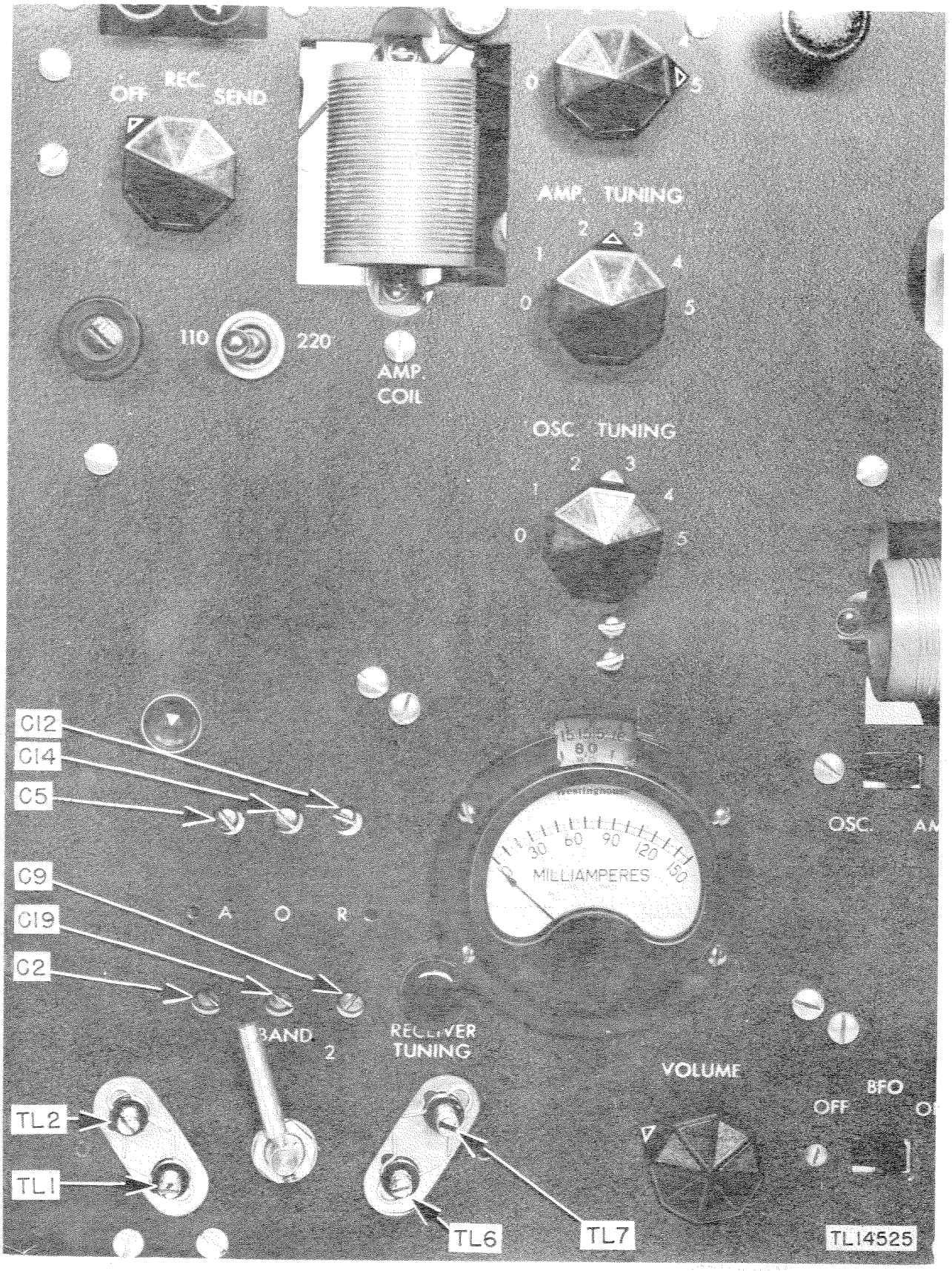


Figure 6. Radio Set AN/PRC-5, location of trimmer adjustments.

(1) ALIGNMENT PROCEDURE FOR BAND 2.

(a) Place the receiver BAND switch in position 2, and set the receiver dial to 16.0 mc.

(b) Set the signal generator for output at 16.0 mc.

(c) Adjust trimmer capacitor C14 for maximum output.

(d) Set receiver dial to 8.2 mc.

(e) Set the signal generator for output at 8.2 mc.

(f) Adjust iron core trimmer in transformer L6 for maximum output.

(g) Repeat steps (a) through (f) above, inclusive, until the dial markings correspond to these two frequencies without further adjustment.

(2) ALIGNMENT PROCEDURE FOR BAND 1.

(a) Place the receiver BAND switch in position 1, and set the receiver dial to 8.0 mc.

(b) Set the signal generator for output at 8.0 mc.

(c) Adjust trimmer capacitor C19 for maximum output.

(d) Set receiver dial to 4.5 mc.

(e) Set the signal generator for output at 4.5 mc.

(f) Adjust iron core trimmer in transformer L7 for maximum output.

(g) Repeat steps (a) through (b) above, inclusive, until the dial markings correspond to these two frequencies without further adjustment.

e. R-f Amplifier Alignment. With the signal generator connected to the ANT and GND posts, and with the output meter connected as above, align the r-f stage in accordance with the following procedure:

(1) ALIGNMENT PROCEDURE FOR BAND 2.

(a) Place the receiver BAND switch in position 2, and set the receiver dial to 16.0 mc.

(b) Set the signal generator for output at 16.0 mc.

(c) Adjust trimmer capacitors C5 and C12 for maximum output.

(d) Set receiver dial to 8.2 mc.

(e) Set the signal generator for output at 8.2 mc.

(f) Adjust the iron core trimmers in coils L1 and L4 for maximum output.

(g) Repeat steps (a) through (f) above, inclusive, until maximum output is obtained at both dial settings.

(2) ALIGNMENT PROCEDURE FOR BAND 1.

(a) Place the receiver BAND switch in position 1, and set the receiver dial to 8.0 mc.

(b) Set the signal generator for output at 8.0 mc.

(c) Adjust trimmer capacitors C2 and C9 for maximum output.

(d) Set receiver dial to 4.5 mc.

(e) Set the signal generator for output at 4.5 mc.

(f) Adjust the iron core trimmers in coils L2 and L5 for maximum output.

(g) Repeat steps (a) through (f) above, inclusive, until maximum output is obtained at both dial settings.

f. Precautions During Alignment. It is essential that the input signal from the signal generator be kept below the threshold of operation of the avc circuit. Maintain an output meter indication of 10 volts or less. Excessive signal inputs will cause overload of either the diode detector or audio-amplifier circuits, and must be avoided because of incorrect alignment indications.

42. PROCEDURE IN LOCATING TROUBLE.

a. Speed in locating trouble in equipment is essential. Frequently after much time has been wasted searching for the cause of equipment failure, the

trouble is found to be so minor that only a few minutes are required to correct it. Follow a systematic process in eliminating possible causes of trouble when failure does occur. It is useless to remove the shields from the transceiver unit and to institue a thorough-going continuity check of the circuits when the symptom of trouble is a lack of voltage or current indication. The common-sense thing to do first is to check the cords, plugs, jacks, switches, and fuses in the unit. They often are sources of trouble. If they are not at fault, the simple act of checking, which takes a few minutes, eliminates them as a possible cause of the trouble. Always check the obvious and simple things first. Make sure that the power cord is actually connected to the power source, and make sure that all plugs are making good contact in their sockets or jacks. When this has been done, and not before, it is time to undertake a close examination of the complete transceiver unit. Daily inspection of the equipment will serve to minimize failures due to minor faults, such as breaks in connecting cords and poor contacts.

b. The trouble chart below lists a number of typical troubles which may occur in this equipment. Note that some of these are caused by failure to adjust the equipment properly when setting it up for use. Always re-check the installation and tune-up procedure before operating the equip-ment.