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WAR DEPARTMENT TECHNICAL MANUAL

TM 11-230C

THIS MANUAL SUPERSEDES TENTATIVE TM 11-230C APRIL 1944

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# RADIO SET

## SCR-694-C



WAR DEPARTMENT

15 AUGUST 1944

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WAR DEPARTMENT,  
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TM 11-230C, Radio Set SCR-694-C, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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OFFICIAL:

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*Major General,  
The Adjutant General.*

DISTRIBUTION:

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(For explanation of symbol see FM 21-6.)

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# DESTRUCTION NOTICE

**WHY** —To prevent the enemy from using or salvaging this equipment for his benefit.

**WHEN**—When ordered by your commander.

**HOW** —1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crow-bars, heavy tools, etc.

2. Cut—Use axes, handaxes, machetes, etc.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades, etc.

4. Explosives—Use firearms, grenades, TNT, etc.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

## USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

**WHAT**—1. Smash—Cabinet or case, chassis, tubes, tuning capacitor, instrument panel, and every electrical and mechanical part.  
Rip out all wiring in the unit. Destroy nameplates and circuit labels.

2. Cut—Wire, cables, cords, and covers.

3. Burn—Calibration book, technical manual, and other printed matter.

4. Bury or scatter—Any or all of the above pieces after demolishing the equipment.

# DESTROY EVERYTHING

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## SAFETY NOTICE

Operation of this equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not operate this equipment when removed from case.



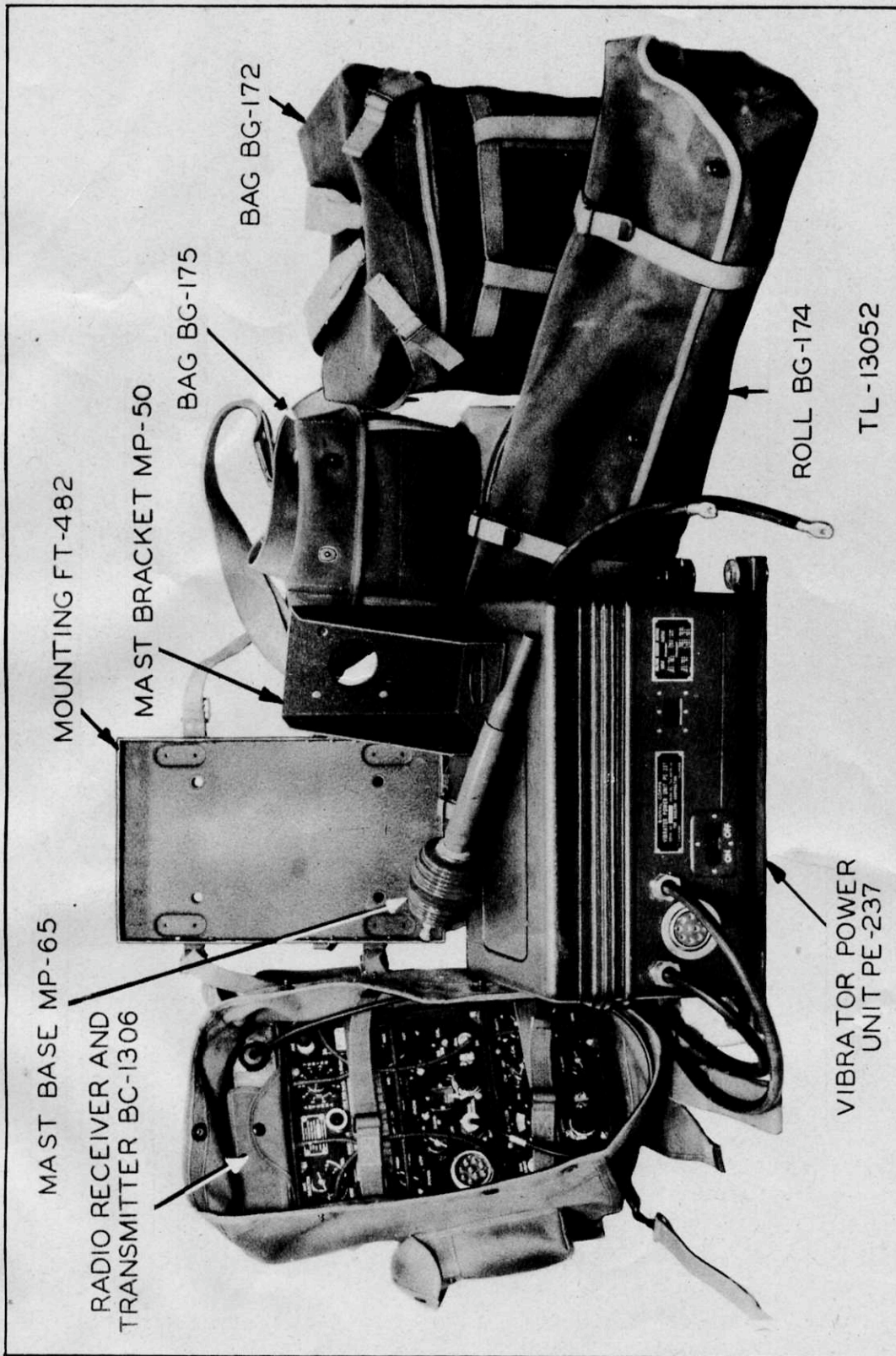


Figure 1. Radio Set SCR-694-C Components.

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# SECTION I DESCRIPTION

**1. GENERAL.** Radio Set SCR-694-C is a compact and efficient two-way radio telephone and radio telegraph unit which will provide communication between moving or stationary vehicles, or as a portable field radio set. The net weight of the complete radio set is 191.5 pounds.

### 2. RANGE.

*a. Operating Range.* This set will provide communication up to 15 miles on voice and up to 30 miles on continuous wave (cw) between moving vehicles.

*b. Frequency Range.* Radio Set SCR-694-C covers the frequency range 3,800 to 6,500 kilocycles (kc). Crystals used in the transmitter operate at one-half of the transmitting frequency.

### 3. TYPES OF TRANSMISSION AND RECEPTION.

*a.* Radio Set SCR-694-C will transmit and receive:

- (1) Continuous-wave (c-w) radio telegraph.
- (2) Voice-modulated radio telephone (phone), amplitude-modulated.
- (3) Tone-modulated radio telegraph, modulated continuous wave (mcw), amplitude-modulated.

*b.* All types of transmission are master-oscillator-controlled or crystal-controlled.

(1) A calibration chart for master-oscillator operation is attached to the front of the transmitter.

(2) A 200-kc crystal in the receiver furnishes standard-frequency check points against which to check and correct the calibration of the transmitter or receiver.

(3) Provision has been made for two crystals to be plugged into a receptacle on the front panel of the transmitter in order to control frequency during crystal-controlled operation.

(4) A three-position switch selects the frequency-controlling element: MO, CRYSTAL A, or CRYSTAL B.

(5) A chart attached to the front of the crystal cover provides a convenient place to record the frequencies of the crystals inside and the corresponding dial settings.

### 4. COMPONENTS.

*a.* Radio Set SCR-694-C includes the following items:

- 1 Antenna AN-160.
- 1 Bag BG-172 (for accessories).
- 1 Bag BG-173 (for radio receiver-transmitter).
- 1 Bag BG-175 (for Generator GN-58).
- 1 Box BX-53-A (for spare tubes).
- 1 Box BX-54-A (for spare crystals).
- 2 Cord CD-307-A (headset extension cord), 1 in use, 1 spare.
- 1 Cord CD-318-A (cord and control switch for Microphone T-45).
- 2 Cord CD-604 (for headset), 1 in use, 1 spare.
- 2 Cord CD-933 (attached to headset), 1 in use, 1 spare.
- 1 Cord CD-1086 (7 ft.), (connects generator to set).
- 1 Cord CD-1086 (44 in.), (connects vibrator unit to set).
- 1 Cord CD-1119 (connects Battery BA-48 to set).
- 1 Counterpoise CP-12.
- 1 Counterpoise CP-13.
- 2 Crank GC-7 (for Generator GN-58).

- 1 Generator GN-58, including one set spare brushes inside case.
- 1 Guy GY-12.
- 1 Guy GY-42 (two 20-ft. lengths of Twine RP-11, with 2 insulators and  $\frac{5}{16}$ -inch collar clamp).
- 1 Halyard M-378.
- 1 Halyard M-379.
- 2 Headset HS-30, 1 in use, 1 spare.
- 1 Insulator IN-127.
- 1 Key J-45.
- 2 Lamp, Pilot (installed in spare tube box).
- 1 Leg LG-2-A.
- 2 Leg LG-3.
- 1 Mast Base MP-65.
- 1 Mast Bracket MP-50.
- 6 Mast Section MS-116-A, 3 in use, 3 spare.
- 2 Mast Section MS-117-A, 1 in use, 1 spare.
- 2 Mast Section MS-118-A, 1 in use, 1 spare.
- 1 Microphone T-17.
- 1 Microphone T-45.
- 1 Mounting FT-482.
- 3 Neon Bulb, stock number 2Z5889-3,  $\frac{1}{4}$ -watt (installed in spare tube box).
- 1 Panel Cover M-404.
- 1 Receiver and Transmitter BC-1306, including:
  - 1 Crystal Holder FT-241 with 200-kc crystal.
  - 1 Set of Tubes as follows:
    - 1 Tube JAN-2E22.
    - 2 Tube JAN-3A4.
    - 1 Tube JAN-OC3/VR-105 (VT-200).
    - 1 Tube JAN-3Q4 (VT-264).
    - 1 Tube JAN-1S5 (VT-172).
    - 2 Tube JAN-1L4.
    - 2 Tube JAN-1R5 (VT-171).
    - 2 Pilot Lamp, 2 volts, 60 ma.
    - 1 Neon Bulb, stock number 2Z5889-3,  $\frac{1}{4}$ -watt.
- 2 Reel RL-29.
- 1 Roll BG-174 (for generator legs, mast sections, etc.).
- 4 Stake GP-27-A.
- 2 Technical Manual TM 11-230C (for Radio Set SCR-694-C).
- 1 Vibrator Power Unit PE-237, including:
  - 2 Tube JAN-1005 (VT-195).
  - 2 Tube JAN-1006 (VT-249).
  - 2 Vibrator VB-1.
  - 2 Vibrator, heavy duty.
  - 5 ft. Wire W-128.

b. The following items taken from a complete Radio Set SCR-694-C constitute the equipment for field use:

- 1 Antenna AN-160.
- 1 Bag BG-172 (for accessories).
- 1 Bag BG-173 (for receiver-transmitter).
- 1 Bag BG-175 (for Generator GN-58).
- 1 Box BX-53-A (for spare tubes).
- 1 Box BX-54-A (for crystals).
- 2 Cord CD-307-A (headset extension cord), 1 in use, 1 spare.
- 1 Cord CD-318-A (cord and control switch for microphone T-45).
- 2 Cord CD-604 (for headset), 1 in use, 1 spare.
- 2 Cord CD-933 (attached to headsets), 1 in use, 1 spare.
- 1 Cord CD-1086 (7 ft.) (connects generator to receiver-transmitter).
- 1 Cord CD-1119 (connects Battery BA-48 to receiver-transmitter).
- 1 Counterpoise CP-12.
- 1 Counterpoise CP-13.
- 2 Crank GC-7 (for Generator GN-58).
- 1 Generator GN-58 (including one set of spare brushes inside case).
- 1 Guy GY-12.
- 1 Guy GY-42 (two 20-ft. lengths of Twine RP-11, with 2 insulators and  $\frac{5}{16}$ -inch collar clamp).
- 1 Halyard M-378.
- 1 Halyard M-379.
- 2 Headset HS-30, 1 in use, 1 spare.
- 1 Insulator IN-127.
- 1 Key J-45.
- 2 Lamp, Pilot (installed in spare tube box).
- 1 Leg LG-2-A.
- 2 Leg LG-3.
- 6 Mast Section MS-116-A, 3 in use, 3 spare.
- 2 Mast Section MS-117-A, 1 in use, 1 spare.
- 2 Mast Section MS-118-A, 1 in use, 1 spare.
- 1 Microphone T-17.
- 1 Microphone T-45.
- 3 Neon Bulb,  $\frac{1}{4}$ -watt (installed in spare tube box).
- 1 Panel Cover M-404.
- 1 Receiver and Transmitter BC-1306, including:
  - 1 Crystal Holder FT-241 with 200-kc crystal.
  - 1 Set of Tubes as follows:
    - 1 Tube JAN-2E22.
    - 2 Tube JAN-3A4.
    - 1 Tube JAN-OC3/VR-105 (VT-200).
    - 1 Tube JAN-3Q4 (VT-264).
    - 1 Tube JAN-1S5 (VT-172).
    - 2 Tube JAN-1L4.
    - 1 Tube JAN-1R5 (VT-171).
- 2 Lamp, Pilot, 2 volts, 60 ma.
- 1 Neon bulb,  $\frac{1}{4}$ -watt.

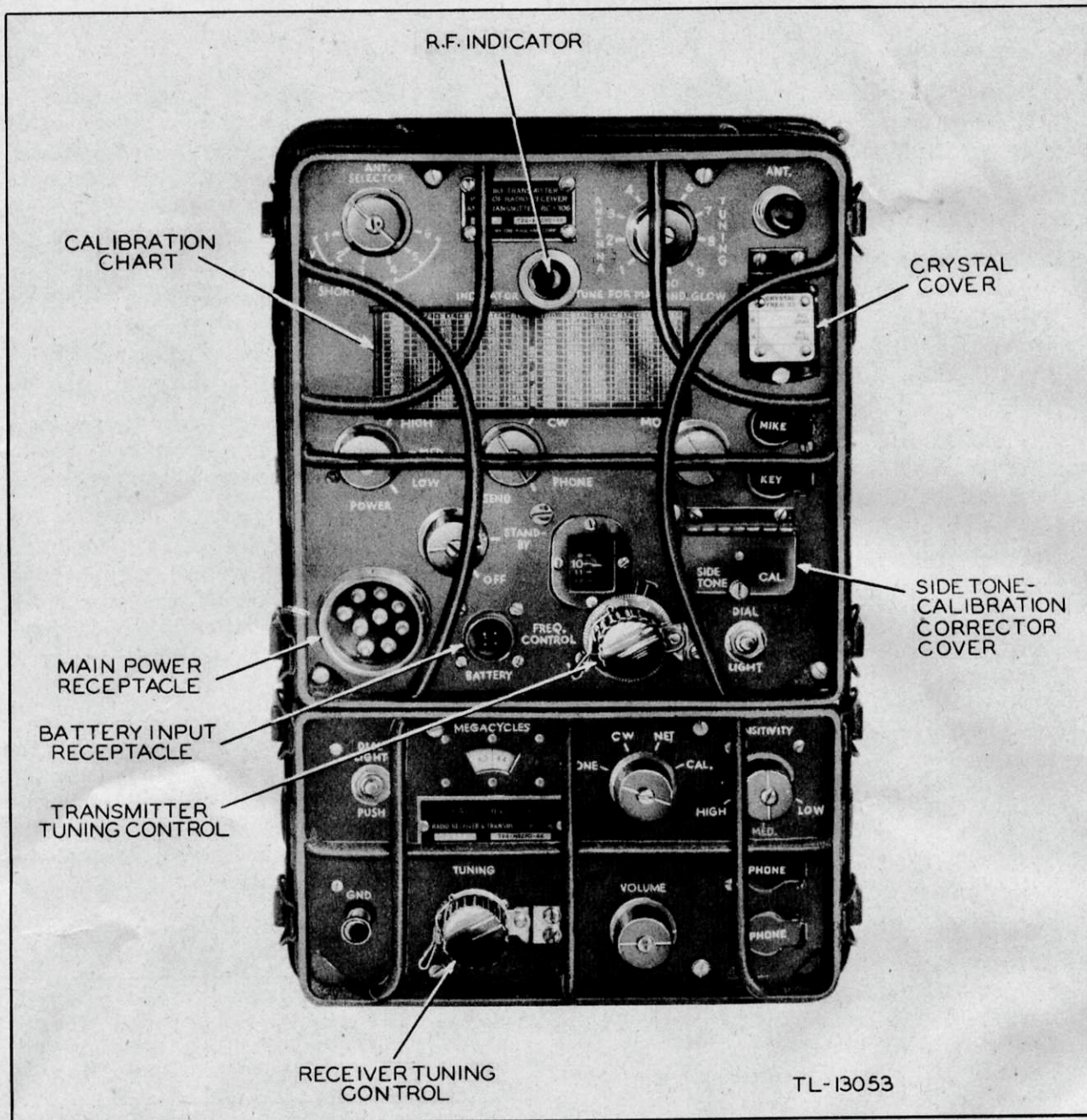


Figure 2. Radio Receiver and Transmitter BC-1306.

- 2 Reel RL-29.
- 1 Roll BG-174 (for generator legs, mast section, etc.)
- 2 Technical Manual TM 11-230C (for Radio Set SCR-694-C).
- 1 ft. Wire W-128.

c. To pack the radio set for field use:

(1) Remove the receiver-transmitter and panel cover from Mounting FT-482.

(2) Fasten Panel Cover M-404 on the front of receiver-transmitter.

(3) Install receiver-transmitter with panel cover in Bag BG-173. In pocket of this bag place the following:

- 1 Headset HS-30 with Cord CD-933 attached.
- 1 Cord CD-307-A (headset extension).
- 1 Cord CD-1119.

(4) See that the cover plates for the crank holes and the power receptacle of Generator GN-58 are tightened and that the generator is placed in Bag BG-175.

(5) See that the antenna equipment roll contains the following items:

- 6 Mast Section MS-116-A.
- 2 Mast Section MS-117-A.
- 2 Mast Section MS-118-A.
- 4 Stake GP-27-A.
- 1 Leg LG-2-A (with seat).
- 2 Leg LG-3.
- 1 Insulator IN-127.
- 2 Crank GC-7.
- 1 Cord CD-1086 (7 ft.). (Remove from vehicle if previously used to connect power unit to receiver-transmitter.)

(6) See that the following items are packed in Bag BG-172:

- 1 Antenna AN-160 on Reel RL-29.
- 1 Box BX-53-A (containing set of spare tubes).
- 1 Box BX-54-A (for crystals).
- 1 Cord CD-307-A (headset extension).
- 1 Cord CD-318-A.
- 1 Counterpoise CP-12 and CP-13 on Reel RL-29.
- 1 Guy GY-12.
- 1 Guy GY-42 (two 20-ft. length of Twine RP-11, with 2 insulators and  $\frac{5}{16}$ -inch collar clamp).
- 1 Halyard M-378.
- 1 Halyard M-379.
- 1 Key J-45.
- 2 Technical Manual TM 11-230C.

- 1 Headset HS-30 and Cord CD-933 (assembled).
- 1 Microphone T-17.
- 1 Microphone T-45.
- 1 ft. Wire W-128.

## 5. POWER INPUT.

a. The primary source of power for Radio Set SCR-694-C when operated in a vehicle is the vehicular storage battery (not a radio set component). The battery voltage may be either 6, 12, or 24 volts with negative (—) grounded.

b. The vehicular power supply, Vibrator Power Unit PE-237, contains two independent power systems; one a heavy duty unit for operating both the receiver and the transmitter; the other, a small unit for operating the receiver alone at high efficiency over long periods of listening.

c. The primary source of power for the radio set when operated as a field set is Generator GN-58, which supplies power to both the receiver and the transmitter.

d. Battery BA-48 may be used to operate the receiver alone. Each battery will operate the receiver for a continuous period of approximately 20 hours. If operated intermittently, longer operating life may be expected.

## 6. POWER OUTPUT.

a. *Transmitter.* The power output of the transmitter varies over wide limits depending upon the position of the POWER switch and upon the type of power supply employed. The normal power output under these varying conditions is given in the following table.

Power Switch	Vibrator Power Unit PE-237		Generator GN-58	
	Phone	CW	Phone	CW
High	8.5 watts	25 watts	6 watts	17 watts
Medium	4.5 watts	21 watts	4 watts	14 watts
Low	2.2 watts	13 watts	2 watts	8.5 watts

b. *Receiver.* The maximum output of the receiver exceeds 75 milliwatts in normal operation from either the vehicular supply or the hand generator. When operated from Battery BA-48, slightly lower power is obtained.

7. RADIO RECEIVER AND TRANSMITTER BC-1306. This component, shown in figure 2, is a

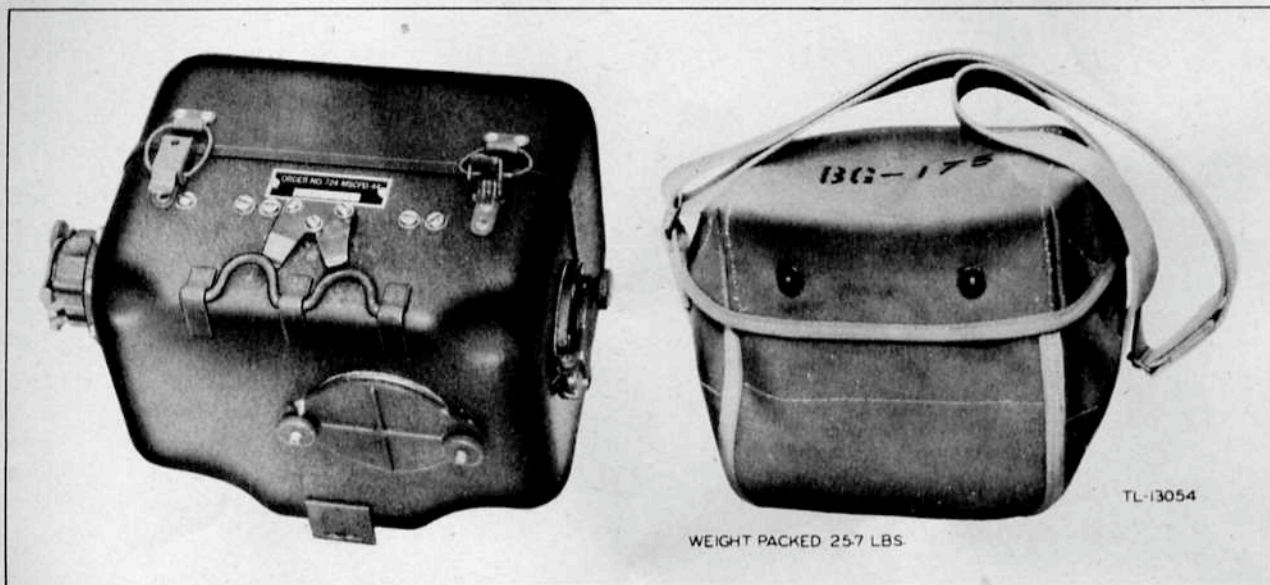


Figure 3. Generator GN-58 and Bag BG-175 for carrying Generator GN-58.

complete receiver and transmitter, operating in the frequency range of 3,800 kc to 6,500 kc. It obtains its power from a separate power supply, either Vibrator Power Unit PE-237 in a vehicle, or Generator GN-58 in field operation. It is light in weight, portable, and watertight. Panel Cover M-404, a waterproof metal cover, is provided as additional assurance that no water will enter the set. With this cover in place, the set will float. This unit is normally carried in Bag BG-173. A calibration chart attached to the front panel of the transmitter gives the dial settings for every 20-kc interval between 3,800 kc and 6,500 kc.

**8. GENERATOR GN-58.** Generator GN-58, shown in figure 3, is a hand-cranked generator which supplies all voltages required for the operation of Radio Receiver and Transmitter BC-1306. The output voltage of the high-voltage section is not as high as that delivered by the vehicular power supply because the generator would be too difficult to crank. The difference in transmitter power output when operated from the hand generator

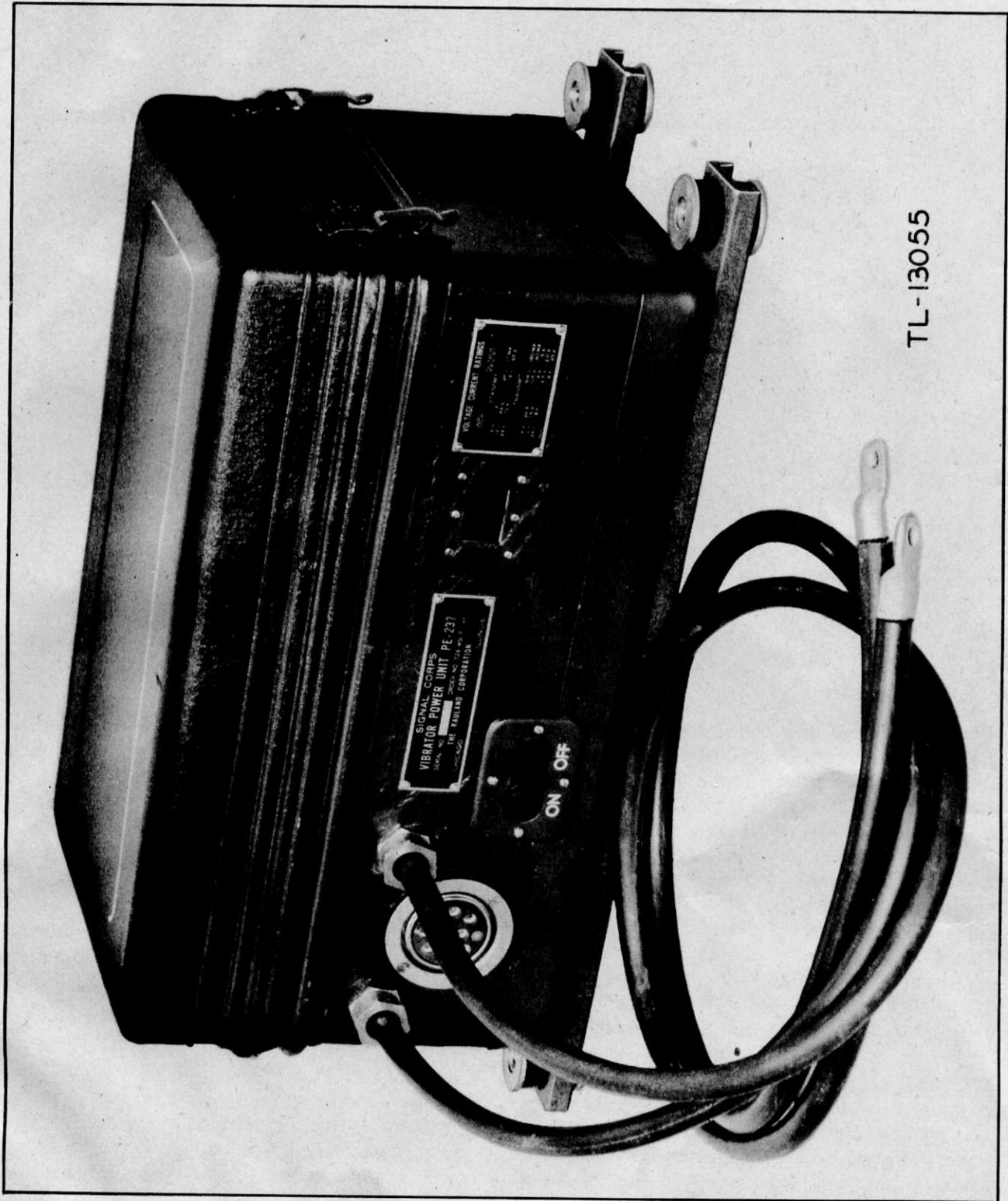
and from the vibrator power unit are given in the table in paragraph 6. The accessories required for the generator are:

- 1 Leg LG-2-A.
- 2 Leg LG-3.
- 2 Crank GC-7.
- 1 Cord CD-1086 (7 ft.).

All of these accessories are carried in the antenna equipment roll, Roll BG-174. The generator itself is carried in Bag BG-175, shown in figure 3.

#### 9. VIBRATOR POWER UNIT PE-237.

*a.* Vibrator Power Unit PE-237 (fig. 4) is a vehicular operation component which furnishes all required operating voltages to the receiver and transmitter. It contains two distinctly different power supply systems, a heavy duty unit for supplying power to both the receiver and transmitter for normal two-way communication, and a small power supply unit for supplying the receiver only during long periods of listening.



TL-13055

Figure 4. Vibrator Power Unit PE-237.

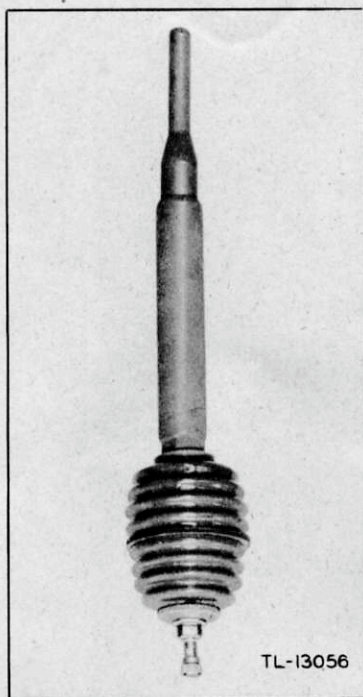


Figure 5. Mast Base MP-65.

b. The input voltage to the power supply may be either 6, 12, or 24 volts, with negative (—) grounded. A quick-change switch inside of the unit changes all of the necessary connections on both power systems simultaneously to correspond to the voltage of the vehicular battery. A window on the side of the case permits observation of a drum on the switch, indicating the voltage for which the switch is set, without the necessity of opening the case. A circuit breaker in the battery circuit protects the unit in case of accidental short circuit. The case of the unit is watertight to prevent damage to the contents in event of immersion.

**10. ROLL BG-174.** The antenna equipment roll, Roll BG-174, is a canvas roll provided with carrying straps. It contains the following items:

- 2 Crank GC-7.
- 1 Cord CD-1086 (7 ft.).
- 1 Insulator IN-127.
- 1 Leg LG-2-A.
- 2 Leg LG-3.
- 6 Mast Section MS-116-A.
- 2 Mast Section MS-117-A.
- 2 Mast Section MS-118-A.
- 4 Stake GP-27-A.

Figure 7 shows two views of the roll, one open with

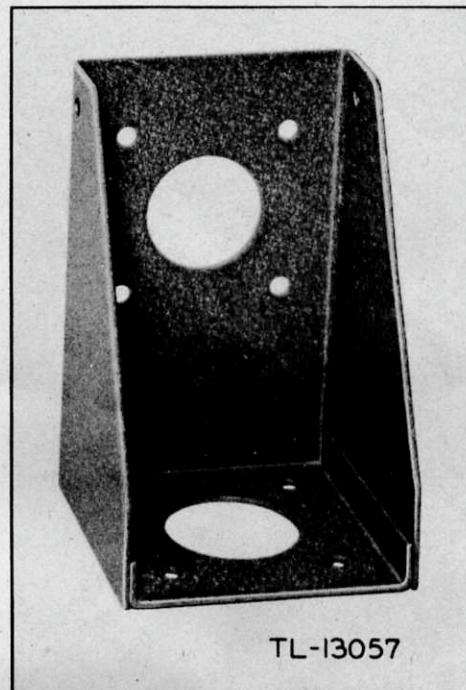


Figure 6. Mast Bracket MP-50.

contents displayed, the other with the roll closed, ready for carrying.

**11. MAST BASE MP-65.** Mast Base MP-65 (fig. 5) is a combination antenna insulator of low capacity and a flexible mounting for the antenna, allowing the mast antenna to pivot at its base.

**12. MAST BRACKET MP-50.** Mast Bracket MP-50 (fig. 6) is a heavy steel bracket for mounting Mast Base MP-65 to the vehicle. It offers a choice of two positions for the mast base.

**13. PANEL COVER M-404.** Panel Cover M-404 (fig. 12) is a metal watertight cover that serves three purposes:

a. When fastened over the front of Radio Receiver and Transmitter BC-1306 it forms a watertight seal. (The radio set itself is waterproof without the cover.)

b. It adds buoyancy to the set so that it will float when placed in water.

c. When placed on the back of the radio set (fastened to Mounting FT-482), the gasket in the panel cover acts as a shock relief for the receiver-transmitter.



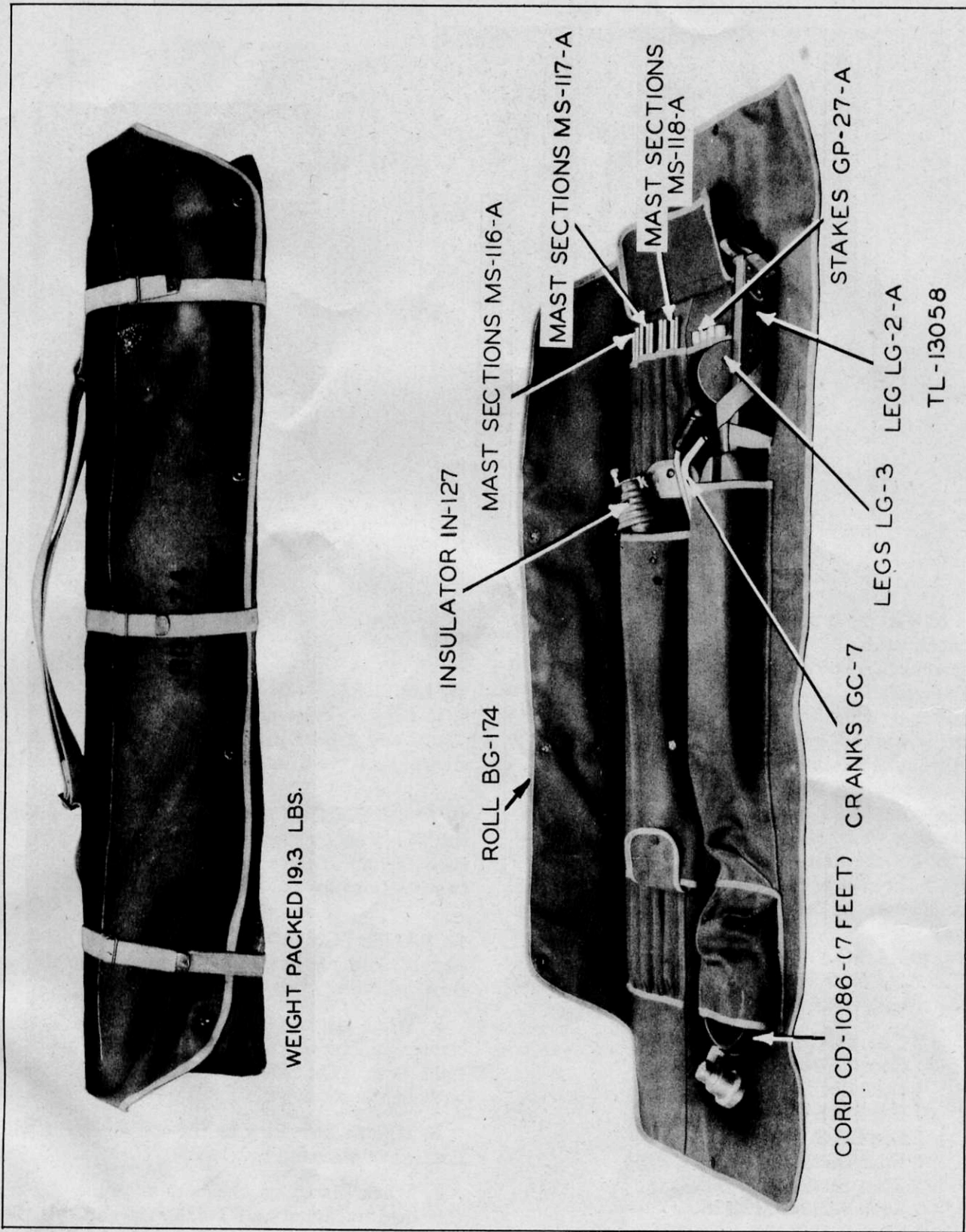


Figure 7. Roll BG-174, antenna equipment roll.



Figure 8. Bag BG-172, packed.

**14. ACCESSORIES.** Most of the operating accessories for this radio set are carried in Bag BG-172, a canvas bag with carrying straps attached. The contents of this bag are as follows:

- 1 Antenna AN-160 assembled on Reel RL-29.
- 1 Box BX-53-A containing spare tubes.
- 1 Box BX-54-A (for crystals).
- 1 Cord CD-307-A.
- 1 Cord CD-318-A.
- 1 Counterpoise CP-12 } Assembled on
- 1 Counterpoise CP-13 } Reel RL-29.
- 1 Guy GY-12.

- 1 Guy GY-42 (two 20-ft. length of Twine RP-11, with 2 insulators and  $\frac{5}{16}$ -inch collar clamp).
- 1 Halyard M-378 (80 ft.).
- 1 Halyard M-379 (10 ft.).
- 1 Headset HS-30 and Cord CD-933 (assembled).
- 1 Key J-45.
- 1 Microphone T-17.
- 1 Microphone T-45.
- 5 ft. Wire W-128.

Figure 9 shows the contents of the bag. Figure 8 shows the bag packed, ready to be carried.

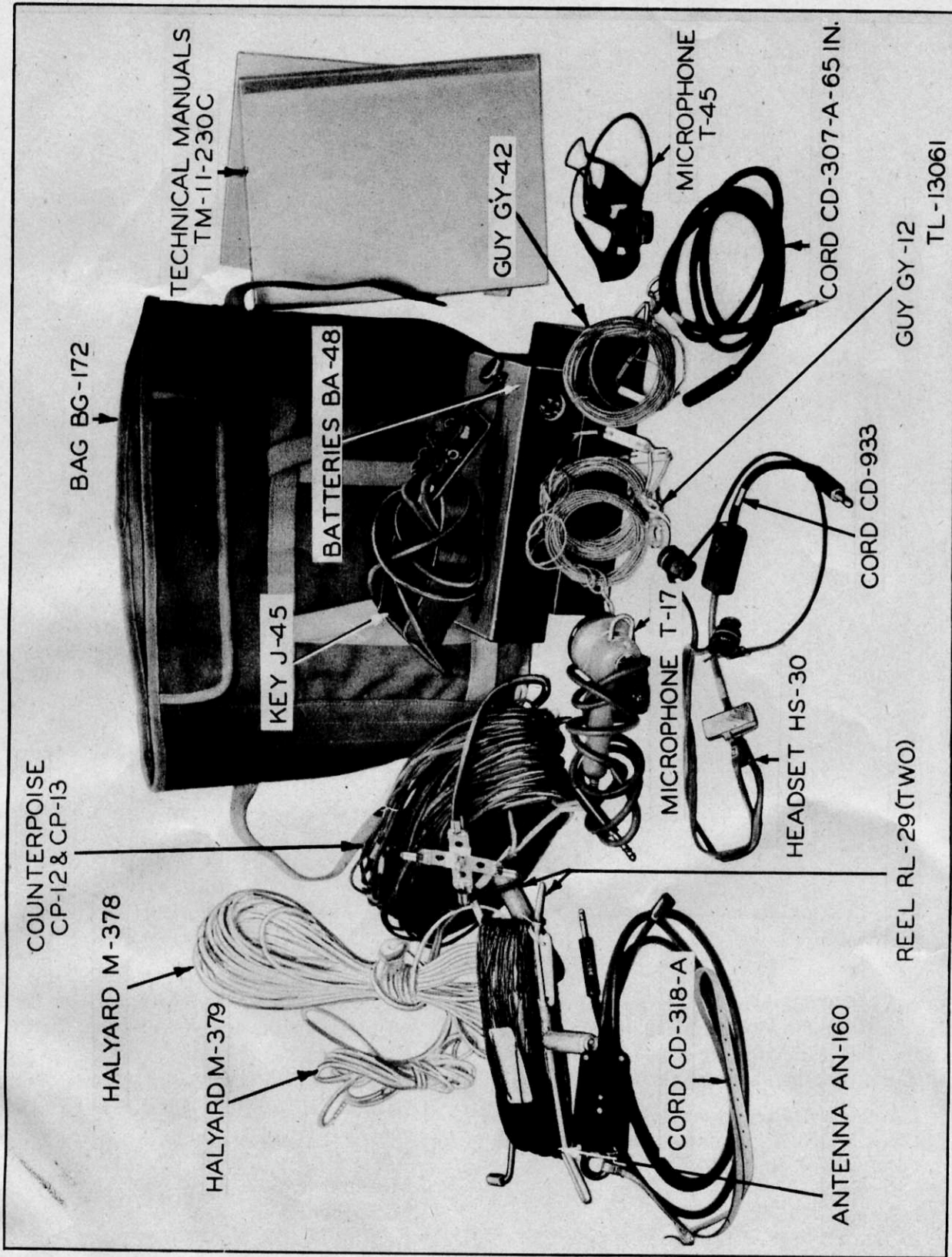


Figure 9. Accessories normally carried in Bag BG-172.

## SECTION II

# INSTALLATION AND OPERATION

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### 15. VEHICULAR INSTALLATION OF MOUNTING FT-482.

*a.* If there is a specified position for Mounting FT-482, install the mounting in accordance with standard installation instructions (see applicable manual of the TM 11-2700 series).

*b.* If there is no standard installation specified for the vehicle in which the installation is being made, select a position which will enable the operator to reach the set reasonably well, and which is close to the position chosen for the mast installation.

*c.* Install the mounting securely by means of the hardware provided.

### 16. VEHICULAR INSTALLATION OF RADIO RECEIVER AND TRANSMITTER BC-1306.

*a.* Remove the receiver-transmitter from the canvas cover.

*b.* For transportation or storage, mount the radio set in Mounting FT-482 with the Panel Cover M-404 in place on the equipment. Fasten the equipment by means of straps on the mounting, passed through belt loops on the receiver-transmitter.

*c.* For immediate use, remove Panel Cover M-404 from the receiver-transmitter, turn it upside down, and slip it into the back of the receiver-transmitter. Then fasten the equipment in Mounting FT-482 by means of straps passed through belt loops on the receiver-transmitter.

*d.* A narrow strap at the center of each side of the mounting holds Panel Cover M-404 in place so that the set may be removed if desired, leaving the panel cover in place.

*e.* Connect the antenna lead to the ANT binding post.

*f.* Connect the ground lead to the GND post on the receiver.

*g.* Connect Cord CD-1086 (44 in.), screwing the retaining ring up tight.

### 17. VEHICULAR INSTALLATION OF VIBRATOR POWER UNIT PE-237.

*a.* Install the vibrator unit in the standard position specified for the vehicle in which installation is being made.

*b.* If no standard position has been specified, select a horizontal surface large enough to accommodate the vibrator unit and its mounting feet, and to permit a slight movement of the unit when operating over rough terrain. The spot selected should be near enough to the terminal box in the vehicle for the heavy input cables to reach the terminal box in the vehicle and close enough to the set to permit Cord CD-1086 (44 in.) to make connections between the vibrator unit and the set.

*c.* Securely fasten the mounting to the vehicle by means of the hardware provided.

*d.* Connect the heavy input cables to the vehicular terminal box, making sure of the following:

(1) That the negative (−) terminal of the vehicular storage battery is grounded to the frame of the vehicle. (The set will not operate properly in vehicles with the positive (+) battery terminal grounded.)

(2) That the negative (−) lead of the power unit is connected to the grounded terminal in the vehicular terminal box.

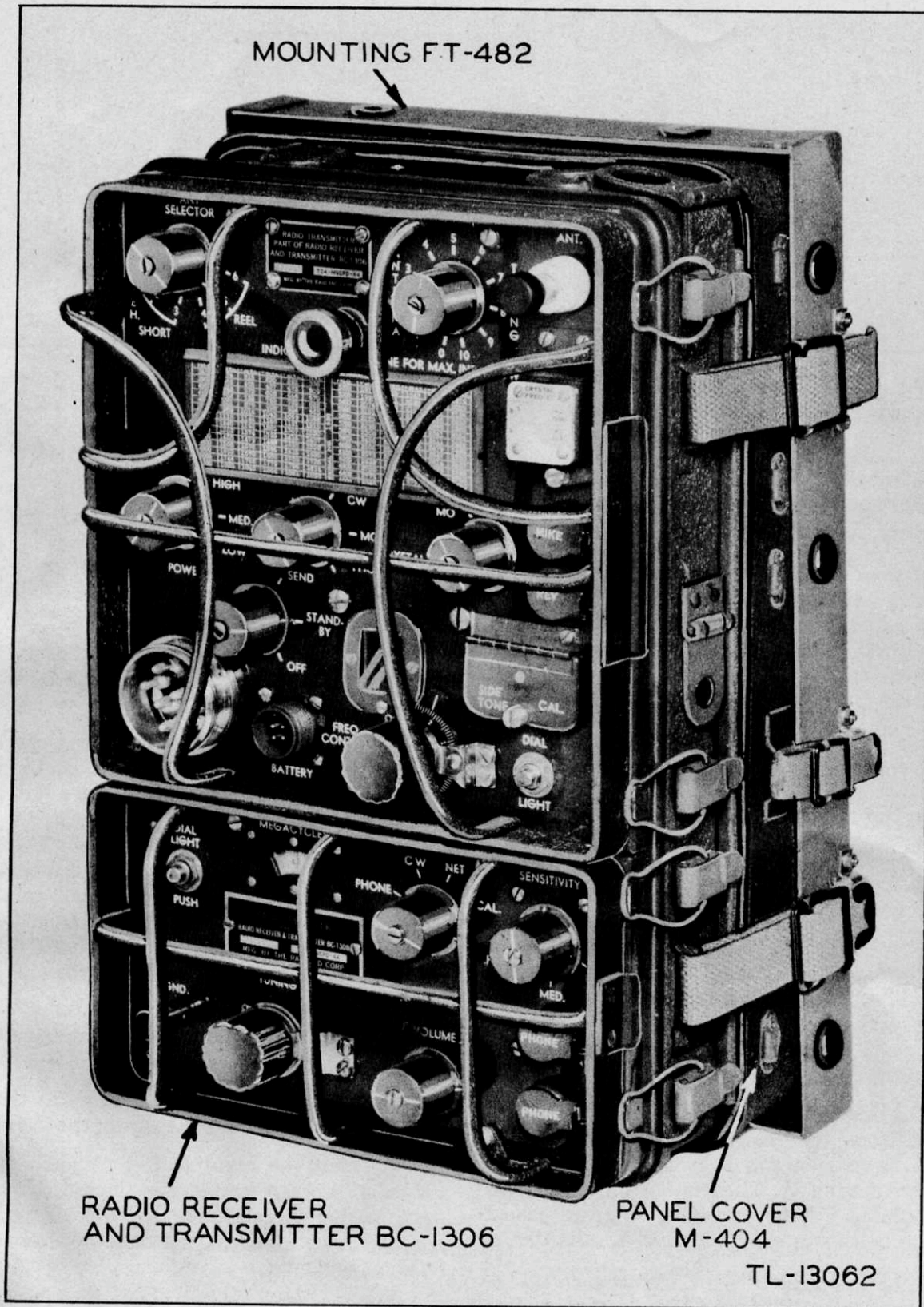


Figure 10. Radio Receiver and Transmitter BC-1306, mounted for vehicular use.

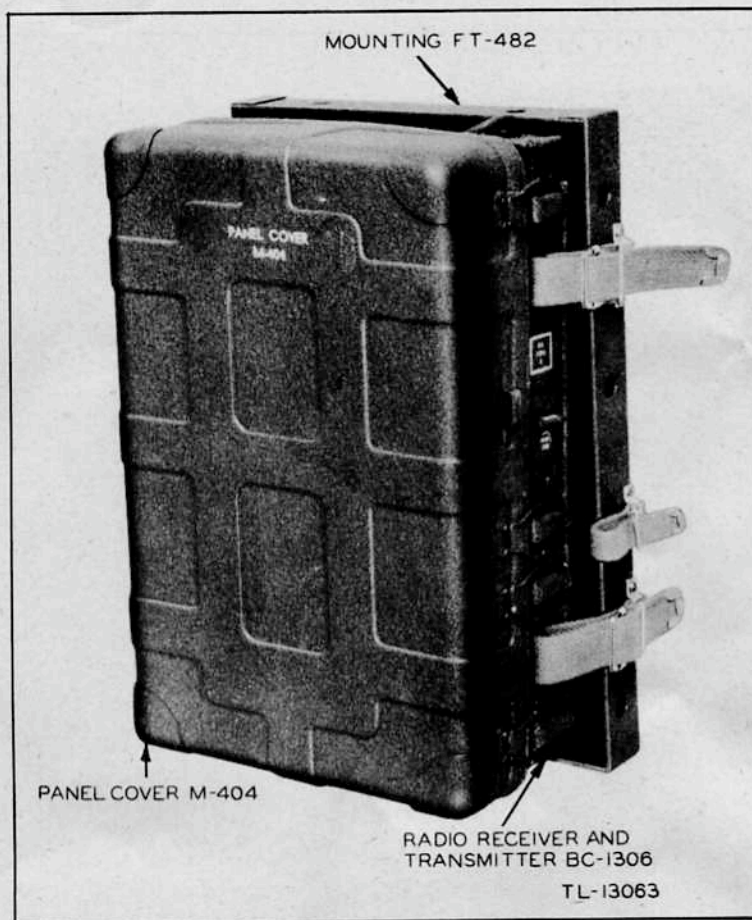


Figure 11. Radio Receiver and Transmitter BC-1306, mounted for vehicular transportation and storage.

(3) That the connections in the terminal box are clean and tight.

(4) That the nominal battery voltage of the vehicle is correct.

e. Observe the indicator through the window in the side of the case. If it does not agree with the voltage of the vehicular battery, remove the cover of the vibrator unit, pull up on the knob of the switch, and shift it to agree with the voltage of the vehicular storage battery. Then replace top.

f. Push the OFF button on the side of the vibrator unit, and connect Cord CD-1086 (44 in.) between transmitter and vibrator unit, making sure that the retaining rings are turned up tight. (If the cord is not long enough to reach, Cord CD-1086 (7 ft.) may be used, but must be removed when the set is removed from the vehicle for field operation.)

g. Turn the transmitter SEND-STANDBY-

OFF switch to OFF, and push the ON button on the vibrator unit. The unit is now ready to operate.

## 18. SELECTION OF ANTENNAS FOR FIELD USE.

a. Radio Set SCR-694-C when used as a field set may use one of two different types of antennas depending upon circumstances or requirements: either a vertical mast antenna mounted on the side of the radio set, or a long (half-wave) horizontal antenna suspended between two tall objects such as trees or buildings.

(1) When a permanent or semi-permanent installation can be made, the long antenna should be used. It will transmit and receive farther.

(2) When the equipment must be moved rapidly and frequently from one location or another, use the whip antenna.

b. The advantages of the collapsible antenna are:

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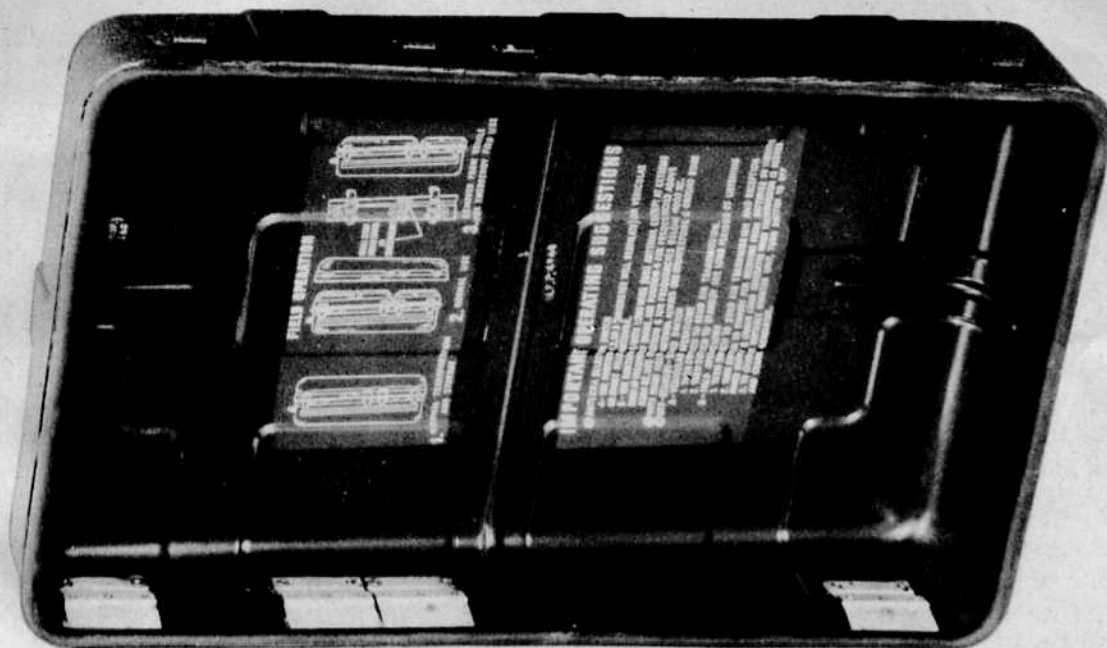


Figure 12. Panel Cover M-404.

- (1) It can be set up or taken down quickly.
- (2) It will permit most satisfactory transmission and reception over short distances (up to 25 miles).
- (3) The space required is small.
- (4) The presence of tall objects for support is not required.
- (5) The antenna permits transmission equally well in all directions.
- (6) The antenna can be quickly tuned from one end of the frequency band to the other.

*c.* The principal disadvantage is that the antenna is not highly efficient for distances in excess of 25 miles, compared to the long antenna.

*d.* The principal advantage of the long (half-wave) antenna is its transmission efficiency. It will permit very satisfactory transmission and reception over comparatively long distances when properly installed.

*e.* The principal disadvantages of the long antenna are:

- (1) It requires tall objects, or at least one tall object for support.
- (2) The antenna length must be changed if the frequency is to be shifted appreciably (more than 200 kc).
- (3) It will not permit satisfactory transmission and reception in the directions parallel to its length.

## 19. INSTALLATION OF VERTICAL MAST ANTENNA.

*a.* Select a location that affords concealment yet permits the antenna to project up in a relatively open space (fig. 13). Do not let it touch branches, bushes, or tree limbs.

*b.* Spread out the eight branches of the counterpoises as far as they will reach radially, like the spokes of a wheel. Drive a Stake GP-27-A through the center of the connector and into the earth to provide a good ground.

*c.* Set the receiver-transmitter at the center of the counterpoise and connect the counterpoise lead to the GND post on the receiver.

*d.* Extend the support for Insulator IN-127

through the opening in the side of Bag BG-173 and insert the insulator in the supports. Connect the binding post on the insulator to the ANT post on the transmitter with a short piece of Wire W-128, running the wire through the upper hinge slot in the bag.

*e.* Screw together three Mast Sections MS-116-A, one Mast Section MS-117-A, and one Mast Section MS-118-A.

*f.* Close the clamp ring of Guy GY-42 (two 20 ft. lengths of Twine RP-11, with 2 insulators and  $\frac{5}{16}$ -in. collar clamp) and hook the end of Guy GY-12 through the holes in the collar clamps to keep the clamps closed. Slip this over the top end of the assembled mast sections and screw the mast into Insulator IN-127. Slip the Stakes GP-27-A through the "S" hooks attached to the ends of the guy cords and drive the stakes into the ground at approximately equally spaced points around the set so as to hold the mast erect.

## 20. INSTALLATION OF LONG ANTENNA.

*a.* Select a location that affords concealment and protection, yet provides support for Antenna AN-160 (fig. 14). A minimum length of 125 feet is required for the antenna.

*b.* Erect the antenna making use of any suitable supports, such as trees, buildings, or even fence posts. The antenna should be elevated to between 5 and 30 feet (fig. 14), but will work when as low as 3 feet off the ground. Such low elevation is not recommended, however. Use Halyards M-378 and M-379 to hold the antenna.

*c.* Locate the radio set at any point that will not allow the lead-in to touch ground or any other object, such as trees or buildings. Connect the antenna lead-in to the ANT binding post on the transmitter.

*d.* Set up Generator GN-58 in accordance with paragraph 21.

*e.* Connect accessories in accordance with paragraph 22.

*f.* For adjustment, see paragraph 41.

## 21. INSTALLATION OF GENERATOR GN-58.

The hand generator is carried in Bag BG-175. The supporting legs are carried in antenna equipment Roll BG-174. To mount the generator on its legs proceed as follows:



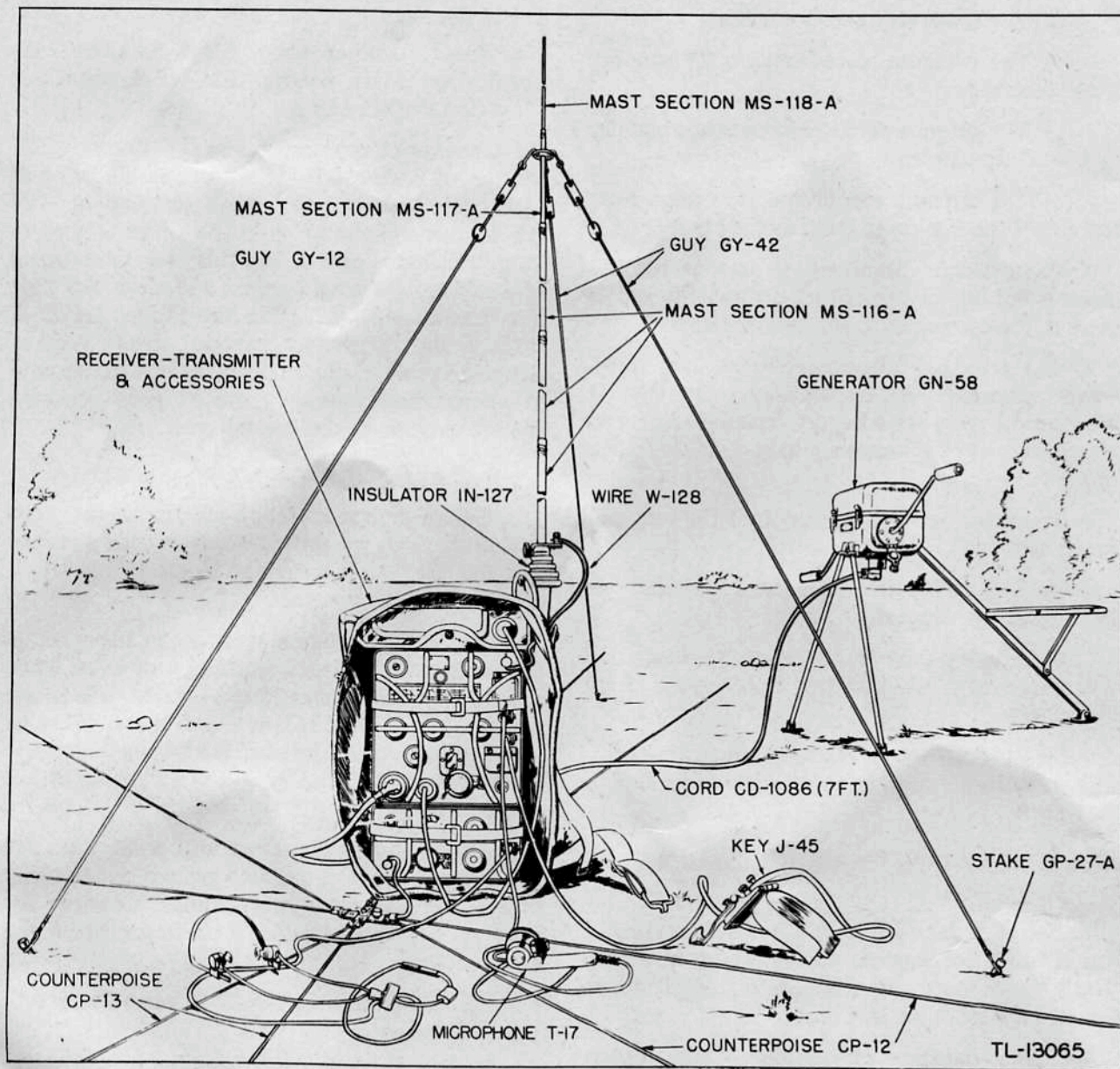
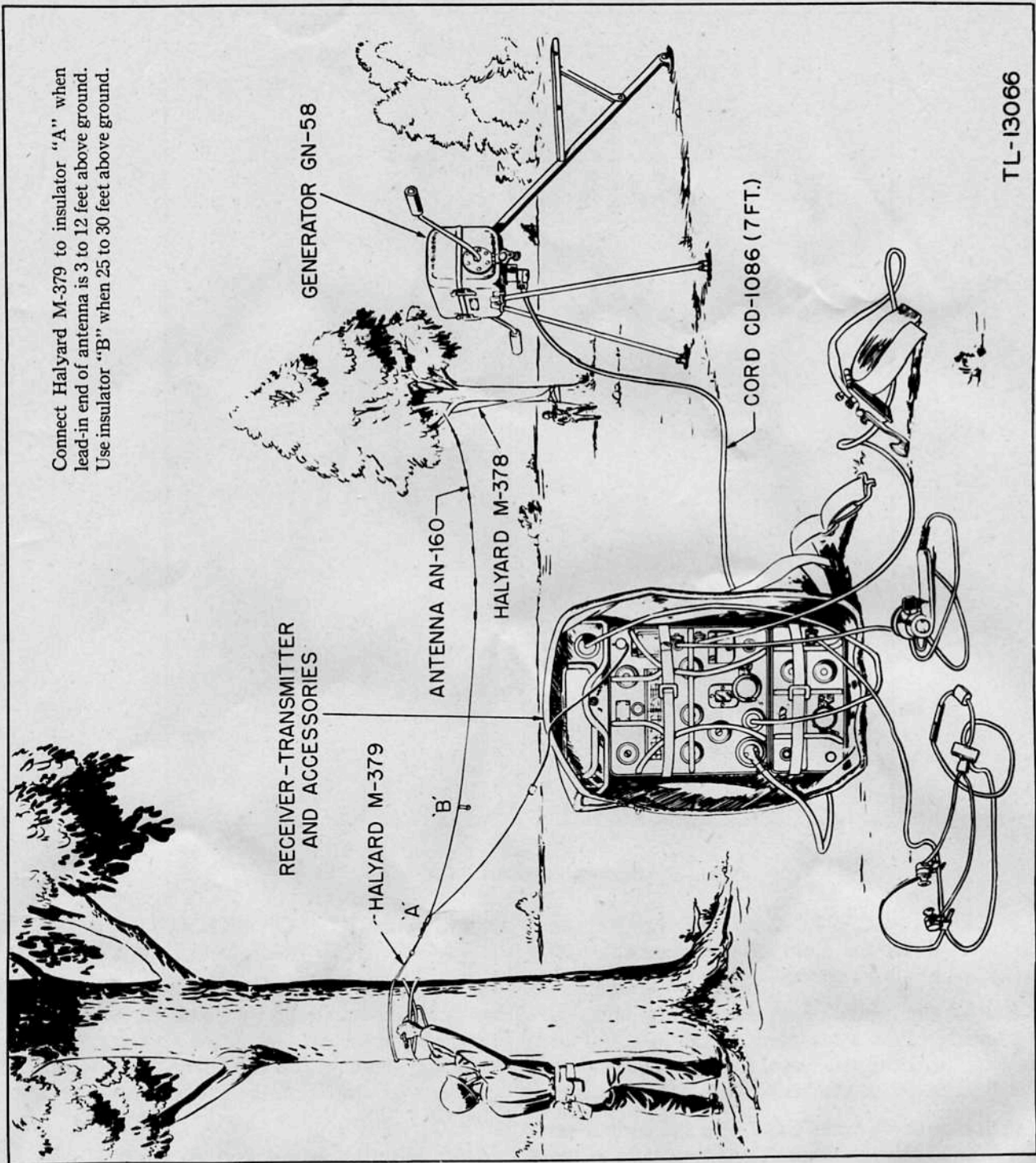


Figure 13. Field installation, mast antenna.



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Figure 14. Field installation, with Antenna AN-160.

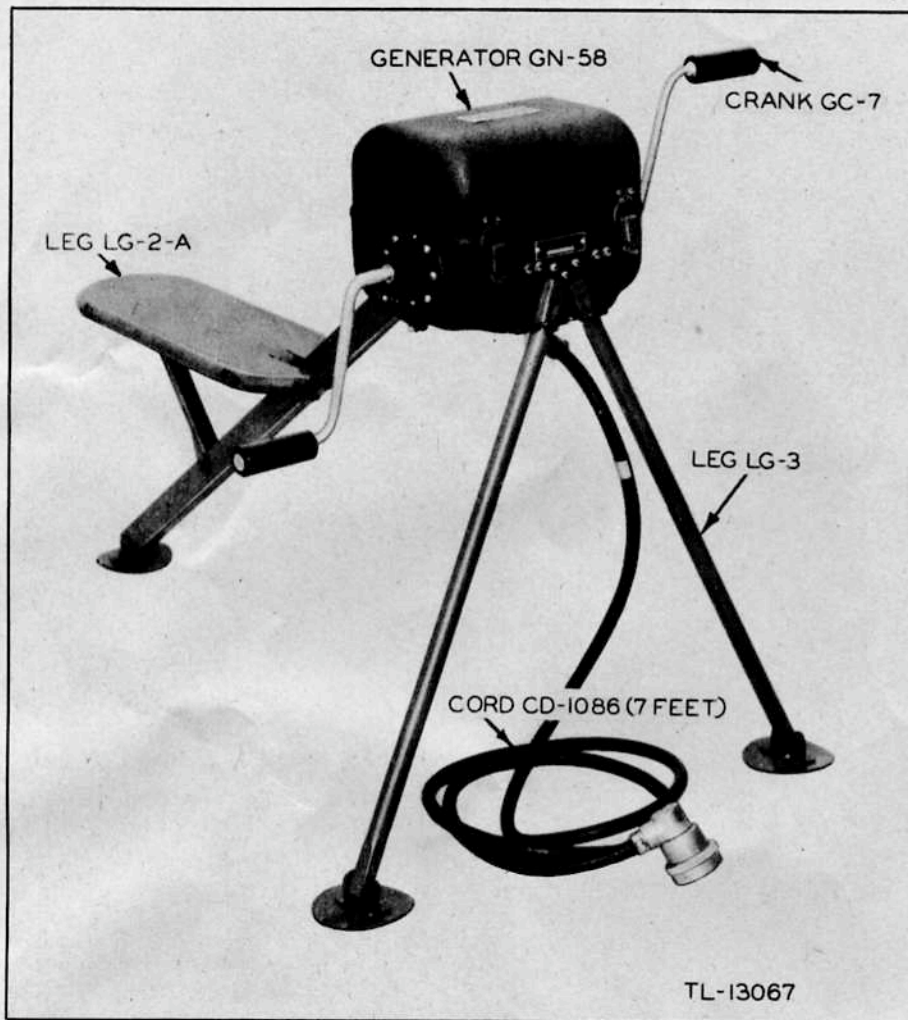


Figure 15. Generator GN-58.

*a.* Insert two Leg LG-3 upward through the metal loops on the front of the generator and under the retaining springs.

*b.* Rest the generator on the two legs and slip the bottom of the attachment of Leg LG-2-A into its retainer. Drop the metal loop over the top of the attachment on the back of the generator.

*c.* Insert two Cranks GC-7 into the sockets on the sides of the generator. The long shafts of the cranks should be at an angle of 180° to each other (fig. 15).

*d.* Connect the male plug of Cord CD-1086 (7 ft.) to the generator receptacle, and the female plug to the receiver-transmitter, turning the retaining rings up tight on both plugs. Generator GN-58 is now ready for operation.

## 22. INSTALLATION OF RECEIVER-TRANSMITTER AND ACCESSORIES.

*a.* Take the receiver-transmitter out of its canvas cover and remove Panel Cover M-404. Slip the cover on the back of the set and re-install in the bag, leaving the front flaps open to allow operation of the controls and entrance of the cables (fig. 16).

*b.* Attach the female end of Cord CD-1086 (7 ft.) to the power receptacle, screwing the fastening ring up tight.

*c.* For phone operation, insert the plug of Microphone T-17 or of control Cord CD-318-A (for Microphone T-45) into the MIKE jack, or, for cw or mcw, insert the plug of Key J-45 into the KEY jack.

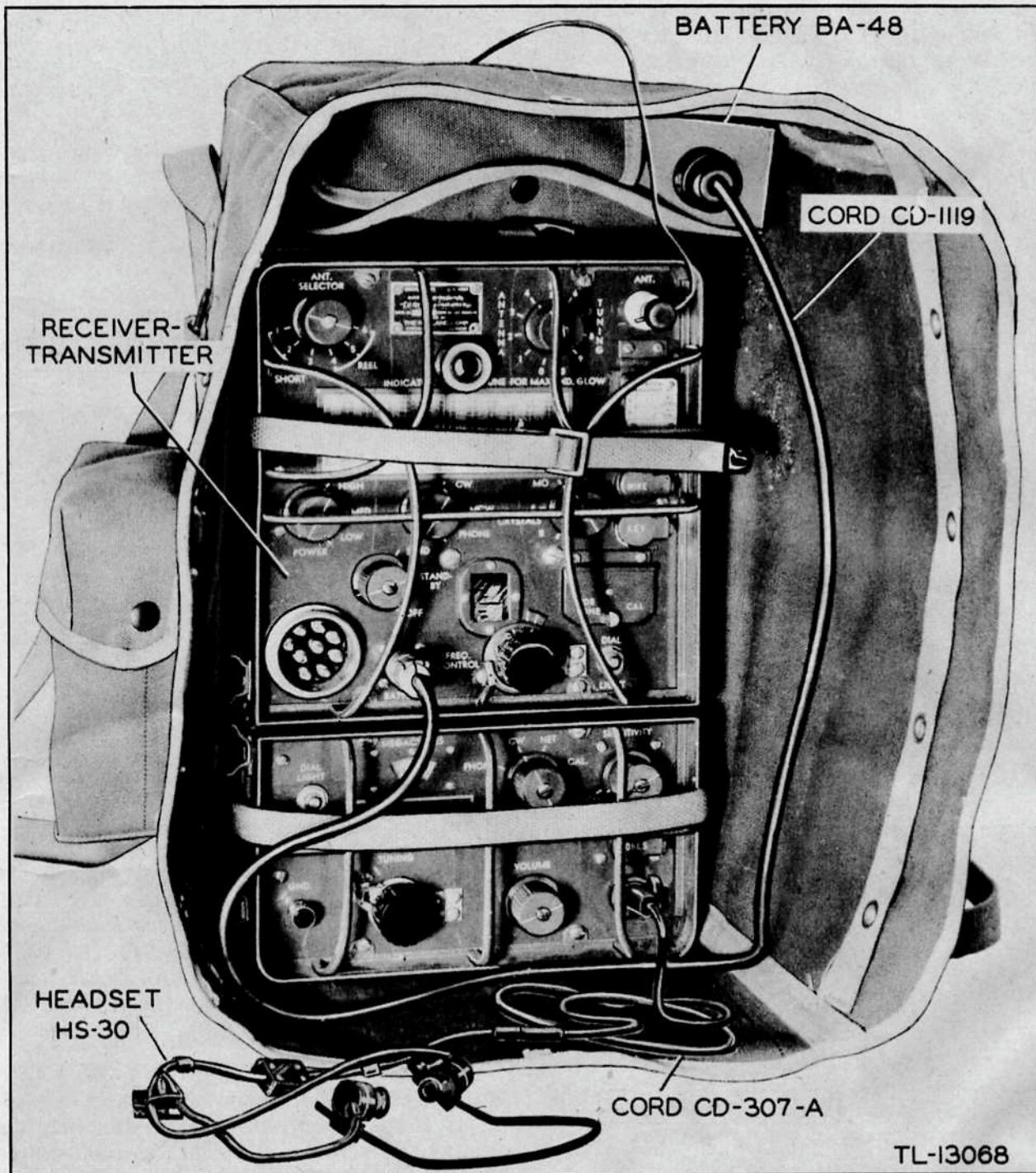


Figure 16. Receiver and transmitter and accessories.

d. Insert the plug of the headset extension cord CD-307-A into the PHONES jack and insert the plug of the headset into the jack on the extension cord.

e. If Battery BA-48 is used, insert the male plug end of Cord CD-1119 into the receptacle on the battery; then insert the female plug into the BATTERY receptacle on the panel of the transmitter and turn the retaining ring up tight.

f. Connect the antenna lead to the ANT binding post.

g. Connect a short direct ground lead to the GND binding post and run it to a ground connection such as Stake GP-27-A driven into moist earth.

**23. OPERATION OF THE RECEIVER.** The receiver of this radio set may be operated from any one of the following four power sources:

Battery BA-48

Generator GN-58

Vibrator Power Unit PE-237

Battery BA-48 for receiving, Generator GN-58 for transmitting.

a. When operated from Battery BA-48, proceed as follows:

(1) Insert the male plug of Cord CD-1119 into the receptacle on the battery.

(2) Insert the female plug of Cord CD-1119 into the BATTERY receptacle on the transmitter and screw the retaining ring up tight.

(3) Insert the plug of a headset into the PHONES jack.

(4) Turn the SEND-STANDBY-OFF switch on the transmitter to STANDBY.

(5) Turn the PHONE-CW-NET-CAL switch to PHONE or CW, depending upon the type of signal to be received.

(6) Turn the SENSITIVITY switch to HIGH. This will provide maximum sensitivity so that weak signals may be heard. If the signals are strong, the signal-to-noise ratio can be improved by using a lower sensitivity position.

(7) Turn the VOLUME control clockwise until a strong hiss, or some signal is heard.

(8) Tune for the desired signal.

(9) Adjust VOLUME control to suit the convenience of the operator.

(10) To turn the receiver off, remove the headset plug from the PHONES jack, or turn the SEND-STANDBY-OFF switch to the OFF position.

b. When operated from Generator GN-58 alone, proceed as follows:

(1) Connect receiver-transmitter to generator by means of Cord CD-1086 (7 ft.), screwing the retaining rings up tight at both ends of the cord.

(2) Turn the SEND-STANDBY-OFF switch to SEND.

(3) Direct someone to turn the cranks of the generator at a speed of approximately 60 revolutions per minute (rpm).

(4) Proceed otherwise as in subparagraph a above.

c. When operated from Vibrator Power Unit PE-237 proceed as follows:

(1) Connect receiver-transmitter to vibrator unit by means of Cord CD-1086 (44 in.), screwing the retaining rings at both plugs up tight.

(2) For listening alone, turn the SEND-STANDBY-OFF switch to STANDBY. (For two-way communication turn switch to SEND.)

(3) Proceed otherwise as in subparagraph a above except that to turn set off, turn SEND-STANDBY-OFF switch to OFF.

d. When the receiver-transmitter is set up using Battery BA-48 for receiving and Generator GN-58 for transmitting, proceed as follows:

(1) Connect the receiver-transmitter to the generator by means of Cord CD-1086 (7 ft.) and connect Battery BA-48 to the BATTERY receptacle on the transmitter by means of Cord CD-1119.

(2) Turn the SEND-STANDBY-OFF switch to STANDBY. With this arrangement the receiver is operated by Battery BA-48, while the transmitter is ready to operate as soon as the generator is operated.

(3) Proceed otherwise as in subparagraph a above.

**CAUTION:** When using the receiver, installed in the vehicle, for long periods, always turn the SEND-STANDBY-OFF switch on the transmitter to STANDBY. This automatically transfers the receiver to the standby portion of the vibrator unit which draws only about one-quarter as much power as the heavy duty portion when operating only the receiver.

**24. RECEIVER DIAL SETTINGS.** The receiver dial is directly calibrated in megacycles (mc) (1 mc = 1,000 kc). Each small division equals 20 kc. Figure 17 shows views of several dial settings and the corresponding frequencies. In reading the dial, disregard the decimal point between the figures on the dial scale. Read in hundreds of kilocycles the pair of numbers to the left of the index line on the window; then add 20 kc for each division between those figures and the index line on the window.

#### 25. RECEIVER CALIBRATION.

a. A 200-kc crystal in the receiver supplies a series of crystal-controlled check frequencies against which to check the calibration of the receiver and transmitter. These check frequencies are all harmonics of 200 kc. The calibration check points are 3,800 kc, 4,000 kc, 4,200 kc, etc., up to 6,400 kc.

b. To check the receiver calibration, proceed as follows:

(1) Turn the PHONE-CW-NET-CAL switch to CAL.

(2) Turn the SEND-STANDBY-OFF switch to SEND, or to STANDBY if Battery BA-48 is used.

(3) Turn the CW-MCW-PHONE switch to PHONE.

(4) Turn the receiver dial to the lowest frequency check point (3,800 kc) and adjust the receiver TUNING knob until zero beat is obtained on the strongest beat note in the vicinity of the crystal check point. The receiver is out of calibration by the amount that the index line on the dial window fails to coincide with the exact frequency.

(5) Turn the SENSITIVITY switch to the lowest setting that will give satisfactory crystal check points. This avoids weak spurious signals that are not the correct calibration check points.

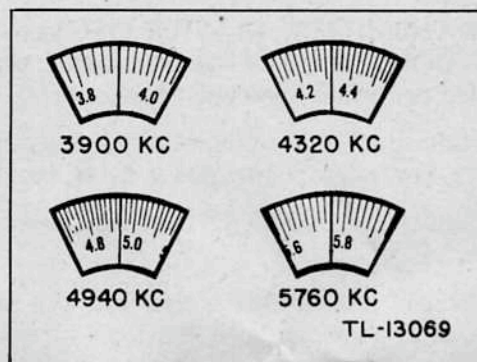


Figure 17. Receiver dial settings.

(6) Having checked the calibration at 3,800 kc, proceed through the entire tuning range checking the calibration at 4,000 kc, 4,200 kc, 4,400 kc, etc., up to 6,400 kc. If the receiver is badly out of calibration it may be corrected in accordance with paragraph 80.

#### 26. PRECAUTIONS DURING OPERATION OF RECEIVER.

a. Never leave the PHONE-CW-NET-CAL switch on NET or CAL because the sensitivity of the receiver is very low in these positions.

b. When checking calibration of the receiver, use the lowest setting of the sensitivity switch that will give satisfactory beat notes. This avoids spurious responses that might be misleading. If interference is experienced because of strong signals being picked up, disconnect the antenna during calibration.

c. Check the position of the IMPEDANCE switch in the rear of the receiver chassis. See that it agrees with the impedance of the headset.

**NOTE:** When Headset HS-30 is used with Cord CD-933, the impedance of the combination is low (250 ohms). When the headset is used with Cord CD-604, the impedance of the combination is high (4,000 ohms).

d. The lowest position of the sensitivity switch that will give satisfactory reception of a given signal usually produces the "cleanest" signal.

e. When the receiver is operated from Battery BA-48, always plug Cord CD-1119 into the receptacle on the battery before attaching the plug on the other end of the cord to the BATTERY receptacle on the transmitter.

**27. TRANSMITTER, MASTER-OSCILLATOR OPERATION.** To operate the transmitter, master oscillator controlled, proceed as follows:

*a.* Perform all of the preliminary connecting of antenna, key, microphone, power cable, etc.

*b.* Turn the SEND-STANDBY-OFF switch to SEND.

*c.* Connect the antenna and set the ANT. SELECTOR to agree with the type of antenna in use.

*d.* Line up the two dots on the INDICATOR barrel so that maximum light will be emitted.

*e.* Set the POWER switch to HIGH.

*f.* Set the CW-MCW-PHONE switch to CW.

*g.* Set the PHONE-CW-NET-CAL switch to PHONE or CW, depending upon the type of signal that is to be transmitted and received.

*h.* If the transmitter calibration has recently been corrected to within 100 kc of the frequency on which it is desired to transmit, proceed as in the following paragraph. If the transmitter calibration has not been recently corrected to within 100 kc of the desired operating frequency, first correct the calibration as directed in paragraph 30, then proceed as in the following paragraphs.

*i.* Set the CRYSTALS switch to MO and adjust the FREQ. CONTROL knob to the proper dial setting (par. 29 below).

*j.* If the long antenna (half-wave) is in use, be sure that the antenna jumpers are adjusted for the desired frequency of operation (par. 41).

*k.* Press the microphone button or the key and adjust the knob TUNE FOR MAX. IND. GLOW until the INDICATOR shows maximum brilliance.

*l.* The POWER switch may then be set to the desired power output and the CW-MCW-PHONE switch set to the type of signal to be transmitted.

**28. CRYSTAL OPERATION OF TRANSMITTER.**

Two crystal channels are provided for crystal controlled operation. When employing crystals proceed as follows:

*a.* Set the CRYSTALS switch to the proper position, CRYSTAL A or CRYSTAL B.

*b.* Set the FREQ. CONTROL knob to the dial

setting corresponding to the frequency of the transmitted signal.

*c.* Set the CW-MCW-PHONE switch to CW or MCW.

*d.* Set the PHONE-CW-NET-CAL switch to NET.

*e.* Set the SENSITIVITY switch to HIGH.

*f.* Adjust the receiver to the transmitted frequency, rocking the receiver dial slightly to both sides of the nominal setting, listening for a strong beat note. If a strong beat note is not heard at the expected frequency, the crystal is not operating properly (even though the INDICATOR may show the presence of r-f power when key is closed). It is then necessary either to use a spare crystal, if available, or to shift over to master oscillator operation (par. 27, Transmitter, Master-Oscillator Operation).

*g.* Set the PHONE-CW-NET-CAL switch to the PHONE or CW position, the CW-MCW-PHONE switch to the CW position, press down key and adjust antenna circuit for greatest indicator glow.

**29. TRANSMITTER DIAL READINGS.** Dial settings for the transmitter are read from two dials. The drum dial behind the window reads thousands and hundreds, while the flat disc attached to the FREQUENCY CONTROL knob reads tens and units. Complete dial readings are the combined indications of both dials. Several views of different dial settings with the corresponding dial readings are given in figure 18. A calibration chart attached to the front of the transmitter furnishes exact dial settings for certain frequencies within the tuning range of the transmitter. To obtain unlisted dial settings, proceed as follows:

*a.* From the desired frequency, subtract the first calibrated frequency below it.

*b.* Find the difference between the dial readings for the calibrated frequency just above and below the desired frequency.

*c.* Multiply the value obtained in subparagraph *a* above by that in subparagraph *b*, and divide the answer by 20.

*d.* Add the answer obtained in subparagraph *c* to the dial setting corresponding to the first calibrated frequency just below the desired frequency. This answer is the new dial setting.

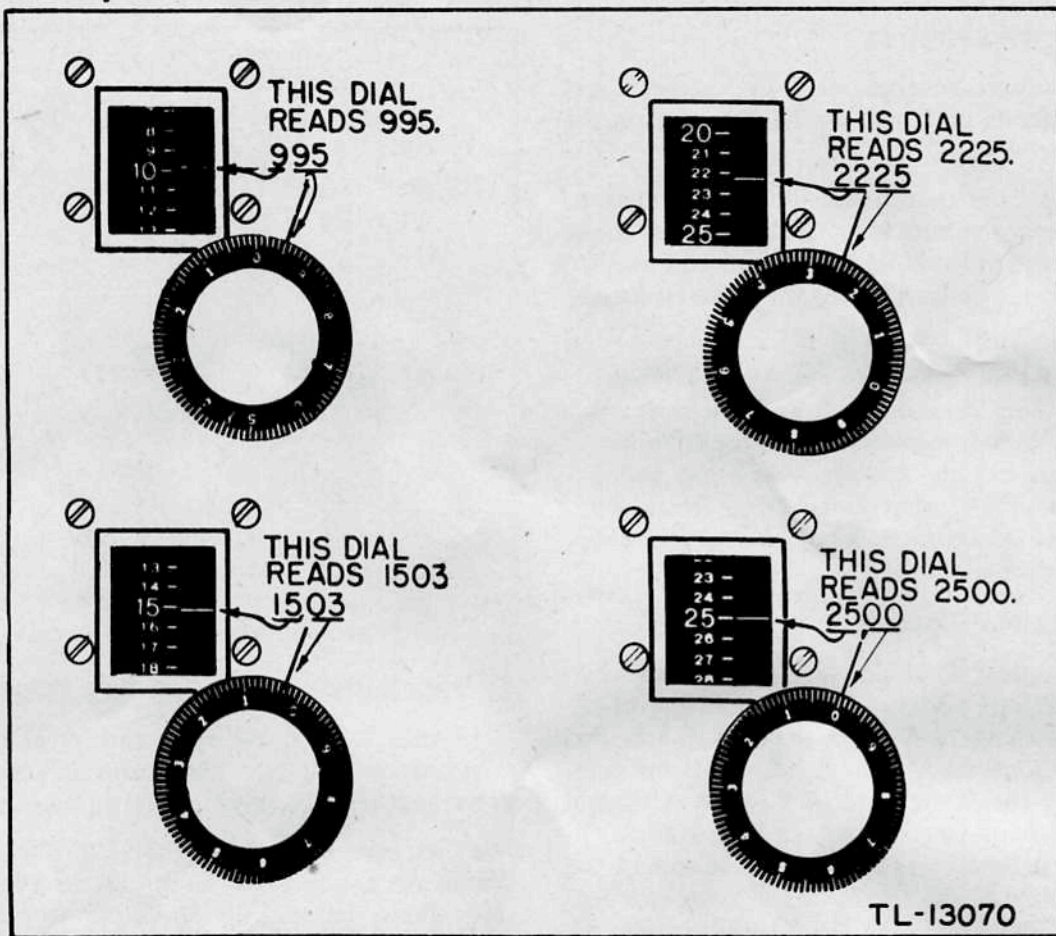


Figure 18. Transmitter dial readings.

### 30. TRANSMITTER, CORRECTING CALIBRATION

a. The transmitter calibration may be corrected from the front of the transmitter without the use of special tools or equipment.

b. There are 14 frequencies distributed evenly throughout the frequency range at which the calibration may be corrected. *Greatest accuracy is obtained if the correction is made at the check frequency nearest the operating frequency.*

c. To correct transmitter calibration proceed as follows:

- (1) Select the crystal check frequency nearest the desired operating frequency.
- (2) Adjust the receiver to zero beat at this check frequency in accordance with paragraph 25, Receiver Calibration.
- (3) Turn the CRYSTALS switch to MO.
- (4) From the calibration chart, determine

the dial setting corresponding to the calibration check frequency. Set the **FREQ. CONTROL** knob to this dial setting. Set the **PHONE-CW-NET-CAL** switch on the receiver to the **NET** position.

(5) Open the cover marked **SIDE TONE CAL.**, and adjust the **CAL.** trimmer until zero beat is heard in the headset, then securely tighten the door to prevent the entry of water.

(6) Turn the **PHONE-CW-NET-CAL** switch to **PHONE** or **CW** to restore the receiver to normal sensitivity for reception.

(7) The transmitter can now be tuned accurately to any frequency within 100 kc. above or below the calibrating frequency. For frequencies more than 100 kc. away from the frequency at which the calibration was corrected, the transmitter calibration should be readjusted at a new crystal frequency within 100 kc. of the desired operating frequency.



### 31. MICROPHONE T-17.

a. To prepare Microphone T-17 for use, insert the microphone plug into the MIKE jack on the transmitter.

b. To operate the microphone, hold it close to the lips, press the button on the handle and speak in a loud, clear voice. Hold the button until finished talking, then release the button to listen for the reply.

**NOTE:** About 2 seconds are required for the tubes to heat properly each time the button is pressed. Wait 2 seconds after pressing the button before talking. Always release the button IMMEDIATELY after transmitting, since no reply can be heard from the receiver with the button switch closed.

### 32. MICROPHONE T-45.

a. To prepare Microphone T-45 for operating, hang the microphone in front of the lips in accordance with figure 19, using the harness attached to the microphone. Adjust the harness for comfort. Hang the strap of Cord CD-318-A around the neck, supporting the switch at a convenient place on the chest of the operator. Connect the plug of Microphone T-45 to the corresponding receptacle on Cord CD-318-A, and insert the plug of Cord CD-318-A into the MIKE jack of the transmitter.

b. To operate Microphone T-45, press the button on the control switch of Cord CD-318-A and speak in a loud, clear voice. Except for substituting the button on the control switch of Cord CD-318-A for the button on the handle of Microphone T-17, the operation of Microphone T-45 is exactly the same as Microphone T-17 described in paragraph 31.

**33. KEY J-45.** Insert the plug of Key J-45 into the KEY jack on the transmitter. Operate the key in the conventional manner. If the key should be lost, the button on Microphone T-17 or the button on the switch of Cord CD-318-A may be used as a key if the plug is inserted into the MIKE jack. Under these circumstances the CW-MCW-PHONE switch on the transmitter is set to CW or MCW, whichever is desired.

**34. NET OPERATION.** See Field Manual FM 24-18, 28 January 1944.

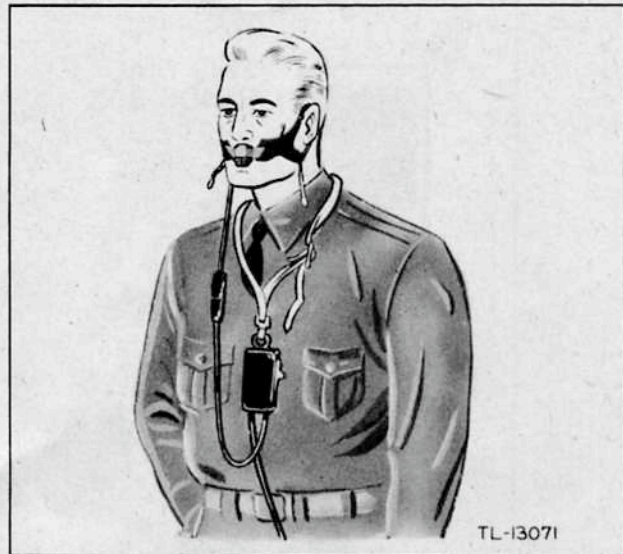


Figure 19. Microphone T-45 in use.

### 35. PRECAUTIONS DURING NET OPERATION.

a. Always tune receiver and transmitter to zero beat accurately. This insures all transmitters in the net being closely on the net frequency.

b. Be sure that the PHONE-CW-NET-CAL switch on the receiver is turned to PHONE or CW when the netting operation is completed. When the switch is left in the NET position, the receiver sensitivity is very low and the transmitter will not modulate properly.

### 36. DIAL LIGHTS.

a. The dial lights in this receiver-transmitter are purposely dim. They furnish enough light to illuminate the required dial figures but not enough to introduce the possibility of enemy observation at night. In daylight the illumination is not visible unless the dial is shielded by the hand or other means.

b. The dials are normally not illuminated. To light the dial press the button marked DIAL LIGHT.

c. The dial light bulbs in both the transmitter and receiver are 2-volt bulbs operating at 1.4 volts.

d. The receiver dial light bulb can be operated when the receiver is operated from Battery BA-48. The transmitter dial light receives its power from the 6-volt filament circuit and consequently can

be operated only when there is voltage in the circuit, as when operating Generator GN-58 or Vibrator Unit PE-237.

### 37. R-F INDICATOR COVER.

*a.* To permit the normal brilliance of the INDICATOR to be adjusted from maximum for daylight operation to minimum for night operation, close to the enemy lines, a cover has been provided over the INDICATOR bulb.

*b.* The amount of light coming through the cover can be changed by rotating the outside rim of the cover which changes the angle of the movable polaroid window with respect to the fixed polaroid window behind it.

*c.* Maximum light is transmitted when the spots on the barrel of the indicator cover are lined up. For minimum light, rotate the rim clockwise one-quarter turn so that the spots are as far apart as possible.

**CAUTION:** Always rotate the rim in a clockwise direction.

### 38. PRECAUTIONS DURING OPERATION.

*a.* Never leave the PHONE-CW-NET-CAL switch on NET or CAL, since this reduces receiver sensitivity and weak signals may not be heard.

*b.* Never tune the transmitter for maximum indicator glow without an antenna connected because this overloads the output tube and subjects the transmitter to excessive r-f voltage.

*c.* Never attempt to operate the transmitter from Generator GN-58 with the SEND-STANDBY-OFF switch on STANDBY unless Battery BA-48 is connected. Under this condition there is no power on the master oscillator and no excitation on the output tube which would be overloaded.

*d.* Always use the correct length of antenna for each operating frequency (par. 41 below).

*e.* Always adjust the knob labeled TUNE FOR MAX. IND. GLOW to produce maximum brilliance of the INDICATOR.

*f.* Always set the CRYSTALS switch to MO when operating master oscillator-controlled.

*g.* Sometimes a short direct ground connection on the set will reduce the noise level in the receiver.

*h.* Always wait approximately 2 seconds after pressing the microphone button before beginning to speak, to allow the tubes to warm up. Watch for INDICATOR GLOW to be sure that the transmitter is functioning.

### 39. OPERATING VIBRATOR POWER UNIT PE-237.

*a.* The operation of the vibrator unit is automatic, controlled by relays in the unit, connected to the SEND-STANDBY-OFF switch in the transmitter. The only controls on the unit are the ON and OFF buttons on the circuit breaker.

*b.* To operate, proceed as follows:

(1) Push the ON button when the radio set is put into operation.

(2) When the set is shut down for the day, push the OFF button.

(3) If the vibrator unit is seriously overloaded, the circuit breaker will trip out shutting down the unit.

(4) To restore operation, push the ON button.

### 40. PRECAUTIONS DURING OPERATION OF VIBRATOR POWER UNIT PE-237.

*a.* Always set the SEND-STANDBY-OFF switch on the transmitter to OFF before pushing the ON button on the vibrator unit. No damage will result if this is not observed, but the ON button on the circuit breaker may fail to lock if pushed in when the switch is at SEND.

*b.* Never hold the circuit breaker in the ON position. If it will not stay in that position when pushed all the way in (with the transmitter switch at OFF) there may be some overload condition that should be investigated.

### 41. ANTENNA AN-160.

*a.* For satisfactory operation of the transmitter, the antenna must be the correct length for any given frequency.

*b.* The antenna has been divided into a number of sections which may quickly be connected or disconnected by means of jumpers with plug and jack connectors (fig. 20).

*c.* A calibration chart attached to each antenna shows which jumper to open or close for certain frequency ranges.

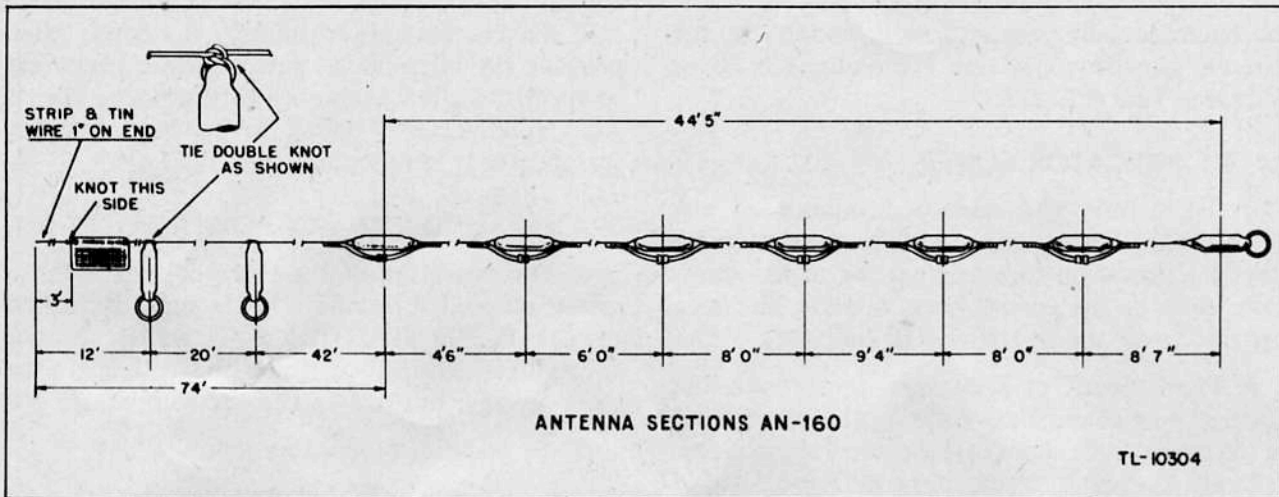


Figure 20. Antenna AN-160, dimensions.

d. The table below carries the same data as the calibration charts attached to the antennas.

FREQUENCY (kc)	1	2	3	4	5	6
6,500—6,000	0	0	0	0	0	0
6,000—5,600	x	0	0	0	0	0
5,600—5,200	x	x	0	0	0	0
5,200—4,800	x	x	x	0	0	0
4,800—4,400	x	x	x	x	0	0
4,400—4,100	x	x	x	x	x	0
4,100—3,800	x	x	x	x	x	x

**NOTE:** The numbers refer to jumpers across the antenna insulator beginning nearest to the lead-in, and 0 indicates an open jumper, while x indicates a closed jumper.

e. Select a suitable location and erect the Antenna AN-160 (fig. 14). Set up the receiver-transmitter at the lead-in end of the antenna with the hand generator. Then proceed as follows:

- (1) Connect the antenna lead-in to ANT. post on transmitter.
- (2) Set CW-MCW-PHONE switch to the CW position.
- (3) Set ANT. SELECTOR switch to position #5, except at extreme high frequency end set to position #4 and low end set to position #6.
- (4) From the calibration chart on the antenna, or from table in subparagraph d above, set the length by adjusting the links of the antenna for the selected frequency of operation.

- (5) Set CRYSTALS switch to MO position for master-oscillator operation and proceed as in paragraph 27, Transmitter, MO Operation, or set switch to either crystal A or B for crystal-controlled operation and proceed as in paragraph 28, Crystal Operation of Transmitter.

- (6) Set the SEND-STANDBY-OFF switch to SEND.

- (7) Set the HIGH-MED-LOW POWER switch to HIGH.

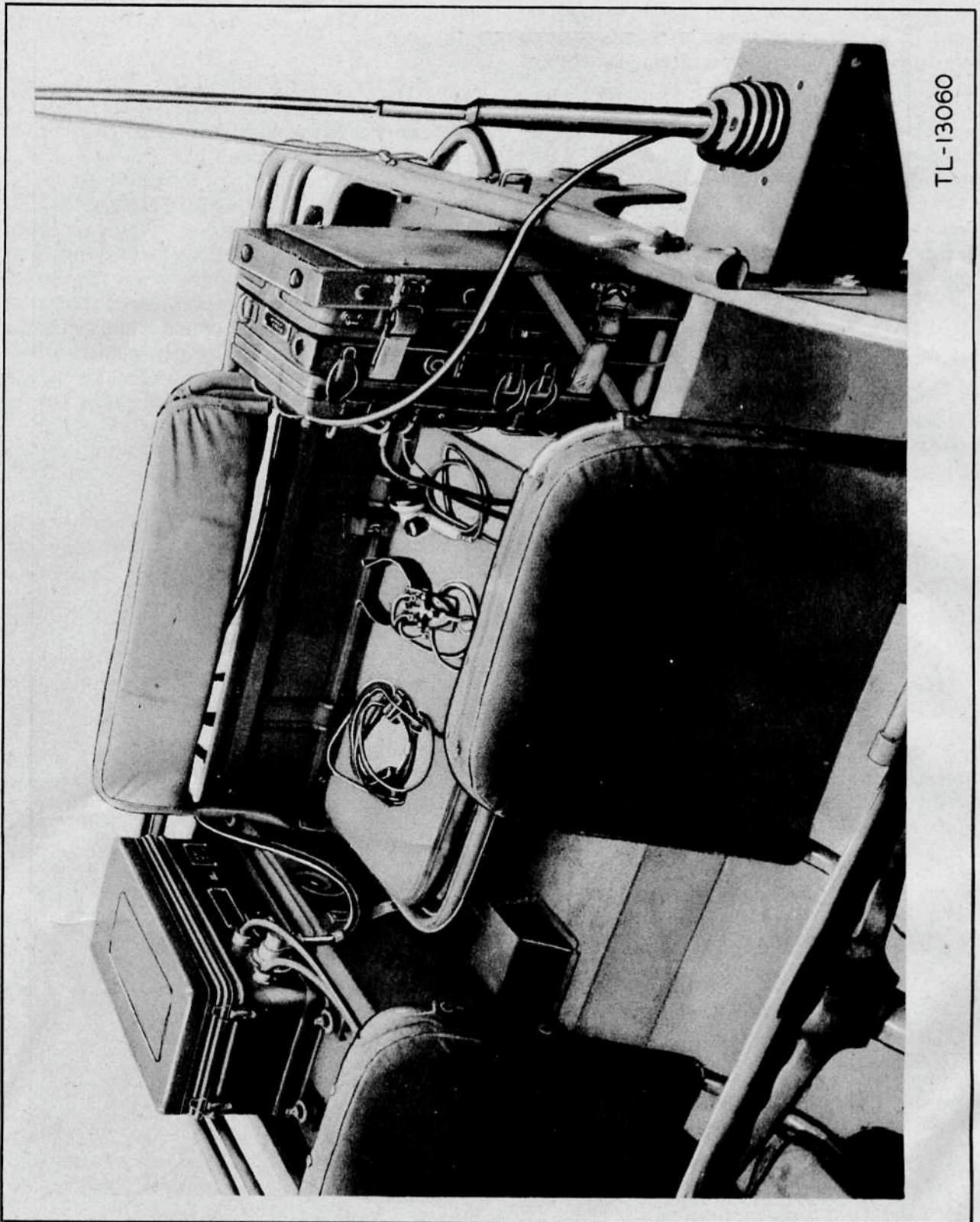
- (8) Set the PHONE-CW-NET-CAL. switch to PHONE or CW, whichever type reception is desired.

- (9) Press microphone button or key and adjust knob TUNE FOR MAX. IND. GLOW to greatest brilliance.

- (10) Set the HIGH-MED-LOW POWER, the CW-MCW-PHONE, and the SEND-STANDBY-OFF switches to positions desired. Transmitter is now ready for operation.

**42. VERTICAL MAST.** Set up the receiver-transmitter and hand generator as shown in figure 13. Erect the whip antenna as directed in paragraph 19, Installation of Vertical Mast Antenna. Proceed as follows:

- a. Set CW-MCW-PHONE switch to the CW position.



TL-13060

*Figure 21. Radio Set SCR-649-C installed in vehicle.*

b. Set ANT. SELECTOR switch to position No. 1 at high frequency end of band, position No. 2 at center of band, and position No. 3 at low end of band.

c. Set CRYSTALS switch to MO position for master-oscillator operation and proceed as in paragraph 27, Transmitter, MO Operation, or set switch to either A or B for crystal-controlled operation and proceed as in paragraph 28, Crystal Operation of Transmitter.

d. Set SEND-STANDBY-OFF switch to SEND.

e. Set HIGH-MED-LOW POWER switch to HIGH.

f. Set the PHONE-CW-NET-CAL switch to PHONE or CW, whichever type reception is desired.

g. Press microphone or key button and adjust TUNE FOR MAX. IND. GLOW knob to greatest brilliance.

h. Set the HIGH-MED-LOW-POWER, the CW-MCW-PHONE and the SEND-STANDBY-OFF switches to the position desired. Transmitter is now ready for operation.

**43. OPERATING GENERATOR GN-58.** Cord CD-1086 connects the generator to the radio set. Care should be exercised to see that the plugs and receptacles are clean and dry when connected, and that the retaining rings on the cable plugs are turned up tight. Turn the crank of the generator approximately 60 revolutions per minute. Direction of rotation is shown by arrows on the side of the generator case. Satisfactory operation can be obtained at 50 to 70 turns per minute.

## SECTION III

### FUNCTIONING OF PARTS

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**44. RECEIVER CIRCUIT ANALYSIS** (fig. 58). The receiver section of Radio Receiver and Transmitter BC-1306 is a 6-tube superheterodyne consisting of one stage of radio-frequency (r-f) amplification, a converter, two stages of intermediate-frequency (i-f) amplification, a second-detector and first audio stage, and an audio-frequency (a-f) power-amplifier stage. Each i-f transformer in this set consists of two coupled permeability-tuned circuits. Each circuit consists of a fixed capacity such as 15-1 and a variable inductance. Tuning is accomplished by moving a slug of compressed powdered iron in the field of the coil. The slugs are moved by means of screws projecting from the top and from the bottom of each i-f transformer. Three multi-purpose tubes are used. The first is the mixer tube 1R5 in socket 59. This tube combines the functions of oscillator and mixer, and at the same time furnishes bias to the audio-power stage. The second multi-purpose tube, type 1R5 in socket 61, functions as the second i-f amplifier, and during calibration is the crystal-controlled calibrating oscillator. The third multi-purpose tube, type 1S5 in socket 62, functions as second detector, automatic volume control (avc), first audio amplifier, and beating oscillator for cw reception.

**45. ANTENNA CIRCUIT.** The antenna is connected to the receiver through plug 52 to the wave trap in antenna transformer 40. The wave trap reduces interference from stations in the frequency range of the image frequency of the receiver. Signals which pass the wave trap are coupled both inductively and capacitively to the first tuned grid circuit. Capacitor 1-A is the rear section of the main tuning capacitor, and capacitor 2 is the trimmer mounted on the same section of the gang.

These two capacitors, in parallel, tune this first circuit to resonance with the incoming signal.

**46. R-F AMPLIFIER.** The signal obtained from the antenna transformer 40 secondary circuit, terminals 3 and 2, is applied between the control grid and filament (chassis) of the 1L4 r-f amplifier tube in socket 58 where the signal is amplified. Capacitor 8-1 closes the first tuned circuit but permits the application of avc voltage to the first grid through the secondary winding of the antenna transformer. Resistor 28-1 passes the necessary avc voltage, and when used in combination with capacitor 8-1, attenuates any i-f or r-f voltage that might accompany the avc voltage and which would produce undesirable feedback if not removed. Capacitor 9-1 bypasses the screen of the first amplifier tube to prevent oscillation in the tube. The output from this tube is coupled inductively and capacitively to the second tuned circuit consisting of the secondary, terminals 3 and 5 of coil 41, gang capacitor 1-B, and trimmer 3. The voltage developed across this circuit is applied to the control grid of converter tube 1R5 in socket 59.

#### **47. MIXER-CONVERTER STAGE.**

a. The converter consists of two parts; the high-frequency oscillator circuit which is tuned by one section of the gang capacitor to a frequency always 456 kc above the signal frequency; and the mixer portion which, by means of the high frequency oscillator voltage, shifts the frequency of the incoming signal down to the intermediate frequency (456 kc).

b. The oscillator portion of the circuit is a version of a standard electron-coupled oscillator, in which the cathode of a tube is tapped up on the

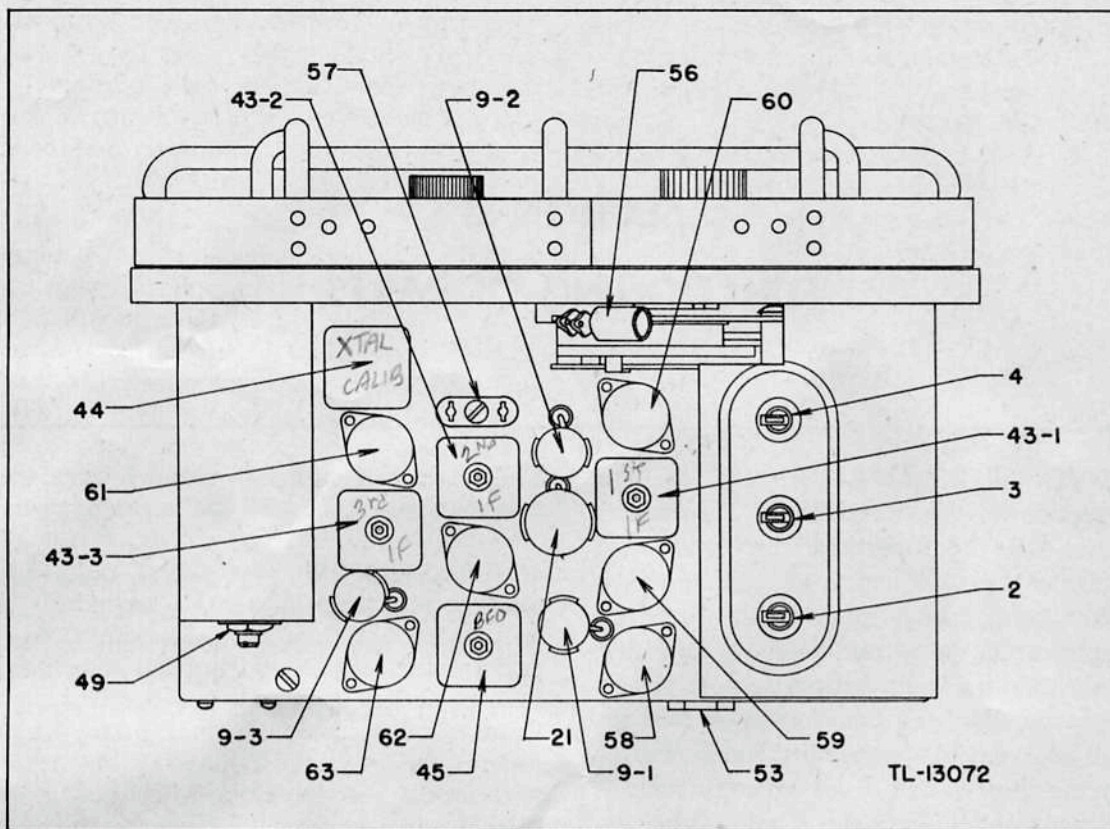


Figure 22. Parts identification, receiver, top view.

tuned grid circuit some distance above ground. In this oscillator there is no cathode; a filament is used instead. In order to make the filament act as a cathode in a conventional electron-coupled oscillator, it is necessary for both ends of the filament to be above ground as far as r-f is concerned. This is accomplished by connecting the negative end of the filament to a tap on the grid circuit, and the positive end of the filament through an additional winding on the oscillator coil, the ground end of which goes to +A instead of to ground. Thus, both ends of the filament are above ground as far as r-f is concerned, yet the filament is satisfactorily lighted by a battery that has one side grounded.

c. The high-frequency oscillator (hfo) coil 42 is tuned by gang capacitor 1-C, trimmer 4, and padding capacitor 7. The function of the padding capacitor is to influence the tuning curve of the oscillator circuit to provide 456 kc tracking above the signal frequency.

d. Since the voltage developed across the oscillator grid leak 28-2 is negative with respect to chassis, it is used to furnish negative bias

voltage to the output tube. The bias is obtained from resistor 28-2 through filter network 26-1, 25-1, 31-4, and 9-2.

e. Screen voltage for the mixer tube is obtained through dropping resistor 27 and the screen is bypassed by capacitor 8-2. The i-f output of the converter is delivered to the first i-f transformer 43-1.

**48. FIRST I-F AMPLIFIER STAGE.** The output voltage from the converter is obtained from the secondary terminals of the first i-f transformer 43-1 and is applied between the grid and filament (chassis) of the first i-f amplifier tube, JAN-11A in socket 60. Screen voltage for this tube is obtained from resistor 32 through SENSITIVITY switch 47 and either resistor 29, 30, or 31-1, depending upon the position of switch 47. The sensitivity of the receiver is controlled by the variation in screen voltage which is brought about by changing the position of the SENSITIVITY switch. The output of the first i-f amplifier tube 60 is applied to the second i-f transformer 43-2.

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was correct!*

**49. SECOND I-F AMPLIFIER STAGE.** The output voltage of the second i-f transformer is applied between chassis and the grid of the JAN-1R5 second i-f amplifier tube in socket 61. During phone, cw, or net operation of the receiver, this tube acts as a conventional i-f amplifier tube, except that there is one more element in the tube than in the JAN-1L4 tube used as the first i-f amplifier tube. This extra element is grounded. At the same time the screen is bypassed to ground by capacitor 8-4. Screen voltage is obtained from the +B circuit through dropping resistor 38. Circuit elements 37, 11, 57, and 15-7 are inoperative. The plate voltage is fed to the output i-f transformer through isolating resistor 39 and is bypassed by capacitor 8-9. The function of this pair of components is to eliminate i-f regeneration. The output of transformer 43-3 is fed to a conventional diode detector circuit.

**50. CRYSTAL CALIBRATOR.** A crystal calibrating circuit is included as part of the second i-f stage and consists of crystal 57, a tuned circuit 44 (resonant at 200 kc), a grid resistor 37, and frequency-corrector capacitor 11. R-f bypassing is accomplished by capacitor 12. The output of the crystal-calibrator circuit is derived from the oscillator grid and is coupled by capacitor 23 to the control grid of the r-f amplifier tube. Calibration of the receiver is obtained when this voltage fed into the r-f amplifier is considered as an incoming cw signal, and is tuned to zero beat in the usual manner for cw reception. Capacitor 8-4 bypasses the tuned circuit in transformer 44 when the PHONE-CW-NET-CAL switch is in all positions except CAL. The oscillator is prevented from working except when the switch is in that position.

**51. DETECTOR.** The secondary output of the third i-f transformer 43-3 is applied to the diode section of tube JAN-1S5 in socket 62. Resistor 28-3 and potentiometer 34-A constitute the diode load, across which is developed the avc voltage which is applied through resistors 28-1 and 26-2 to the grids of tubes JAN-1L4 in sockets 58 and 60. The audio-output voltage from the diode load resistor is passed through capacitor 25-2 to the control grid circuit of the pentode audio-amplifier section of the JAN-1S5 tube.

#### **52. FIRST AUDIO AMPLIFIER.**

a. The pentode portion of the JAN-1S5 tube

in socket 62 functions as a conventional audio-frequency amplifier tube when the set is operated for phone reception. In this condition the entire network associated with transformer 45 can be assumed to be merely a dropping resistor and bypass capacitor for supplying screen voltage to the tube.

b. The a-f component across potentiometer 34-A (volume control) is applied through capacitor 25-2 and resistor 31-3 to the control grid of tube JAN-1S5 in socket 62. Resistors 31-3 and 31-2 provide a d-c return path for the grid of the amplifier section of the tube. The plate voltage of this tube is supplied through plate load resistor 35, across which the output voltage is developed.

#### **53. BEAT-FREQUENCY OSCILLATOR.**

a. The function of a heterodyne oscillator for cw reception is incorporated in the same tube that is used as the first audio amplifier. The beat-frequency oscillator operation of this tube is somewhat unconventional, and a special circuit is necessary to accomplish the desired result.

b. When the oscillator is working, resistor 33 still supplies the screen voltage which is bypassed (for audio) by capacitor 8-6. This capacitor also serves to bring terminal 4 to ground potential as far as r-f voltage is concerned.

c. Terminal 2 of coil assembly 45 is connected to the screen of tube 1S5 in socket 62. Terminal 1 is coupled through blocking capacitor 17 to the control grid of the same tube. This condition causes the tube to oscillate between its control and screen grids at a frequency determined by the inductance in transformer 45 and the capacitance in item 16 plus tube and stray capacities.

**NOTE:** The frequency of this circuit is one-half of the intermediate frequency to improve stability. The second harmonic of this frequency does the actual heterodyning.

d. The r-f voltage on the control grid is coupled through the tube to the plate circuit. Most of this voltage is bypassed to ground through capacitor 13-2 to prevent overloading the grid of the output tube. A small voltage remains, however, which is fed back through capacitor 24 to the grid of the second i-f amplifier tube in socket 61. Here it is amplified and passed on through coil 43-3 to the detector to produce the desired beat note for cw reception.



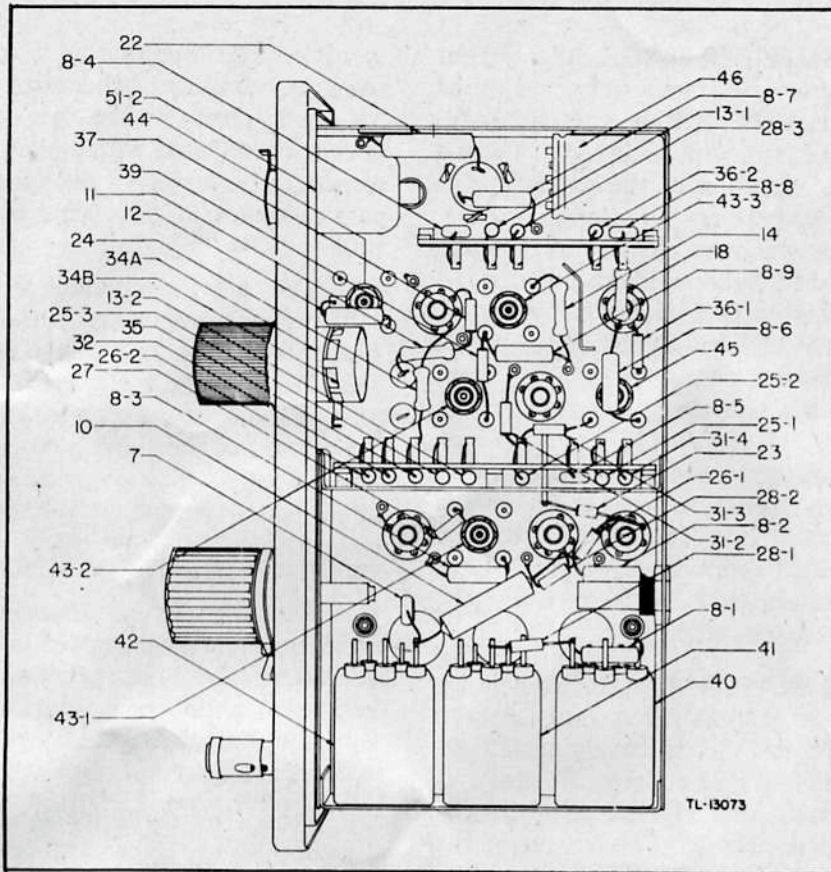


Figure 23. Parts identification, receiver, bottom view.

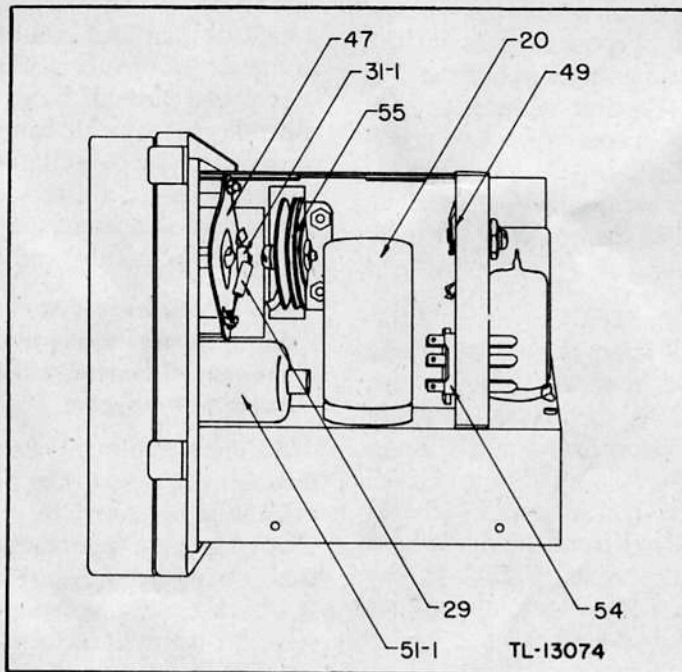


Figure 24. Parts identification, receiver, end view.

#### 54. POWER AMPLIFIER.

a. The output voltage of the first audio-amplifier section of tube JAN-1S5 in socket 62 is applied to the grid of output tube JAN-3Q4 in socket 63 by means of capacitor 25-3 and potentiometer 34-B. Capacitor 13-2 is an r-f bypass on the output of the first audio amplifier to prevent overloading the grid of the output tube with r-f from the beat-frequency oscillator portion of tube JAN-1S5.

b. Bias voltage for the output tube is obtained from the grid leak of the high-frequency oscillator through filter network 9-2, 31-4, 25-1 and 26-1.

c. Screen voltage is obtained through dropping resistor 36-1, and the screen is bypassed to chassis by capacitor 9-3.

d. The output power is fed into transformer 46 which obtains its "B" power directly from the common "B" supply. The output circuit is bypassed by capacitor 18 to prevent the impedance from becoming too high when working into an inductive load such as a headset.

e. The secondary of the output transformer is connected through switch 49 to the headset jacks 51-1 and 51-2. The switch serves to select the output impedance of the receiver (250 or 4,000 ohms).

**55. RECEIVER SIDETONE.** A sidetone signal for monitoring purposes is obtained from the transmitter through resistor 36-2 and blocking capacitor 8-8 and is conveyed to the headset by being applied to the primary of output transformer 46. In this manner, the monitoring signal is transformed to the proper impedance regardless of which impedance tap is selected for the headset.

**56. RECEIVER COMMON CIRCUITS.** Capacitor 20 is a large electrolytic unit designed for suppressing hum and ripple in the filament circuit when the receiver is operated from sources other than batteries. Capacitor 8-7 is an r-f bypass in the same circuit. Coupling in the B+ circuit is prevented by capacitors 21 and 22.

**57. PHONE-CW-NET-CAL SWITCH.** Switch 48 is the PHONE-CW-NET-CAL switch. In the PHONE position only, capacitor 8-5 bypasses the screen of tube JAN-1S5 in socket 62 and stops the bfo action. In the PHONE or CW position, pins

4 and 6 of plug 54 are connected, supplying screen voltage to the modulator tube of the transmitter. In the NET or CAL positions, pins 1 and 4 are connected through switch 48, supplying screen voltage to the master oscillator tube in the transmitter, permitting that tube to function in netting or calibrating operations. The 200-kc crystal oscillator operates only in the CAL position. In all other positions of the switch this oscillator is made inoperative by bypassing the screen grid of the second i-f tube in socket 61 through capacitor 8-4.

#### 58. TRANSMITTER CIRCUIT ANALYSIS (fig. 59).

The transmitter section of Radio Receiver and Transmitter BC-1306 consists of a master oscillator, power amplifier and a modulator circuit. The oscillator may be either self-excited or crystal-controlled and is used to supply r-f power to the grid circuit of the power amplifier tube. Tube JAN-3A4 in socket 140 is an electron-coupled oscillator when the crystal switch 135 is in MO position and a crystal oscillator when the switch is in position Crystal A or Crystal B. The modulator circuit supplies the necessary audio frequency power to modulate the suppressor grid of the power amplifier tube during Phone or MCW operation. A voltage regulator tube is a component part of the transmitter and is used to regulate the plate supply voltage to the master oscillator, the modulator and the receiver circuits.

#### 59. OSCILLATOR.

a. *Master Oscillator.* Capacitors 75-A, 76-A, 76-B, and 77 are used to resonate coil 125. Capacitor 78 is a ceramic unit having a negative temperature coefficient and is connected directly across the oscillator inductance 125. A slug of compressed iron on a bi-metallic strip is used in the coil to compensate for changes in inductance caused by changes in temperature. The oscillator is temperature compensated, both capacitively and inductively.

b. *Crystal Oscillator.* The crystal circuit employed in these transmitters will function properly with crystals covering a wide range of activity. The circuit has been designed so that, if a crystal refuses to operate, the transmitter will oscillate with sufficient amplitude to bias the output tube enough to prevent excessive plate current from being drawn. When this happens, the frequency will not be either the crystal frequency or the

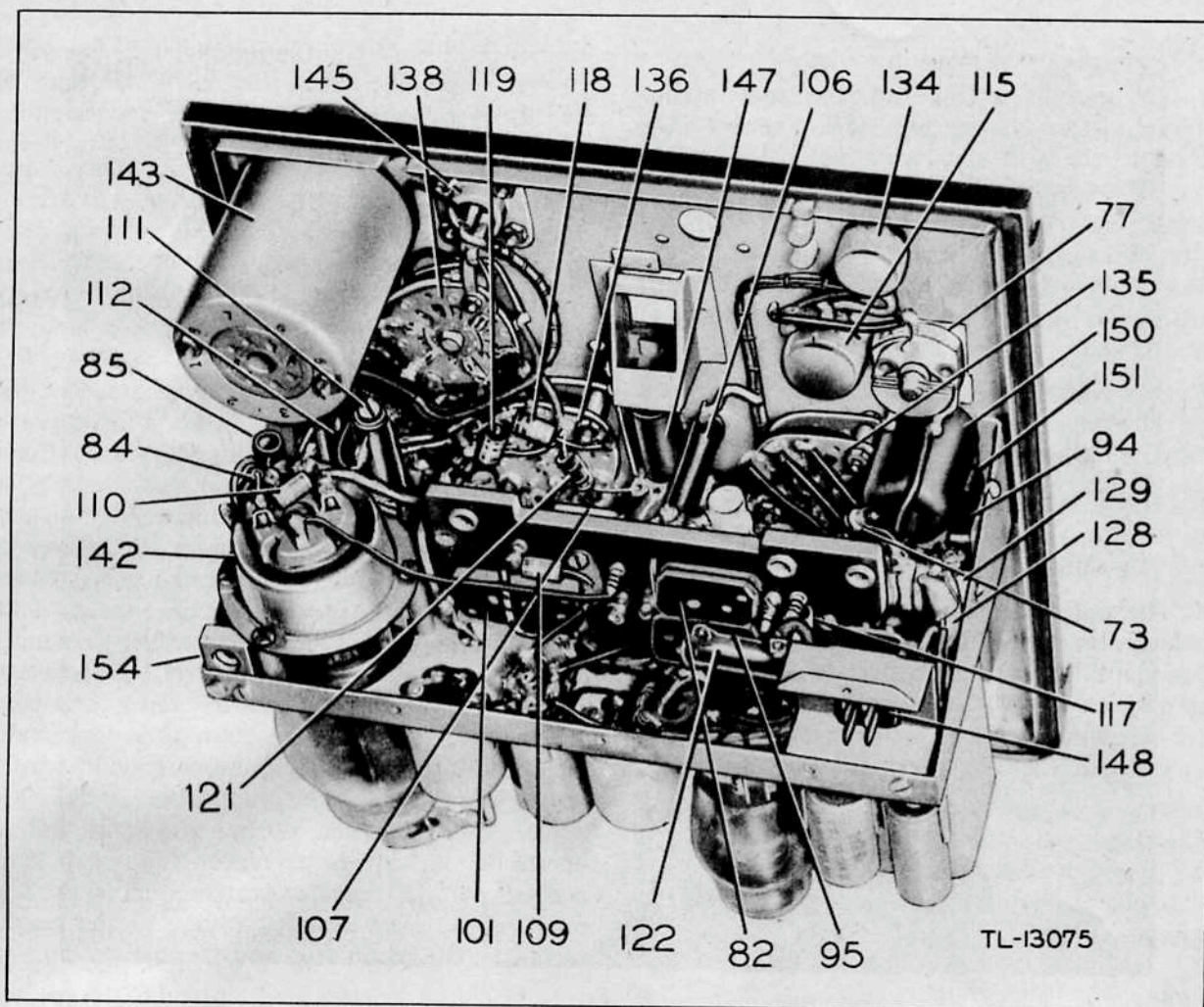


Figure 25. Parts identification, transmitter, rear view.

frequency specified for master oscillator operation at that dial setting, but probably will be near the latter. The INDICATOR probably will show some r-f power but may be erratic in operation.

#### 60. MODULATOR.

a. The modulator circuit supplies the a-f power necessary to modulate the suppressor grid of the power-amplifier tube during phone or mcw operation.

b. The modulator circuit is conventional, consisting of mike jack 151, microphone transformer 132, modulator tube type JAN-3A4 in socket 141, and modulation transformer 133. Resistor 114 is the modulator screen-grid dropping resistor and capacitor 95 is its bypass.

c. Resistor 117 and capacitor 97 comprise the microphone filter.

d. CW-MCW-PHONE switch 136 is used to convert the modulator tube from an audio amplifier to an audio oscillator (in cw or mcw position) (par. 61b). This is done by introducing feedback from its plate to its grid circuit through capacitor 96. Resistor 120 is the audio-oscillator grid leak.

e. In the MCW position resistor 119 loads the suppressor grid of tube JAN-2E22, and capacitor 98 is the audio-oscillator harmonic filter. Resistor 118 is used to equalize the sidetone level between cw and mcw positions. In changing from CW to MCW or PHONE position, the power-amplifier suppressor-grid bias is changed from +6 to -45 volts by means of switch 136. The negative voltage is obtained from the power amplifier grid bias circuit through resistor 108.

## 61. TRANSMITTER SIDETONE CIRCUIT.

a. A sidetone circuit in the transmitter permits the operator to monitor his transmissions either PHONE, CW, or MCW. The sidetone signal is obtained directly from the modulator and therefore does not depend upon the r-f power transmitted. It is possible to hear a sidetone even though there may be no r-f power transmitted. Potentiometer 115 adjusts the volume of sidetone delivered to the receiver through plug 148 on the transmitter, receptacles 66 and 175 in the case, and plug 54 in the receiver.

b. When transmitting cw or mcw, the modulator tube operates as an audio oscillator, furnishing the sidetone. A small portion of this power is transmitted to the headset. The keying relay interrupts the plate voltage of the modulator tube, and at the same time it interrupts the plate circuit of the master oscillator and the screen circuit of the power amplifier. The relay thus keys the sidetone oscillator in synchronism with the transmitted signals.

c. When the PHONE-CW-NET-CAL switch (receiver) is turned to NET or CAL the sidetone oscillator is made inoperative by removal of the screen voltage. This prevents sidetone from interfering with zero beating of the transmitter to the receiver.

## 62. POWER AMPLIFIER.

a. The output of the doubler circuit is directly coupled from a tap on coil 126 to the grid of the power-amplifier tube JAN-2E22 in socket 142. The screen grid is bypassed by capacitor 102. The screen voltage is obtained through dropping resistors 111 and 112 from the high voltage +B connections. On HIGH power these resistors are connected in parallel by switch 137. In MED. power only resistor 112 is in the circuit, and in LOW power the two resistors are connected in series. By varying the screen voltage the output power is altered. Resistor 110 is the grid return for the suppressor grid. This grid is bypassed for r-f by capacitor 84.

b. Capacitor 82 is the power-amplifier grid-return r-f bypass. Resistor 107 is the power-amplifier grid leak. Resistor 108 is part of the power-amplifier suppressor-grid bias voltage divider and resistor 109 is the modulator (tube JAN-3A4 in socket 141) bias resistor. Capacitor 83 is the suppressor-grid audio bypass.

c. Capacitor 85 is the amplifier-filament r-f bypass. Coil 127 and capacitors 75-C (part of main tuning gang) and 86 form the power-amplifier plate tank circuit. Capacitor 87 is used for coupling the power-amplifier output to the antenna-loading coil through relay 156.

63. ANTENNA LOADING CIRCUIT. The output circuit of the transmitter is designed to operate with either a short whip antenna (approximately 15 feet long) or the one-half wave length long Antenna AN-160. Switch 139 is used to select the proper circuit constants for the type of antenna that is to be used and to connect the output circuit to the ANT. post 158. Positions 1, 2, and 3 provide the proper value of loading inductance 131 when used with the short whip antenna. Positions 4, 5, and 6 provide the required loading capacitors 91, 92, and 93 for Antenna AN-160. The antenna tuning coil is 131 and is used to critically resonate the antenna system to the transmitter operating frequency. The neon indicator lamp 152 is connected to the antenna tuning circuit so as to indicate by maximum brilliance when the antenna is tuned properly.

## 64. VOLTAGE REGULATORS.

a. Regulation of the filament voltage of the two JAN-3A4 tubes in the transmitter is accomplished by means of item 157, a selenium rectifier of selected characteristic. It is identical to the voltage regulator on the filament circuit of the receiver. Resistor 122 is the dropping resistor common to the filament circuits of both JAN-3A4 tubes. If one tube is removed, the voltage regulator prevents the voltage on the other tube from becoming excessive.

b. Regulation of the B voltage to the receiver, the modulator, and the screen of the master oscillator is accomplished by the use of JAN-OC3/VR-105 tube. The circuit from the dropping resistor to the +105 volt circuit passes through the jumper between pins 3 and 7 inside the base of the regulator tube. If the tube is removed from the transmitter, no voltage appears on the +105 volt circuit.

65. METERING SOCKET. Metering socket 143 is used to check the circuit voltages of the transmitter during test. Resistor 113 provides a voltage drop in the plate circuit of the power-amplifier tube so that the plate current may be calculated

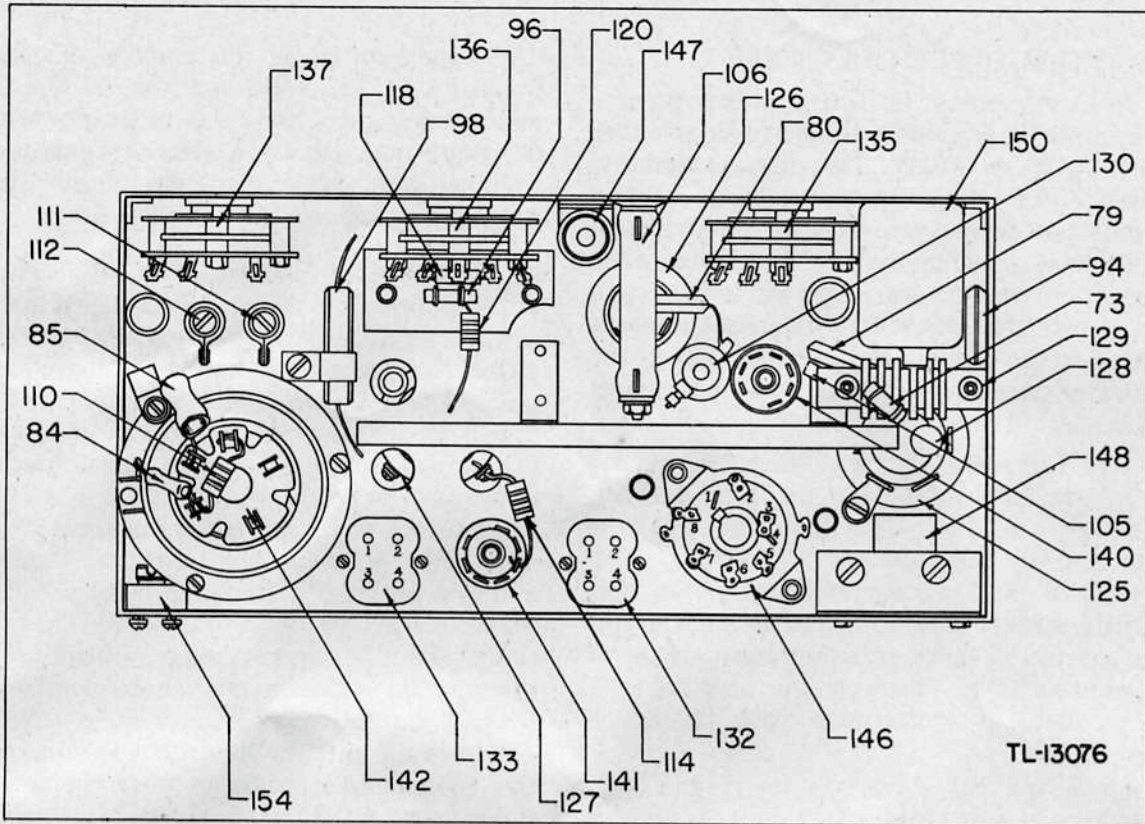


Figure 26. Parts identification, transmitter, bottom view.

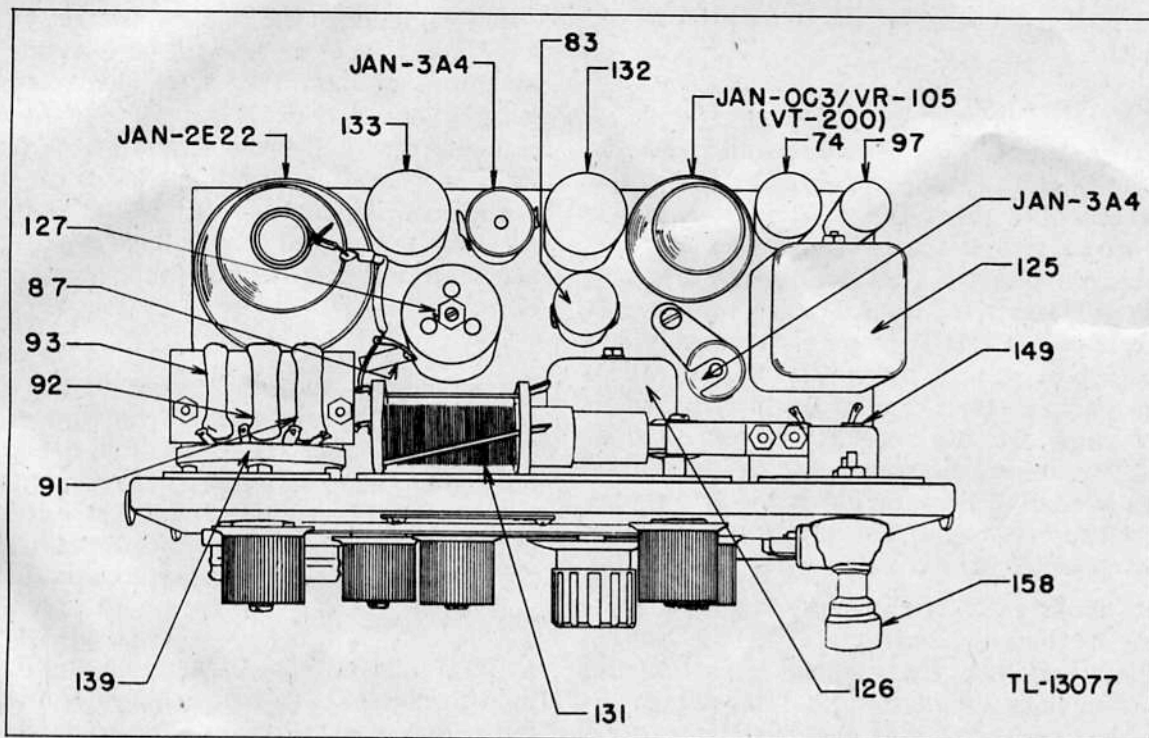


Figure 27. Parts identification, transmitter, top view.

from the voltage obtained across the resistor. Plate current in milliamperes equals volts x 50.

**66. TRANSMITTER SWITCHING.** The switches were designed specifically for use in this transmitter. They employ especially shaped rotors to reduce the number of manual controls. The switch rotors have no stops; consequently they cannot be damaged by forcing. Switches 136, 138, and 139 are constructed with both inner and outer rotors which turn simultaneously. The functioning of the individual switches is shown in figure 62.

**67. VIBRATOR POWER UNIT PE-237.** The basic theory of a power supply, such as Vibrator Power Unit PE-237, is best explained by reference to the circuit shown in figure 28. There are six principal components to such a system:

*a. An Electrically Driven Reversing Switch, the Vibrator.* The types of vibrators used in Vibrator Power Unit PE-237 employ two sets of contacts.

(1) A set of driving contacts. The purpose of the driving contacts is to operate the reed of the vibrator in much the same fashion as an electric buzzer. When switch 9 (fig. 28) is closed, power from battery 10 flows through reed 11, through contacts 5 and 6, through coil 8, and back to the opposite terminal of the battery. As soon as the current flows through coil 8, a magnetic field is built up which pulls armature 7 (a small iron weight on the end of the reed) toward the pole-piece of the coil. When this happens, the movement of the reed separates contact 5 from contact 6, interrupting the current. This stops the magnetic pull on the armature and allows the reed to move back to its former position again, closing the contacts. This cycle of vibration continues until the switch is opened. Power contacts 1, 2, 3, and 4 are operated by the vibration of the reed.

(2) A set of power contacts. The purpose of the power contacts is to connect the battery alternately first to one end of the center-tapped primary of the power transformer, then to the other. This reversing of direction of flow of current simulates alternating current and permits the transformer to step up the applied battery voltage to the high voltage required for B voltage.

*b. The Interference Suppression Filter.* Items 2-1, 2-2, and 2-3 are filters consisting of

chokes 13-1, 13-2, and 13-3 and capacitors 14-1, 14-2, and 14-3, whose function is to suppress the r-f interference at the vibrator contact where it is produced, and to prevent it from getting out into the wiring of the vibrator unit. This is particularly important in multivoltage units employing complicated switching.

*c. The Step-Up Transformer.* Item 3 is the vibrator power transformer, which may have any number of windings necessary to perform the duties required.

*d. The Buffer Capacitor.* Capacitor 12 is normally called the buffer capacitor. Its purpose is to reduce sparking at the contacts.

*e. The Rectifier.* Item 5 is the high-voltage rectifier, which may be either a hot-cathode type or a cold-cathode type rectifier.

*f. The Filter.* Item 6 is a conventional pi-type filter to remove hum from the output current of the rectifier tube.

**68. STANDBY PORTION, VIBRATOR POWER UNIT PE-237.** The standby portion of Vibrator Power Unit PE-237 supplies power only to the receiver portion of Radio Receiver and Transmitter BC-1306. It draws much less current from the vehicular battery than does the heavy duty portion of the vibrator unit when performing the same function. The filaments of the receiver operate directly from the vehicular storage battery through suitable dropping resistors in the vibrator unit. There is no separate control circuit for starting and stopping the unit. The filament circuit to the receiver performs a dual function of carrying power to the receiver filaments and of controlling the operation of the unit. A relay coil in series with the filaments is energized when the filament circuit is closed by the OFF-STANDBY-SEND switch when turned to STANDBY. This closes a set of contacts in series with the vibrator A supply starting the vibrator unit.

**69. DETAILED CIRCUIT ANALYSIS, STANDBY PORTION (fig. 60).** The vehicular battery connects to the power unit through circuit breaker 728. Relay 727 is used to turn on the power unit by applying the battery voltage to both the power transformer 702-1 and vibrator driving coil. Switch 735-2B selects the proper resistance tap on resistor 720 for correct operating voltage of driving coil of VB-1 vibrator. 731 is the vibrator

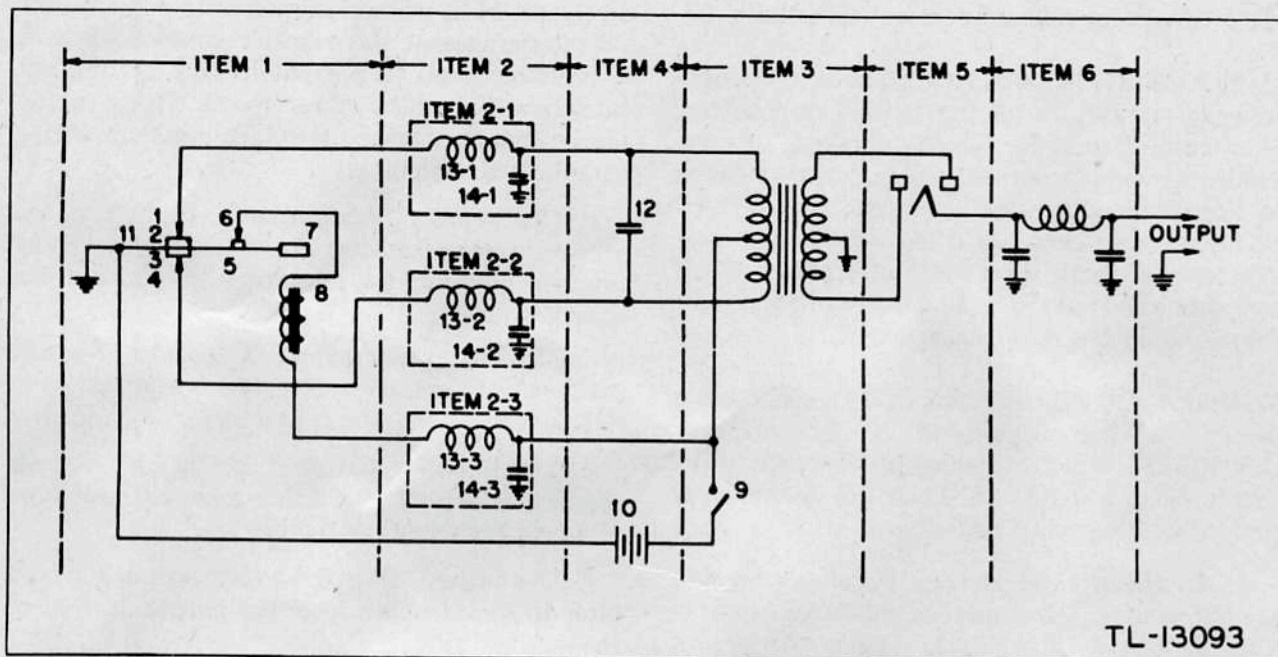


Figure 28. Schematic diagram of basic vibrator circuit.

socket and 705-13, 705-14, 705-15 are filter chokes for elimination of radio frequency noise from the vibrator. 710-14, 710-15, and 710-16 are filter capacitors for r-f noise elimination also. 735-2C and 735-3A are selector switches for connecting proper power transformer taps for 6-, 12-, or 24-volt operation of the power unit. 711 is a buffer capacitor to minimize sparking of vibrator contacts. 730 is a tube socket for the rectifier tube JAN-1005, VT-195. 707-2 and 707-3 are electrolytic filter capacitors filtering the output voltage of the unit; 702-4 is a filter choke for the same purpose. Resistor 737 is an additional filter resistance. The receiver filament circuit operates directly from the vehicular battery through a dropping resistance 719. Switch 735-2A selects the proper resistance tap for 6- 12- or 24-volt battery operation. Capacitors 708-1 and 708-2 are electrolytic type and are used in conjunction with choke 703 to filter out any vibrator ripple from the receiver filament circuit.

#### 70. HEAVY DUTY PORTION, VIBRATOR POWER UNIT PE-237.

**a. General.** The heavy duty portion of Vibrator Power Unit PE-237 supplies all of the necessary power to operate both the receiver and

the transmitter of Radio Receiver and Transmitter BC-1306. The filaments of the receiver operate directly from the vehicular battery through suitable dropping resistors in the vibrator coil. A relay coil in the filament circuit is energized when the SEND-STANDBY-OFF switch is turned to SEND. Contacts on the relay close the circuit to the driving coil of the vibrator causing that device to start operation. The filament voltage for the transmitter is not obtained directly from the vehicular battery but is obtained from the secondary of the vibrator transformers through a voltage regulating transformer, rectifier and filter which maintains close control of the transmitter filament voltage even though the input voltage varies over wide limits.

**b. Multiple Transformer Circuits.** This unit employs five independent small power transformers in place of the more conventional designs of lower power units employing only one transformer. All like kinds of secondaries are connected in series while the primary of each transformer is connected to an independent set of contacts on the vibrator. This arrangement equalizes the power carried by the various contacts. Refer to paragraph 67 for theory of Vibrator Power Unit PE-237.

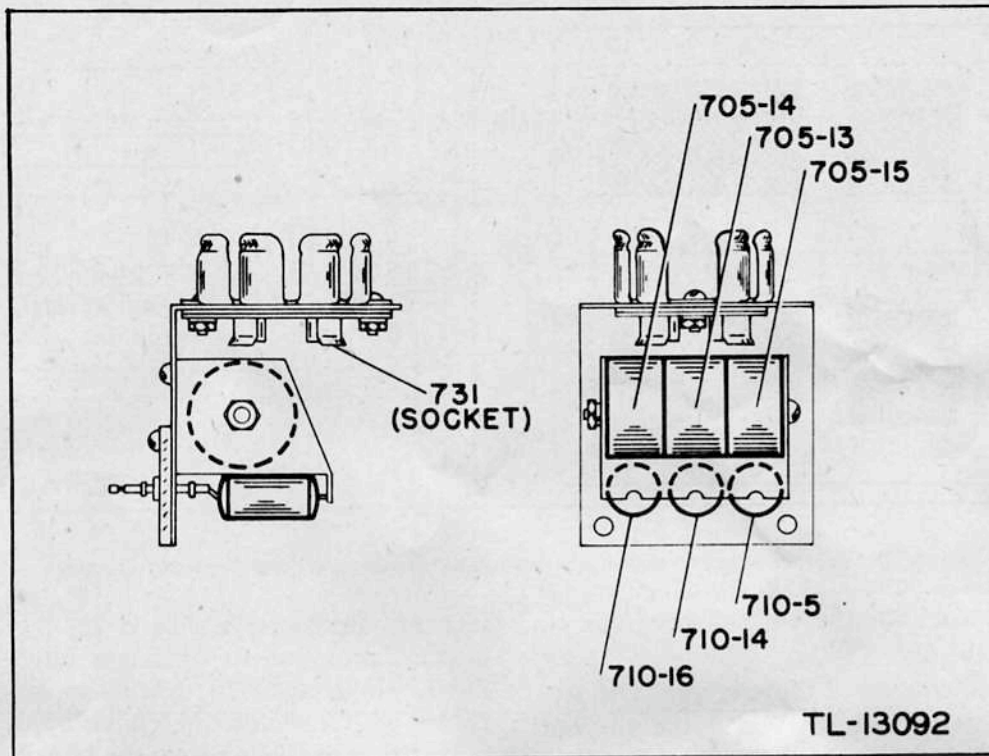


Figure 29. Vibrator power unit, parts identification, standby vibrator filter assembly.

**c. Constant Voltage Transformer Circuit.** The constant voltage transformer employs a combination of resonant circuit action with that of a transformer having high leakage reactance. A specially shaped lamination, shown in figure 30, is employed. The side bars on the core form a magnetic shunt contributing to the regulatory action of the transformer.

(1) The windings are as follows:

- (a) Primary.
- (b) Resonant tank circuit.
- (c) Compensating winding.
- (d) Output winding.

(2) The output energy is largely drawn from the resonant circuit. The voltage in the tank circuit is stabilized by the action of the magnetic shunt interposed between the primary and the tank circuit.

(3) The voltage appearing across the tank circuit varies slightly with changes in primary voltage. These small variations are to a large extent compensated for by opposing the output voltage with a small voltage developed across the compensating winding.

**71. DETAILED CIRCUIT ANALYSIS, HEAVY DUTY PORTION (fig. 60).** The transmitter power unit operates from the vehicular battery through circuit breaker 728. This circuit breaker has a tapped coil to provide for correct cut-out current when operating from either a 6-, 12-, or 24-volt battery. Selector switch 735-4A, 5A, 6A, 7A, 8A, is a five-section wafer type connected in parallel to handle the full load current of the unit. This switch selects the proper operating tap of the circuit breaker. Relay 726 starts the power unit by applying battery voltage to the driving coil of the vibrator. Resistor 718 is the dropping resistor for the coil of relay 726 and selector switch 735-1C selects the proper resistance tap for the relay coil. Switch 735-1B connects the transmitter-antenna relay coil to the proper resistance tap on resistance 717. Electrolytic capacitor 707-1 filters any vibrator ripple from this circuit. Switch 735-1A connects vehicular battery to proper driving coil tap of the large vibrator. Capacitors 710-1 through 710-13 and chokes 705-1 through 705-12 filter out r-f interference produced by sparking of vibrator contacts. Chokes 725-1, 725-2, and 725-3 are for r-f filtering from rectifier tube JAN-1006 (VT-249). Coil 704 is a reactance to drop the 24-volt battery



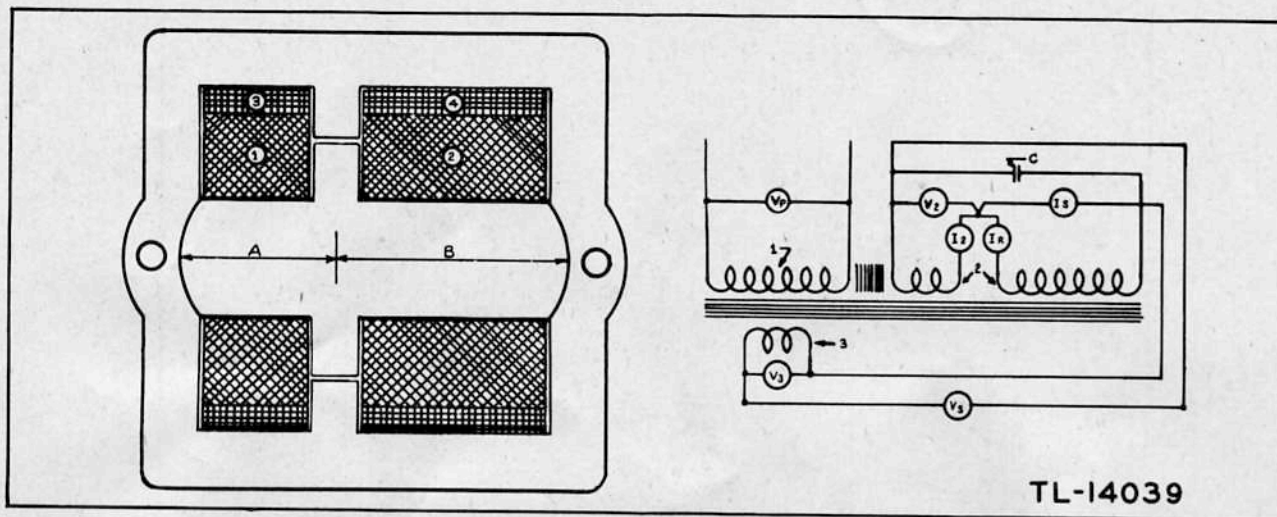


Figure 30. Constant voltage transformer, cross section of transformer and schematic diagram.

voltage to 12 volts for the vibrator driving coil. Capacitors 709-1 and 709-2 suppress sparking for the driving coil contact of the vibrator. The rectifier tube socket is 733, and 732 is the vibrator socket. Power transformers 700-1 through 700-5 are all exactly alike and operate from 6, 12, or 24 volts, depending upon which primary taps are used. Switches 735-4B, 4C, 5B, 5C, 6B, 6C, 7B, 7C, 8B, and 8C are all selector switches to change the connections to the power transformers for the 6-, 12-, or 24-volt operation.

Capacitors 716-1 through 716-5 and resistors 723-1 through 723-5 are for suppression of sparking of the vibrator contacts. Capacitors 714-1, 714-2, and 715 in conjunction with choke 702-3 form the filter section for the high-voltage of the power unit. 701 is the constant voltage transformer for the transmitter filament supply, and 713 is the tuning capacitor for this transformer. A dry-disc selenium type rectifier 729 rectifies the output of the constant voltage transformer; capacitors 712-1 and 712-2 with choke 702-2 form the filter section for the filament supply. Resistor 724 is adjustable to permit regulation of the filament voltage to compensate for variations in rectifier 729, and to permit compensation for any changes of characteristics of components during the life of the unit. Resistors 721-1 and 721-2 are dropping resistors for the B circuit of the receiver. Item 734 is the main connecting socket for the interconnecting cable from transmitter to power unit. Capacitor 706 is connected directly across the battery terminals and is to bypass r-f noise set up by the

vibrator. Resistors 722-1 and 722-2 constitute a bleeder, provided to discharge filter capacitors 714-1, 714-2, and 715, when the power unit is turned off. Capacitor 736 is a hash-filter capacitor provided to bypass r-f from the high-voltage lead.

## 72. GENERATOR GN-58.

**a. General.** The hand generator is a dual-voltage unit driven through a step-up gear train from the cranks. Inside the generator housing is a voltage regulator which acts to keep the voltage constant. A filter is included to eliminate commutator ripple and r-f interference.

**b. Circuit Analysis of Generator GN-58 (fig. 61).** (1) The generator consists of an armature having two independent windings: a 6-volt winding connected to commutator 236 and a 425-volt winding connected to commutator 235. This armature rotates between field coils 237-1 and 237-2.

(2) Voltage regulator 234 is connected across the low voltage commutator and acts on the voltage applied to the field to maintain constant output. Since both the high and low voltage armature windings revolve in the same field, controlling the voltage on the low-voltage commutator also maintains voltage constant on the high voltage commutator.

(3) The high voltage output of commutator 235 is filtered by capacitors 233-1 and 233-2 to remove ripple. The r-f interference from this commutator is removed by the combination of chokes 228-1 and 228-2 and capacitors 233-1 and 233-2.

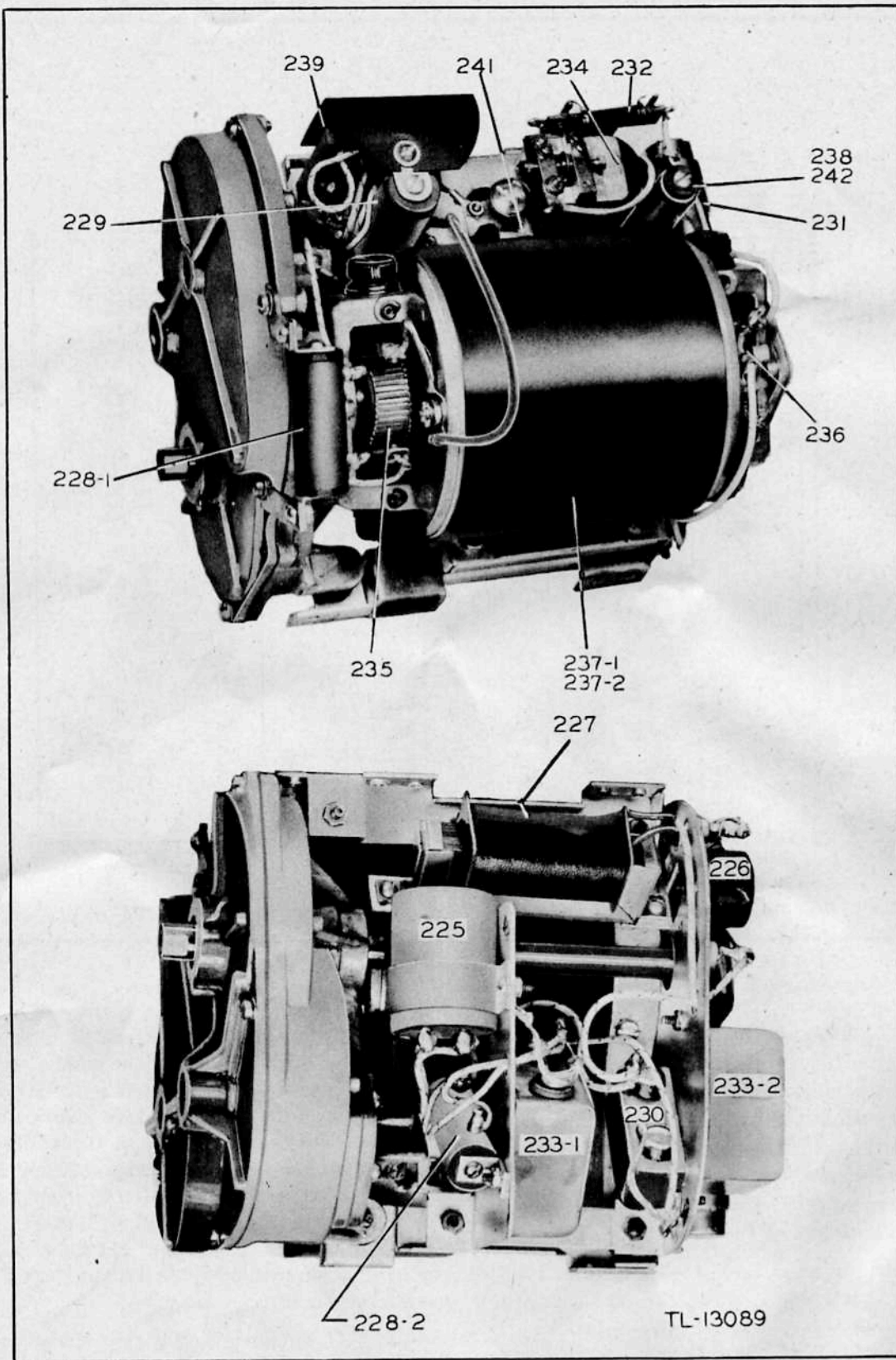


Figure 31. Parts identification, Generator GN-58, top and bottom views.

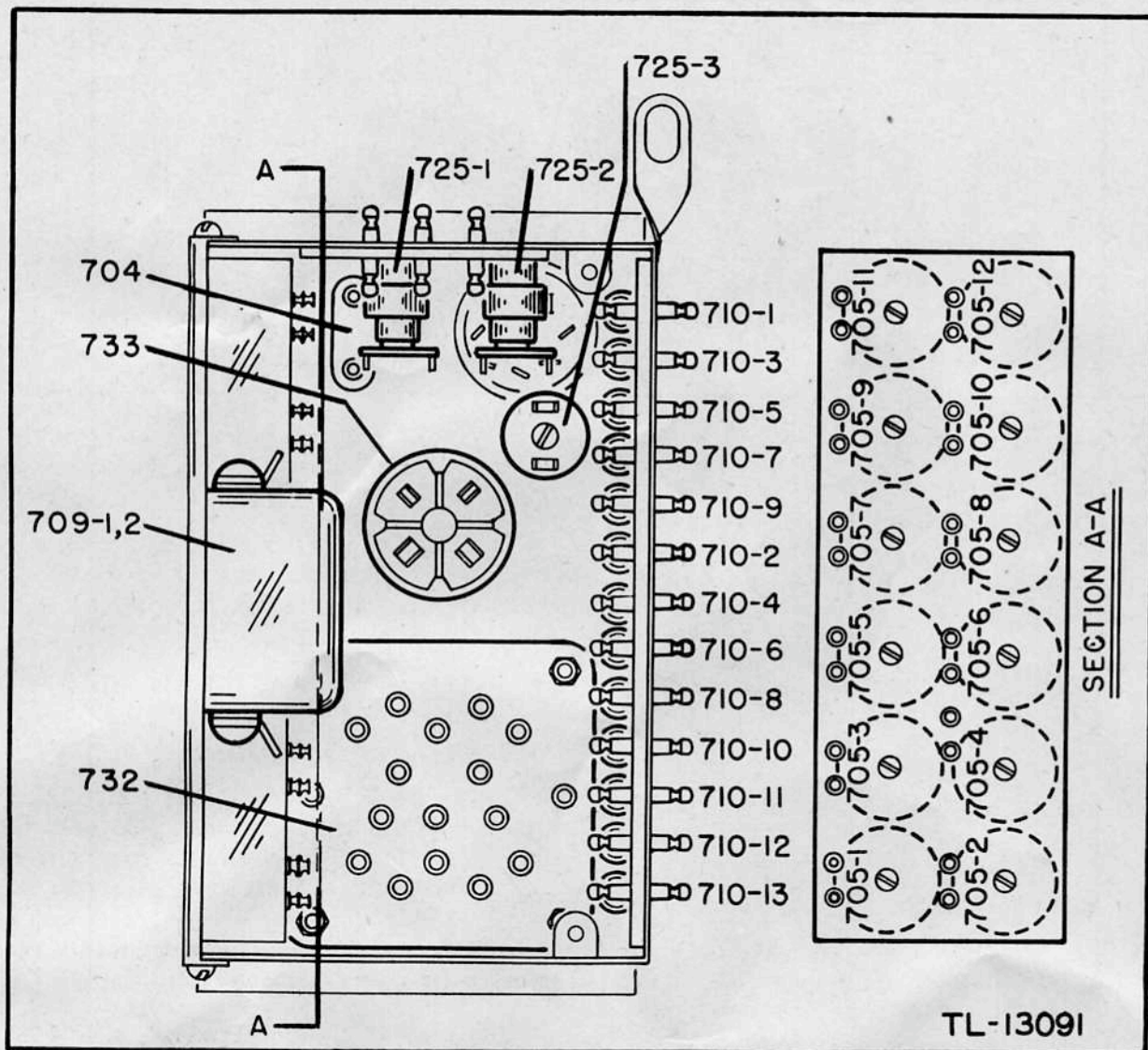


Figure 32. Parts identification, Vibrator Power Unit PE-237, heavy duty filter assembly.

Resistor 229 drops the high voltage to 105 when the voltage regulator in the transmitter is connected. If the voltage at the low end of resistor 229 is measured without the voltage regulator tube in the transmitter being connected, the reading may vary up to the full voltage of the high voltage commutator depending upon the load that is being drawn at the time of measurement.

(4) The output of the 6-volt commutator 236 is filtered for ripple by choke 227 and capacitor 231. It is filtered for r-f interference by choke 226 and capacitor 230. Choke 225 serves a dual purpose: filtering the voltage to the receiver tube filaments, and reducing the voltage from 6 to 1.4.

(5) Resistor 238 is a current limiting resistance in series with the field of the generator which is shorted out by the contacts on the voltage regulator when the output voltage is low. Resistor 242 establishes the operating point of the voltage regulator. Resistor 232 is a temperature compensating resistor to offset the effect of temperature on the resistance of the coil of the regulator. Capacitor 241 absorbs the spark at the contacts of the regulator and suppresses part of the r-f interference produced by the spark.

(6) 239 is the terminal strip to which the leads from receptacle 240 are connected.

(7) Receptacle 240 is the output connection.

## SECTION IV

# MAINTENANCE

UNSATISFACTORY PERFORMANCE OF THIS EQUIPMENT WILL BE REPORTED IMMEDIATELY ON W.D., A.G.O. FORM No. 468. IF FORM IS NOT AVAILABLE, SEE TM 38-250

### 73. GENERAL SERVICING.

*a.* Repairs other than those of a very minor nature are not authorized except at Signal Corps repair shops.

*b.* Field repairs are limited to replacing the following items.

- (1) Receiver tubes and pilot light.
- (2) Transmitter tubes, pilot light and indicator bulb.
- (3) Vibrator unit tubes and vibrators.
- (4) Hand generator brushes.

*c.* Servicing other than the replacements outlined above should be attempted only by competent personnel supplied with adequate test equipment.

*d.* Normal-voltage charts are included in this manual to permit rapid trouble shooting through voltage comparisons.

*e.* Where alignment or adjustments are described, two methods are given; one a technically correct procedure using adequate test equipment; the other a simple test method that can be applied in the field without complete test equipment.

*f.* It is recommended that no adjustment be made to any circuit involving alignment unless absolutely necessary. Extreme care must be exercised to insure that any readjustment does not make the equipment worse. If the alignment controls are improperly adjusted, it may be virtually impossible to restore the equipment to use without test equipment not supplied as part of this radio set.

**74. RECEIVER FAILURE.** The receiver may fail to operate for any one of the following reasons:

*a.* When using Battery BA-48, Cord CD-1119 may not be securely plugged into the battery or into the BATTERY receptacle on the transmitter.

*b.* When using Battery BA-48, the SEND-STAND-BY-OFF switch may be at SEND or OFF. Push the dial light button to see if there is voltage on the filament circuit.

*c.* The phone plug may not be inserted fully into the PHONES jack.

*d.* The antenna may be disconnected.

*e.* When using Vibrator Power Unit PE-237 or Generator GN-58, the power cable from the power supply to the transmitter may not be properly plugged in at both ends.

**NOTE:** A moment's inspection of the equipment will serve to check the troubles listed above.

*f.* When using Vibrator Power Unit PE-237, the circuit breaker may not be ON. Push the receiver dial light button to check for filament voltage or push the ON button on the vibrator unit.

*g.* There may be one or more defective tubes in the receiver (par. 75 below).

*h.* The phones may be defective or the plug on the headset may not be properly inserted into the jack on Cord CD-307-A. Substitute the spare headset and the spare extension cord.

*i.* The microphone button or the key may be jammed, keeping the transmitter in operation, thereby preventing the receiver from functioning.

*j.* The voltage-regulator tube JAN-OC3/VR-105 in the transmitter may be missing or defective, thereby opening the B supply to the receiver.

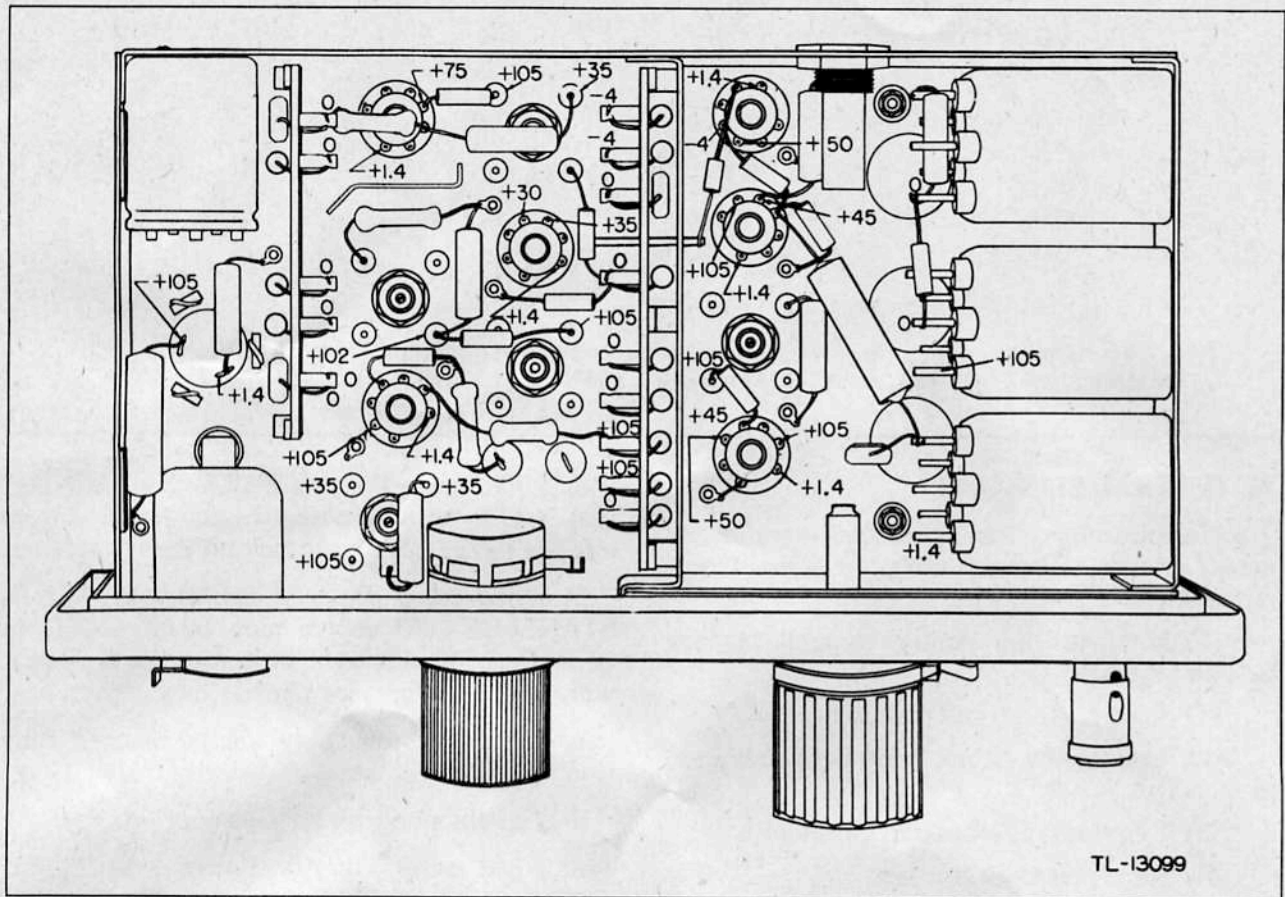


Figure 33. Normal voltage chart, receiver, bottom view.

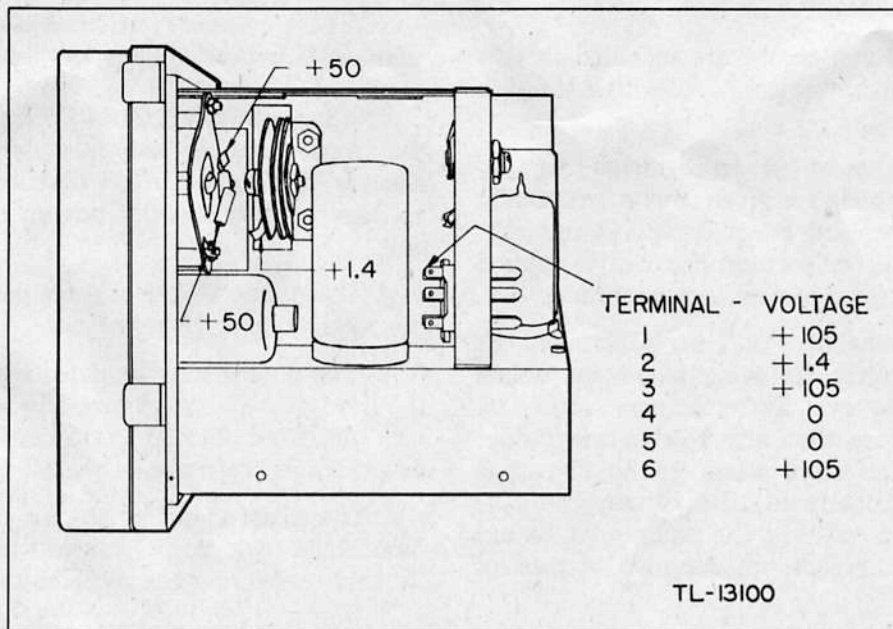


Figure 34. Normal voltage chart, receiver, end view.

k. When using Generator GN-58, that unit may not be functioning properly (par. 89).

l. When using Vibrator Power Unit PE-237, that unit may not be functioning properly (par. 91).

**75. REPLACING RECEIVER TUBES.** To replace tubes proceed as follows:

a. Loosen the four retainer clamps, holding the receiver in the case.

b. Carefully remove the set from the case.

c. Push down on the tube shield holder and press the snap fasteners inward, while holding the tube shield in place.

d. Remove the tube shields by pulling the assembly straight up.

e. Remove the tubes from the receiver, carefully pulling each tube straight up.

f. Remove the spare tubes (in Box BX-53-A) from Bag BG-172.

g. As each tube is removed from the spare tube box, place it in the proper socket in the receiver. Consult the tube layout diagram (on end of receiver chassis) for the proper socket corresponding to each tube type. Before attempting to insert a tube in its socket, line up the blank spot on the socket with the corresponding space on the tube base.

**CAUTION:** Each spare tube box contains two tubes 3A4 which look exactly like the receiver tubes. These are used in the transmitter and should not be confused with the receiver tubes.

h. When all tubes have been installed in their proper sockets, push the tube shield down over the tubes until the catches snap in place.

i. Replace the receiver into its case and fasten the retainer clamps.

**76. REPLACING RECEIVER DIAL LIGHT BULB.** To replace a dial light on the receiver, remove the receiver from the case as described in paragraph 75 above, and replace the dial light bulb with the fingers. The bulb has a bayonet base requiring only a downward push and a turn to the right to secure the bulb.

**77. RECEIVER ALIGNMENT EQUIPMENT.** The equipment needed for alignment of the receiver is as follows:

a. A signal generator or service oscillator of suitable frequency range.

b. An output meter.

c. A dummy antenna (consisting of a 250- $\mu\text{f}$  capacitor).

d. A test cable to supply voltage to the receiver when removed from the cabinet. (Fig. 55 shows the schematic diagram of the circuit test cable.)

**78. RECEIVER ALIGNMENT PROCEDURE.**

a. Loosen the clips which hold the receiver in the case and **carefully** remove the receiver.

b. Remove the bottom plate of the receiver.

c. Connect the receiver to the power plug, antenna plug, and ground plug, using the test cable to make these connections (par. 77 above).

d. Connect an output meter to a phone plug and insert it into one PHONES jack, while the headset is plugged into the other PHONES jack.

e. Supply power to the receiver from one of the usual sources, Vibrator Power Unit PE-237, Generator GN-58, or Battery BA-48. Batteries will be found the most satisfactory supply for alignment purposes since they furnish a steady voltage to the receiver. Turn the SEND-STANDBY-OFF switch to SEND if receiver power is obtained from Generator GN-58 or turn to STANDBY if receiver power is obtained from Battery BA-48 or Vibrator Power Unit PE-237.

f. Set the receiver on one end so that the aligning screws on both the top and bottom of the i-f transformer can be easily reached. **Do not remove the tube shield.**

g. Connect the ground side of the signal generator to the chassis of the receiver.

h. Connect the high potential or hot terminal of the signal generator to the grid of the second i-f tube through a blocking capacitor. See figure 35 for alignment points.

i. Set the signal generator to exactly 456 kc, either by its own calibration or by means of Frequency Meter Set SCR-211.

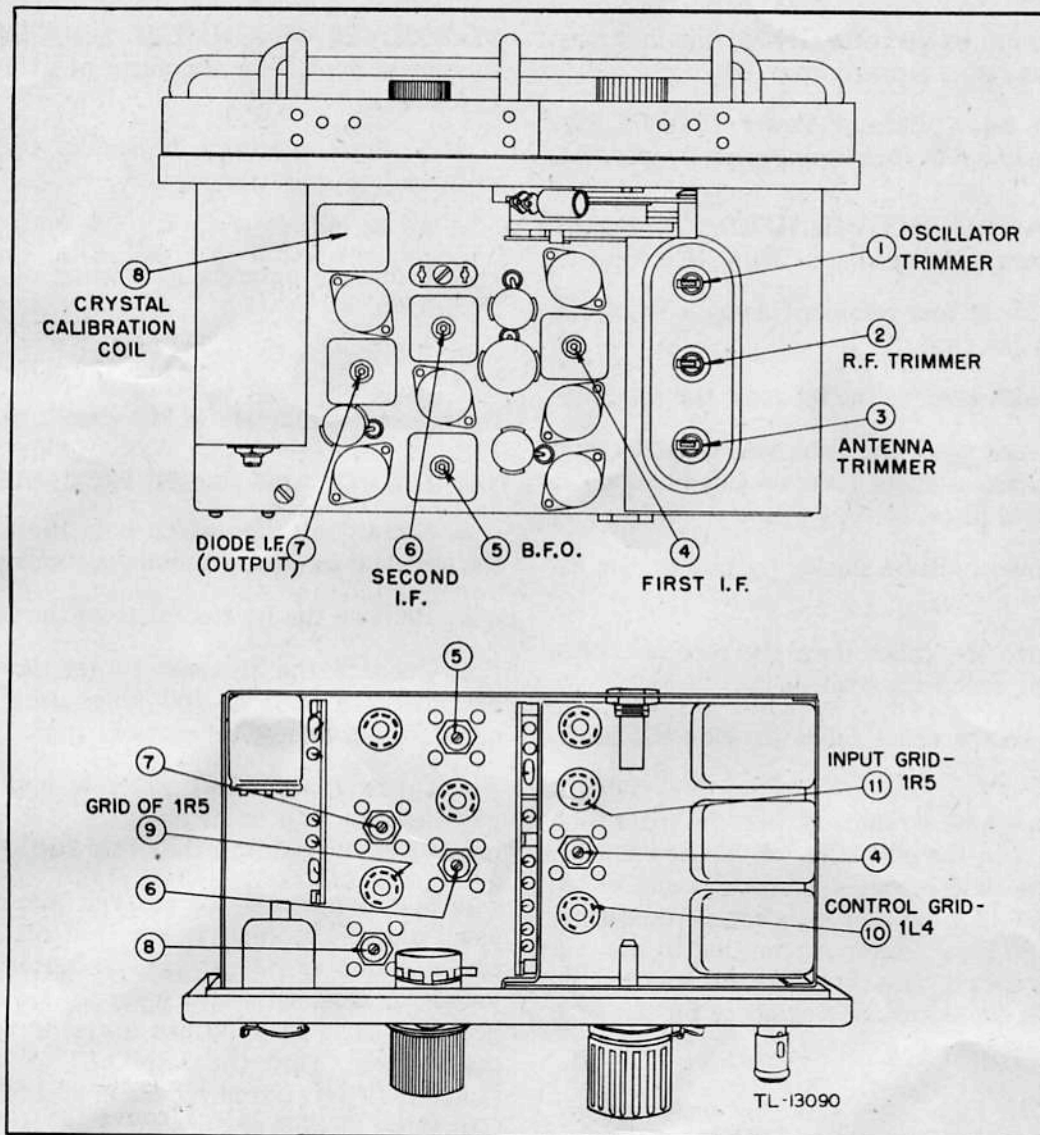


Figure 35. Receiver alignment points.

### ALIGNMENT PROCEDURE

Connect Generator to	Operation	Dummy Antenna
9*	Adjust 7 top and bottom	.01-.25 $\mu f$
10*	Adjust 6 top and bottom	.01-.25 $\mu f$
11*	Adjust 4 top and bottom	.01-.25 $\mu f$
11**	Adjust 5 top only	.01-.25 $\mu f$
Ant. jack*	Adjust 1 top of tuning cond.	250 $\mu f$
Ant. jack*	Adjust 2 top of tuning cond.	250 $\mu f$
Ant. jack	Adjust 3 top of tuning cond.	250 $\mu f$
See paragraph 78 l #	Adjust 8 bottom only.	

\*PHONE-CW-NET-CAL switch in PHONE position.

\*\*PHONE-CW-NET-CAL switch in the CW position.

#PHONE-CW-NET-CAL switch in the CAL position.

j. Turn the VOLUME control clockwise as far as possible and set the SENSITIVITY switch to HIGH.

k. Using a modulated signal from the generator applied to the grid of the second i-f amplifier tube, adjust the screws in the top and bottom of the third i-f transformer for maximum indication on the output meter.

**NOTE:** The locking nuts on the tuning screws must be loosened before the screw is turned, and must be tightened after the alignment is finished. As alignment progresses, reduce the output from the signal generator to prevent overloading of the receiver and to secure most accurate alignment.

l. Move the signal generator output lead from the grid of the second i-f tube to the grid of the first i-f tube. Adjust the screws in the second i-f transformer for maximum indication on the output meter, reducing output from the generator as alignment progresses.

m. Move the generator output connection to the grid of the mixer tube, and adjust the screws in the first i-f transformer, again reducing output from the generator.

n. Set the PHONE-CW-NET-CAL switch to CW and adjust the beat frequency oscillator to exact zero beat.

**NOTE:** The tuning of the beat-frequency oscillator should be checked after the locking nut has been tightened because tightening sometimes causes a slight frequency shift. Several attempts may be necessary before this adjustment can be locked with the beat note close to zero.

o. Recheck all locknuts to be sure that none of the adjustments will shift after the set is restored to service.

p. Set the signal generator at exactly 6.2 mc.

q. Connect the hot lead of the signal generator to the antenna jack on the receiver through the dummy antenna (par. 77 above).

r. Tune in the signal on the receiver by rotating the TUNING knob. If the signal is received when the dial indicates correct reading, the oscillator is properly aligned. If the dial does not indicate the proper frequency, the oscillator must be re-aligned as follows:

(1) Set the receiver dial to the correct frequency.

(2) Adjust the oscillator trimmer (located on the section of the gang capacitor nearest the panel of the receiver). This trimmer should be adjusted for maximum indication on the output meter. Some receivers will give a response at two adjustments of this trimmer.

**Be sure the oscillator trimmer is adjusted in accordance with instructions in paragraph 79 below.**

s. Adjust the remaining trimmers (r-f and converter circuits) on the gang capacitor for maximum reading on the output meter, being careful not to move the TUNING control.

t. Proceed as in paragraph 25 and adjust calibration oscillator screw number 8 in figure 35 for maximum output.

u. The receiver is now completely aligned. Replace bottom on the receiver, install receiver in case and tighten latches.

## 79. OSCILLATOR TRIMMER ADJUSTMENT.

a. In this receiver there are two signal frequencies which will produce output for a given oscillator frequency. One of these frequencies is lower than the oscillator frequency by an amount equal to the intermediate frequency (456 kc), while the other is higher than the oscillator frequency by the same amount.

b. The signal frequency is below the oscillator frequency. The r-f and converter circuits are tuned to this frequency to get greatest sensitivity in the overall receiver.

c. The frequency that is above the oscillator frequency by an amount equal to the intermediate frequency is the image frequency. The r-f and converter circuits are not tuned to this frequency and will almost keep signal of this frequency out of the receiver. The sensitivity to the image frequency is consequently very much lower than to the signal frequency.

d. When adjusting an oscillator trimmer that gives two responses it is always wise to shift the signal-generator frequency to the image frequency, to assure that the image frequency is above the signal frequency. If the signal frequency is 6.2 mc, the image should be heard when the generator is tuned to 6.2 mc plus twice the intermediate frequency



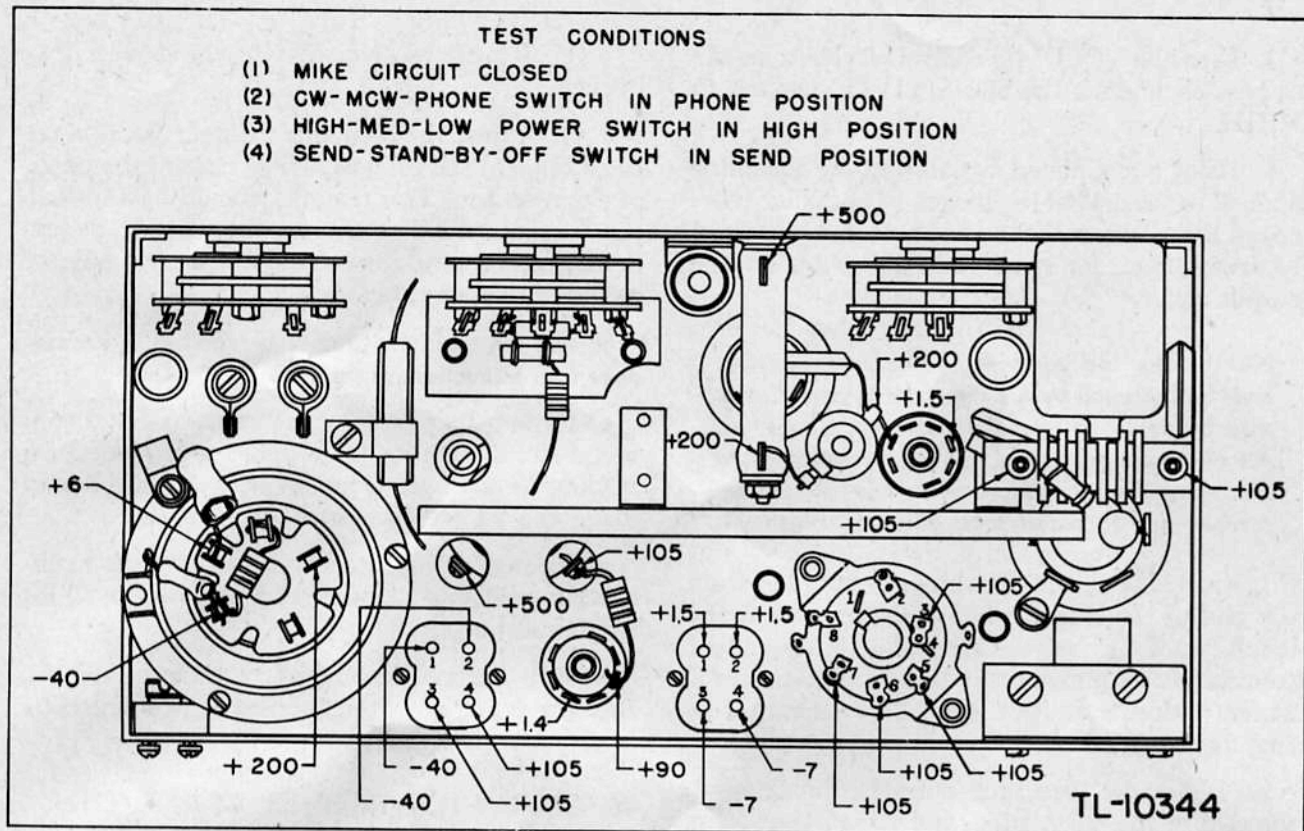


Figure 36. Normal voltage chart, transmitter.

(6200 kc + 912 kc = 7,112 kc or 7.112 mc). The output of the signal generator usually must be increased considerably to hear the response at the image frequency. If no signal is heard at the place where the image signal is supposed to be received, tune the generator to the low side of the signal frequency and search for a response at a frequency lower than the signal frequency by an amount equal to twice the intermediate frequency. In this case, 6,200 kc (6.2 mc) — 912 kc = 5,288 kc or 5.288 mc. If the image frequency is below the signal frequency the oscillator trimmer has been adjusted to the wrong response.

e. The simple rule for adjusting an oscillator trimmer which gives two responses is to set the trimmer to the response obtained with the least capacity in the trimmer. This puts the oscillator above the signal frequency. The response at the higher capacity puts the oscillator below the signal frequency, which is incorrect.

## 80. RECEIVER ALIGNMENT WITHOUT TEST EQUIPMENT.

a. If the receiver should become progressively

less sensitive with the passage of time, and replacing tubes does not materially improve the sensitivity, recheck the alignment of the receiver while it is still possible to pick up signals or noise. If the headset is used as an output indicator, the trimmer adjustments are loosened, one at a time, and each (except the oscillator trimmer) turned slightly, first to one side of its former position, then to the other. Notice whether any improvement in signal can be obtained. The i-f adjustment should be locked at the point of maximum response, and the r-f and converter trimmer capacitors left at the position of maximum response.

b. If the calibration of the receiver is off as judged by the crystal calibrating circuit in the receiver, the calibration can be restored to normal. Adjust the oscillator trimmer a slight amount in the direction which improves calibration; then adjust the r-f and converter trimmers until, by a series of small movements of these trimmers, the calibration has been restored and maximum sensitivity preserved.

**81. TRANSMITTER FAILURE.** The transmitter may fail to operate for any of the following reasons:

a. When using Vibrator Power Unit PE-237, the SEND-STANDBY-OFF switch may be at STANDBY (which only operates the receiver) or at OFF.

b. When using Vibrator Power Unit PE-237, the circuit breaker may be off. Push the ON button.

c. When using Vibrator Power Unit PE-237, the voltage switch in the power unit may be set for a higher voltage than the vehicular battery. (The switch may be set for 12- or 24-volt operation on a vehicle with a 6-volt battery, or may be set for 24-volt operation on a vehicle with a 12-volt battery.) Check the switch position through the window in the side of the case.

d. When using Generator GN-58 without Battery BA-48, the SEND-STANDBY-OFF switch may be at STANDBY (which requires Battery BA-48 to operate the low power stages of the transmitter) or at OFF.

e. The PHONE-CW-NET-CAL switch may be in the NET or CAL position.

f. The plug of the microphone or key may not be properly connected to its correct jack.

g. The power cable from the power supply to the transmitter may not be properly secured at both ends, and the retaining rings may not be properly tightened.

h. The power cable may have one or more broken connections. Try the other Cord CD-1086.

i. The antenna may not be connected.

j. When operated with Generator GN-58, the transmitter may actually be operating but the INDICATOR may be out of resonance either because the knob TUNE FOR MAX. IND. GLOW has not been adjusted, or because the ANT switch is in the wrong position. Inspect switch setting and adjust the knob.

k. There may be a defective tube in the transmitter (par. 82).

l. When operated with Generator GN-58, the hand generator may not be turned fast enough or may not be operating properly. Pushing the dial

light button when the CW-MCW-PHONE switch is in either MCW or CW position should light up the dial if the generator is operating.

m. When using Generator GN-58 with Battery BA-48 the power cable from the battery to the transmitter may not be properly connected at the transmitter or at the battery, or the battery may be exhausted. Check for voltage or turn SEND-STANDBY-OFF switch to SEND, which does not require Battery BA-48.

n. On crystal-controlled operation a crystal may be inoperative. There are three principal reasons why a crystal may fail to operate in the transmitter:

(1) The CRYSTALS switch may be in an incorrect position.

(2) The FREQ. CONTROL knob may not be adjusted to the proper dial setting.

(3) The crystal may be defective.

## **82. REPLACING TRANSMITTER TUBES.**

a. Turn the SEND-STANDBY-OFF switch to OFF.

b. Disconnect power cable at the transmitter.

c. Remove plugs, microphone, and key.

d. Disconnect antenna.

e. Loosen the four retainer clamps on the side of the transmitter case.

f. Gradually work the transmitter loose and remove from the case, **making sure that output tube in left corner of transmitter clears the cabinet.**

g. To remove small tubes, first remove the shield, then the tubes. Spare tubes are carried in the Box BX-53-A in Bag BG-172. Line up the blank space on the tube with the blank space in the socket before attempting to insert the tube into the socket.

h. To remove the large output tube, loosen the tube clamp around the base of the tube, then remove the top cap connection and remove the tube.

**CAUTION:** The top cap in normal operation carries approximately 500 volts regardless of whether the key is open or closed. Be sure the power cable is disconnected from the transmitter before touching this connection. After inserting the new tube be sure to replace the top cap and to tighten the tube clamp.

i. The voltage regulator tube seldom fails unless physically damaged. To replace it, first loosen the tube clamp; then remove the tube.

j. When replacing the transmitter in the cabinet, use care not to damage the power tube. Seat the transmitter properly in the cabinet and fasten the four retainer clamps.

**83. REPLACING TRANSMITTER DIAL LIGHT BULB.** The transmitter dial light is located between the main tuning capacitor and the panel, and consequently cannot be replaced from the back. To replace the lamp proceed as follows:

a. Remove the receiver from the case and remove the dial light extractor mounted behind it.

b. Remove the four screws holding the window and gasket in front of the transmitter dial.

c. Replace the lamp through the opening, using the dial light extractor.

d. Replace the window, gasket, and frame, tightening up the screws to make the unit waterproof.

e. Replace extractor and receiver in case.

**84. REPLACING R-F INDICATOR BULB.** If the INDICATOR fails to glow, the lamp may be replaced as follows:

a. Remove INDICATOR cover by turning the rear knurled part of the assembly in a counterclockwise direction.

b. The lamp may then be removed from its bayonet type socket by pressing the bulb in and turning it in a counterclockwise direction.

c. To insert the new lamp, reverse the procedure. After replacement, make sure that the INDICATOR cover is tight.

**85. REMOVING MAIN TUNING CAPACITOR.**

a. The main tuning capacitor in the transmitter has been designed so as to be easily removed for access to the parts mounted above and behind it.

b. When properly removed and replaced, no harm is done to the calibration of the transmitter.

c. To remove capacitor proceed as follows:

(1) Remove **FREQ. CONTROL** knob and dial lock assembly.

(2) Remove only four screws marked A on shield at rear of tuning capacitor (fig. 37).

(3) Remove three screws (item 5, fig. 37), which mount tuning capacitor to front panel.

(4) Remove capacitor by pulling straight back. Banana plugs make unsoldering unnecessary.

d. To replace capacitor reassemble in reverse order.

**NOTE:** When replacing the flat disc dial on the capacitor shaft, the setscrew must engage the flat on the shaft. If this precaution is not observed the calibration will be inaccurate. To readjust dial lock place lock in approximately the normal position, close clamp and tighten mounting screws.

**86. TRANSMITTER ALIGNMENT EQUIPMENT.**

The following equipment is recommended for alignment of the transmitter:

a. Frequency Meter Set SCR-211. If Frequency Meter Set SCR-211 is not available, the calibrating crystal in the receiver may be used.

b. A voltmeter with a resistance of 1,000-ohms-per-volt and several scales reading up to 150 volts.

c. A 5,000-ohm, 20-watt carbon or other non-inductive resistor.

d. A stabilized power source. Vibrator Power Unit PE-237 is recommended, although Generator GN-58 may be used if necessary. It may be slightly more difficult to peak the adjustments due to voltage variations caused by changes in cranking speed for which the voltage regulator in the generator cannot completely compensate.

**87. TRANSMITTER ALIGNMENT PROCEDURE.**

a. Remove the power cable from the transmitter.

b. Unfasten the clips and remove the transmitter from its case. Be careful not to damage the power amplifier tube.

c. Attach the power cable to the power receptacle on the front of the panel.

**CAUTION:** The top cap of the output tube and many other points carry approximately 500 volts when the power is on. Exercise extreme caution.

d. Set the **CW-MCW-PHONE** switch to **PHONE**.

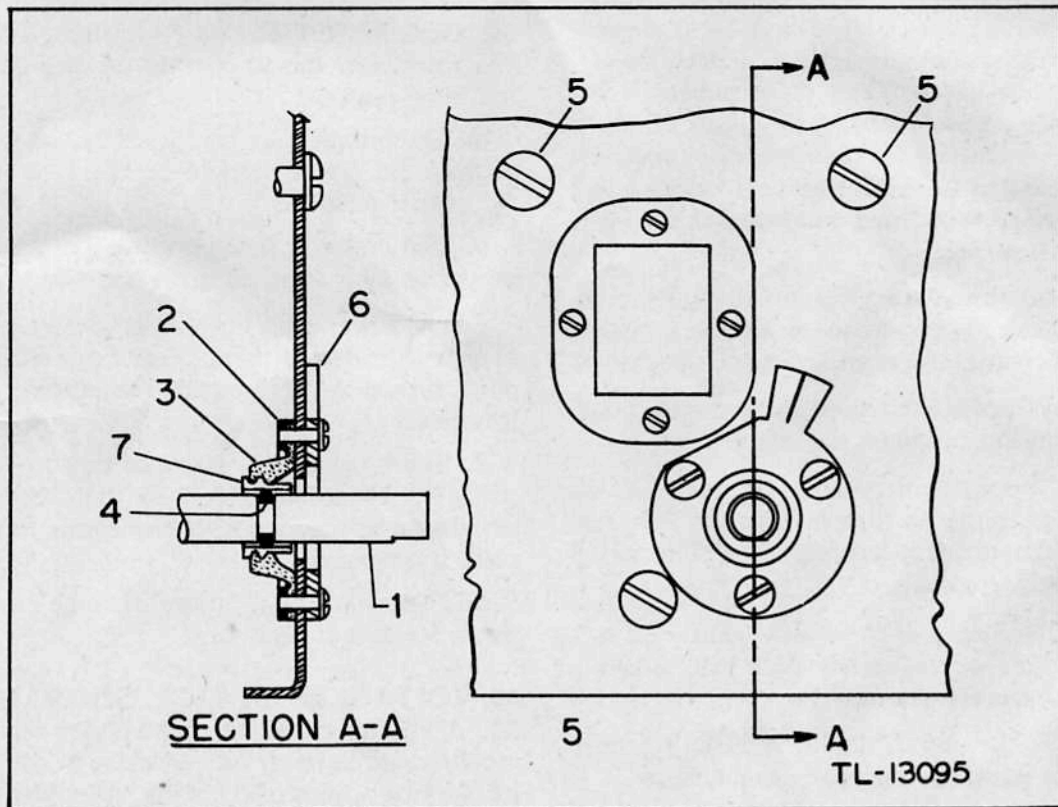
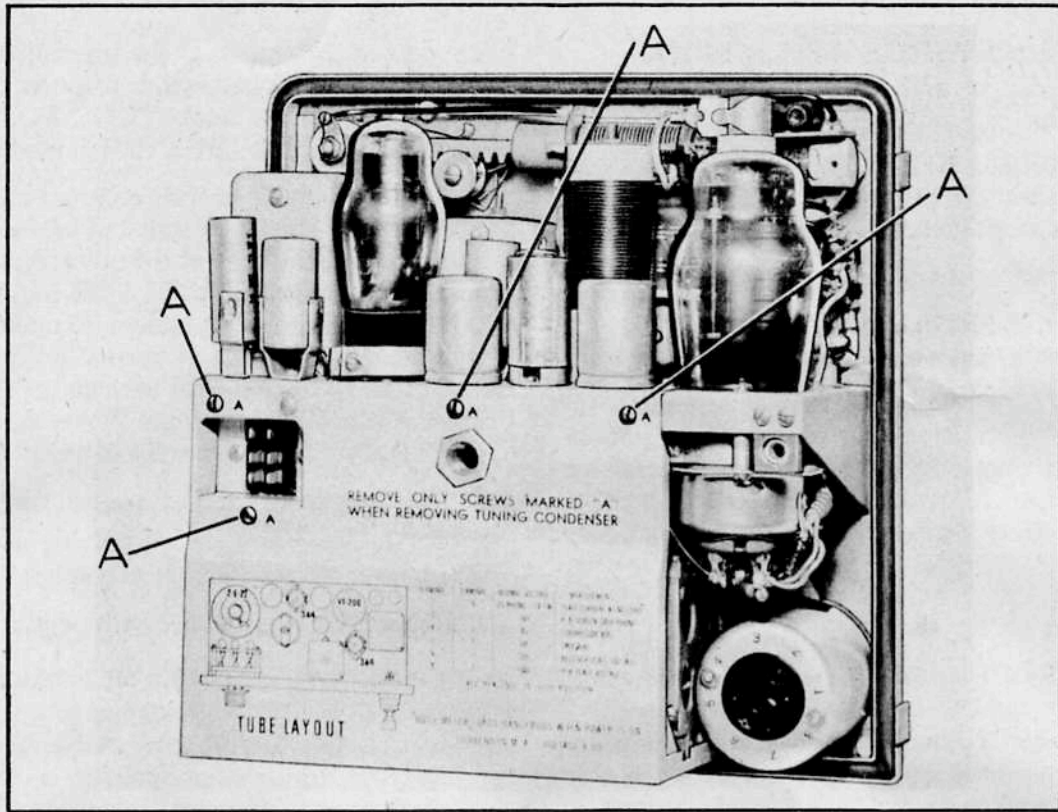


Figure 37. Removal of transmitter tuning capacitor (par. 85).

e. Set the CRYSTALS switch to MO.

f. Turn the ANT. SELECTOR switch to SHORT position 1, and adjust the knob marked TUNE FOR MAX. IND. GLOW to any position between 5 and 10. Do not use any position lower than 5, as misalignment will result.

g. Set the frequency meter to 6,300 kc.

h. Set the FREQ. CONTROL knob on the transmitter to the setting indicated on the calibration chart for 6,300 kc.

i. Press the microphone button and listen in the phones connected to the frequency meter for the signal from the transmitter. Adjust the master-oscillator (M.O.) trimmer (fig. 38) to exact zero beat. If the 200-kc crystal in the receiver is used instead of the frequency meter, proceed as instructed in paragraph 30.

**NOTE:** Since Frequency Meter Set SCR-211 can give beat notes between harmonics of the transmitter and of the frequency meter, measurements of the transmitter frequency should be taken at several points on the dial to be sure that the transmitter has been aligned to the correct frequency and that it calibrates closely over its entire range. If a check is made at several points and it is found that only the one at which the adjustment has been made is closely on frequency, and that the other points checked are considerably in error, it is probable that the wrong beat note was used in the frequency meter, and that none of the frequencies is correct.

j. Connect the negative lead of the 1,000-ohm-per-volt meter to point No. 5 on the metering socket and connect the positive lead to the chassis.

k. Adjust the doubler trimmer (fig. 38) for maximum output indication on the meter.

l. Using approximately a 3-volt scale of the meter, connect the positive lead of the meter to point No. 2 and the negative lead to point No. 8 of the metering socket.

**CAUTION:** Both ends of the meter connected in this way are approximately 500 volts above chassis. Use extreme caution.

m. Adjust the power amplifier (P.A.) trimmer (fig. 38) for minimum indication on the meter.

n. Connect the 5,000-ohm carbon resistor from the ANT post on the transmitter to some bare

metal part of the chassis of the transmitter. Turn the ANT. SELECTOR switch to point 5 on the REEL scale. Rotate knob TUNE FOR MAX. IND. GLOW until INDICATOR glows brightest.

o. As a final check to insure proper alignment, the transmitter should be tuned at one end of the frequency band and then at the other. At the same time adjust the knob TUNE FOR MAX. IND. GLOW at each end. This is done to make certain that the indicator glows at normal brilliance and can be tuned to resonance at each end of the band. Correct voltmeter readings are shown in the chart at the rear of the transmitter shield and in figure 36.

p. The alignment of the transmitter is now complete.

q. Remove the power cable as a safety measure.

r. Replace the transmitter in its case.

**88. TRANSMITTER ALIGNMENT WITHOUT TEST EQUIPMENT.** Transmitter alignment without test equipment is virtually impossible. Never attempt to align the transmitter without a voltmeter equivalent to that described in paragraph 86.

**89. GENERATOR GN-58 FAILURE.** The hand generator may fail to operate for any one of the following reasons:

a. The cranks may be turned in the wrong direction. An arrow marked on the case indicates the proper direction.

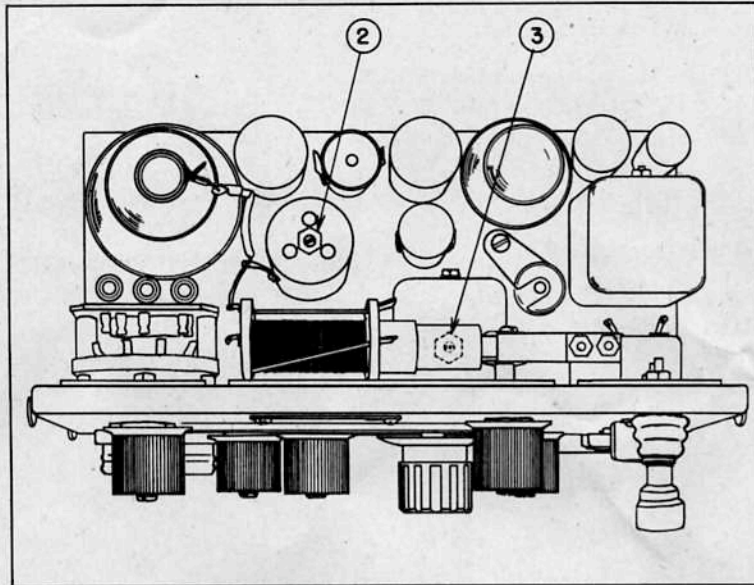
b. The crank is being turned too slowly. The proper speed is 50 to 70 turns per minute.

c. The power cable may not be properly plugged in at both ends and the retainer rings on the cable plugs turned up tight on the receptacles. Tighten if necessary.

d. The brushes may be worn down or may be stuck in the brush holders so that they do not make proper contact with the commutator. Replace if necessary.

e. There may be a failure of some circuit element. Replace if necessary.

**90. VOLTAGE REGULATOR, GENERATOR GN-58.** A vibrating contact-type voltage regulator is incorporated in the hand generator to compensate for varying speeds of cranking. Adjust with Gage TL-127 according to directions inside the cover of the generator, only when necessary.



SCREWS ② AND ③ ARE ADJUSTED ONLY WHEN THE MAIN TUNING CAPACITOR OR THE COILS TUNED BY THIS CAPACITOR ARE REPLACED.

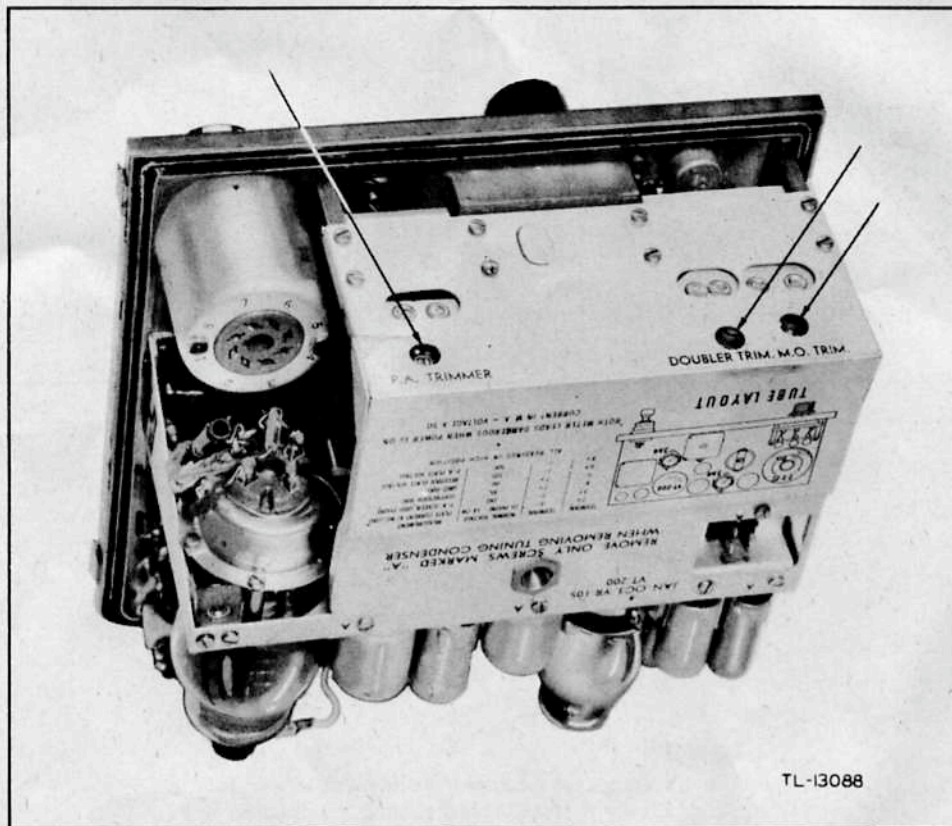


Figure 38. Transmitter alignment points.

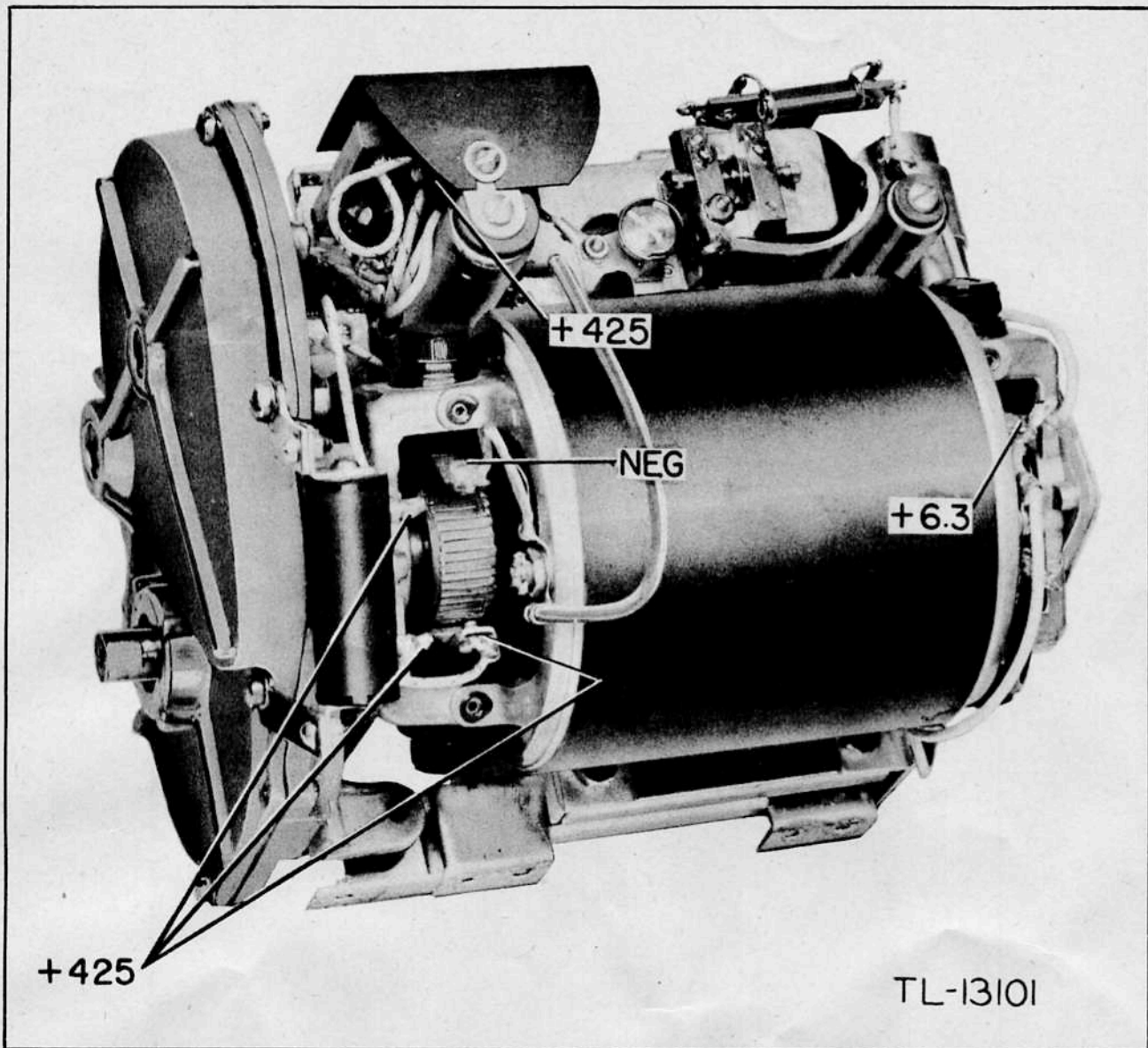


Figure 39. Voltage chart, Generator GN-58.

Terminal number	Voltage to chassis
20	6.3
21	425
23	6.3
24	Chassis
32	425
34	6.3

Note: Above voltages are measured to chassis at no load.

Note: Terminals on terminal board connect to similarly numbered pins in power receptacle. Where there is no terminal corresponding to a receptacle pin number, the pin has no connection.

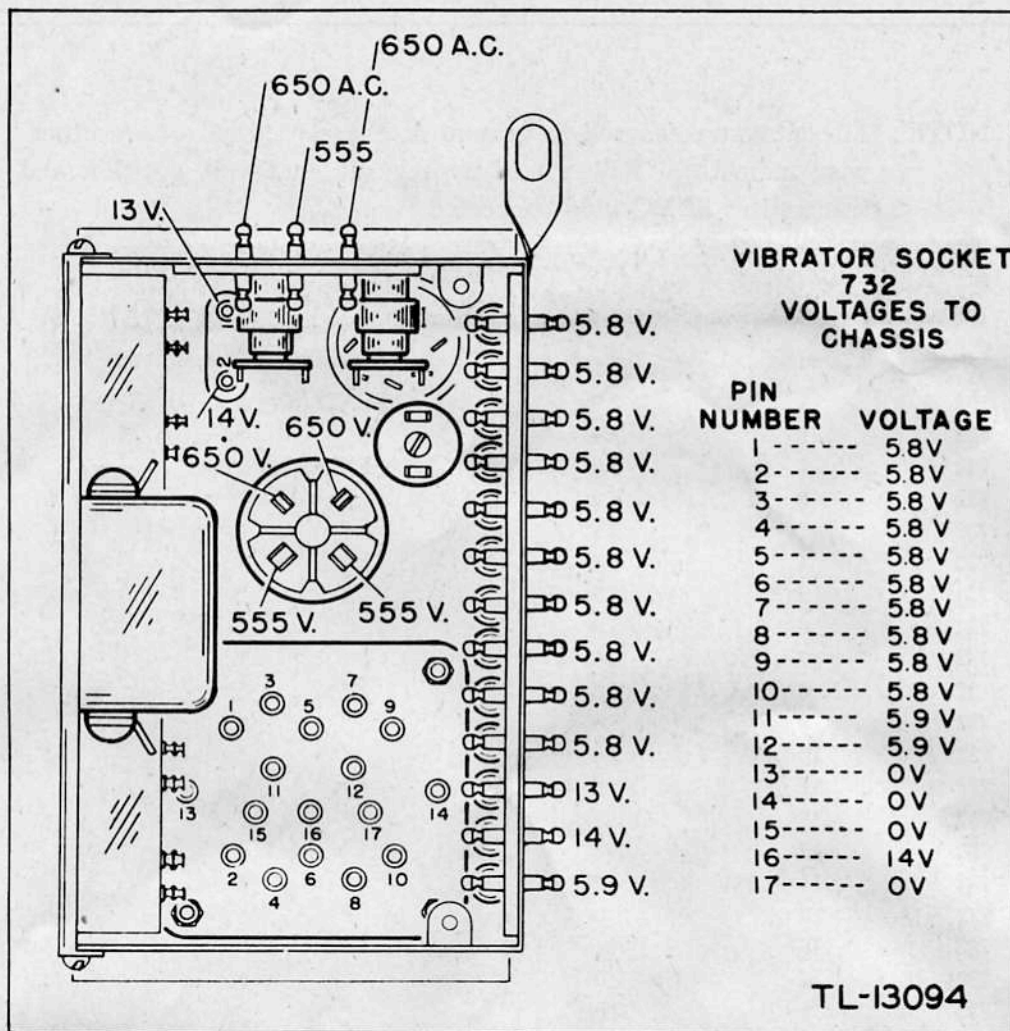


Figure 40. Voltage chart, heavy duty filter, Vibrator Power Unit PE-237.

### 91. VIBRATOR POWER UNIT PE-237 FAILURE.

If the vibrator power unit fails to deliver power when the transmitter SEND - STANDBY - OFF switch is at SEND or STANDBY, proceed as follows:

**a.** Inspect Cord CD-1086 connecting the vibrator power supply to the set. See that it is properly plugged in at both ends and that the connecting rings are turned up tight. Check the cord for continuity.

**b.** Place the ear on the case of the unit listening for the click of the relays as the SEND-STANDBY-OFF switch is turned back and forth, and for the faint characteristic buzzing sound of the small vibrator in the STANDBY position, or the louder

higher-pitched buzzing of the heavy duty vibrator in the SEND position.

**c.** If the click of the relays cannot be heard, investigate the battery circuit and the condition of the battery itself.

**d.** If the click of the relays can be heard, but one of the vibrators does not buzz, remove the cover of the unit and replace whichever unit does not buzz.

**e.** If the vibrators are replaced, and one or the other portions of the unit do not perform, replace the corresponding rectifier tube.

**f.** To prevent the entrance of moisture, tighten down the top securely after replacing vibrators or tubes.



NOTE: All voltages measured to ground or chassis except where otherwise indicated. Power unit switch set on 6-volt position and transmitter of BC-1306 connected.

ERRATA: Voltages listed are approximate and vary with changes of vibrators, tubes, and circuit components.

<i>Item</i>	<i>Terminal</i>	<i>Voltage</i>	<i>Transmitter Switch Position</i>
702	1	2.9	SEND (Key down) or STANDBY
702	2	1.4	" " "
732	1	5.8	SEND (Key down)
732	2	5.8	" "
732	3	5.8	" "
732	4	5.8	" "
732	5	5.8	" "
732	6	5.8	" "
732	7	5.8	" "
732	8	5.8	" "
732	9	5.8	" "
732	10	5.8	" "
732	11	5.9	" "
732	12	5.9	" "
732	13	0	" "
732	14	0	" "
732	15	0	" "
732	16	14	" "
732	17	0	" "
733	1	650	" "
733	2	700 AC	" "
733	3	700 AC	" "
733	4	650	" "
731	1	5.9	STANDBY
731	2	5.7	"
731	3	5.7	"
731	4	0	"
734	20	6.5	SEND (Key down)
734	21	105	" "
734	22	1.4	SEND (Key down) or STANDBY
734	23	1.4	" " "
734	24	0	" " "
734	32	552	SEND (Key down)
734	33	100	STANDBY
734	34	6.0	SEND (Key down)
734	35	0	" "

Figure 41. Voltage chart, Vibrator Power Unit PE-237.

<i>Item</i>	<i>Terminal</i>	<i>Voltage</i>	<i>Transmitter Switch Position</i>
702-1	3	28	STANDBY
702-1	4	13.5	"
702-1	5	5.7	"
702-1	6	5.9	"
702-1	7	5.7	"
702-1	8	13.5	"
702-1	9	28	"
702-1	11	120 AC	"
702-1	12	0	"
702-1	13	120 AC	"
702-1	14	122	"
702-1	15	122	"
702-4	1	122	"
702-4	2	110	"
730	1	0	"
730	2	100	"
730	3	120 AC	"
730	4	0	"
730	5	120 AC	"
730	6	122	"
730	7	110	"
730	8	122	"
701	1 to 2	55 AC	SEND (Key down)
701	3 to 4	460 AC (Approx.)	" "
701	8 to 4	430 AC (Approx.)	" "
701	5	8 AC	" "
701	6	7.4	" "
701	7	8 AC	" "
702-2	10	7.3	" "
702-2	16	7.1	" "
700-1,2,3,4,5	1	28	" "
"	2	14	" "
"	3	5.8	" "
"	4	5.9	" "
"	5	5.8	" "
"	6	14	" "
"	7	28	" "
"	8 to 9	130 AC	" "
"	10 to 11	130 AC	" "
"	12 to 13	11 AC	" "
702-3	17	555	" "
702-3	18	555	" "
702	19	552	" "

Figure 41. Voltage chart, Vibrator Power Unit PE-237 (cont'd).

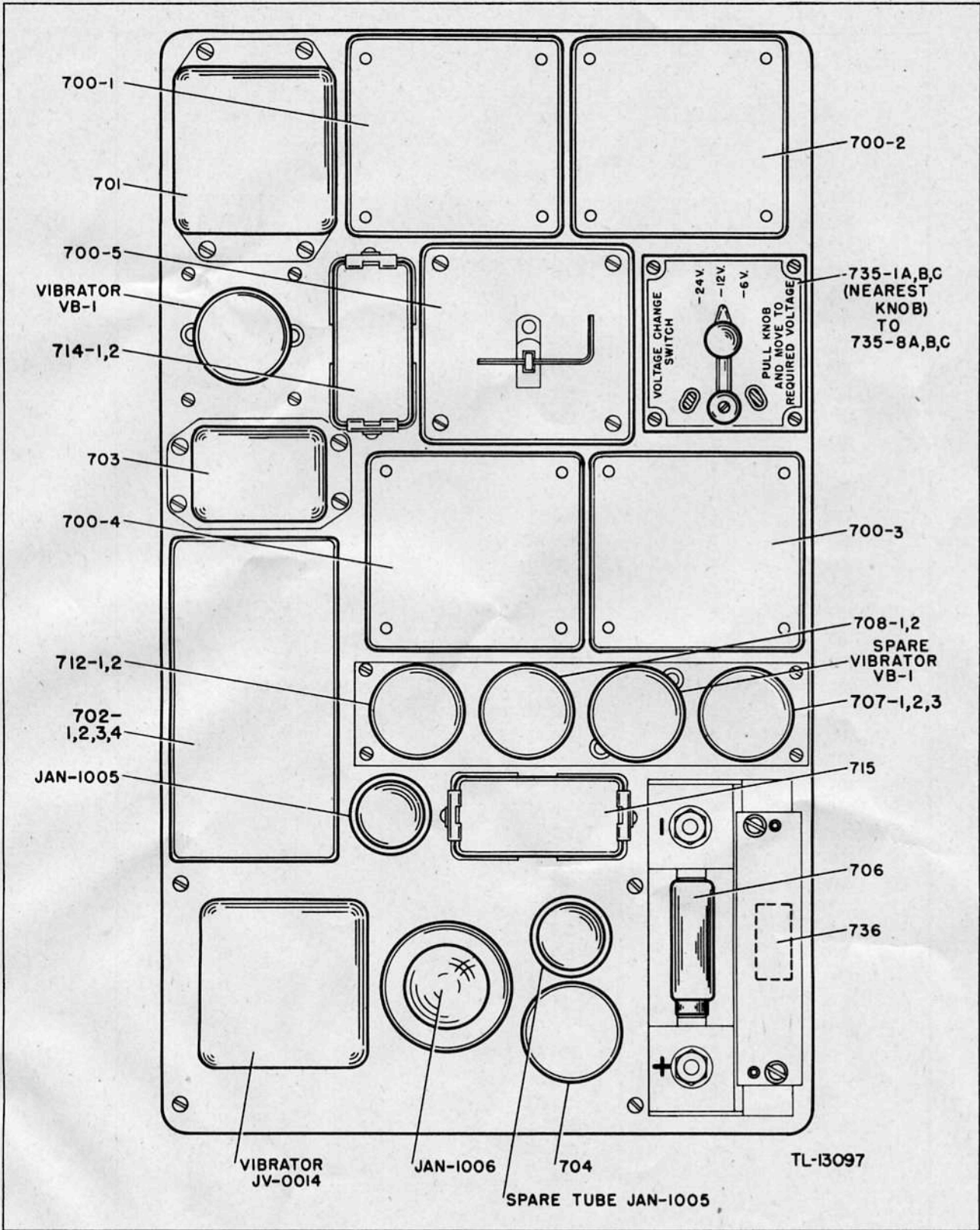


Figure 42. Parts identification, Vibrator Power Unit PE-237, top view.

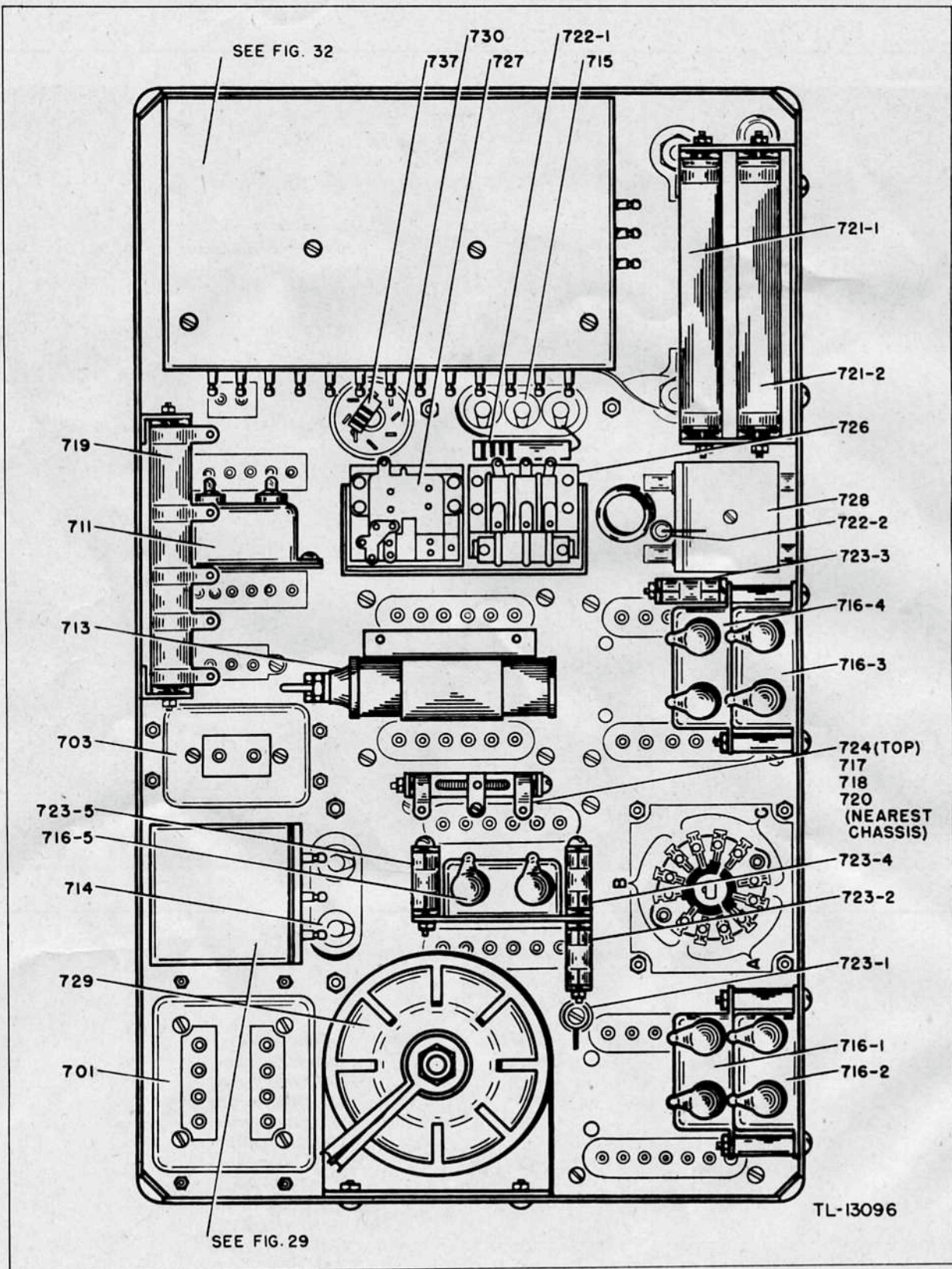


Figure 43. Parts identification, Vibrator Power Unit PE-237, bottom view.

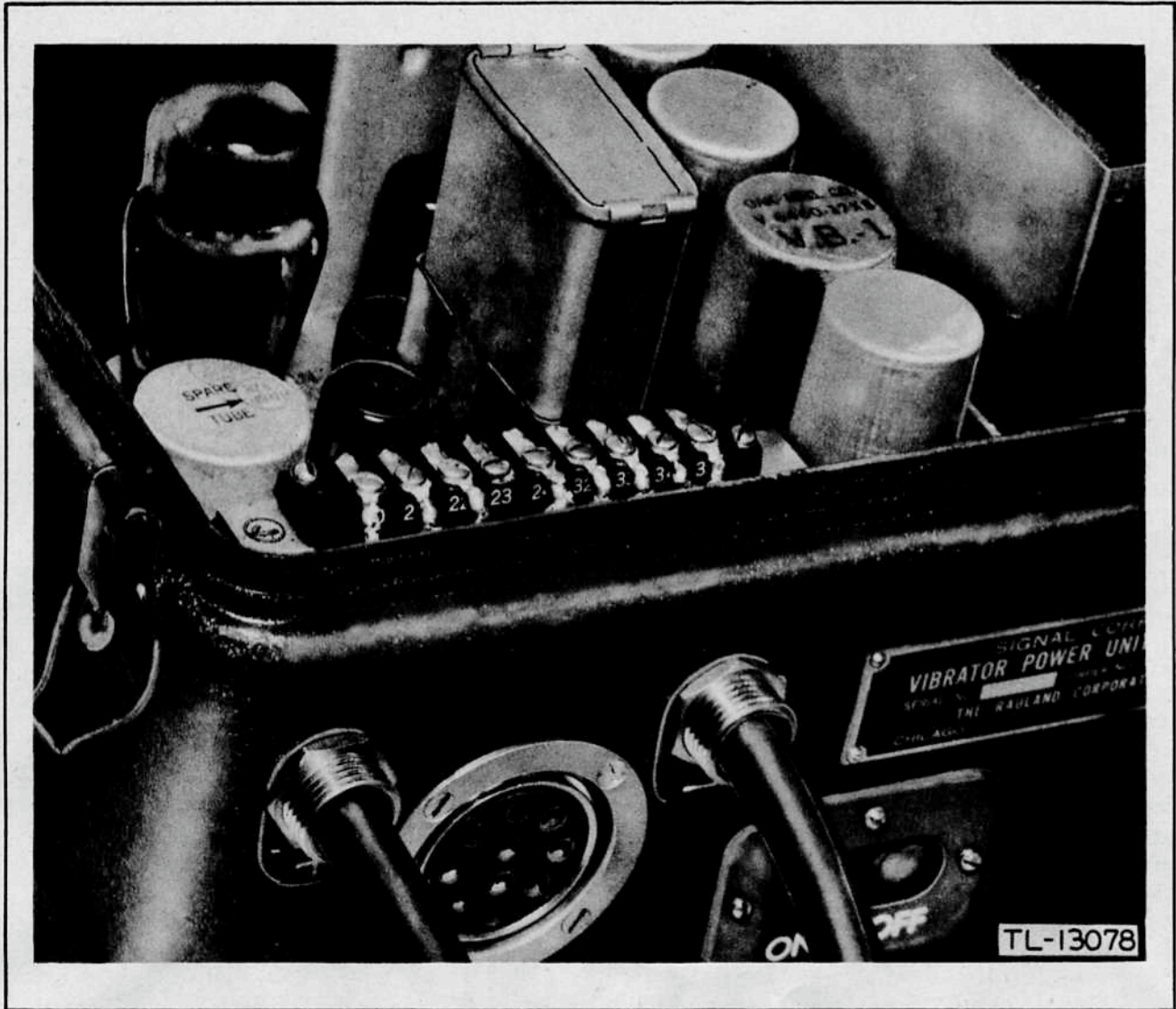


Figure 44. Vibrator Power Unit PE-237, voltage on terminal strip.

<i>Terminal Number</i>	<i>Voltage to Chassis</i>	<i>Transmitter Switch Position</i>
20	6.5	SEND (key down)
21	105	SEND (key down)
22	1.4	SEND (key down) or STANDBY
23	1.4	SEND (key down) or STANDBY
24	0	SEND (key down) or STANDBY
32	550	SEND (key down)
33	100	STANDBY
34	6.0	SEND (key down)
35	0	SEND (key down)

## 92. MOISTURE-PROOFING AND FUNGI-PROOFING.

*a. General.* The operation of Signal Corps equipment in tropical areas where temperature and relative humidity are extremely high requires special attention. The following items represent problems which may be encountered in operation:

(1) Resistor, capacitors, coils, chokes, transformer windings, etc., fail.

(2) Electrolytic action takes place in resistors, coils, chokes, transformer windings, etc., causing eventual break-down.

(3) Hook-up wire and cable insulation break down. Fungus growth accelerates deterioration.

(4) Moisture forms electrical leakage paths on terminal boards and insulating strips, causing flash-overs and crosstalk.

(5) Moisture provides leakage paths between battery terminals.

*b. Treatment.* A moisture-proofing and fungi-proofing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture and fungi-resistant varnish applied with a spray gun or brush. Refer to TB SIG 13, Moisture-proofing and Fungi-proofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moisture-proofing and fungi-proofing.

**CAUTION: Varnish spray may have toxic effects if inhaled. To avoid inhaling spray, use respirator if available; otherwise, fasten cheese-cloth or other cloth material over nose and mouth.**

### *c. Step-by-Step Instructions for Treating Radio Receiver and Transmitter BC-1306.*

#### (1) PREPARATION.

(a) Make all repairs and adjustments necessary for proper operation of the equipment.

(b) Clean all dirt, rust, fungus, oil, grease, etc., from the equipment to be processed.

#### (2) DISASSEMBLY OF RECEIVER.

(a) Loosen retainer clamps and remove receiver from case.

(b) Remove four screws and washers holding protective grillwork to panel; remove grillwork.

(c) Remove four screws and washers holding bottom plate to chassis; remove plate.

(d) Remove screws holding sensitivity switch to chassis and panel; remove switch.

(e) Release two catches holding tube shield; remove shield.

(f) Remove nuts holding shield to PHONE-CW-NET-CAL switch; remove shield.

(g) Remove crystal (not to be treated).

#### (3) DISASSEMBLY OF TRANSMITTER.

(a) Loosen retainer clamps and remove transmitter from case.

(b) Remove four screws and washers holding protective grillwork to panel; remove grillwork.

(c) Loosen setscrew and remove tuning capacitor knob.

(d) Remove three screws and washers on front panel and four screws and lockwashers marked A on back of chassis; remove tuning capacitor assembly.

(e) Remove two nuts and lockwashers holding metering socket and shield to power receptacle; remove socket and shield.

(f) Remove two set screws on resistor strip over antenna selector switch to permit masking of switch contacts.

(4) CLEANING. Clean all dirt, dust, rust, fungus, oil, grease, etc., from those portions of the equipment which could not be reached before disassembly.

(5) MASKING OF RECEIVER. Cover the following components with masking tape as shown in figures 45 and 46.

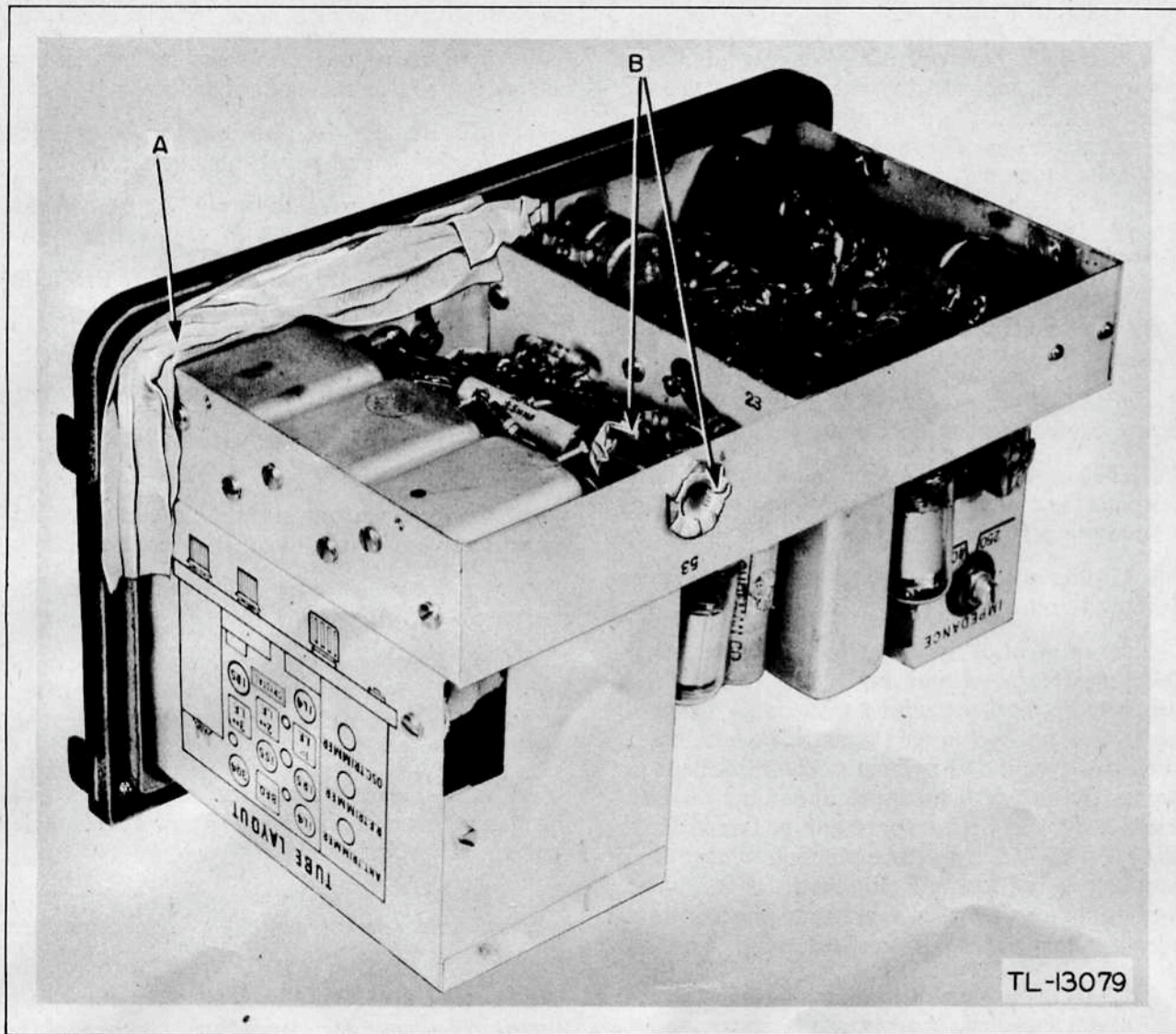
(a) Opening adjacent to tuning mechanism, item A, figure 45.

(b) Openings at end of ground jack, item B, figure 45.

(c) Prongs of male power plug, item A, figure 46.

(d) Impedance switch (not shown).

(e) Sensitivity switch, item B, figure 46.



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Figure 45. Components masked in bottom interior of receiver chassis.

(f) PHONE-CW-NET-CAL switch, item C, figure 46.

(g) Drive gears of tuning mechanism, item D, figure 46.

(h) Antenna connector jack, item E, figure 46.

(6) MASKING OF TRANSMITTER.

(a) Power receptacle, item A, figure 47.

(b) Battery receptacle, item B, figure 47.

(c) Dial and shaft opening for tuning capacitor assembly, item C, figure 47.

(d) Push button for dial light, item D, figure 47.

(e) Prongs of power plug, item A, figure 48.

(f) Tuning capacitor connector jacks, item B, figure 48.

(g) Contacts of tube socket 142, item C, figure 48.

(h) POWER switch, item D, figure 48.

(i) Metering socket, item E, figure 48.

(j) SEND-STANDBY-OFF switch, item F, figure 48.

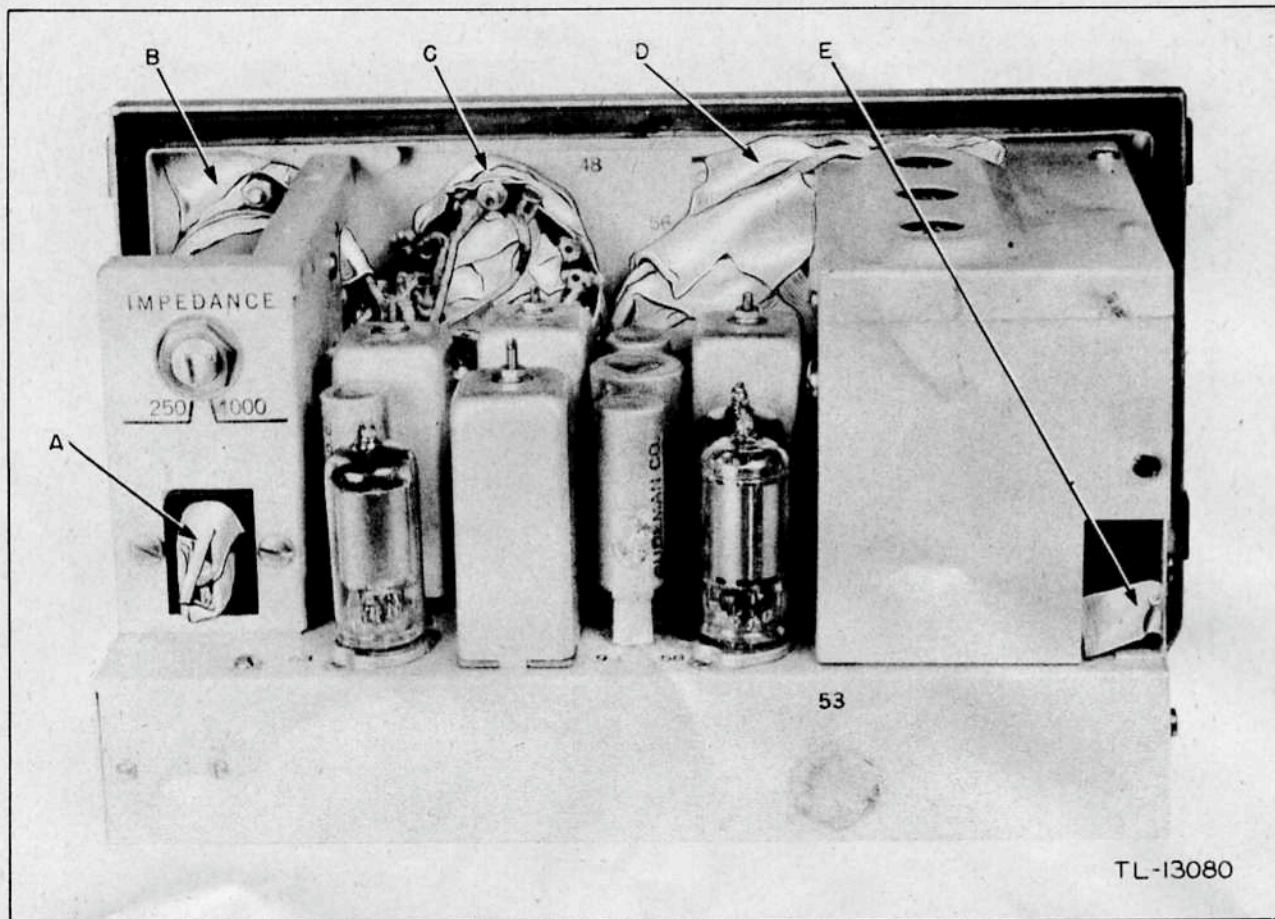


Figure 46. Components masked on rear of receiver chassis.

(k) CW-MCW-PHONE switch, item G, figure 48.

(l) Rubber closure for tuning capacitor shaft, item H, figure 48.

(m) Dial opening item I, figure 48.

(n) MO-CRYSTAL switch, item J, figure 48.

(o) Variable capacitor 77, item K, figure 48.

(p) Drive mechanism of antenna tuning coil, item A, figure 49.

(q) Contacts of keying relay, item B, figure 49. (Loosen tube clamp and remove tube 2E22 to gain access to relay, and replace tube and grid cap after masking contacts.)

(r) ANT. SELECTOR switch, item C, figure 49.

(s) Receiver antenna jack, item D, figure 49.

(t) Selenium rectifier 157 (not shown).

(u) Prongs on terminal strip of tuning capacitor, item A, figure 50.



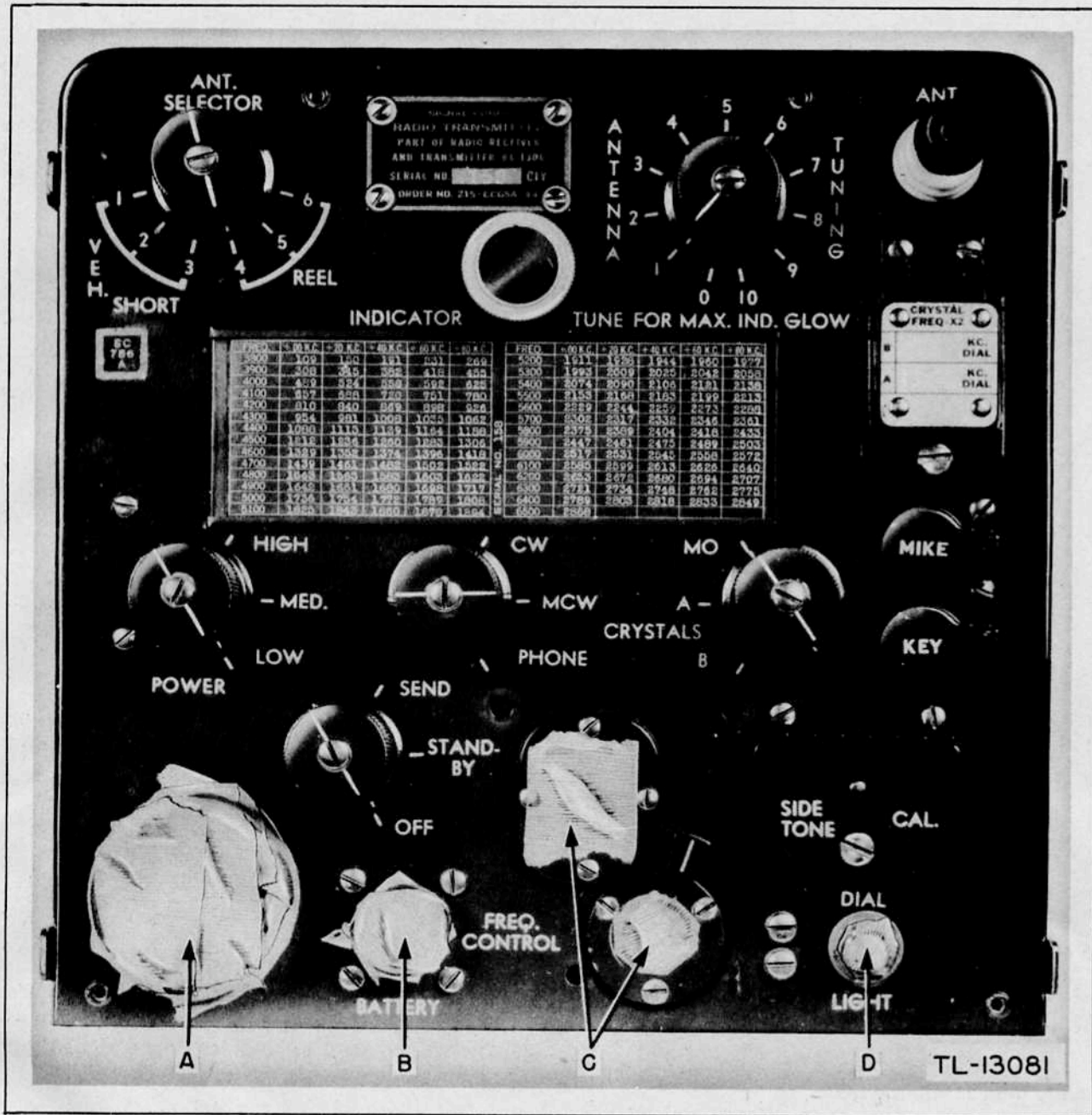
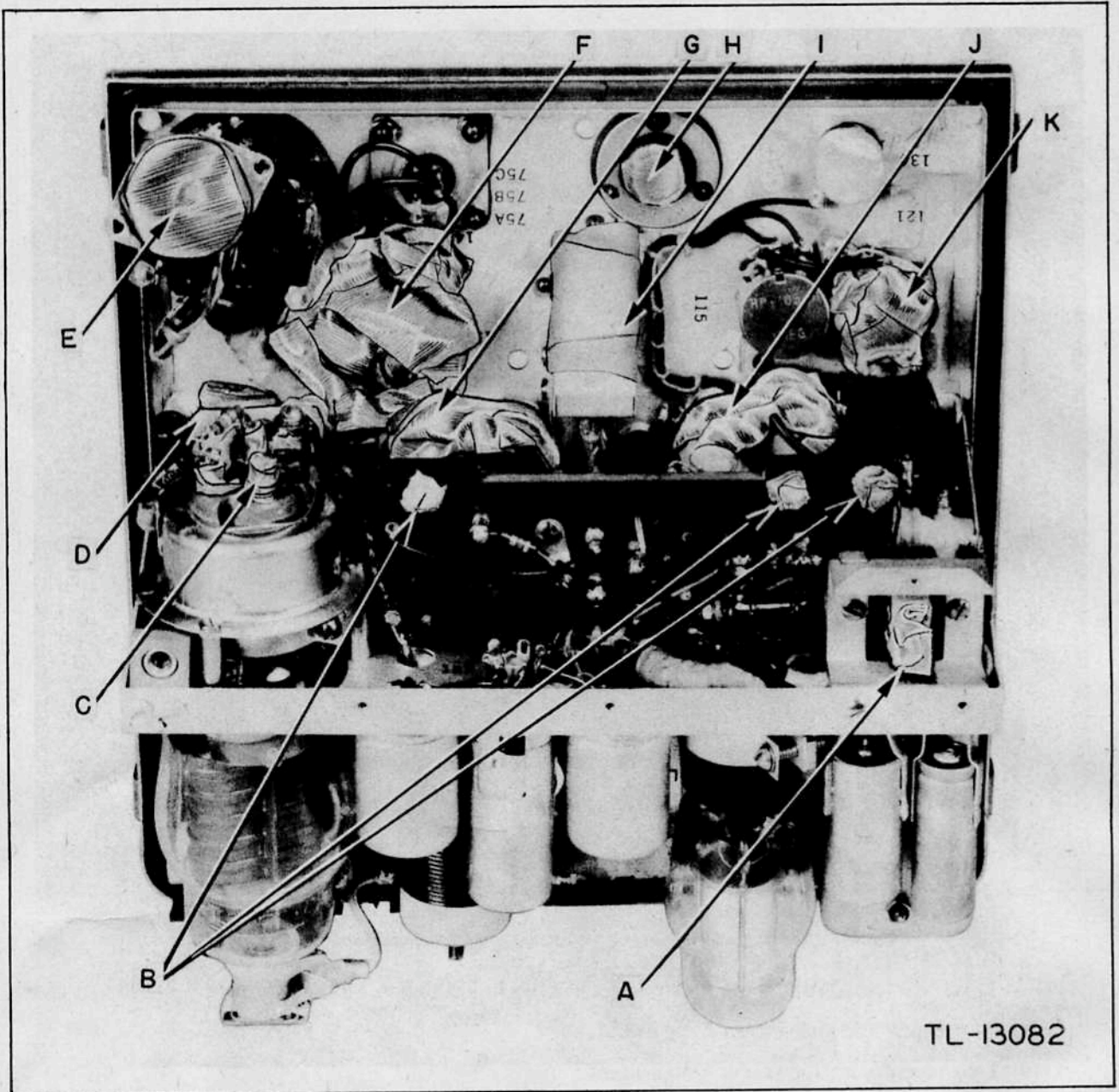


Figure 47. Components masked on front panel of transmitter.



TL-13082

Figure 48. Components masked on rear of panel and bottom of chassis of transmitter.

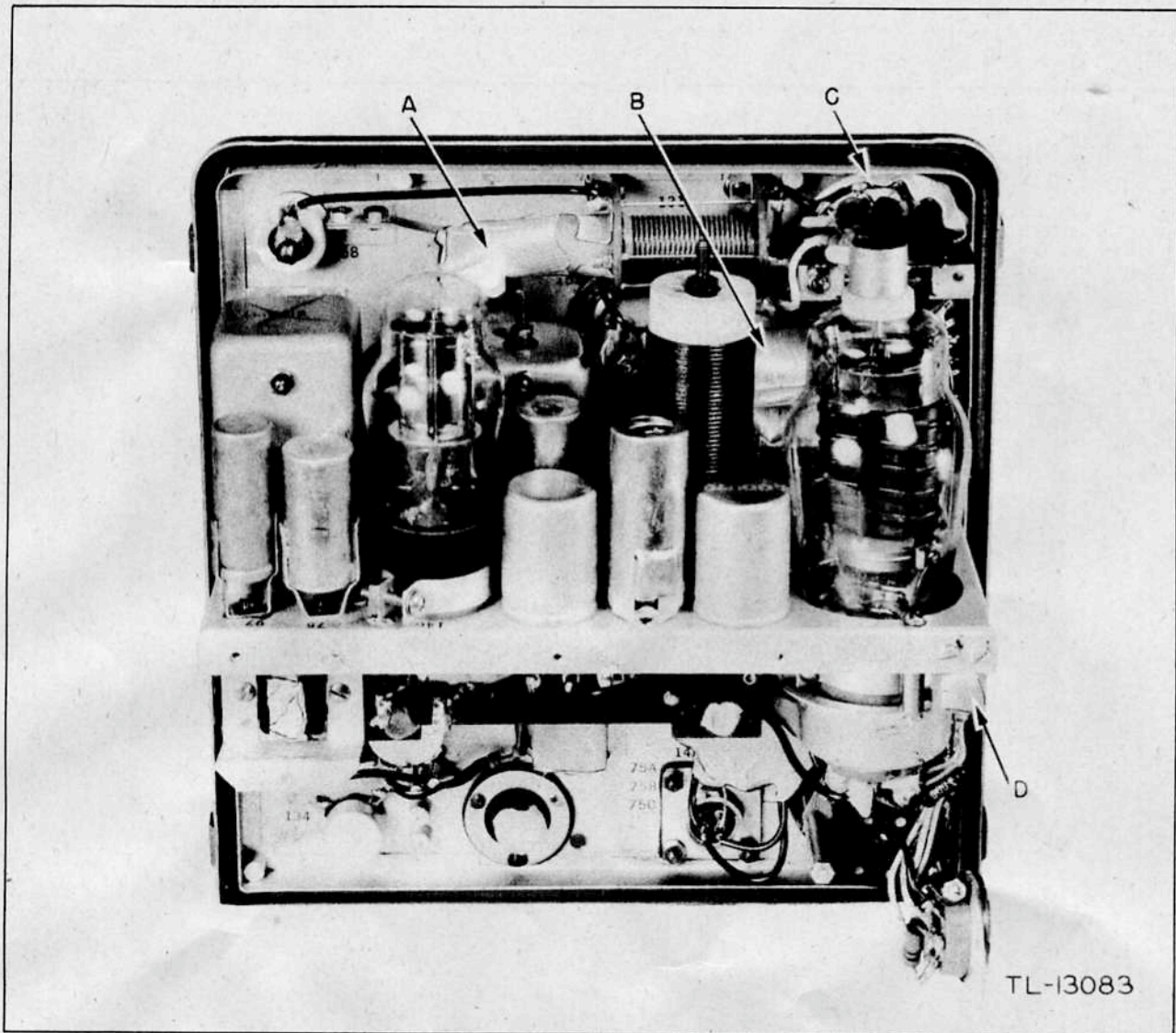


Figure 49. Components masked on rear of panel and top of chassis of transmitter.

(7) MASKING OF CASE.

- (a) Four connector jacks, item A, figure 51.
- (b) Two receptacles for power plugs, item B, figure 51.

(8) DRYING.

- (a) Place the equipment to be treated in a drying oven and bake from 2 to 3 hours at 160° F. Do not exceed 160°F.
- (b) If wax begins to melt on any of the components, decrease the temperature and increase

the baking time 1 hour for each 10° drop in temperature.

(9) VARNISHING.

- (a) Spray three coats of moisture-proofing and fungi-proofing on components, allowing a 15- to 20-minute drying period between each coat. (Do not spray tuning capacitor.)
- (b) Use a brush to apply varnish to any portion of the equipment which was not reached by the spray gun, making sure that all components are adequately protected by the varnish.

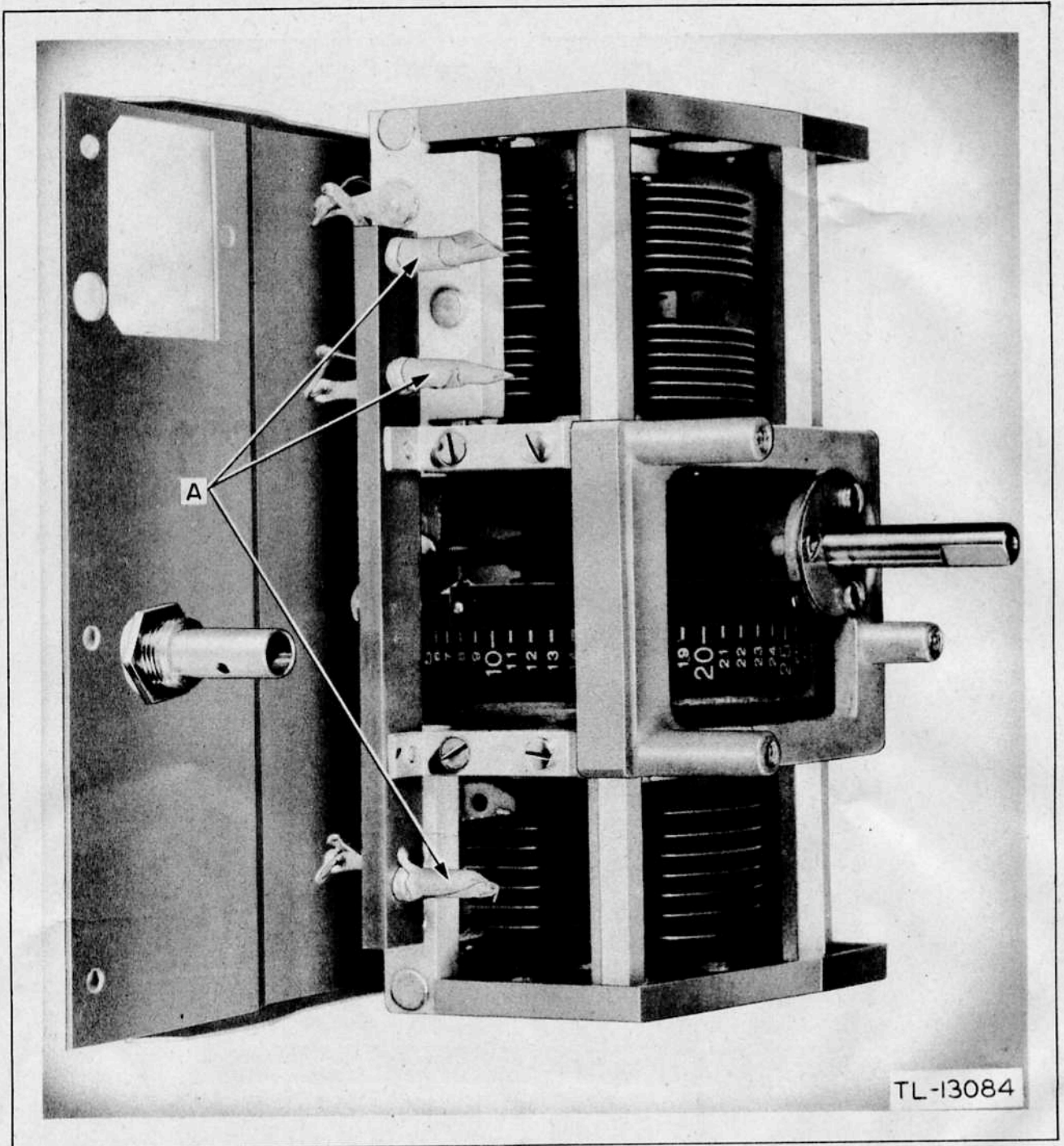


Figure 50 Components masked on tuning capacitor of transmitter.

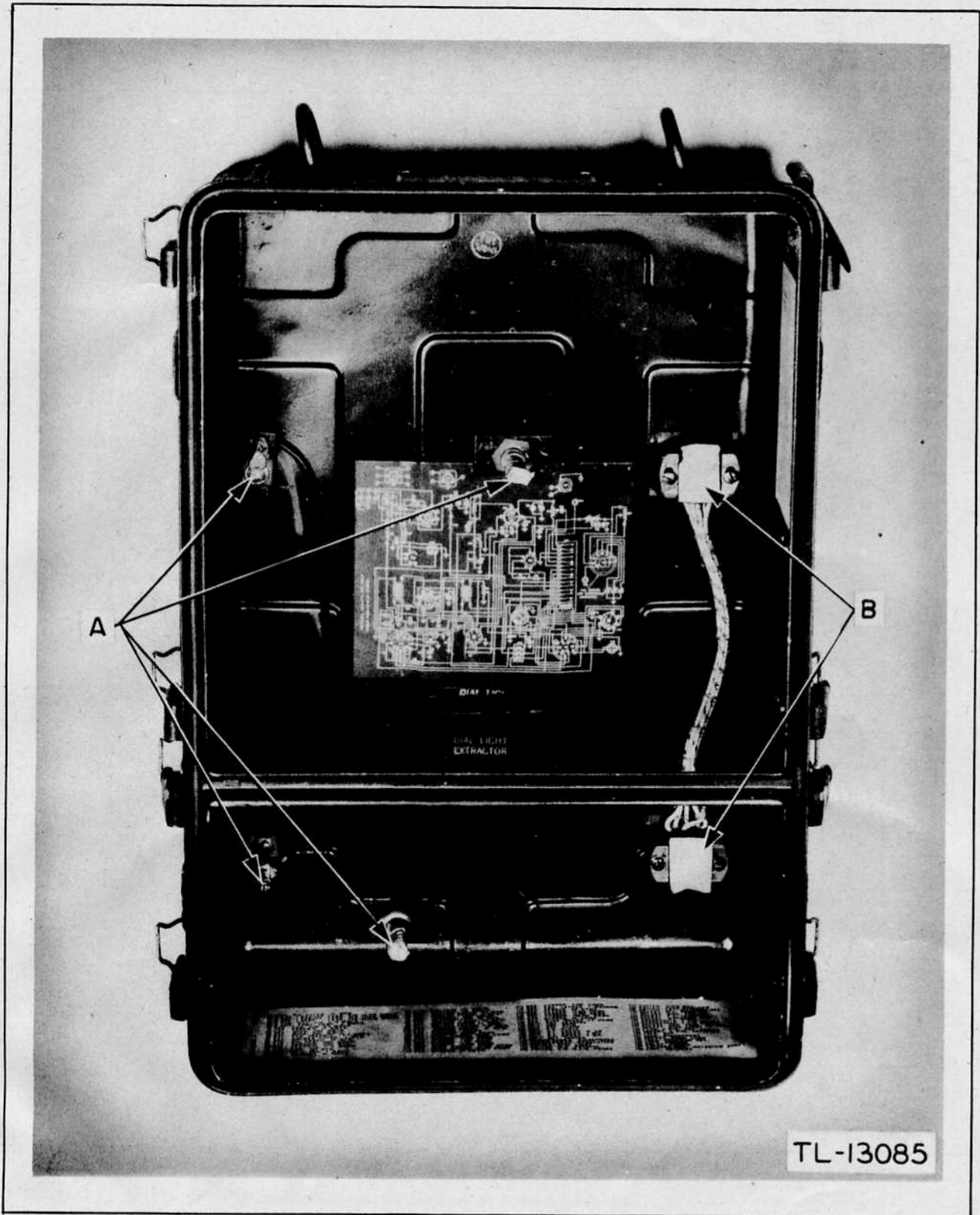


Figure 51. Components masked in case of receiver and transmitter.

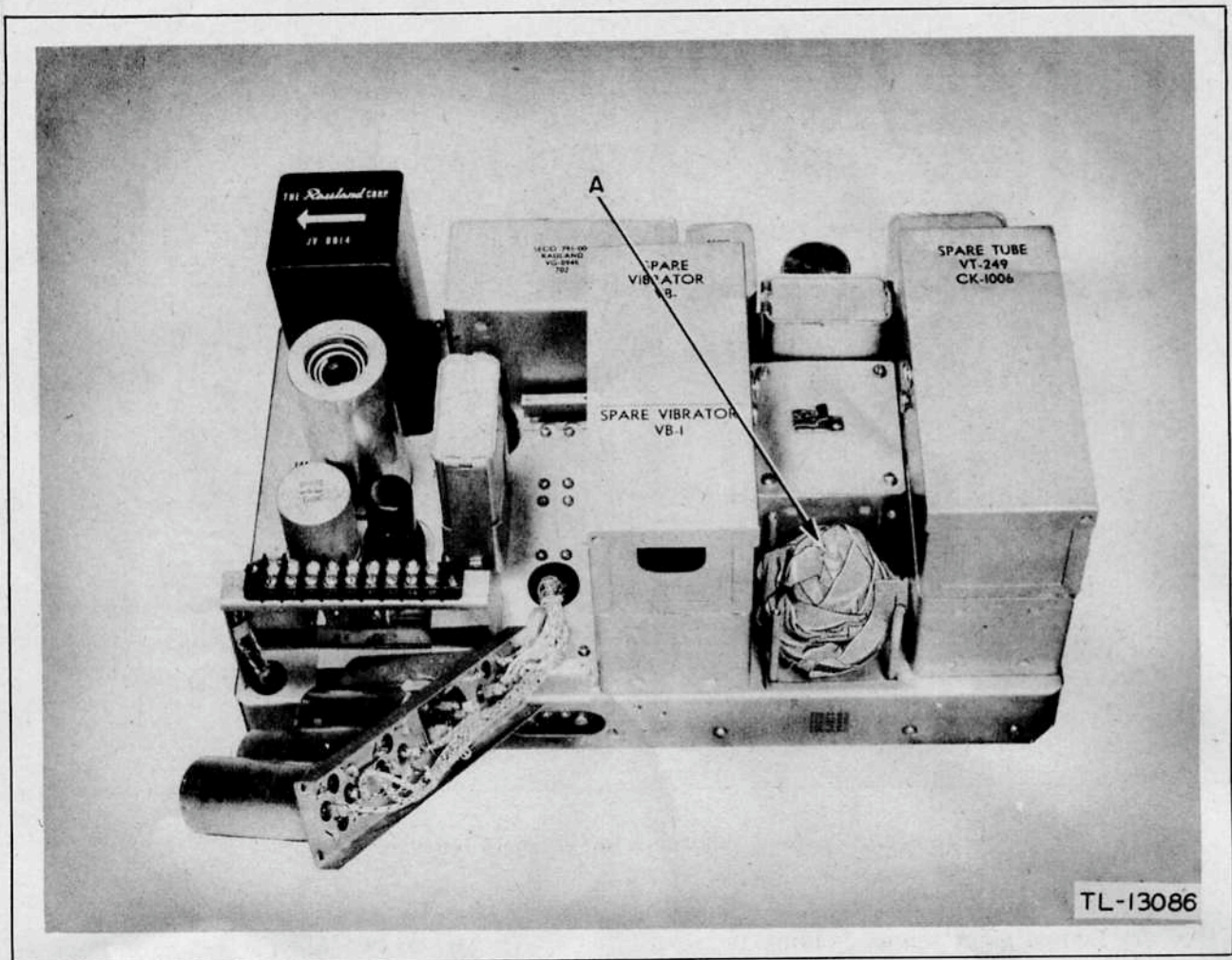


Figure 52. Components masked on top of vibrator power unit chassis.

(c) Apply a brush coat of varnish to the phenolic terminal strip on the tuning capacitor.

(10) REASSEMBLY.

(a) Remove all masking tape and clean all contacts with varnish remover; burnish the contacts.

(b) Reassemble the receiver and transmitter by reversing the procedure outlined for disassembly.

(c) Mark case MFP with date of treatment.

(d) Check over-all performance of the receiver and transmitter and make any adjustments that are warranted.

d. Step-by-Step Instructions for Treating Vibrator Power Unit PE-237.

(1) PREPARATION.

(a) Make all repairs and adjustments necessary for proper operation of the equipment.

(b) Clean all dirt, rust, dust, fungus, oil, grease, etc., from the equipment to be processed.

(2) DISASSEMBLY.

(a) Release four fasteners holding top cover to chassis; remove cover.

(b) Remove two nuts and washers holding battery cables to terminals; remove cables.

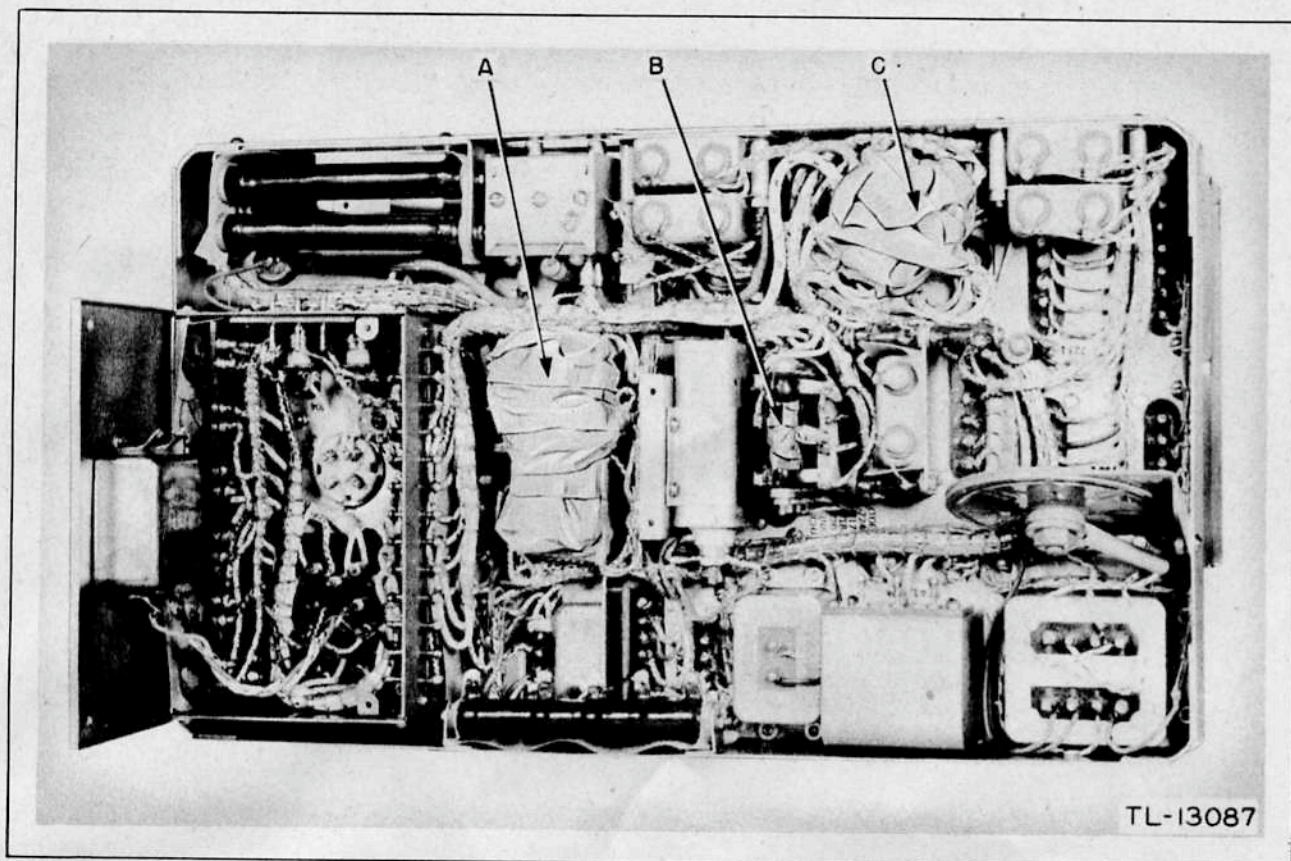


Figure 53. Components masked on base of vibrator power unit chassis.

(c) Loosen eight screws holding terminal lugs to bakelite terminal strip; remove lugs and retighten screws.

(d) Remove four screws holding plug assembly to front panel and remove assembly.

(e) Remove six nuts, lockwashers and washers from studs holding chassis to bottom of case; lift chassis from case.

(f) Remove 12 screws holding cradle assembly to bottom of chassis; remove cradle assembly.

(g) Remove four screws holding filter capacitor subchassis to main chassis and swing clear of main chassis as shown in figure 52.

(h) Remove two screws holding cover plate immediately below sockets of Vibrator JV-0014 and rectifier Tube VT-249 and swing cover plate clear of main chassis as shown in figure 53.

(i) Loosen two Allen setscrews in knob of voltage change switch and remove the knob.

(j) Remove four setscrews holding cover of voltage change switch; remove cover.

(k) Remove one screw and nut holding the selenium rectifier; loosen the remaining screw and swing rectifier clear of the wiring.

### (3) CLEANING.

Clean all dirt, dust, rust, fungus, oil, grease, etc., from those portions of the vibrator power supply which could not be reached before disassembly.

### (4) MASKING.

Cover the following components with masking tape as in figures 52 and 53.

(a) The portion of the voltage change switch which is on top of chassis, item A, figure 52.

(b) Two circuit breakers, item A, figure 53.

(c) The variable resistor, item B, figure 53.

(d) The portion of the voltage change switch which is on the under side of the chassis, item C, figure 53.

(5) DRYING.

Follow procedure outlined in subparagraph c (8) above.

(6) VARNISHING.

Follow procedure outlined in subparagraph c (9) above.

(7) REASSEMBLY.

(a) Remove all masking tape.

(b) Reassemble the vibrator power unit by reversing the procedure outlined for disassembly.

(c) Mark case MFP with date of treatment.

(d) Check performance of the vibrator power unit and make any adjustments that are necessary.

*e. Step-by-Step Instructions for Treating Generator GN-58.*

(1) PREPARATION.

Follow the procedure outlined in subparagraph (1) above.

(2) DISASSEMBLY.

(a) Disengage six slide fasteners holding cover to generator; remove cover.

(b) Loosen one screw holding fiber plate over terminal strip.

(c) Loosen five screws holding leads to terminal strip; remove leads.

(d) Remove six screws holding crank coupling and bearing assembly to left side of case. Pry the bearing assembly out of the case with a screwdriver.

(e) Remove seven screws holding crank coupling and bearing assembly to right side of case. Pry the bearing assembly out of the case with a screwdriver.

(f) Remove five screws holding shock mount to front of case.

(g) Remove four screws holding shock mount to back of case; remove chassis assembly from case.

(3) CLEANING.

Follow procedure outlined in subparagraph c (4) above.

(4) DRYING.

Follow procedure outlined in subparagraph c (8) above.

(5) VARNISHING.

Apply one brush-coat of moisture-proofing and fungi-proofing varnish to the components, exercising care to avoid coating of open contact points, switches, and commutators.

(6) REASSEMBLY.

(a) Reassemble the generator by reversing the procedure outlined for disassembly.

(b) Mark generator MFP with date of treatment.

(c) Check over-all performance of generator; make any adjustments that may be indicated.



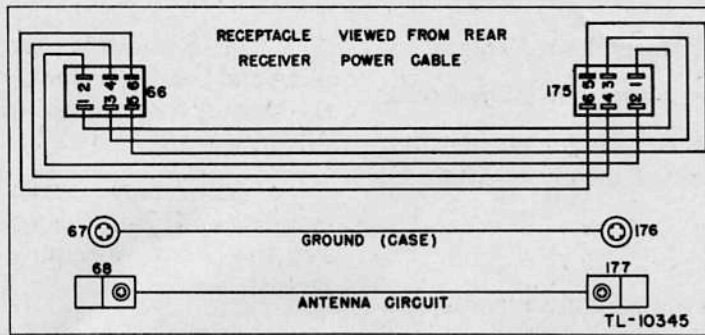


Figure 54. Case wiring diagram (receiver-transmitter).

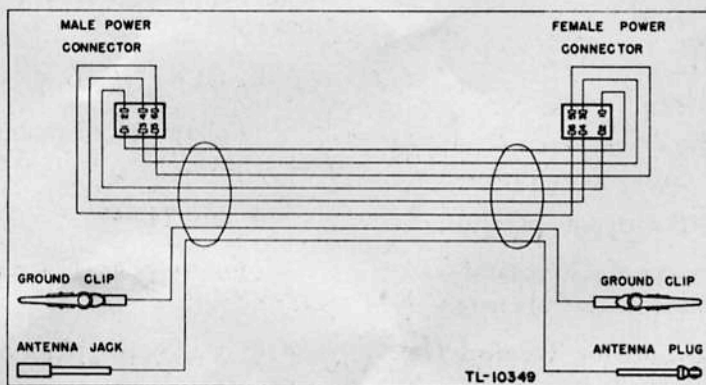


Figure 55. Circuit test cable.

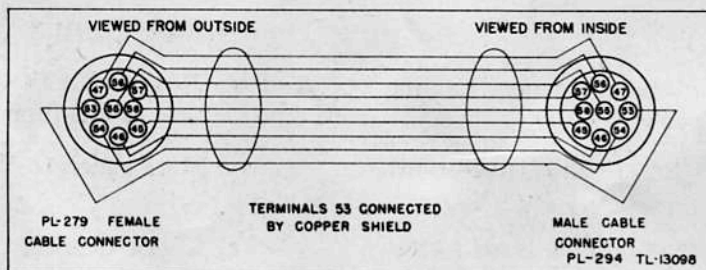


Figure 56. Circuit of Cord CD-1086 (7 ft. or 44 in.).

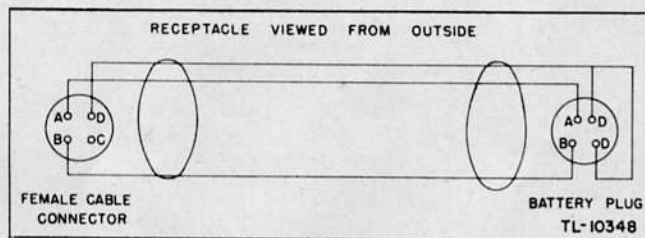


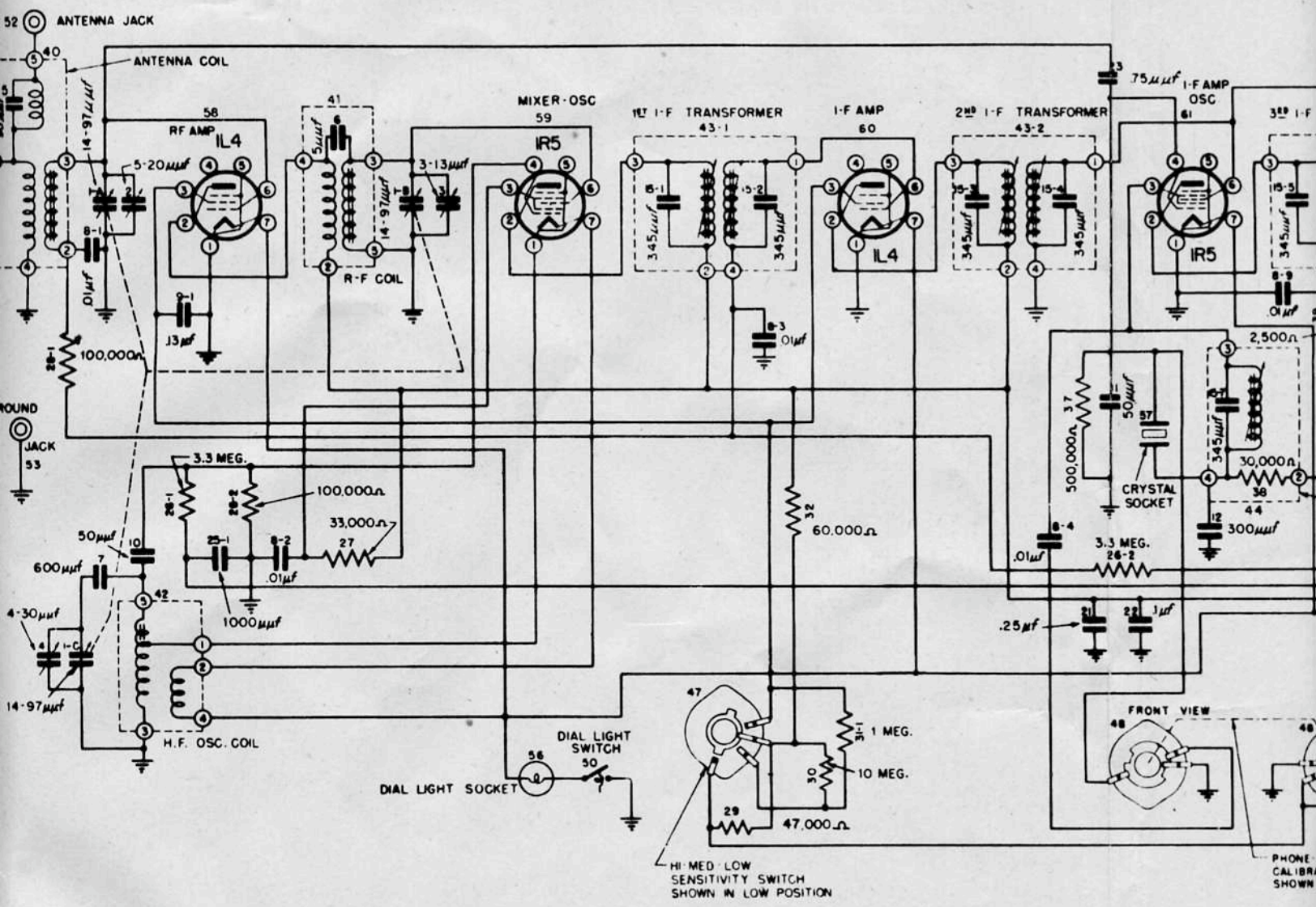
Figure 57. Circuit of Cord CD-1119.

## PARTS IDENTIFICATION FOR RECEIVER OF RADIO RECEIVER AND TRANSMITTER BC-1306

1-A	Capacitor	Ganged	{	variable air, 14-97 $\mu\mu\text{f}$	
1-B	Capacitor			variable air, 14-97 $\mu\mu\text{f}$	
1-C	Capacitor			variable air, 14-97 $\mu\mu\text{f}$	
2	Capacitor, variable, ceramic,			5-20 $\mu\mu\text{f}$	
3	Capacitor, variable, ceramic,			3-13 $\mu\mu\text{f}$	
4	Capacitor, variable, ceramic,			4-30 $\mu\mu\text{f}$	
5	Capacitor, ceramic,			90 $\mu\mu\text{f}$	
6	Capacitor, ceramic,			5 $\mu\mu\text{f}$	
7	Capacitor, molded mica,			600 $\mu\mu\text{f}$	
8-1	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-2	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-3	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-4	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-5	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-6	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-7	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-8	Capacitor, molded paper,			.01 $\mu\text{f}$	
8-9	Capacitor, molded paper,			.01 $\mu\text{f}$	
9-1	Capacitor, oil paper,			.13 $\mu\text{f}$	
9-2	Capacitor, oil paper,			.13 $\mu\text{f}$	
9-3	Capacitor, oil paper,			.13 $\mu\text{f}$	
10	Capacitor, ceramic,			50 $\mu\mu\text{f}$	
11	Capacitor, ceramic,			50 $\mu\mu\text{f}$	
12	Capacitor, silver mica,			300 $\mu\mu\text{f}$	
13-1	Capacitor, ceramic,			100 $\mu\mu\text{f}$	
13-2	Capacitor, ceramic,			100 $\mu\mu\text{f}$	
14	Capacitor, ceramic,			250 $\mu\mu\text{f}$	
15-1	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
15-2	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
15-3	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
15-4	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
15-5	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
15-6	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
15-7	Capacitor, silver mica,			345 $\mu\mu\text{f}$	
16	Capacitor, silver mica,			200 $\mu\mu\text{f}$	
17	Capacitor, ceramic,			75 $\mu\mu\text{f}$	
18	Capacitor, ceramic,			1500 $\mu\mu\text{f}$	
19	Capacitor, mica spark plate,			250 $\mu\mu\text{f}$	
20	Capacitor, electrolytic,			1000 $\mu\text{f}$	
21	Capacitor, oil paper,			.25 $\mu\text{f}$	
22	Capacitor, molded paper,			.1 $\mu\text{f}$	
23	Capacitor, molded phenolic,			.75 $\mu\mu\text{f}$	
24	Capacitor, ceramic,			3 $\mu\mu\text{f}$	
25-1	Capacitor, ceramic,			1000 $\mu\mu\text{f}$	
25-2	Capacitor, ceramic,			1000 $\mu\mu\text{f}$	
25-3	Capacitor, ceramic,			1000 $\mu\mu\text{f}$	
26-1	Resistor, carbon,			3.3 megohm	
26-2	Resistor, carbon,			3.3 megohm	
27	Resistor, carbon,			33,000 ohm	
28-1	Resistor, carbon,			100,000 ohm	
28-2	Resistor, carbon,			100,000 ohm	
28-3	Resistor, carbon,			100,000 ohm	
*29	Resistor, carbon,			47,000 ohm	
30	Resistor, carbon,			10 megohm	
31-1	Resistor, carbon,			1 megohm	
31-2	Resistor, carbon,			1 megohm	
31-3	Resistor, carbon,			1 megohm	
31-4	Resistor, carbon,			1 megohm	
32	Resistor, carbon,			60,000 ohm	
33	Resistor, carbon,			1.25 megohm	
34-A	Resistor, variable, carbon,			1 megohm	
34-B	Resistor, variable, carbon,			1 megohm	
35	Resistor, carbon,			270,000 ohm	
36-1	Resistor, carbon,			25,000 ohm	
36-2	Resistor, carbon,			25,000 ohm	
37	Resistor, carbon,			500,000 ohm	
38	Resistor, carbon,			30,000 ohm	
39	Resistor, carbon,			2,500 ohm	
40	Coil Assembly, antenna				
41	Coil Assembly, R-f				
42	Coil Assembly, H-f osc.				
43-1	Transformer, I-f				
43-2	Transformer Assembly, I-f				
43-3	Transformer Assembly, I-f				
44	Coil Assembly, cal. osc.				
45	Coil Assembly, beat freq. osc.				
46	Transformer, audio output.				
47	Switch, HIGH-MED-LOW sensitivity				
48	Switch, PHONE-CW-NET-CAL.				
49	Switch, output imp. (250 and 4000 ohms)				
50	Switch, dial light				
51-1	Jack, phone				
51-2	Jack, phone				
52	Jack, antenna connector				
53	Jack, ground				
54	Plug, male, 6 pin power				
55	Voltage Reg. (selenium rectifier)				
56	Socket, dial light				
57	Socket, 200 kc crystal				
58	Socket, R-f amplifier tube, 1L4				
59	Socket, converter-osc. tube, 1R5				
60	Socket, 1st I-f amp. tube, 1L4				
61	Socket, 2nd I-f amp.-cal. osc. tube 1R5				
62	Socket, diode audio amp. tube, 1S5				
63	Socket, audio output tube				

\*Resistor 29, in equipments serial No. 1 to No. 211, was 20,000 ohms. Equipments bearing serial No. 1 to No. 211 must be modified in the field by changing Resistor 29 to 47,000 ohms, = 10W,  $\frac{1}{2}$  watt, to improve the low output characteristics of the calibration oscillator.





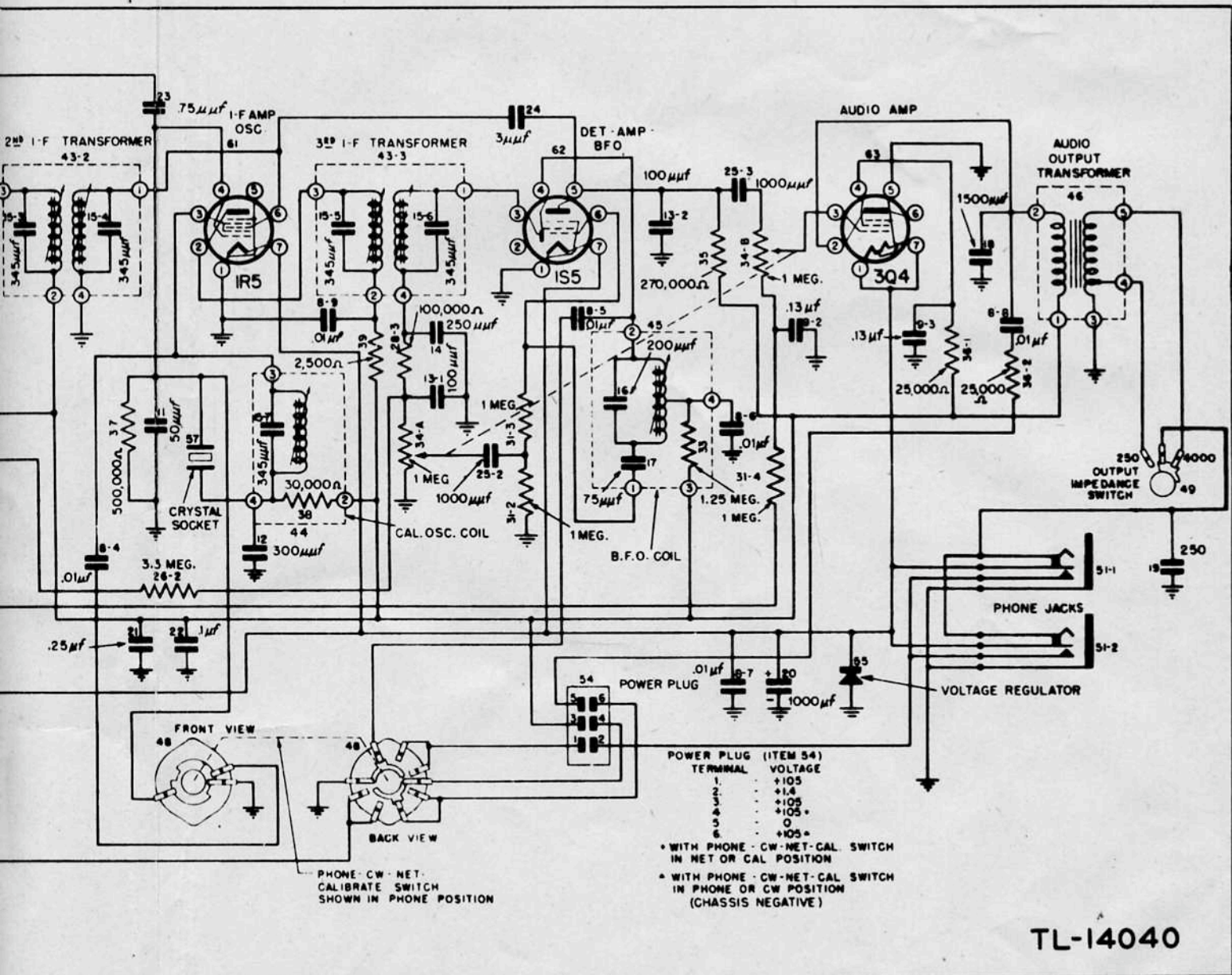
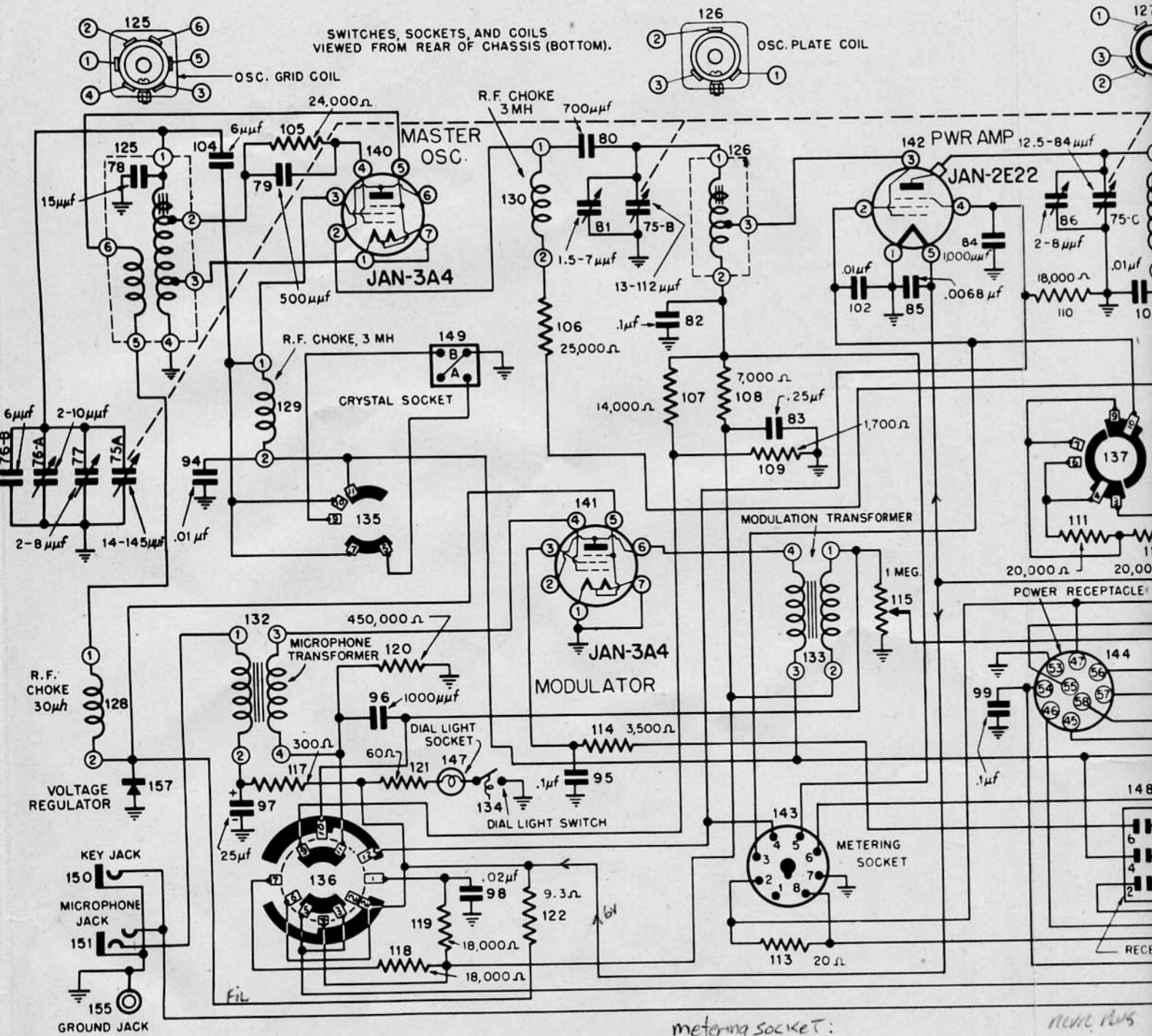


Figure 58. Schematic diagram, receiver of Radio Receiver and Transmitter BC-1306.

## PARTS IDENTIFICATION, TRANSMITTER OF RADIO RECEIVER AND TRANSMITTER BC-1306

74	Capacitor, oil paper, .25 $\mu\text{f}$	115	Resistor, variable, carbon, 1 megohm
75-A	Capacitor } Ganged { variable, air 14-145 $\mu\text{f}$	117	Resistor, carbon, 300 ohm
75-B	Capacitor } Tuning { variable, air 13-112 $\mu\text{f}$	118	Resistor, carbon, 18,000 ohm
75-C	Capacitor } Cond. { variable, air 12.5-84 $\mu\text{f}$	119	Resistor, carbon, 18,000 ohm
76-A	Capacitor, variable, air, 2-10 $\mu\text{f}$	120	Resistor, carbon, 450,000 ohm
76-B	Capacitor, temp. comp., 6 $\mu\text{f}$	121	Resistor, carbon, 60 ohm
77	Capacitor, variable air, 2-8 $\mu\text{f}$	122	Resistor, wire wound, 9.3 ohm
78	Capacitor, ceramic, 15 $\mu\text{f}$	124	Coil, ant. loading
*79	Capacitor, mica, 500 $\mu\text{f}$	125	Coil, osc. grid
80	Capacitor, mica, 700 $\mu\text{f}$	126	Coil, osc. plate
81	Capacitor, variable ceramic, 1.5-7 $\mu\text{f}$	127	Coil, P. A. plate
82	Capacitor, molded paper, .1 $\mu\text{f}$	128	Coil, R-f choke, 30 $\mu\text{h}$
83	Capacitor, oil, paper, .25 $\mu\text{f}$	129	Coil, R-f choke, 3 mh
84	Capacitor, ceramic, 1000 $\mu\text{f}$	130	Coil, R-f choke, 3 mh
85	Capacitor, ceramic, .0068 $\mu\text{f}$	131	Coil, ant. tuning
86	Capacitor, variable, air, 2-7 $\mu\text{f}$	132	Transformer, microphone
87	Capacitor, mica, .003 $\mu\text{f}$	133	Transformer, modulation
88	Capacitor, 152 to gnd., 6 $\mu\text{f}$	134	Switch, dial light
91	Capacitor, ceramic, 90 $\mu\text{f}$	135	Switch, M. O.-CRYSTAL
92	Capacitor, ceramic, 115 $\mu\text{f}$	136	Switch, C. W.-M. C. W.-PHONE
93	Capacitor, ceramic, 135 $\mu\text{f}$	137	Switch, HIGH-MED.-LOW
94	Capacitor, molded paper, .01 $\mu\text{f}$	138	Switch, SEND-STANDBY-OFF
95	Capacitor, molded paper, .1 $\mu\text{f}$	139	Switch, ANT. SELECTOR
96	Capacitor, ceramic, 1000 $\mu\text{f}$	140	Socket, M. O. tube, 3A4
97	Capacitor, electrolytic, 25 $\mu\text{f}$	141	Socket, mod. tube, 3A4
98	Capacitor, molded paper, .02 $\mu\text{f}$	142	Socket, P. A. tube, 2E22
99	Capacitor, molded paper, .1 $\mu\text{f}$	143	Socket, metering
100	Capacitor, molded paper, .1 $\mu\text{f}$	144	Receptacle, 9 pin power
101	Capacitor, molded paper, .01 $\mu\text{f}$	145	Receptacle, 4 pin battery
102	Capacitor, molded paper, .01 $\mu\text{f}$	146	Socket, reg. tube, VR-105-30
104	Capacitor, ceramic, 6 $\mu\text{f}$	147	Socket, dial light
105	Resistor, carbon, 24,000 ohm	148	Plug, 6 pin, rec. power
106	Resistor, wire wound, 25,000 ohm	149	Socket, 4 pin, crystals
107	Resistor, carbon, 14,000 ohm	150	Jack, key
108	Resistor, carbon, 7,000 ohm	151	Jack, microphone
109	Resistor, carbon, 1,700 ohm	152	Socket, neon lamp
110	Resistor, carbon, 18,000 ohm	154	Jack, receiver ant.
111	Resistor, wire wound, 20,000 ohm	155	Jack, ground
112	Resistor, wire wound, 20,000 ohm	156	Relay, keying
113	Resistor, carbon, 20 ohm	157	Voltage Reg. (selenium rect.)
114	Resistor, carbon, 3,500 ohm	158	Post, antenna

\*Capacitor 79, in those sets containing a 1,000  $\mu\text{f}$  capacitor, must be changed to 500  $\mu\text{f}$ .

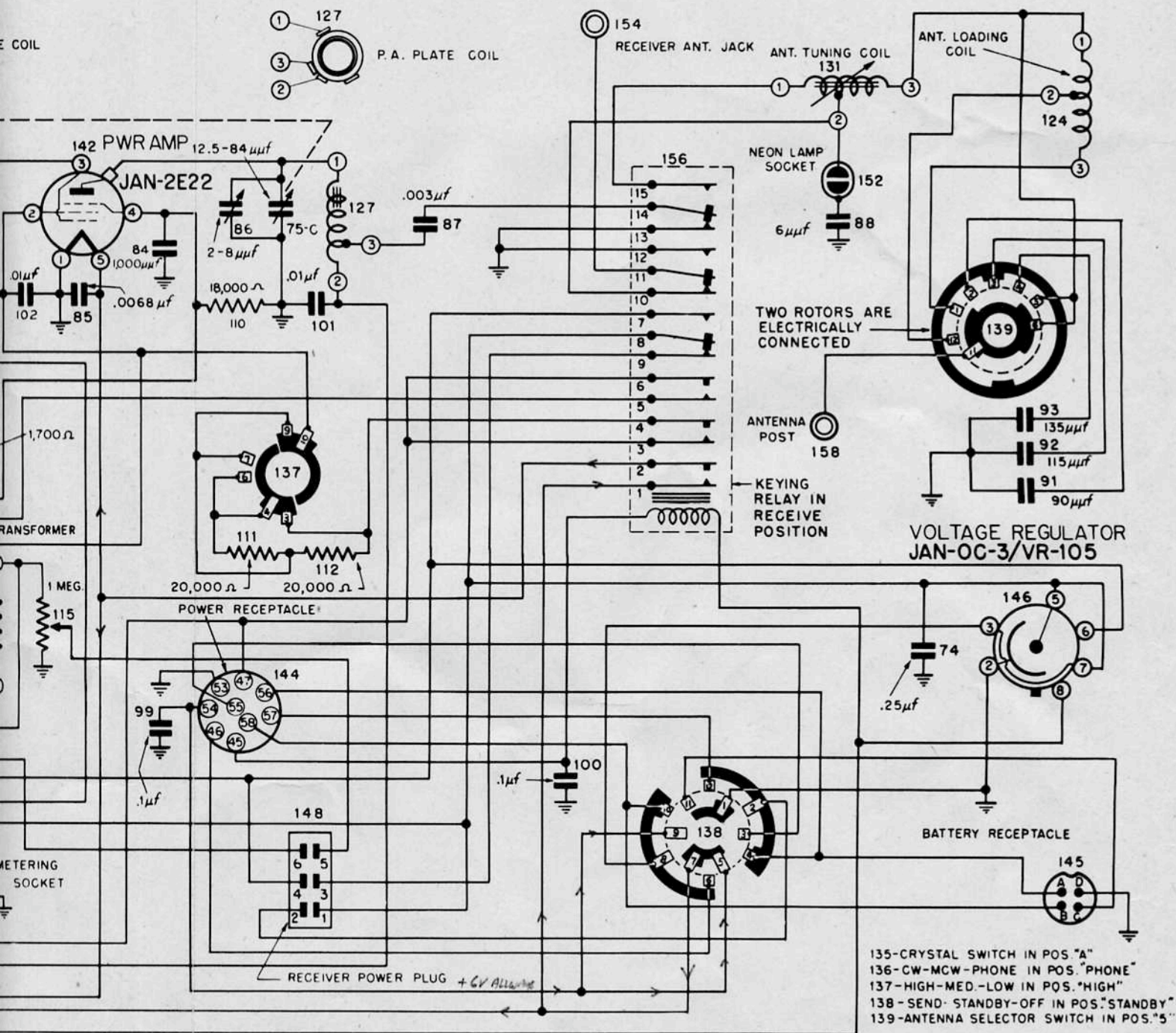


SWITCHES, SOCKETS, AND COILS VIEWED FROM REAR OF CHASSIS (BOTTOM).



metering socket:

- 2 - B Final Ip (ma = Vx50)
  - 3 - PA screen VOLTAGE (180V)
  - 4 - PA suppressor bias (-45V)
  - 5 - PA grid (drive, bias) (-60V)
  - 6 - RX PLATE B+ (+105V)
  - 8 - PA Ep (500)
- 1 +105  
 2 +1.4  
 3 +105  
 4 +105 when  
 5 φ - (AV)  
 6 +105 when



**TL-14041**

Figure 59. Schematic diagram, transmitter of Radio Receiver and Transmitter BC-1306.

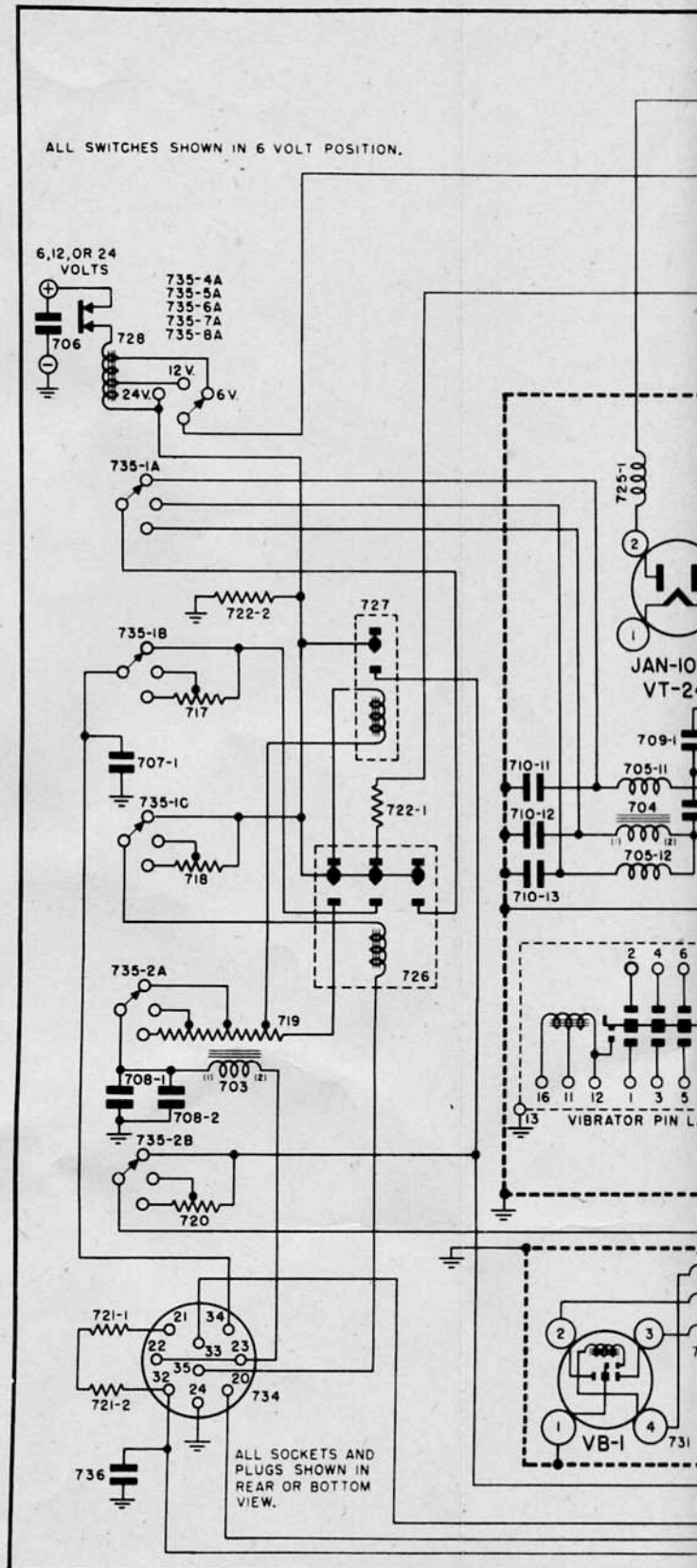
*NEVIC PLUGS*  
 1 +105  
 2 +1.4  
 3 +105  
 4 +105 when "Phone-cw-NET-CAL" SW IN "NET" OR "CAL" POSITION  
 5 φ (AUDIO FM RATE OF AUDIO OUT VIA 25K AND .01) CALLED "SIDETONE"  
 6 +105 when "Phone-cw-NET-CAL" SW IN "PHONE" OR "CW" POSITION

GREEN VOLTAGE (180V)  
 PRESSOR BIAS (-45V)  
 DRIVE BIAS (-60V)  
 PLATE B+ (+105V)  
 A (500)

135-CRYSTAL SWITCH IN POS. "A"  
 136-CW-MCW-PHONE IN POS. "PHONE"  
 137-HIGH-MED.-LOW IN POS. "HIGH"  
 138-SEND-STANDBY-OFF IN POS. "STANDBY"  
 139-ANTENNA SELECTOR SWITCH IN POS. "5"

## PARTS IDENTIFICATION, VIBRATOR POWER UNIT PE-237.

700-1 to 700-5	Transformer-Transmitter Power.
701	Transformer-Receiver filament.
702-1	Transformer-Receiver power.
702-2	Choke; Transmitter filament—7.5 mh.
702-3	Choke, Transmitter "B"—0.5 hv.
702-4	Choke, Receiver "B"—15 hv.
703	Choke, Receiver filament—0.1 hv.
704	Reactor-Vibrator driving coil.
705-1 to 705-15	Choke, Hash to 10 mh.
705-1 to 705-15	Choke, Hash 6 to 10 mh.
706	Capacitor-oil, .5 mfd, 120 v, hash filter.
707-1 to 707-2	Capacitor-electrolytic, 80 mfd, 50 v, filter.
707-2, 3	Capacitor-electrolytic, 40 mfd, 300 v, filter.
708-1, 2	Capacitor-electrolytic, 500 mfd, 25 v, filter.
709-1, 2	Capacitor-oil, 1.0 mfd, 200 v, filter.
710-1 to 710-16	Capacitor-oil, .05 mfd, 120 v, hash filter.
711	Capacitor-oil, 0.5 mfd, 120 v, buffer.
712-1, 2	Capacitor, electrolytic, 1250 mfd, 10 v, filter.
713	Capacitor-oil, 0.5 mfd, 660 v, a-c, Constant voltage transformer.
714-1	Capacitor-oil, 0.5 mfd, 1000 v, filter.
714-2	Capacitor, oil, 3.5 mfd, 1000 v, filter.
715	Capacitor-oil, 4 mfd, 1000 v, filter.
716-1 to 716-5	Capacitor-oil, 1.25 mfd, 100 v, buffer.
717	Resistor, wire-wound, 36 ohms, 10 watts.
718	Resistor, wire-wound, 90 ohms, 10 watts.
719	Resistor, wire-wound, 46.91 ohms, 50 watts.
720	Resistor, wire-wound, 100 ohms, 10 watts.
721-1, 2	Resistor, wire-wound, 5000 ohms, 50 watts.
722-1, 2	Resistor, carbon, 2700 ohms, 2 watts.
723-1 to 723-5	Resistor, wire-wound, 15 ohms, 5 watts.
724	Resistor, wire-wound, adjustable, 1 ohm, 10 watts.
725-1 to 725-3	Choke-hash, 7 mh.
726	Relay-3 pole, 2 position, 30 ohm coil.
727	Relay-1 pole, 1 position, 3.6 ohm coil.
728	Circuit breaker-1 pole, 1 position.
729	Rectifier-selenium, full wave, 6.5 v, 2.0 amp.
730	Socket-tube, octal, phenolic.
731	Socket-wafer, 4 prong, for Vibrator VB-1.
732	Socket-phenolic, 17 prong, for Vibrator JV-0014.
733	Socket-tube, ceramic, 4 prong.
734	Socket-transmitter, connecting, 9 prong.
735-1A, 1B, 1C, 2A, 2B, 2C, 3A, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 6C, 7A, 7B, 7C, 8A, 8B, 8C	Switch-wafer, 3 pole, 3 position.
736	Capacitor-oil, .04 mfd, 1000 v, hash filter.
737	Resistor, carbon, 1000 ohms, 1/2 watt.
JAN-1006	Tube-glass, 4 prong, rectifier.
VT-249	
JAN-1005	Tube-metal, octal base, rectifier.
VT-195	





... IN 6 VOLT POSITION.

...  
...  
...  
...  
...  
...

... 06V

ALL SOCKETS AND PLUGS SHOWN IN REAR OR BOTTOM VIEW.

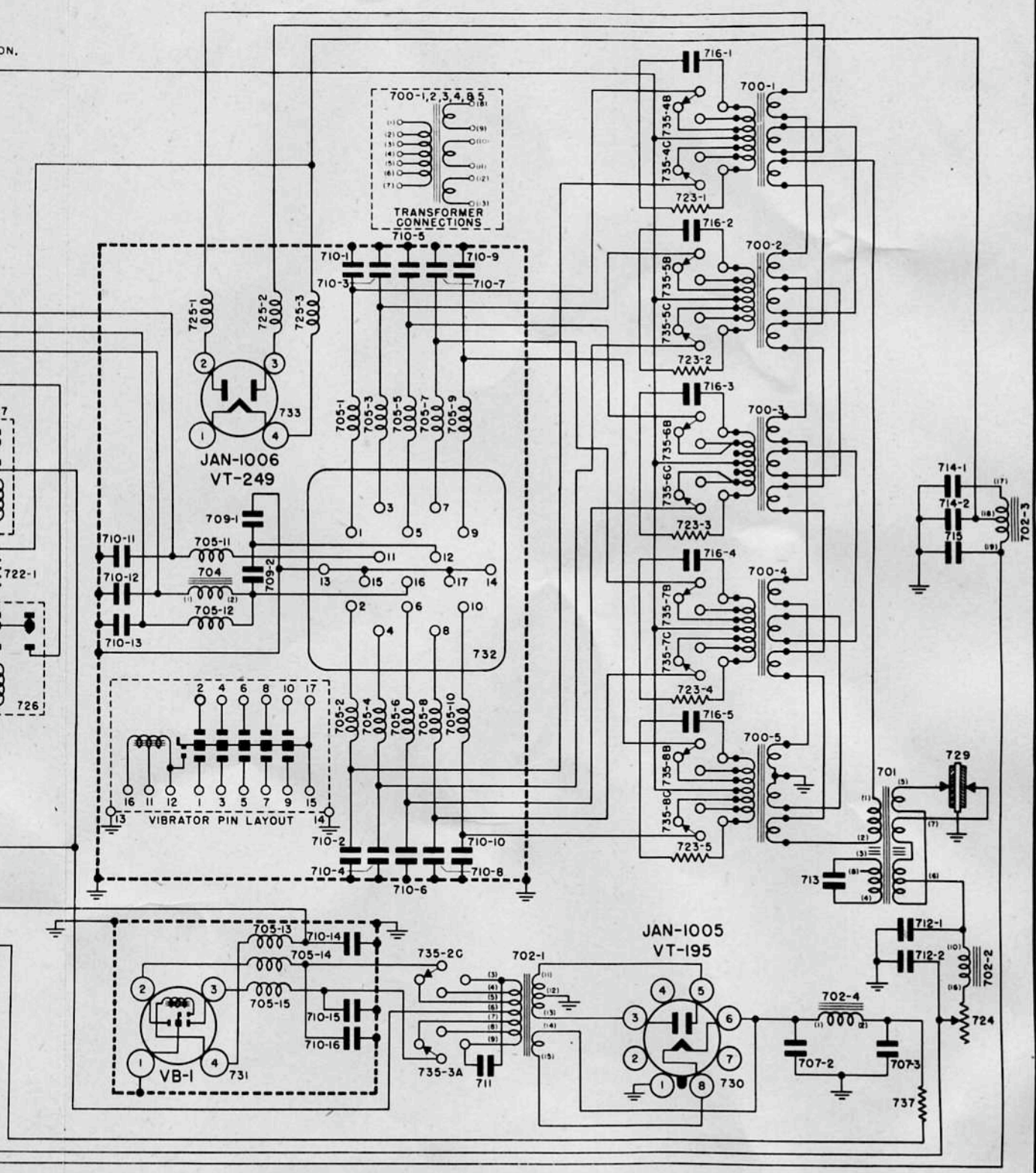
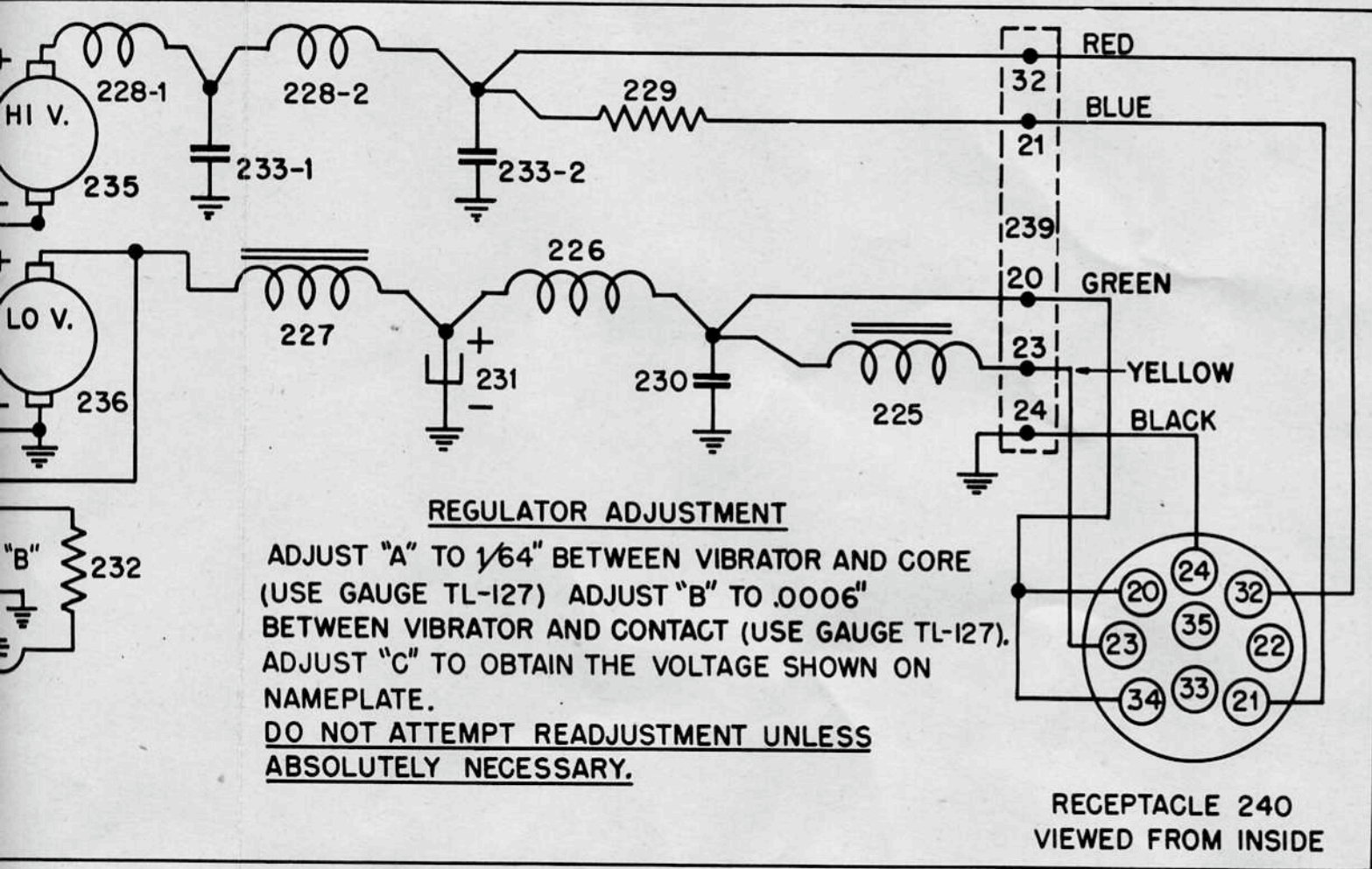
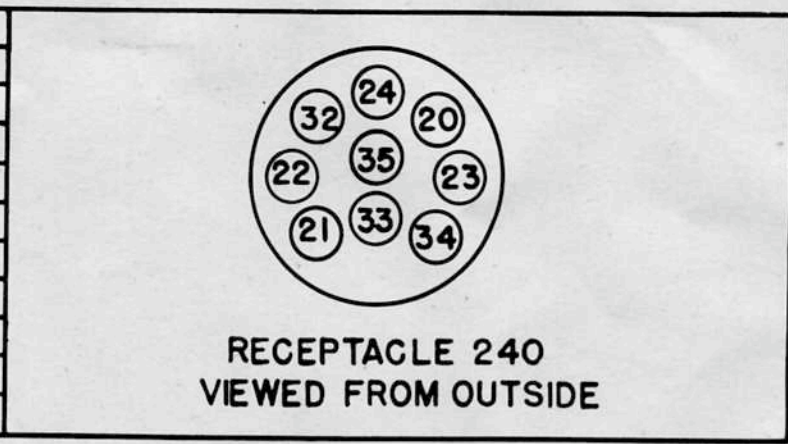


Figure 60. Schematic diagram, Vibrator Power Unit PE-237.

TL-14042



VOLTAGE	CIRCUIT
5.3	TRANSMITTER FILAMENTS
2.5	REC. AND TRANS. — 105 V.
5.3	REC. FILAMENT — 1.4 V.
E.G.	GROUND
2.5	TRANSMITTER B +
5.3	KEYING RELAY



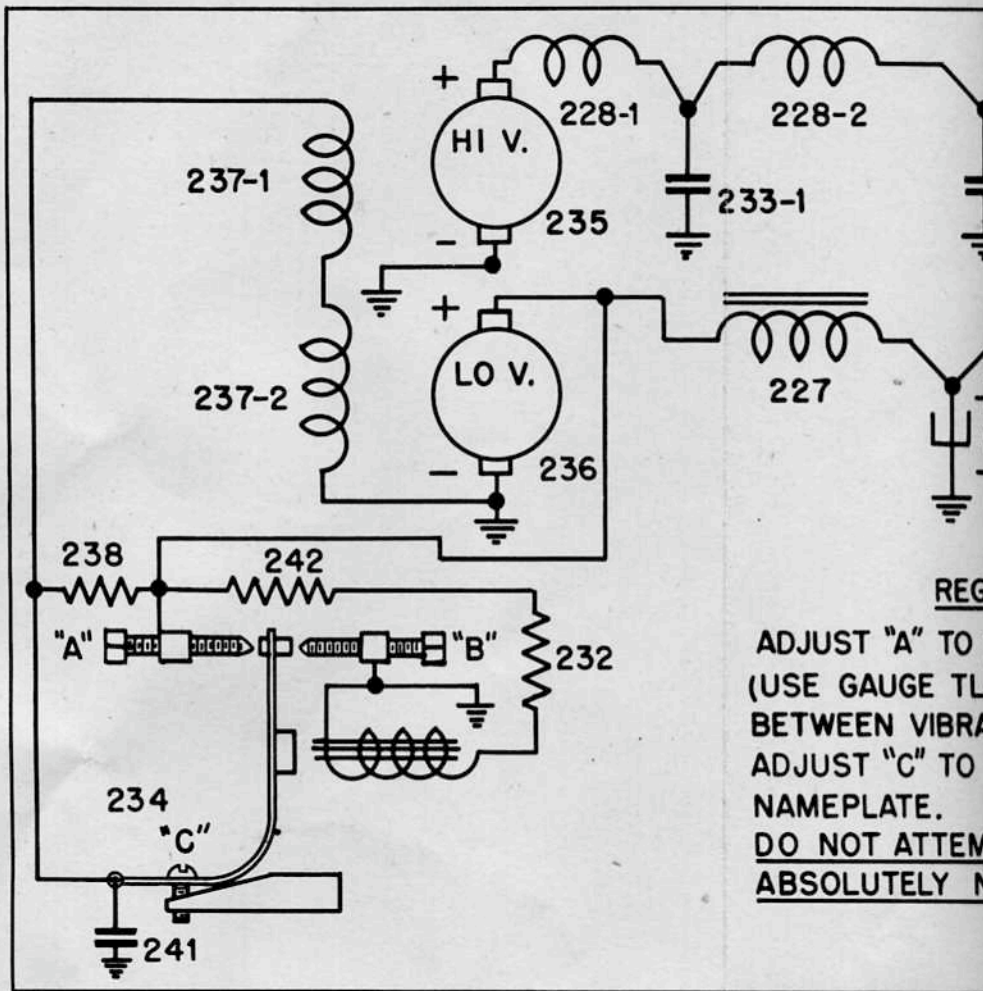
ART MEASUREMENTS MADE  
 H NO LOAD.

TL-14043

Figure 61. Schematic diagram, Generator GN-58.

**PARTS IDENTIFICATION, GENERATOR GN-58**

- 5 Choke, 22 mh, 10.6 ohms.
- 6 Choke, hash filter, 11 mh.
- 7 Choke, filament, 4 mh.
- 8-1 Choke, hash filter, 530 mh.
- 8-2 Choke, hash filter, 530 mh.
- 9 Resistor, wire-wound, 10000 ohm, 20 w.
- 0 Capacitor, oil, 0.5 mfd, 120 v.
- 1 Capacitor, electrolytic, 250 mfd, 10 v.
- 2 Resistor, temp. comp. 15 ohms.
- 3-1 Capacitor, oil, filter, 2 mfd, 600 v.
- 3-2 Capacitor, oil, filter, 2 mfd, 600 v.
- 4 Voltage regulator.
- 5 Armature (H.V. commutator and L.V. commutator).
- 7-1 Field coil.
- 7-2 Field coil.
- 8 Resistor, 3 ohm, 10 w.
- 9 Terminal board.
- 0 Receptacle, power.
- 1 Capacitor, 0.1 mfd, 200 v.
- 2 Resistor, 25 ohm, 10 w.



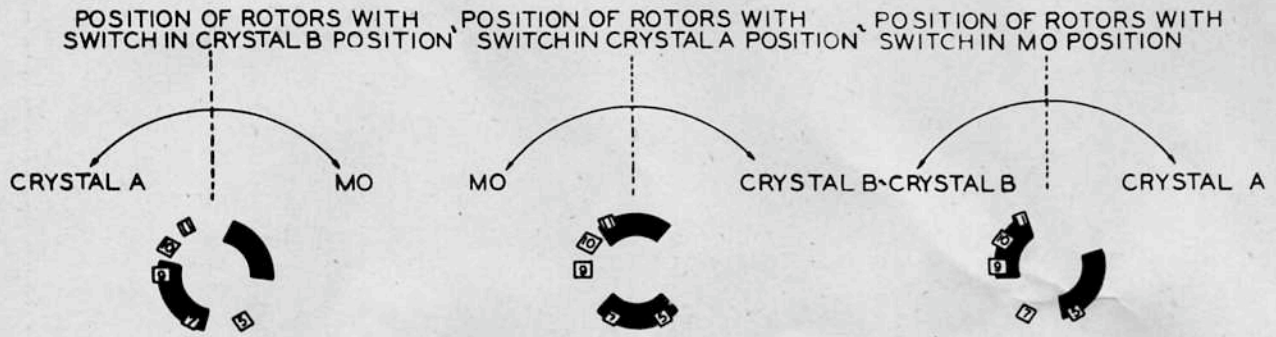
**REG**  
**ADJUST "A" TO**  
**(USE GAUGE TL**  
**BETWEEN VIBRA**  
**ADJUST "C" TO**  
**NAMEPLATE.**  
**DO NOT ATTEM**  
**ABSOLUTELY M**

TERMINAL	VOLTAGE	CIRCUIT
2 0	6.3	TRANSMITTER FILAMENT
2 1	4 2 5	REC. AND TRANS. — 10
2 2	—	—
2 3	6.3	REC. FILAMENT — 1.4
2 4	NEG.	GROUND
3 2	4 2 5	TRANSMITTER B +
3 3	—	—
3 4	6.3	KEYING RELAY
3 5	—	—

*W2005 -  
 5000 60000*

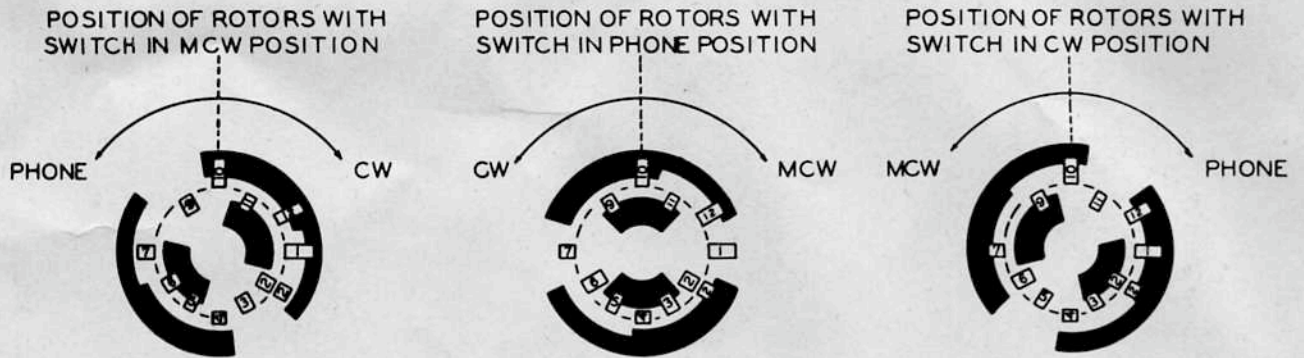
**VOLTAGE CHART MEASUREMENTS MADE WITH NO LOAD.**

SWITCH 135



NOTE:-  
ROTATION OF SWITCH AS VIEWED  
FROM BACK OF PANEL.

SWITCH 136

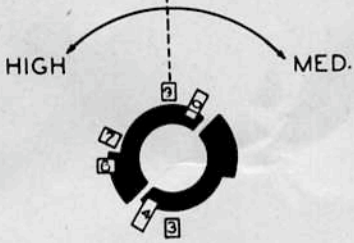


NOTE 1:-  
ROTATION OF SWITCH AS VIEWED  
FROM BACK OF PANEL.

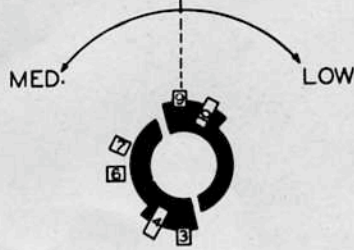
NOTE 2:-  
NO. 4 LUG HAS NO CONNECTION  
TO ROTORS. USED AS TIE LUG  
FOR RESISTOR 118 ONLY.

SWITCH 137

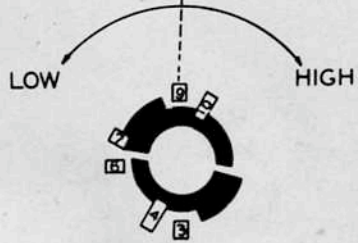
POSITION OF ROTORS WITH SWITCH IN LOW POSITION



POSITION OF ROTORS WITH SWITCH IN HIGH POSITION



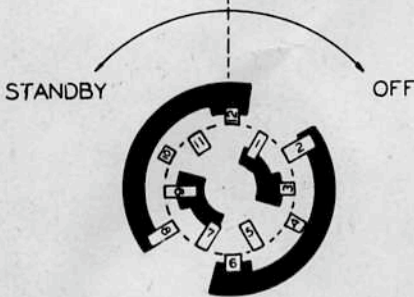
POSITION OF ROTORS WITH SWITCH IN MED. POSITION



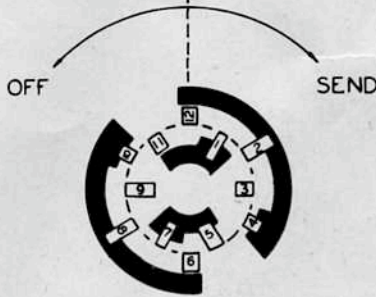
NOTE:-  
ROTATION OF SWITCH AS VIEWED  
FROM BACK OF PANEL.

SWITCH 138

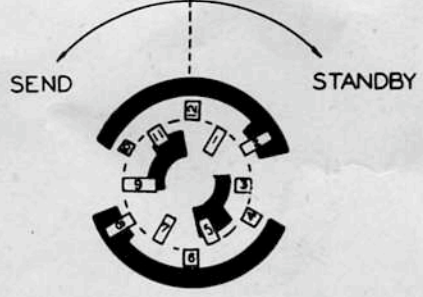
POSITION OF ROTORS WITH SWITCH IN SEND POSITION



POSITION OF ROTORS WITH SWITCH IN STANDBY POSITION



POSITION OF ROTORS WITH SWITCH IN OFF POSITION



NOTE:-  
ROTATION OF SWITCH AS VIEWED  
FROM BACK OF PANEL

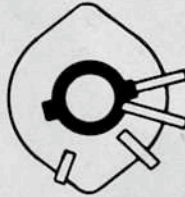
SWITCH 47

POSITION OF ROTOR WITH SWITCH IN LOW POSITION

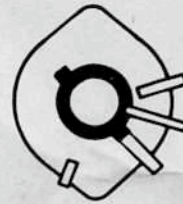


NO CONNECTION TO ROTOR IN ANY POSITION

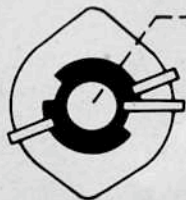
POSITION OF ROTOR WITH SWITCH IN HIGH POSITION



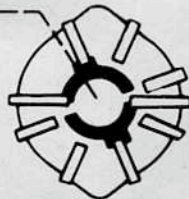
POSITION OF ROTOR WITH SWITCH IN MED. POSITION



SWITCH 48



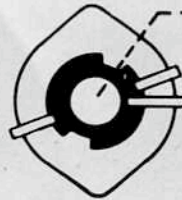
FRONT VIEW



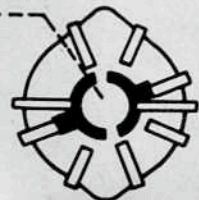
REAR VIEW

POSITION OF ROTORS WITH SWITCH IN PHONE POSITION

SWITCH 48



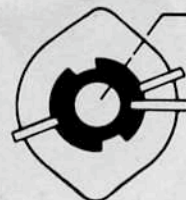
FRONT VIEW



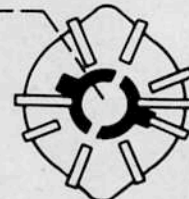
REAR VIEW

POSITION OF ROTORS WITH SWITCH IN NET POSITION

SWITCH 48



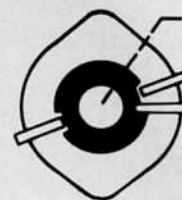
FRONT VIEW



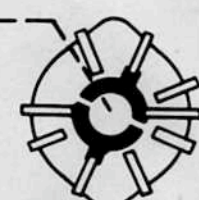
REAR VIEW

POSITION OF ROTORS WITH SWITCH IN CW POSITION

SWITCH 48



FRONT VIEW



REAR VIEW

POSITION OF ROTORS WITH SWITCH IN CAL POSITION

TL-14044

Figure 62. Transmitter and receiver switching data.

## SECTION V SUPPLEMENTARY DATA

### Par. 93. MAINTENANCE PARTS LIST FOR RADIO SET SCR-694-C (ANTENNA AND ACCESSORY GROUP).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per SCR-694-C
	2A275-160	ANTENNA AN-160.			*	*	*	*	1
	3A48	BATTERY BA-48.			*	*	*	*	1
	2Z5889-3	BULB, NEON JL-0011.			*	*	*	*	2
	3E1307A-5.5	CORD CD-307-A.			*	*	*	*	1
	3E1318A	CORD CD-318-A.			*	*	*	*	1
	3E1999-86	CORD CD-1086 (7 ft.).			*	*	*	*	1
	3E1604	CORD CD-604.			*	*	*	*	1
	3E1999-86-3.8	CORD CD-1086 (44 in.).			*	*	*	*	1
	3E1999-119	CORD CD-1119.			*	*	*	*	1
	3E1933-6	CORD CD-933.			*	*	*	*	1
	3E2076A	CORD CO-76-A (5 ft.).			*	*	*	*	1
	2A712	COUNTERPOISE CP-12.			*	*	*	*	1
	2A713	COUNTERPOISE CP-13.			*	*	*	*	1
	3H1407	CRANK GC-7.			*	*	*	*	2
	2Z3501-24	CRYSTAL UNIT DC-24.			*	*	*	*	1
	2X14	CRYSTAL HOLDER FT-243.			*	*	*	*	1
	3H2358	GENERATOR GN-58.			*	*	*	*	1
	2A1312	GUY GY-12.			*	*	*	*	1
	2A1336-42	GUY GY-42 (same as Guy GY-12 except two are used and hook is peened into a clamping ring).			*	*	*	*	2
	6Z4938	HALYARD M-378.			*	*	*	*	1
	6Z4939	HALYARD M-379.			*	*	*	*	1
	2B830	HEADSET HS-30.			*	*	*	*	1

\* Indicates stock available.

22 Par. 93. MAINTENANCE PARTS LIST FOR RADIO SET SCR-694-C (ANTENNA AND ACCESSORY GROUP)—Cont'd.

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per SCR-694-C
2B1300		INSERT M-300.			•	•	•	•	1
3G627		INSULATOR IN-127.			•	•	•	•	1
3Z3445		KEY J-45.			•	•	•	•	1
2Z6102A		LEG LG-2-A.			•	•	•	•	1
2Z6103		LEG LG-3.			•	•	•	•	2
2A2088-65		MAST BASE MP-65.			•	•	•	•	1
2A2090-50		MAST BRACKET MP-50.			•	•	•	•	1
2A2416		MAST SECTION MS-116-A.	3		•	•	•	•	6
2A2417		MAST SECTION MS-117-A.	1		•	•	•	•	2
2A2418		MAST SECTION MS-118-A.	1		•	•	•	•	2
2B1617		MICROPHONE T-17.			•	•	•	•	1
2B1645		MICROPHONE T-45.			•	•	•	•	1
2Z6721-482		MOUNTING FT-482.			•	•	•	•	1
2Z5971.1		PILOT LIGHT.			•	•	•	•	2
2Z7168		PLUG PL-68.			•	•	•	•	1
2C5395-1306		RADIO RECEIVER AND TRANSMITTER BC-1306.			•	•	•	•	1
2A3129		REEL RL-29.			•	•	•	•	1
2B1589/1		SHIELD.			•	•	•	•	1
2A3327A		STAKE GP-27-A.			•	•	•	•	4
3Z8109		SWITCH SW-109 (for all models except T-17-D).			•	•	•	•	1
3Z8217		SWITCH SW-217 (for T-17-D).			•	•	•	•	1
6D13087		TECHNICAL MANUAL TM 11-230C.			•	•	•	•	2
2J2E22		TUBE JAN-2E22.			•	•	•	•	1
2J3A4		TUBE JAN-3A4.			•	•	•	•	2
2J0C3/VR105		TUBE JAN-0C3/VR-105.			•	•	•	•	1
2J3Q4		TUBE JAN-3Q4. (VT-264).			•	•	•	•	1
2J1S5		TUBE JAN-1S5. (VT-172).			•	•	•	•	1



2J1L4	TUBE JAN-1L4.	.	.	.	.	.	.	.	2
2J1R5	TUBE JAN-1R5. (VT-171).	.	.	.	.	.	.	.	2
2J1005	TUBE JAN-1005. (VT-195).	.	.	.	.	.	.	.	1
2J1006	TUBE JAN-1006. (VT-249).	.	.	.	.	.	.	.	1
3Z10161	TERMINAL TM-161 (ring tip—solderless).	.	.	.	.	.	.	.	7
3Z10163	TERMINAL TM-163 (spade tip—solderless).	.	.	.	.	.	.	.	2
2B1589	UNIT MICROPHONE MC-419.	.	.	.	.	.	.	.	1
3H6800-237	VIBRATOR POWER UNIT PE-237.	.	.	.	.	.	.	.	1
1B128	WIRE W-128.	.	.	.	.	.	.	.	1

\* Indicates stock available.

Par. 94. MAINTENANCE PARTS LIST FOR RADIO RECEIVER AND TRANSMITTER BC-1306, (RECEIVER GROUP).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per BC-1306
1A-1C	3D9097V	CAPACITOR: variable; air, 14-97- $\mu$ mf; 500 peak volts; Oak 904-3-24.			•	•	•	•	1
2	2D9020V-8	CAPACITOR: variable; ceramic; 5-20- $\mu$ mf; 500 v dc; Erie TS2A, type N300.			•	•	•	•	1
3	3DK9013V-3	CAPACITOR: variable; 3-13- $\mu$ mf $\pm$ 20%; Erie TS2A, type N300.			•	•	•	•	1
4	3D9030V-6	CAPACITOR: variable; 4-30- $\mu$ mf; 500 v dc; Erie TS2A-N500.			•	•	•	•	1
5	3D9090-10	CAPACITOR: fixed; ceramic; 90- $\mu$ mf $\pm$ 3%; 300 v dc; Centralab 813.			•	•	•	•	1
7	3D9600-19	CAPACITOR: fixed; mica, 600- $\mu$ mf $\pm$ 10%; 300 v dc; Mica-mold OXM.			•	•	•	•	1
8	3D810-160.1	CAPACITOR: paper; fixed; 10,000- $\mu$ mf $\pm$ 20%; 120 v dc; Micamold 338-10, Philco 305-1523.			•	•	•	•	1
9	3DA130-5	CAPACITOR: fixed; paper; 130,000- $\mu$ mf $\pm$ 20%; 150 v dc; Gudeman 7015.			•	•	•	•	1
10	3D9050-49.4	CAPACITOR: fixed; ceramic; 50- $\mu$ mf $\pm$ 10%; 300 v dc; Erie type M.			•	•	•	•	1
11	3D9050-79.2	CAPACITOR: fixed; ceramic; 50- $\mu$ mf $\pm$ 5%; 300 v dc; Muter type B.			•	•	•	•	1
12	3D9300-8	CAPACITOR: fixed; mica; 300- $\mu$ mf $\pm$ 10%; 500 v dc; Mica-mold PO.			•	•	•	•	1
13	3D9100-126	CAPACITOR: fixed; ceramic; 100- $\mu$ mf $\pm$ 20%; 300 v dc; Muter type B.			•	•	•	•	1
14	3D9250-65	CAPACITOR: fixed; ceramic; 250- $\mu$ mf $\pm$ 20%; 500 v dc; Muter type B.			•	•	•	•	1
18	3DA1500-18	CAPACITOR: fixed; ceramic; 1,500- $\mu$ mf $\pm$ 20%; 300 v dc; Muter type B or 20.			•	•	•	•	1
19	3D9250-66	CAPACITOR: fixed; mica; 250- $\mu$ mf $\pm$ 10%; 300 v dc; Underwood CM-251E.			•	•	•	•	1
20	3DB1000-3	CAPACITOR: fixed; electrolytic; 1,000- $\mu$ f $\pm$ 50% $\pm$ 20%; 3 v dc; Magnavox 4376.			•	•	•	•	1
21	3DA250-88	CAPACITOR: fixed; paper; 250,000- $\mu$ mf $\pm$ 20%; 200 v dc; Gudeman 7016.			•	•	•	•	1
22	3DA100-209	CAPACITOR: fixed; paper; 100,000- $\mu$ mf $\pm$ 20%; 120 v dc; Micamold 340-22.			•	•	•	•	1



Par. 94. MAINTENANCE PARTS LIST FOR RADIO RECEIVER AND TRANSMITTER BC-1306 (Receiver Group)—Cont'd.

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per BC-1306
44	2C5395-1306/C12	COIL: r-f; osc; Rauland LL-0017.			•	•	•	•	1
45	2C5395-1306/T4	TRANSFORMER: r-f; Monarch LU-0002.			•	•	•	•	1
46	2Z9632.133	TRANSFORMER: audio-output; Rauland dwg. LO-0072; special; Standard Transformer Corp. 234-A7.			•	•	•	•	1
47	3Z9825-62.94	SWITCH: rotary; Oak type 26760-HI.			•	•	•	•	1
48	3Z9825-62.93	SWITCH: rotary; Oak type 26763-HI.			•	•	•	•	1
49	3Z9825-62.92	SWITCH: rotary; Oak type 26780-23.			•	•	•	•	1
50	3Z9824-42.1	SWITCH: pushbutton; Stackpole type SM.			•	•	•	•	1
51	2Z5598-7	JACK ASSEMBLY: phone; Rauland VG-0688.			•	•	•	•	1
52	2Z5598-5	JACK: banana type; Rauland VG-0624.			•	•	•	•	1
53	3Z635-12	BINDING POST: spring type; Amer. Rad. Hdwe. 1755.			•	•	•	•	1
54	2Z7227-2	PLUG: male; 6-prong; polarized; Jones P-306-AB.			•	•	•	•	1
55	3H4858-6	RECTIFIER: selenium dry disc; 1.4 v dc rating; filament voltage regulator; Fansteel QI 0360.			•	•	•	•	1
57	2Z8672.28	SOCKET: crystal; 2-contact; Cinch 9816.			•	•	•	•	1
58 63	2Z8799-19	SOCKET: miniature tube; 7-contact; low loss bakelite.			•	•	•	•	6
	2Z5816.21	KNOB: tuning; Rauland QP-0015.			•	•	•	•	1

\* Indicates stock available.

Par. 95. MAINTENANCE PARTS LIST FOR RADIO RECEIVER AND TRANSMITTER BC-1306 (TRANSMITTER GROUP).

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per BC-1306
73	3D9003-16.1	CAPACITOR: fixed; ceramic; 3- $\mu$ mf $\pm$ 10%; 500 v dc; Muter type A.			*	*	*	*	1
74	3DA250-88	CAPACITOR: fixed; paper; 250,000- $\mu$ mf $\pm$ 20%; 200 v dc; Gudeman 7016.			*	*	*	*	2
75A-75C	3D9145V-3	CAPACITOR: variable; air; 3-section; Rauland CV-331.			*	*	*	*	3
76A-76B	3D9010V-6	CAPACITOR: variable; air; 2-section; 2- $\mu$ mf minimum, 10- $\mu$ mf maximum.			*	*	*	*	2
77	3D9008V-6	CAPACITOR: variable; air; 2-8- $\mu$ mf; Oak 884-AT.			*	*	*	*	1
78	3D9015-26	CAPACITOR: fixed; ceramic; 15- $\mu$ mf $\pm$ 5%; 500 v dc; Centralab 667-A.			*	*	*	*	1
79	3D9500-18	CAPACITOR: fixed; mica; 500- $\mu$ mf $\pm$ 10%; 500 v dc; Dubilier 5W.			*	*	*	*	1
80		CAPACITOR: fixed; mica; 700- $\mu$ mf $\pm$ 10%; 500 v dc; Dubilier 5W.			*	*	*	*	1
81	3D9001VE5-1	CAPACITOR: variable; ceramic; 1.5- $\mu$ mf minimum, 7- $\mu$ mf maximum.			*	*	*	*	1
82	3DA100-209.1	CAPACITOR: fixed; paper; 100,000- $\mu$ mf $\pm$ 10%; 120 v dc; Micamold 340-22.			*	*	*	*	1
84 96	3DA1-123	CAPACITOR: fixed; ceramic; 1,000- $\mu$ mf $\pm$ 10%; 500 v dc; Muter type B or 20.			*	*	*	*	2
85	3DA6.800-2	CAPACITOR: fixed; ceramic; 6,800- $\mu$ mf $\pm$ 30% - 20%; 300 v dc; Muter type D.			*	*	*	*	1
86	3D9015V-19	CAPACITOR: variable; air; 2-7 $\mu$ mf; 4,000 peak volts; Oak 886-AT.			*	*	*	*	1
87	3DA3-5	CAPACITOR: fixed; mica; 3,000- $\mu$ mf $\pm$ 10%; 750 v dc; Micamold "W."			*	*	*	*	1
91	3D9090-9	CAPACITOR: fixed; ceramic; 90- $\mu$ mf $\pm$ 5%; 3800 v ac; test; Rauland CC-900C.			*	*	*	*	1
92	3D9115	CAPACITOR: fixed; ceramic; 115- $\mu$ mf $\pm$ 5%; 3800 v ac; test; Rauland CC-111-XC.			*	*	*	*	1
93	3D9135-6	CAPACITOR: fixed; ceramic; 135- $\mu$ mf $\pm$ 5%; 3800 v ac; test; Rauland CC-131-XC.			*	*	*	*	1
94	3DA10-160.1	CAPACITOR: fixed; paper; 10,000- $\mu$ mf $\pm$ 20%; 120v dc; Micamold 338-10, Philco 305-1523.			*	*	*	*	1
95 99 100	3DA100-209	CAPACITOR: fixed; paper; 100,000- $\mu$ mf $\pm$ 20%; 120 v dc; Micamold 340-22.			*	*	*	*	3

\* Indicates stock available.

Par. 95. MAINTENANCE PARTS LIST FOR RADIO RECEIVER AND TRANSMITTER BC-1306 (Transmitter Group)—Cont'd

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per BC-1306
97	3DB25-34	CAPACITOR: fixed; electrolytic; 25- $\mu$ f +100% -10%; 25 v dc; Micamold 935-1.			•	•	•	•	1
98	3DA20-85	CAPACITOR: fixed; paper; 20,000- $\mu$ mf =20%; 300 v dc; Micamold 340-27, Rauland CP-203F.			•	•	•	•	1
101	3DA10-126.1	CAPACITOR: fixed; paper; 10,000- $\mu$ mf =10%; 1,000 v dc; Micamold 345-25.			•	•	•	•	1
102	3DA10-124.1	CAPACITOR: fixed; paper; 10,000- $\mu$ mf =20%; 600 v dc; Micamold 342.			•	•	•	•	1
103	3DA5-18	CAPACITOR: fixed; mica; 5,000- $\mu$ mf =10%; 500 v dc; Dubilier type IR or Aerovox 1464.			•	•	•	•	1
104	3D9006-10	CAPACITOR: fixed; ceramic; 6- $\mu$ mf =5%; 500 v dc; Centralab.			•	•	•	•	1
105	3Z6624-3	RESISTOR: 24,000-ohm =5%; 1/2-watt; Erie 504.			•	•	•	•	1
106	3Z6625-59	RESISTOR: fixed; wire-wound; 25,000-ohm =5%; 10-watt; Scientific Industries 279.			•	•	•	•	1
107	3Z6614-5	RESISTOR: fixed; carbon; 14,000-ohm =10%; 1-watt; Stackpole MB-1.			•	•	•	•	1
108	3Z6570-19	RESISTOR: fixed; carbon; 7,000-ohm =10%; 1/2-watt; Stackpole MB 1/2.			•	•	•	•	1
109	3Z6170-4	RESISTOR: fixed, carbon; 1,700-ohm =10%; 1/2-watt; Stackpole MB 1/2.			•	•	•	•	1
110	3RC21BE183K	RESISTOR: fixed; carbon; 18,000-ohm =10%; 1/2-watt; ASA type RC21BE183K.			•	•	•	•	3
111	3Z6620-71	RESISTOR: fixed; wire-wound; 20,000-ohm =5%; 10-watt; Scientific Industries 280.			•	•	•	•	2
112	3RC31AE200J	RESISTOR: fixed; carbon; 20-ohm =5%; 1-watt; Stackpole MB-1.			•	•	•	•	1
114	3Z6350-31	RESISTOR: fixed; carbon; 3,500-ohm =10%; 1/2-watt; Stackpole MB 1/2.			•	•	•	•	1
115	3Z6801-17	RESISTOR, POTENTIOMETER: single-section; 1-meg =20%; Chicago Tel. type LM.			•	•	•	•	1
117	3Z6030-76	RESISTOR: fixed; carbon; 300-ohm =20%; 1/2-watt; Stackpole MB 1/2.			•	•	•	•	1
120		RESISTOR: fixed; carbon; 450,000 ohms =10%; 1/2 watt; Stackpole MB 1/2.			•	•	•	•	1
121	3Z6006-17	RESISTOR: fixed; carbon; 60-ohm =10%; 1/2-watt; Stackpole MB 1/2.			•	•	•	•	1

122	3Z5999-3	RESISTOR: fixed; wire-wound on ceramic tube; 9.3-ohm = 2 1/2%; 5-watt; Scientific Industries 282.							1
124	2C5395-1306/C9	COIL: antenna r-f loading; Monarch LX-0007.							1
125	2C5395-1306/C11	COIL ASSEMBLY: osc grid tuning; Rauland LL-0018.							1
126	2C5395-1306/C8	COIL: r-f; doubler; Monarch LX-0011.							1
127	2C5395-1306/C10	COIL: power amplifier r-f plate; Monarch LX-0013.							1
128	3C323-34B	COIL: r-f choke; Rauland LC-0080.							1
129	2C5395-1306/C5	COIL: r-f choke; S. W. Inductor Co. SW3475.							1
130	2C5395-1306/C1	COIL: r-f; choke; S. W. Inductor Co. SW3467.							1
131	2C5395-1306/C4	COIL: r-f; antenna tuning; Monarch VG-0579.							1
132	2Z9631.95	TRANSFORMER: input; a-f microphone; Stancor 234-A5.							1
133	2Z9634.39	TRANSFORMER: modulation; Stancor 234-A6.							1
134	3Z9824-42.1	SWITCH: pushbutton; Stackpole type SM.							1
135	3Z9825-62.81	SWITCH: rotary; Oak 25629-HI.							1
136	3Z9825-62.82	SWITCH: rotary; Oak 25630-HI.							1
137	3Z9825-62.88	SWITCH: rotary; Oak 25618-HI.							1
138	3Z9825-62.84	SWITCH: rotary; Oak 26671-HI.							1
139	3Z9825-62.85	SWITCH: rotary; Oak 26636-HI-C.							1
140	2Z8677.36	SOCKET: tube; miniature; 7-pin; Cinch 9834.							1
141	2Z8677.37	SOCKET: tube; miniature; 7-pin; Cinch CP-50103.							1
142	2Z8675.46	SOCKET: PA tube socket; 5-prong; Rauland VG-0109.							1
143	2Z8678.52	SOCKET: octal; 8-pin; Amphenol 74-8.							1
144	2Z7119.12	RECEPTACLE: plug; 9 male pins; Rauland VG-0838.							1
145	2Z8799-134	RECEPTACLE: Socket SO-134.							1
146	2Z8678.52	SOCKET: regulator tube; octal; Rauland ST-800E.							1
147	2Z5883-69	SOCKET ASSEMBLY: miniature bayonet; Rauland SL-0021.							1
148	2Z7227-2	SOCKET: male; polarized; Jones P-306-AB.							1
149	2Z8678	SOCKET: 4-contact (for 2 crystal units; marked A and B), center mounting hole; crystals each mount in two holes; Cinch Mfg. 9804; part of BC-650 of SCR-609-A and SCR-610-A.							1

\* Indicates stock available.

**Par. 95. MAINTENANCE PARTS LIST FOR RADIO RECEIVER AND TRANSMITTER BC-1306 (Transmitter Group)-Cont'd.**

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per BC-1306
150 151	2Z5598-6	JACK AND CABLE ASSEMBLY: microphone and key; Rauland VG-0634; special.			*	*	*	*	2
152	2Z5885-8	SOCKET ASSEMBLY: neon; candalabra bayonet; Drake lamp socket 628W, and nut Drake 60D.			*	*	*	*	1
154	2Z9401.35	JACK ASSEMBLY: banana type; Rauland VG-0631.			*	*	*	*	1
155	2Z5598-4	JACK: large banana type; Rauland BG 0315.			*	*	*	*	1
156	2Z7594	RELAY: keying; Auto E. Co. Z11247; C. P. Clare A-16214.			*	*	*	*	1
157	3H4858-7	RECTIFIER: selenium; dry disc; filament voltage regulator; 157 ma $\pm$ 13% at 76°F; Fansteel QJ-0361.			*	*	*	*	1
158	3Z774-5.1	POST: binding; screw-type; Rauland VG-1003.			*	*	*	*	1

\* Indicates stock available.



**Par. 96. MAINTENANCE PARTS LIST FOR VIBRATOR POWER UNIT PE-237.**

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per PE-237
	3E7173-1	BATTERY CABLE; 5 ft. long; lugs on each end; No. 4 gauge stranded; Rauland special dwg. VW-0173.			•	•	•	•	2
706	3DA450-2	CAPACITOR: fixed; paper; 450,000- $\mu$ f +14% -6%; 120 v dc; Rauland special CO-454.			•	•	•	•	1
710	3DA50-109	CAPACITOR: fixed; oil; 50,000- $\mu$ f +14% -6%; 120 v dc; Rauland special CO-503-C.			•	•	•	•	16
709	3DB1.205B	CAPACITOR: fixed; paper; dual; 1- $\mu$ f +14% -6%; 200 v dc; Rauland special CO-205-B.			•	•	•	•	1
716	3DB1A25-2	CAPACITOR: fixed; paper; 1.25- $\mu$ f +14% -6%; 100 v dc; Rauland special CO-125-A.			•	•	•	•	5
714	3DB3A5-2	CAPACITOR: fixed; paper; dual; 500,000- $\mu$ f and 3.5- $\mu$ f +14% -6%; 1,000 v dc; Rauland special CO-405-H.			•	•	•	•	1
715	3DB4-54.8	CAPACITOR: fixed; paper; 4- $\mu$ f +14% -6%; 1,000 v dc; Rauland special CO-405-G.			•	•	•	•	1
736	3DA40-16	CAPACITOR: fixed; paper; 40,000- $\mu$ f +14% -6%; 1,000 v dc; Rauland CO-403, special.			•	•	•	•	1
711	3DA500-24	CAPACITOR: fixed; paper; 500,000- $\mu$ f +14% -6%; 120 v dc; Rauland CO-504-N.			•	•	•	•	1
713	3DA500-160	CAPACITOR: fixed; paper; 500,000- $\mu$ f +14% -6%; 750 v dc; Rauland CO-504-P, special.			•	•	•	•	1
707	3DB80-2	CAPACITOR: fixed; electrolytic; 3-section; 40- $\mu$ f +40% -10%, 300 v dc; 40- $\mu$ f +40% -10%, 300 v dc; 80- $\mu$ f +40% -10%; 500 v dc; Rauland CE-167 special; Mallory F. P.			•	•	•	•	1
708	3DB500-14	CAPACITOR: fixed; electrolytic; dual; 500-500- $\mu$ f +40% -10%; 25 v dc ea section; Rauland CE-108-B, special; Mallory F. P.			•	•	•	•	1
712	3DB1250	CAPACITOR: fixed; electrolytic; dual; 1,250-1,250- $\mu$ f +40% -10%; 10 v dc ea section; Rauland CE-258, special; Mallory F. P.			•	•	•	•	1
328	3H900-50-9	CIRCUIT BREAKER: tapped to break at 15, 30, or 50 amps. =20%; Rauland D-0035.			•	•	•	•	1
703	3C323-34C	COIL: choke; filter; Rauland special LC-0101.			•	•	•	•	1
704	3C323-34F	COIL: choke; reactor; Rauland VG 1206.			•	•	•	•	1
725	3C323-34E	COIL: choke; Rauland LC-0126, special.			•	•	•	•	3

\* Indicates stock available.

### Par. 96. MAINTENANCE PARTS LIST FOR VIBRATOR POWER UNIT PE-237.—Cont'd.

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per PE-237
	2Z4868.58	GASKET: special Rauland QR-0053.			*	*	*	*	1
705	3C323-34D	REACTOR: choke coil; Rauland special LC-0099.			*	*	*	*	15
729	3H4858-8	RECTIFIER: selenium; 2 plates; 2 amps at 6.5 volts -40 to +50°C; Rauland JR-0009.			*	*	*	*	1
727	2Z7599-38	RELAY: single-pole, single-throw; D-0036, special; GM Lab. 12995.			*	*	*	*	1
726	2Z7591-9	RELAY: 3-pole, double-throw; Rauland D-0037; GM Lab 12996.			*	*	*	*	1
717	3Z6003F6-5	RESISTOR: fixed; wire-wound 36-ohm; tapped at 12 ohms ±5%; 10-watt; Rauland RW-2360.			*	*	*	*	1
719	3Z6004F6	RESISTOR: fixed; wire-wound 46.31-ohm; tapped at 3.6, 6.3, 19.6 ohms ±3%; 50-watt; Rauland RW-7460-X.			*	*	*	*	1
718	3Z6009-5	RESISTOR: fixed; wire-wound; 90-ohm; tapped at 30 ohms ±5%; 10-watt; Rauland RW2900.			*	*	*	*	1
720	3Z6010-129	RESISTOR: fixed; wire-wound; 100-ohm; tapped at 35 ohms ±4%; 10-watt; Rauland RW-2101.			*	*	*	*	1
721	3Z6500-144	RESISTOR: fixed; wire-wound; 5,000-ohm ±5%; 50-watt; Rauland RW-7502.			*	*	*	*	1
722	3Z6627-11	RESISTOR: fixed; carbon; 27,000-ohm ±10%; 2-watt; Rauland RC4273.			*	*	*	*	2
737	3RC20AE102K	RESISTOR: fixed; carbon; 1,000-ohm ±10%; ½-watt; Rauland RC2102.			*	*	*	*	1
723	3Z6001E5-24	RESISTOR: fixed; wire-wound; 15-ohm ±20%; 5-watt; Rauland RW-1150.			*	*	*	*	5
724	3Z4801-3	RESISTOR: adjustable; 1-ohm ±20%; 10-watt; Rauland RW-2010-X.			*	*	*	*	1
733	2Z8307-4	SHIELD: tube; Rauland JS-0065, special.			*	*	*	*	1
731	2Z8674.17	SOCKET: tube; 4-prong; Rauland ST-406-A.			*	*	*	*	1
730	2Z8674.71	SOCKET: vibrator; 4-prong; Rauland ST-400-C.			*	*	*	*	2
734	2Z8799-137.1	SOCKET: tube; 8-prong; Rauland ST-800-L.			*	*	*	*	2
734	2Z8679.6	SOCKET AND SHELL ASSEMBLY: 9 female contacts; Rauland VG-1172, special.			*	*	*	*	1
732	2Z8687-3	SOCKET: vibrator; Rauland QP-0156 special.			*	*	*	*	1

735-1	2Z8878-32	SPRING: Rauland AG-1604, special.											1
735-5	3Z9825-62.91	SWITCH: rotary; 9-pole; Oak type 26781-H3.											1
702	3Z9825-41.3	SWITCH: rotary; 15-pole; Rauland X-0131.											1
700	2Z9626.12	TRANSFORMER AND FILTER ASSEMBLY: Rauland VG-0945.											1
701	2Z9625-17	TRANSFORMER: Rauland LP-0120, special.											5
	2Z9614-42	TRANSFORMER: Rauland LP-0121, special.											1
	3H6693-2	VIBRATOR: non-synchronous; 6 v dc at 0.15 amps; 100 cps $\pm$ 7%; Rauland JV-0013.	1										1
	3H6694-11	VIBRATOR: non-synchronous; 6 v dc at 1.5 amps; 12 v dc at 0.55 amps; 24 v dc at 0.55 amps; 200 cps $\pm$ 2%; Rauland JV-0014.	1										1

\* Indicates stock available.

### Par. 97. MAINTENANCE PARTS LIST FOR GENERATOR GN-58.

NOTE: Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Ref symbol	Signal Corps stock No.	Name of part and description	Running spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock	Quan per GN-58
B-98-2	3H1632A/B1	BRUSH: assembly, high voltage, Milorganite #6782.	2						2
B-98-3	3H2358/B5	BRUSH: low voltage, copper-graphite, Milorganite #CM1F.	2						2
	3H1407	CRANK GC-7.							2
	6Q45127	GAUGE TL-127.							1
B-98-4	3H2358/D10	GENERATOR DRIVE ASSEMBLY: complete, Warwick Mfg. Corp. #84140.							1
B-98-5	3H2402A	GENERATOR UNIT: internal, Pioneer Gen-E-Motors #SF-20; Warwick Mfg. Corp. #383.							1
B-98-6	3Z6001E5-27	RESISTOR: 3 watt, 15 ohms, $\pm$ 15% negative temperature compensation, Warwick Mfg. Corp. #60709.							1

\* Indicates stock available.